

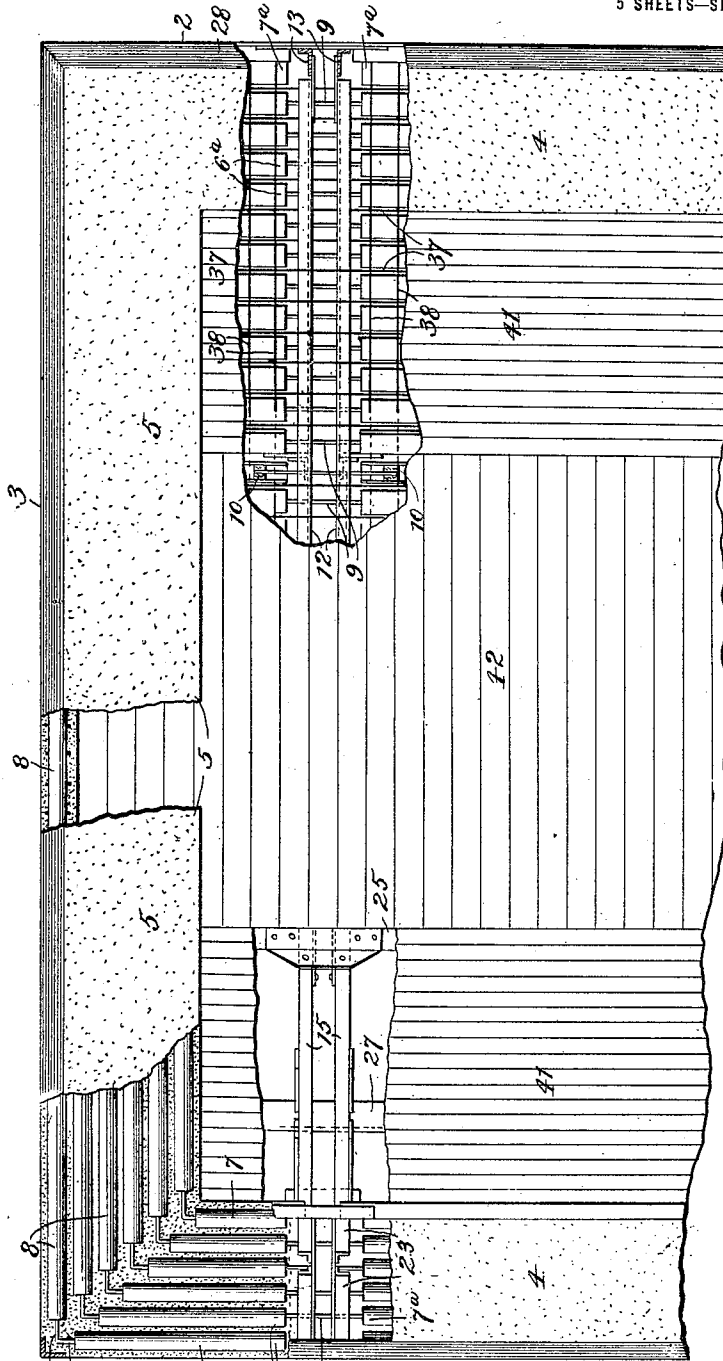
J. C. BRAESTRUP.
 REINFORCED CONCRETE FLOATING STRUCTURE.
 APPLICATION FILED FEB. 7, 1920.

1,371,846.

Patented Mar. 15, 1921.

5 SHEETS—SHEET 1.

Fig. 1.



Witness:

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 By *Milans & Milans*
 Attorneys:

