

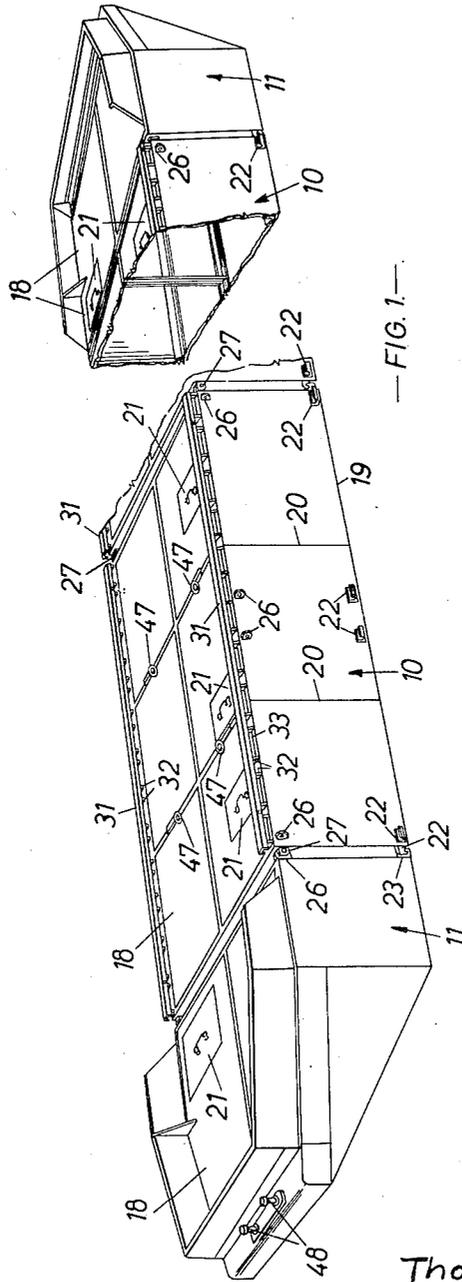
May 29, 1962

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PONTOON STRUCTURE

3,036,539

Filed March 26, 1957

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—FIG. 1.—

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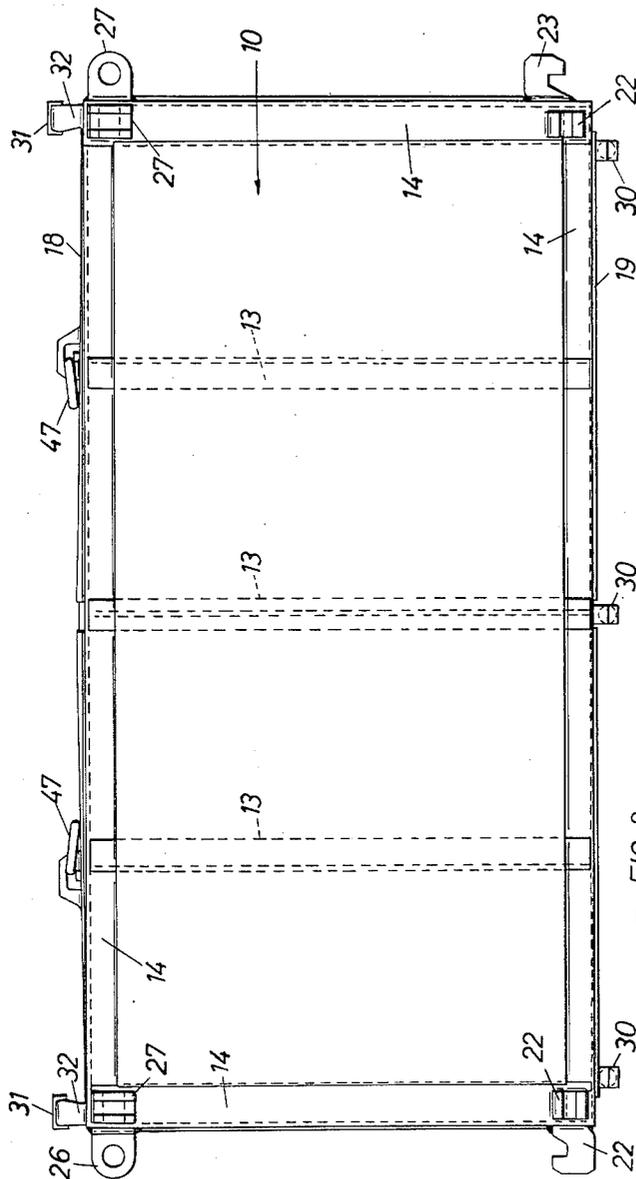
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Filed March 26, 1957