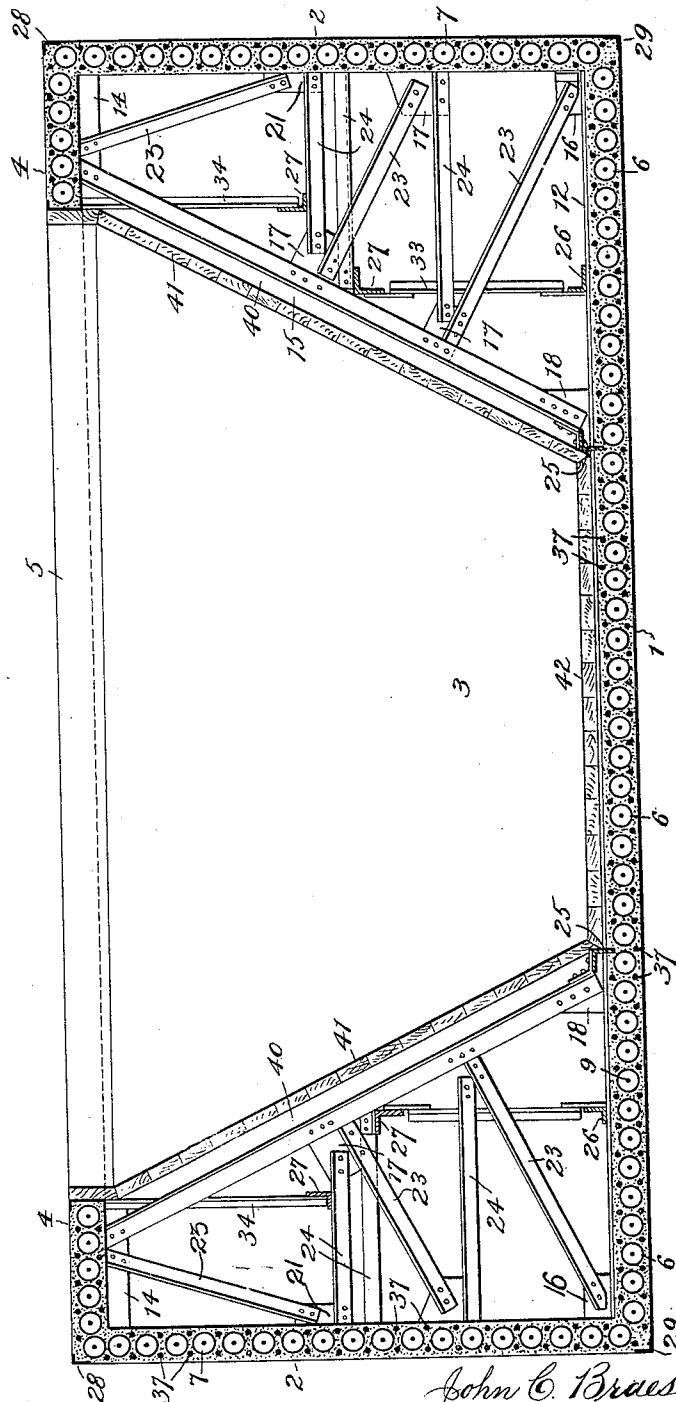
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5 SHEETS—SHEET 2.

Fig. 2



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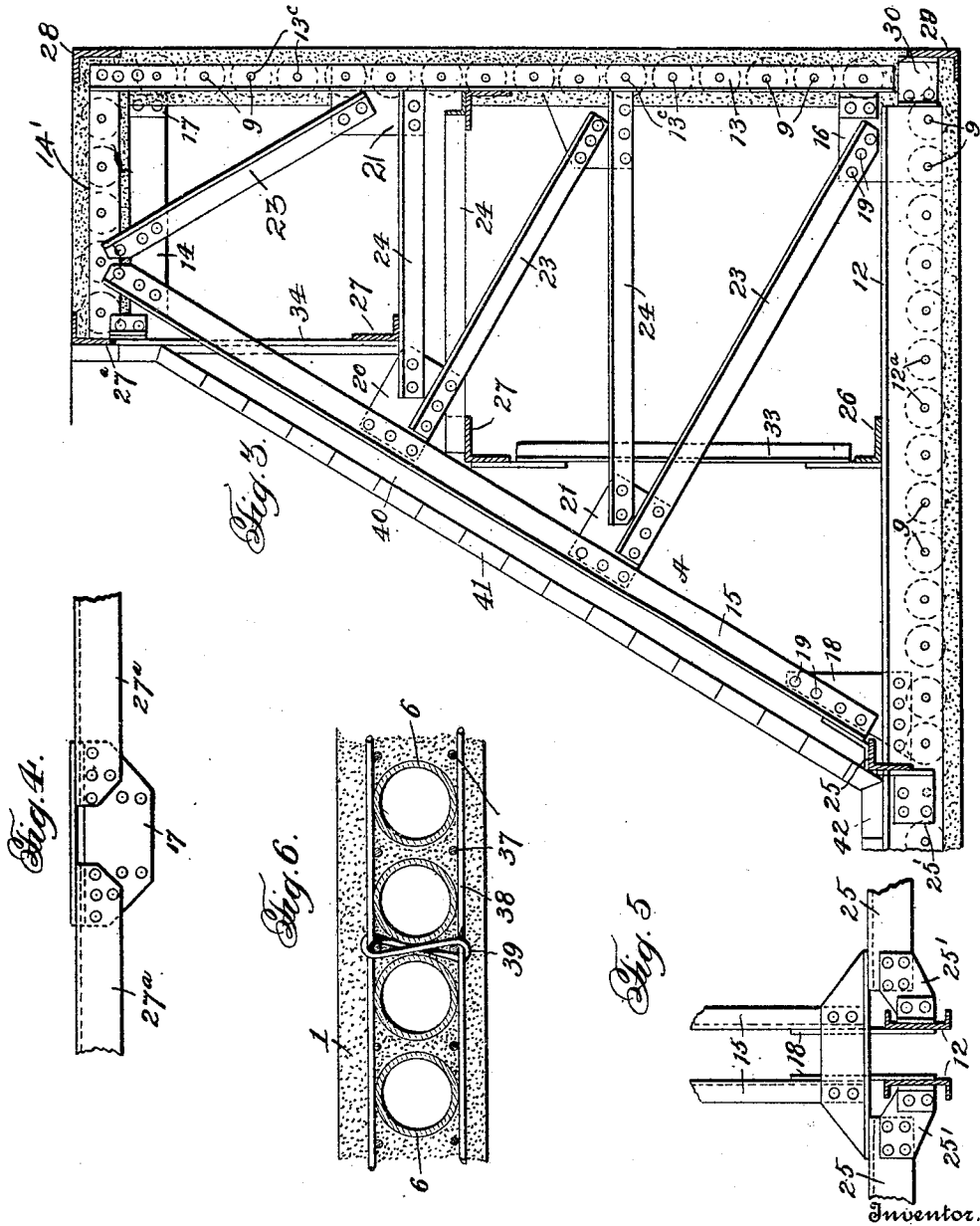
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5 SHEETS—SHEET 3.



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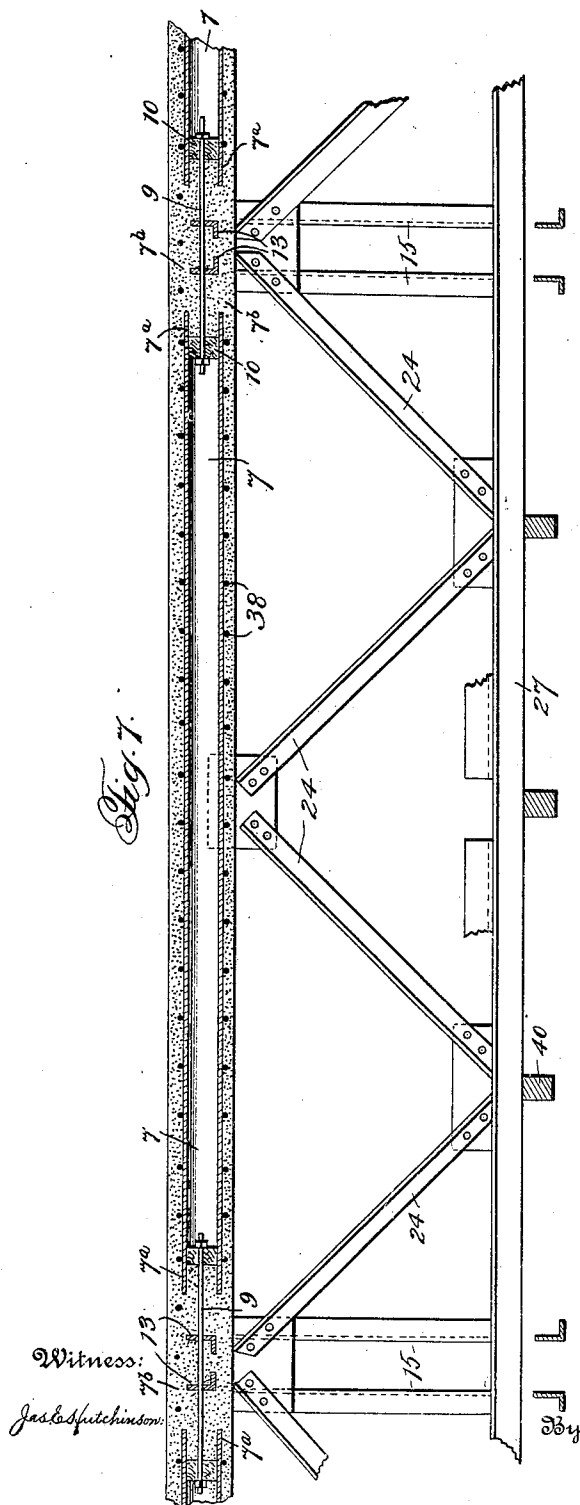
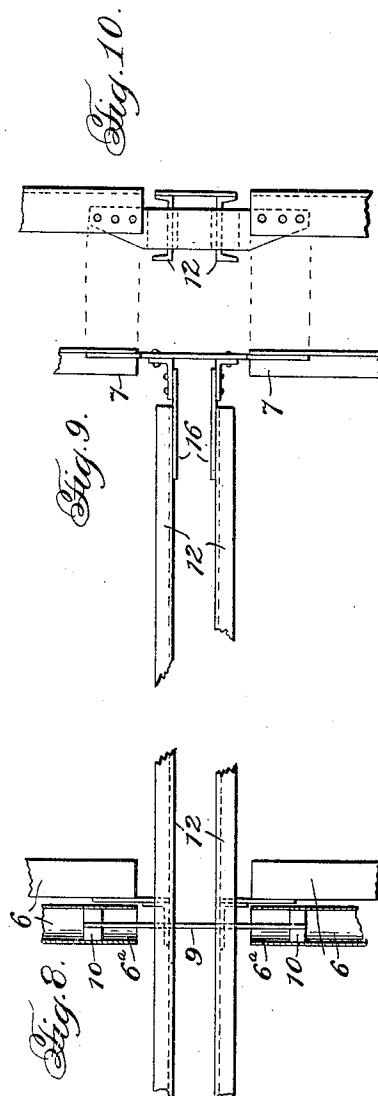
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5 SHEETS—SHEET 4.