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— FIG. 2. —

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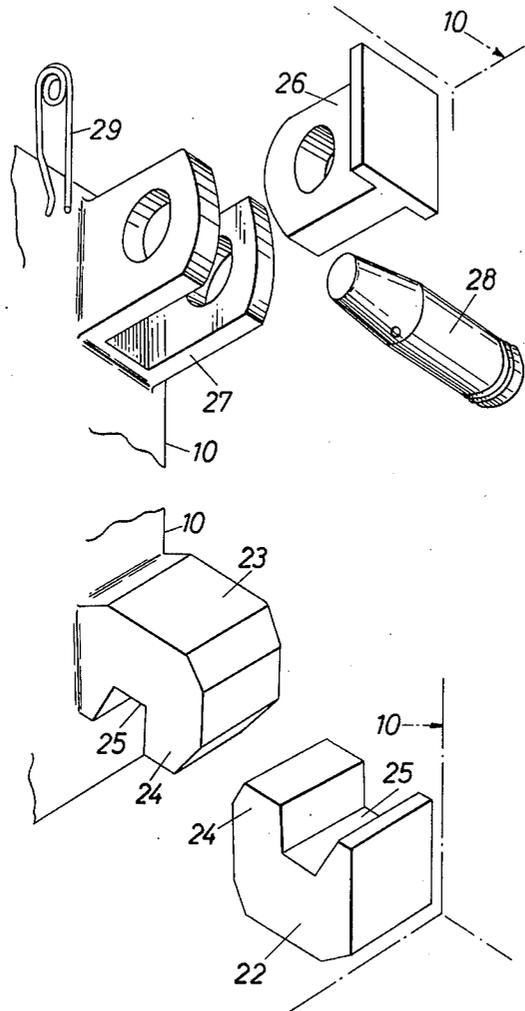
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3,036,539

Filed March 26, 1957

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— FIG. 3. —

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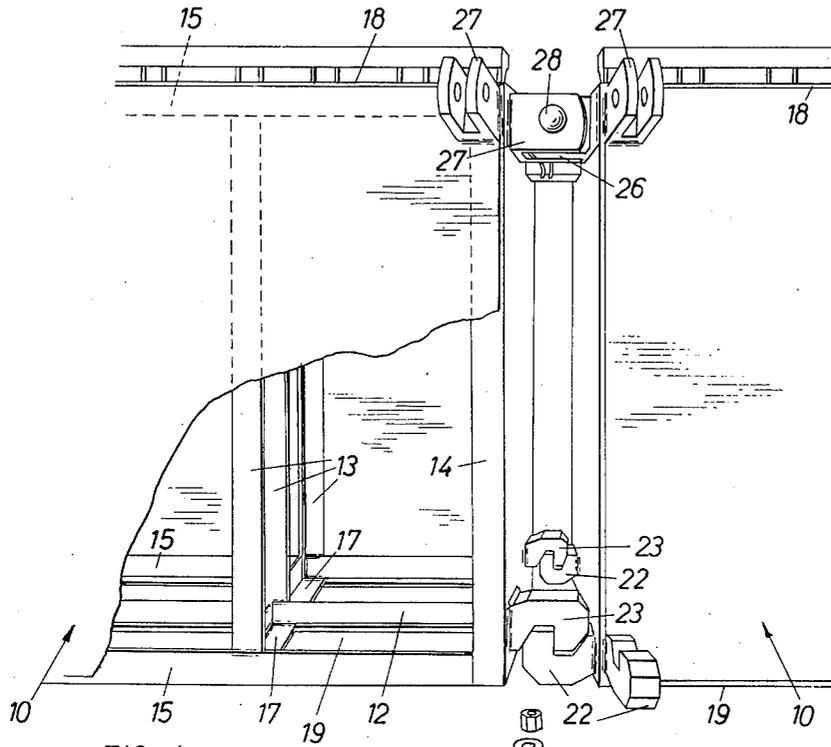
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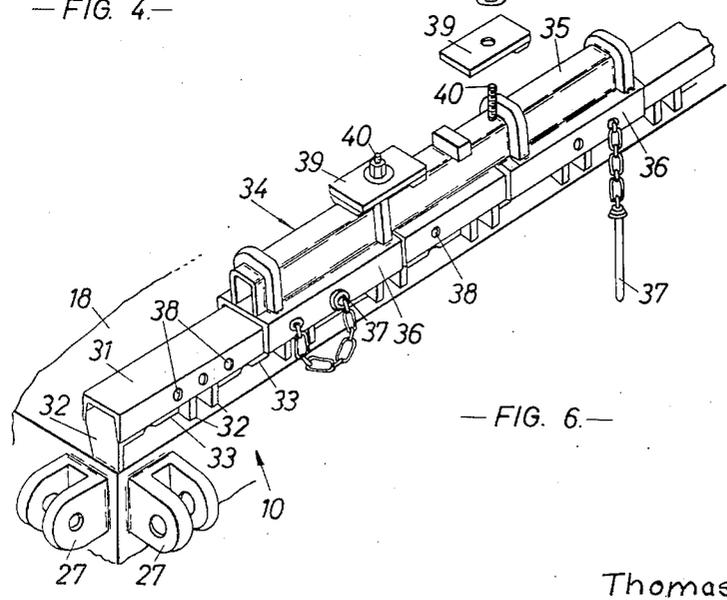
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Filed March 26, 1957