Inventor:

John C. Braestrup

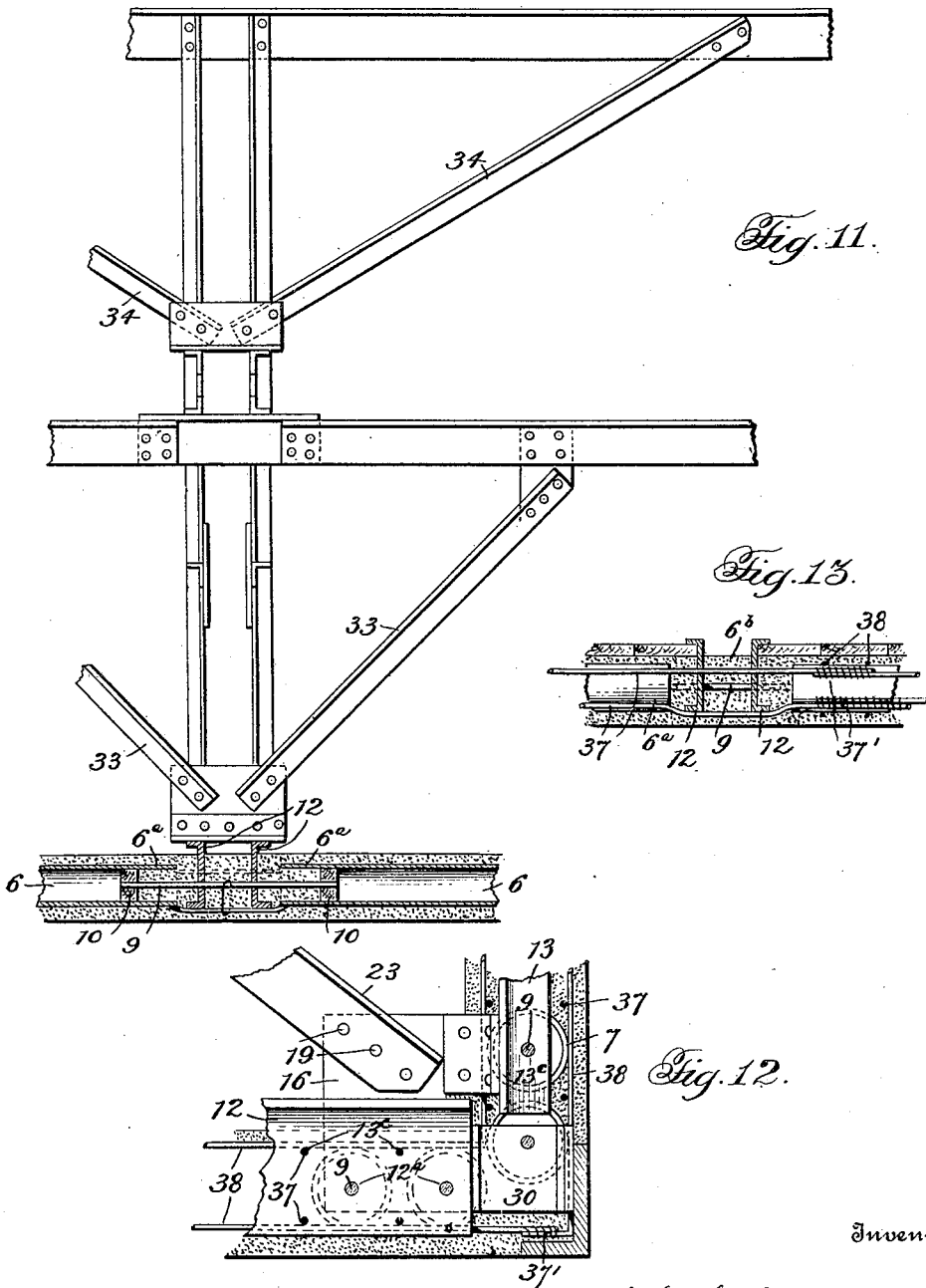
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5 SHEETS—SHEET 5.



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UNITED STATES PATENT OFFICE.

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REINFORCED CONCRETE FLOATING STRUCTURE.

1,371,846.

Specification of Letters Patent.

Patented Mar. 15, 1921.

Application filed February 7, 1920. Serial No. 357,010.

To all whom it may concern:

Be it known that I, JOHN C. BRAESTRUP, a citizen of the United States, residing at East Liberty, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Reinforced Concrete Floating Structures, of which the following is a specification, reference being had therein to the accompanying drawing.

This invention relates to improvements in reinforced concrete floating structures, such as barges, scows, ships, etc., and has for its object to provide an improved, strong, light, buoyant structure of this nature that can be produced at low cost.

An important novel characteristic of the invention resides in the special use of tubular reinforcing elements, the particular manner of interlocking the same in the concrete body and sealing the ends thereof, and their connection together.

Important features of the invention also lie in the special reinforcing frames provided, and the particular association and arrangement thereof with the tubular reinforcing elements, whereby great strength and load-carrying capacity is combined with lightness, and the structure can be easily and quickly built in courses.

The invention, with other objects and advantages thereof and the particular construction, combination and arrangement of parts comprising the same, will be understood from the hereinafter contained detailed description when considered in connection with the accompanying drawings forming part hereof and illustrating one embodiment of the invention.

In the drawings:

Figure 1 is a top plan view with parts shown in section of one end portion of a barge constructed in accordance with the present invention.

Fig. 2 is a transverse section.

Fig. 3 is a transverse section on an enlarged scale through one side of the construction.

Figs. 4 and 5 are detailed views of the connections between certain of the frame members.

Fig. 6 is a transverse section on an enlarged scale through a portion of the bottom.

Figs. 7, 8, 9, 10, 11, 12 and 13 are detailed views of certain parts of the construction.

The invention comprehends a hull for boats, barges, ships and the like constructed of concrete, with its walls largely formed hollow, and having rows or series of closely associated tubular reinforcing elements embedded in the walls thereof. Associated with the rows of tubular reinforcing elements are rows or sets of transverse and longitudinal reinforcing rods located adjacent opposite side faces thereof, and at intervals along the tubular reinforcing elements, are provided frames extending from side to side of the structure. Each tubular reinforcing element is made up of sections arranged end to end in spaced relation with portions of the concrete of the walls extending a short distance within the ends of the tubular sections, the transverse frames being located in the spaces between the ends of the sections of the tubular reinforcing elements. The transverse frames, which are connected together and partially embedded in the concrete bottom and side walls, serve to reinforce and truss the structure transversely, and also as means for positioning and supporting the other reinforcing elements during the building up process.

The present application is to be considered as a continuation of my application Serial No. 226,179, filed April 2, 1918, in so far as the subject matter is common to the two cases.

In the drawings, the invention is shown embodied in a barge structure having a bottom wall 1, side walls 2, end walls 3, and gunwale portions 4—5 along the sides and ends.