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- FIG. 4. -



- FIG. 6. -

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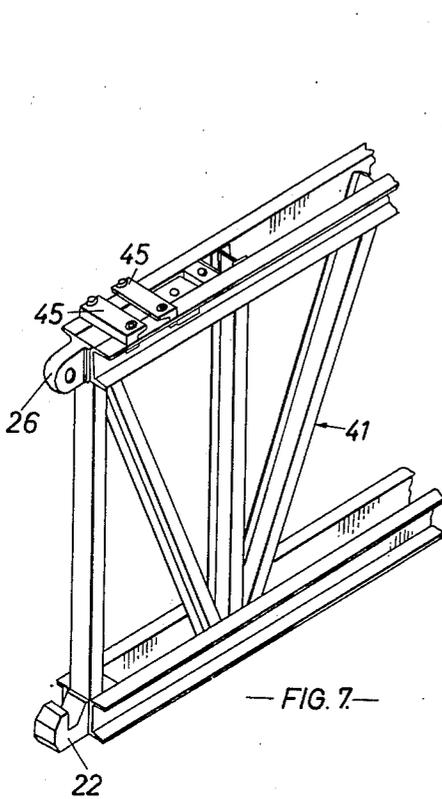
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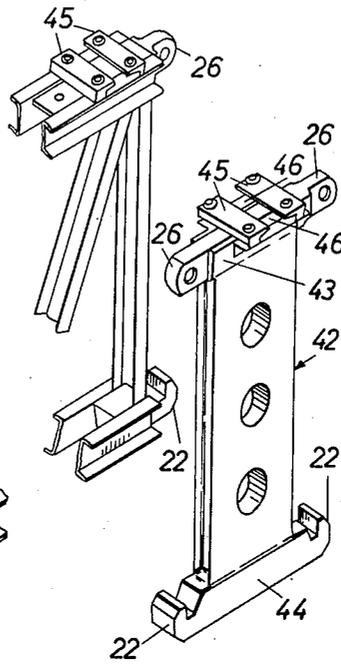
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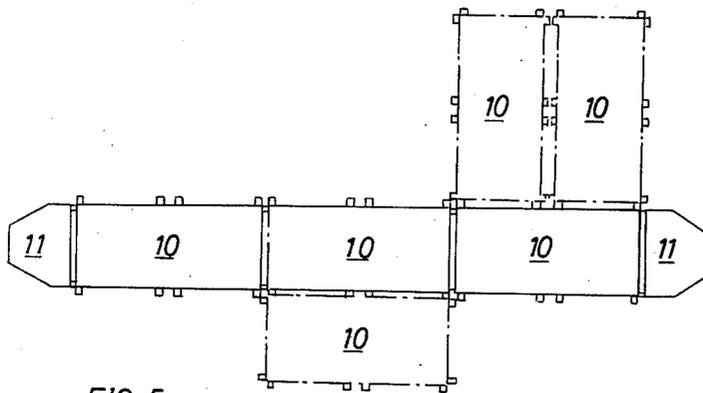
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—FIG. 7.—