6 and 7 designate, respectively, the tubular reinforcing elements of the bottom and sides, and 8 those of the ends, the former extending longitudinally, while the reinforcing elements 8 of the ends extend transversely and are arranged to constitute continuations of the side reinforcing elements 7. The tubular reinforcing elements, which are preferably constructed of steel, are arranged in the walls in rows close together and are of a diameter about two inches less than the thickness of the walls. Each of the longitudinal reinforcing elements 6—7 is made up of sections arranged in longitudinal alignment in separated relation with end portions 6^a—7^a thereof filled up and sealed from each other by portions 6^b—7^b of the concrete walls. The sections of the tubular reinforcing elements 6—7 are connected together by

rods 9, said rods having their ends embedded in the portions 6^b—7^b of the concrete walls and connected with plugs 10, of wood or other suitable material, positioned within the tubular elements. Similar connections are provided between the end sections of the tubular reinforcing elements 8 of the end walls with the end portions of the tubular reinforcing elements 6—7, in this instance connecting rods having angularly related portions 13^a—13^b being employed. The sections of the several tubular reinforcing elements 6—7 are grouped, as shown, to leave spaces between the ends thereof extending completely across the bottom 1, side walls 2, and gunwale portions 3. At intervals along the longitudinal tubular reinforcing elements 6—7 at the spaces 11 between the ends of the sections, transverse frames are provided. The transverse frames are shown composed of pairs of lower horizontal channel bars 12 extending across and embedded in the bottom wall 1, pairs of vertical L-bars 13 in the side walls 2 secured at their lower ends to the ends of the horizontal channel bars 12, upper horizontal angle bars 14' secured at their outer ends to the upper ends of the vertical L-bars 13, and inclined truss members or struts consisting of pairs of angle bars 15 extending from the inner end portions of the upper horizontal bars 14 to the lower channel bars 12 intermediate the ends thereof, the connections between the members being made by suitable tie plates 16—17—18 and upper horizontal strips 14, the parts being secured by rivets, bolts or the like, 19 as shown. 20, 20' and 21 designate gusset plates to which are secured inclined and horizontal braces 23—24. The lower horizontal channel members 12 and vertical bars 13 are provided with rows of apertures 12^a—13^c to accommodate the intermediate connecting rods 9, said rods extending through the apertures in the bars from one group of tubular sections to another.

Extending between the transverse frames and connecting the same together at their bottom parts are intermediate L-bars 25, said bars being partially embedded in the bottom wall 1 and connected at opposite ends by tie plates 25' with the horizontal channel bars 12 of the transverse frames. 26, 27 and 27^a designate respectively intermediate L-bars, the bars 26 connecting adjacent channel bars 12, the L-bars 27^a being secured at opposite ends to the top portions 4 at the inner sides thereof, and the L-bars 27 being disposed about midway the top and bottom of the frames and secured at opposite ends to horizontal braces 24. 33, 34 are angle braces between the horizontal bars 27, 27^a and 28, 29 designate angle bars extending longitudinally between the frames at the outer corner portions of the structure, suit-

able tie plates 30 being provided between these parts.

Associated with the rows of tubular reinforcing elements 6, 7 and 8, in the bottom, sides, ends and gunwale portions are series of longitudinal reinforcing rods 37, and transverse reinforcing rods 38, the sets of reinforcing rods being embedded in the walls at the sides of the rows of tubular reinforcing elements. The longitudinal reinforcing elements 37 are made in sections and arranged so that the end portions of adjacent rod sections overlap at one side of the adjacent frames, and are connected by wrappings 37' of wire, as shown, (see especially Fig. 13 of the drawings). The sets of reinforcing rods at opposite sides are connected by tie wires 39, and the lower set of longitudinal rods 37 is connected with the rods 9 by wire ties 39', the upper set of rods 37 extending through openings in the channel bars 12, and the lower set of longitudinal rods 37 extending beneath the channels 12. On the inclined struts are arranged rafters 40, and secured thereto and upon the inclined struts are floor boards 41. 42 designates flooring extending over the bottom and across the channel bars 12.

In the building process, two or more of the transverse frames, connected together, are set up upon temporary supports with a temporary platform of boards at the under sides of the frames. The tubular reinforcing elements 6 and the sets of transverse and longitudinal reinforcing rods 37—38 of the bottom are first laid in place, and the concrete forced in and permitted to set in and about the same, and the horizontal channel bars 12 and intermediate connecting L-bars 25. In the laying of the tubular reinforcing elements the connecting rods 9 are passed through the rows of openings 12^a—13^a, in the horizontal channel bars 12 and vertical L-bars, the ends of the rods 9 passing through openings in the plugs 10 positioned in the end portions of the sections, the rods 9 and plugs 10 serving to support the sections of the tubular reinforcing elements and the position of the same being accurately determined by the rows of openings 12^a—13^a in the horizontal channel bars 12 and L-bars 13. The sides, ends and gunwale portions 3—4 are then built up in courses in like manner.