—FIG. 8.—



—FIG. 5.—

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3,036,539

**PONTOON STRUCTURE**

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Filed Mar. 26, 1957, Ser. No. 648,644

Claims priority, application Great Britain Mar. 28, 1956  
5 Claims. (Cl. 114—5)

This invention relates to pontoons such as are used as floating piers for bridges or in the construction of rafts, being particularly concerned with that type of pontoon which is constructed in a plurality of self-contained sections connected together by releasable means.

A common application of such sectional pontoons is in connection with the known system of bridging in which each main girder comprises at least one row of standardized panels pinned together end-to-end, two or more such main girders being connected side-by-side by means of transom beams clamped to their chord members and supporting a suitable decking.

The standard pontoons used in the above connection have hitherto been built of wood in three hollow sections each 20 feet long, 5 feet 9 inches wide and 2 feet 6 3/4 inches deep, a plain rectangular centre section being detachably secured between two similar bow sections suitably shaped at their outer ends, and forming therewith a tripartite pier with a displacement of 14 1/2 tons when showing 8 inches of freeboard. In the known pontoons referred to, the bow sections have been provided with open cockpits for the handling personnel, whilst the centre section has had a complete deck with water-tight hatches and metal seatings or bearers for the bridge members to be supported thereon.

The connection together of the known pontoon sections aforesaid has been effected by means of over-dead-centre latches, the (or each) flat end of any given section having two such latches adjacent its right-hand corners and suitable projections adjacent its left-hand corners for engagement by the latches of the next section.

The latch fastenings above described are expensive to produce and the strength of the connection made thereby is obviously limited by that of the timber decks and sides to which the fastener parts are secured. Furthermore, the fastener parts arranged at the pontoon sides are normally below water and consequently difficult to fasten or release, besides being liable to damage from floating debris.

The relatively light construction of the known pontoon renders them very liable to damage through enemy action, accidents during transport, manoeuvring into position, or operational use, and also necessitates the several pontoons of any given pier or raft being held in spaced side-by-side relation either by means of suitable connecting posts associated with the main girder panels or by means of distributing girders wherever a landing bay requires connection to the endmost floating bay of a bridge.

The objection of the present invention is to provide an improved construction of sectional pontoon whose sections, whilst substantially cheaper to produce than the known timber sections for a given flotation capacity, are inherently stronger and capable of being connected, not only end-to-end but in a variety of other relationships and either in mutual contact or spaced apart, without any handling of submerged parts being necessary, the resultant assembly having adequate rigidity independently of any extraneous superstructure such as a bridge girder or girders.

According to this invention, the several buoyant sections of the improved pontoon are constructed as closed steel tanks adapted to be connected together, either directly or through the medium of further, non-buoyant

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components by causing a rigid lug on the lower part of one component to interengage with a correspondingly placed complementary lug on the next component upon interdigitation of further lugs provided on the upper parts of such components, separation of the lower lugs being thereafter prevented by pinning the upper lugs together.

The lower lugs aforesaid may be respectively formed with upwardly and downwardly directed teeth each having behind it a notch adapted, after relative vertical and horizontal movement of the two lugs, snugly to receive the coacting tooth, and the end faces of the two lugs may be bevelled or rounded to facilitate the interengagement aforesaid.

Similar sets of lugs may be provided at the sides of the buoyant sections as well as at the ends thereof, to permit of any two such sections being connected either side-by-side, end-to-end, or end-to-side as requisite, and with or without the interposition of a non-buoyant spacing member. This latter may have its lower lugs so arranged that a buoyant section disposed between, and directly connected to, two such members can be lifted clear of the pontoon structure after removal of the pins associated with its upper lugs.

In the accompanying drawings:

FIG. 1 is a fragmentary perspective view of a sectional pontoon according to the present invention.

FIG. 2 is an end view of one section of such pontoon.

FIG. 3 is a fragmentary perspective view showing the lugs and hooks for connecting the sections end-to-end.

FIG. 4 is a similar view showing two sections connected together by the lugs or hooks of FIG. 3.

FIG. 5 is a diagrammatic plan view showing alternative methods of assembling the pontoon sections together.

FIG. 6 is a fragmentary perspective view showing the gunwale of one pontoon section and a saddle mounted thereon.

FIG. 7 is a fragmentary perspective view of a non-buoyant connector for use with the pontoon sections, and

FIG. 8 is a perspective view of another form of connector.

In the example illustrated in FIGS. 1 and 2, according to the present invention a pontoon is constructed in five sections each fabricated from steel sheets, joists, and strips in the form of a closed tank 8 feet wide by 4 feet deep, three sections 10 which are 17 feet 4 inches in length and of right-angled prismatic form being interposed between two 6-foot bow sections 11 whose outer ends are tapered and raked to reduce the resistance offered to a flow of water longitudinally thereof.

Each section comprises upper and lower medial T bars 12 connected at spaced positions by vertical struts 13 and welded to end frames 14 which are themselves united to stringers 15, the end frames and stringers having plating welded thereto and the stringers being connected by further struts 13 and transverse members 17 and deck and bottom plating 18, 19, as well as by bulkheads 20 dividing the interior of the section into three watertight compartments accessible by hatches 21 in the deck 18. The bottom 19 may be reinforced by longitudinal skids 30.

A pontoon assembled from three of the sections 10 is of course somewhat heavier than the known tripartite wooden pontoon, but its extra width and depth, and consequent greater buoyancy, give it an increased freeboard, and since all its sections are normally closed it may be loaded until awash if desired, the three sections 10 when coupled together having a total buoyancy of 30 tons at 9 inches freeboard. Furthermore, the individual sections are much more robust and longer-lived, besides being more easily carried by road owing they have less overhang

than the known timber sections on the average transport vehicle.

The inner end of one of the bow sections 11, and corresponding ends of the intermediate sections 10 are each provided, adjacent their lower corners, with two projecting lugs or hooks 22 (see FIG. 3) which are substantially L shaped, the other ends of the intermediate sections, and the inner end of the second bow section, being provided with corresponding, but inverted lugs or hooks 23.

These lugs or hooks 22, 23 are fixed upon the several pontoons at appropriate common levels, so that the longitudinally-extending parts of the lugs or hooks 22 on one section will lie somewhat above those of the lugs or hooks 23 on a second section offered up in alignment with the first.

Each lug 22 (or 23) is formed at its outer end with a tooth 24, upstanding or dependant (as the case may be) and having behind it a complementary, but slightly deeper notch 25, so that after any two unlike lugs or hoops have been brought into contact, a depression of the lug 22 (produced by suitably canting the pontoon section) will cause it to ride under the dependant tooth 24 on, and to enter the notch 25 in, the coacting lug 23 which of course simultaneously interengages with the lug 22 in a similar manner.

To facilitate such interengagement of the lugs or hooks 22, 23, it has been found convenient to incline the outer side of each tooth 24 and the inner side of each notch 25 at 30 degrees to the vertical, the other two sides being vertical, or even raked to give a hook effect. Alternatively the tooth 24 and notch 25 of each lug may be bevelled at both sides, or made of part-circular or similar form.

Accurate opposition of the pairs of interengageable lugs or hooks 22, 23, which will of course be submerged during assembly together of two floating sections 10, 11 (or 10, 10), is simplified by providing each section with two further lugs adjacent the upper corners of its end wall. It has been found convenient to form these upper lugs as vertical apertured plates 26, or complementary apertured clevises 27, accordingly as the section ends concerned bear lower lugs 22 or lower lugs 23.

The upper lugs are so arranged, and project by such an amount, that, before the lower pairs of lugs or hooks 22, 23 can be brought into contact prior to interengagement, each of the vertical plates 26 on one pontoon section must be entered within the clevises 27 on the juxtaposed section, which is thus laterally located with reference to the first.