By the special construction and arrangement of parts hereinbefore described, a light buoyant structure of great strength and load-carrying capacity is afforded. The particular arrangement of the tubular reinforcing elements in rows close together with the sets of transverse and longitudinal reinforcing rods is important in providing walls that are largely hollow and of the requisite strength. The portions of the

concrete walls entering the ends of the sections of the tubular elements not only provides a secure interlock between the parts but also constitutes a seal for the ends of the sections, the resulting structure having a number of independent chambers, this particular construction possessing the advantage that if one part of the wall should be injured, the structure will not become waterlogged, and can be easily repaired. The transverse frames not only serve as reinforcing means but in addition are of advantage in accurately locating and supporting the other reinforcing elements during the building process, insuring the uniform distribution thereof throughout the completed structure.

While I have illustrated in the drawings, by way of example, a preferred embodiment of the invention, it will of course be understood that minor changes and variations in the particular construction shown, and the carrying out of the invention in the other forms as will appeal to those skilled in the art and falling within the scope of the appended claims, may be practised without departing from the spirit of the invention. In this connection, it will be understood that different forms of angle bars may be employed, that the tubular reinforcing elements may take other forms and be of different lengths, and that the number of transverse frames may be varied to meet different conditions.

What I claim is:—

1. A floating structure comprising a concrete hull and reinforcing means embedded in the walls thereof including a row of parallel longitudinally extending tubular reinforcing elements comprising sections in longitudinal alinement and with the ends separated, transversely extending reinforcing members located at intervals along the tubular reinforcing elements in the spaces between the sections thereof, and means connecting the sections of the tubular reinforcing elements to said transversely extending reinforcing members.

2. A floating structure comprising a concrete hull and reinforcing means embedded in the walls thereof including a row of parallel longitudinally extending tubular reinforcing elements, each of said tubular reinforcing elements comprising sections in longitudinal alinement and with the ends separated, transversely extending reinforcing frames located at intervals along the reinforcing elements in the spaces between the sections thereof, members extending between and connecting the transversely extending frames together, and means connecting the sections of the tubular reinforcing elements to said transversely extending reinforcing frames.

3. A floating structure comprising a con-

crete hull, and reinforcing means therefor including tubular reinforcing elements embedded in the walls thereof with portions of the concrete walls extending into end portions of said reinforcing elements and filling up and sealing the same.

4. A floating structure comprising a concrete hull and reinforcing means therefor embedded in the walls thereof including tubular reinforcing elements arranged end to end in separated relation, plugs positioned in adjoining end portions of the tubular elements beyond the ends thereof, and a rod connecting said plugs, the end portions of the tubular reinforcing elements located to the outer sides of said plugs being filled with concrete.

5. A floating structure comprising a concrete hull and reinforcing means embedded in the walls thereof including a series of parallel tubular reinforcing elements, each of said reinforcing elements comprising tubular sections arranged in longitudinal alinement and with the ends separated, with portions of the concrete of the wall of the hull extending into and filling up end portions of the tubular sections, and rows of rods at opposite sides of and extending at right angles to the series of tubular reinforcing elements.

6. A floating structure comprising a concrete hull and reinforcing means embedded in the walls thereof including a series of parallel tubular reinforcing elements, each of said reinforcing elements comprising tubular sections arranged in longitudinal alinement and with the ends separated, with portions of the concrete of the wall of the hull extending into and filling up end portions of the tubular sections, rows of rods at opposite sides of and extending at right angles to the series of tubular reinforcing elements, and tie wires connecting the opposite sets of rods together.

7. A floating structure comprising a concrete hull and reinforcing means embedded in the walls thereof including a series of parallel tubular reinforcing elements, each of said reinforcing elements being composed of sections arranged in longitudinal alinement and with the ends separated with portions of the concrete of the wall of the hull extending into and filling up end portions thereof, series of parallel transverse rods, and parallel longitudinal rods at opposite sides of the row of tubular reinforcing elements.

8. A floating structure comprising a concrete hull and reinforcing means embedded in the walls thereof including a row of parallel tubular reinforcing elements, each of said tubular reinforcing elements comprising sections in longitudinal alinement and with the ends separated with portions of the concrete of the wall extending into and fill-

ing up end portions of the tubular sections, and transversely extending channel bars located at intervals along the tubular reinforcing elements in the spaces between the sections thereof.

9. A floating structure comprising a concrete hull and reinforcing means embedded in the walls thereof including a row of parallel tubular reinforcing elements, each of said tubular reinforcing elements comprising sections in longitudinal alinement and with the ends separated with portions of the concrete of the wall extending into and filling up end portions of the tubular sections, transversely extending channel bars located at intervals along the tubular reinforcing elements in the spaces between the sections thereof, and means connecting the sections of the tubular reinforcing elements to said transversely extending channel bars.

10. A floating structure comprising a concrete hull and reinforcing means embedded in the walls thereof including a row of parallel tubular reinforcing elements, each of said tubular reinforcing elements comprising sections in longitudinal alinement and with the ends separated with portions of the concrete of the wall extending into and filling up end portions of the tubular sections, transversely extending channel bars located at intervals along the tubular reinforcing elements in the spaces between the sections thereof, and longitudinal rod members having their opposite ends embedded in the concrete in the ends of adjacent tubular sections.

11. A floating structure comprising a concrete hull and reinforcing means embedded in the walls thereof including a row of parallel tubular reinforcing elements, each of said tubular reinforcing elements comprising sections in longitudinal alinement and with the ends separated with portions of the concrete wall extending into and filling up end portions thereof, a series of transverse channel bars located at intervals along the row of tubular reinforcing elements in the spaces between the ends of the sections thereof, said channel bars having rows of openings in alinement with the rows of tubular reinforcing elements, and rods extending through the openings in the transverse channel members and having their ends embedded in the concrete in the end portions of the tubular sections.

12. A floating structure comprising a concrete hull with reinforcing means therefor including rows of parallel longitudinal tubular reinforcing elements embedded in the bottom and side walls thereof, the rows of tubular reinforcing elements being made up of sections arranged end to end in separated relation, the concrete of the wall extending into end portions of the tubular sections, and

transverse reinforcing frames located at intervals along the tubular longitudinal reinforcing elements in the spaces between the sections thereof, each of said transverse frames including a horizontal member embedded in the bottom wall, vertical side members embedded in the side walls, and connections between the upper portions of said vertical members and the horizontal member intermediate the ends thereof.

13. A floating structure comprising a concrete hull with reinforcing means therefor including rows of parallel longitudinal tubular reinforcing elements embedded in the bottom and side walls thereof, the rows of tubular reinforcing elements being made up of sections arranged end to end in separated relation, the concrete of the wall extending into end portions of the tubular sections, transverse reinforcing frames located at intervals along the tubular longitudinal reinforcing elements in the spaces between the sections thereof, each of said transverse frames including a horizontal member embedded in the bottom wall, vertical side members embedded in the side walls, and connections between the upper portions of said vertical members and the horizontal member intermediate the ends thereof, and connections between the ends of the tubular sections and the horizontal members of the transverse frames.

14. A floating structure comprising a concrete hull with reinforcing means therefor including rows of parallel longitudinal tubular reinforcing elements embedded in the bottom and side walls thereof, the rows of tubular reinforcing elements being made up of sections arranged end to end in separated relation, the concrete of the wall extending into end portions of the tubular sections, transverse reinforcing frames located at intervals along the tubular longitudinal reinforcing elements in the spaces between the sections thereof, each of said transverse frames including a horizontal member embedded in the bottom wall, vertical side members embedded in the side walls, and connections between the upper portions of said vertical members and the horizontal member intermediate the ends thereof, and means connecting the transverse frames together.

15. A floating concrete structure comprising a concrete hull and reinforcing means embedded in the walls thereof including a row of parallel longitudinally extending tubular reinforcing elements, each of said tubular reinforcing elements comprising sections in longitudinal alinement and with the ends separated, transversely extending reinforcing frames located at intervals along the reinforcing elements in the spaces between the sections thereof, means connecting the sections of the tubular reinforcing elements

together and to said transversely extending reinforcing frames.

16. A floating structure comprising a concrete hull, and reinforcing means therefor including a plurality of transverse frames located at intervals along the same, each of said frames comprising a horizontal bar embedded in the bottom wall, vertical bars embedded in the side walls, inclined struts connecting the upper portions of the vertical bars with the horizontal bars intermediate

the ends thereof, and L-bars extending longitudinally along the outer face of the junction between the side walls and bottom, said L-bars being connected with the transverse frames. 15

In testimony whereof I hereunto affix my signature in the presence of two witnesses.

JOHN COSMUS BRAESTRUP.

Witnesses:

JOHN N. RAMSEY,
N. H. LEWIS.