On interengagement of the lower lugs 22, 23 as above described and as shown in FIG. 4, the upper lugs 26, 27 become fully interdigitated and can be secured together by a pin 28 passed through the aligned holes therein. Preferably the upper lugs 26, 27 and the pins 28 associated therewith correspond in dimensions to the parts used for connecting together the girder panels of the known bridging equipment already referred to, and the pins 28 may be retained by cotter pins 29 preferably in the form of hairpin springs. Alternatively, the pins may be of the kind described in the specification of my prior patent application No. 535,628.

It will be appreciated that the pin connections above referred to co-operate with the lower interengaging lugs or hooks 22, 23 to produce a longitudinally and laterally rigid assembly of the several pontoon sections, and obviously if desired the upper connections may be strengthened by substituting a suitably offset clevis for each of the plates 26.

Similar upper and lower lugs are provided at both sides of each pontoon section 10, there being upper lugs 26 and lower lugs 22 at one side, whilst the other side carries a corresponding number of lugs 27 and 23, and all these lugs are so arranged that any given section 10 can be rigidly connected side-by-side, or side-to-end, with a similar section or pair of sections (see FIG. 5).

At each side of the pontoon section, the two midships pairs of lugs 26, 22 (or 27, 23) are united to suitably placed inter-stringer struts 13 and the transverse members 17 connecting these to the corresponding struts at the

other side of the section are preferably reinforced by diagonal bracing (not shown).

For use in supporting a bridge or other superstructure, the upper stringers 15 of each pontoon section 10 are provided with gunwales 31 of inverted channel section, each of these latter being spaced above the deck plating 18 by means of transverse partitions 32 which are connected in pairs by medial webs 33.

Associated with these gunwales 31 are saddles 34 (see FIG. 6) each of which comprises an inverted channel member 35 with means for attaching a superstructure element thereto and welded at opposite ends to two larger inverted channels 36 adapted to embrace the gunwale. The positioning of such a saddle is effected by captive pins 37 adapted to be passed transversely through the channels 36 to engage holes 38 in the gunwales.

In a case where the superstructure element to be located is a known form of standardized girder panel, the attachment means provided may comprise pressure pads 39 mounted on studs 40 carried by the upper channel 35 and adapted to bear upon the bottom chord of the panel aforesaid.

Should it be desired to build up a floating structure whose overall loading is insufficient to justify the use of a solid assembly of pontoon sections 10, an appropriate number of such sections may be connected in mutually-spaced relationship by means of non-buoyant components such as those shown in FIGS. 7 and 8.

The component 41 illustrated in FIG. 7 has an effective length equal to that of a pontoon section 10 and comprises a trussed girder panel with lugs 26, 22 (or alternatively lugs 27, 23 at its upper and lower corners respectively, as well as suitable anchorages for sway-braces connecting it to a similar component.

The shorter component 42 shown in FIG. 8 is intended for use in connecting side-by-side two sections 10 whose end lugs are coupled to the side lugs of a third section. In this case, an upper bar 43 with integral end lugs 26 (or 27) is united by a vertical box-like fabrication to a lower bar 44 having lugs 22 (or 23) at opposite ends thereof.

A pair of clamping plates 45 for gripping the foot of a transom beam or the like are mounted upon flanges 46 welded to opposite sides of the upper bar 43, and similar plates are associated with the top chord members of the lug connector 41 at each end of the latter; the transom beams or their equivalent being used to carry a suitable decking.

Such decking may consist of wooden chassis carried by stringer assemblies on the transom beams, in a manner well known in connection with bridging systems, or alternatively the transom beams may support steel decking elements similar to those described in the specification of my prior patent application No. 527,111, now abandoned.

It will be appreciated that, since the connectors 41, 42 have like lugs 20 (or 23) at opposite ends thereof, it is possible to disengage an adjacent pontoon section 10 from between two of them by raising one connector and lowering the other, after removal of the pins 28. The section so disengaged can then be lifted clear to facilitate the carrying out of maintenance work thereon.

In assembling a bridge, piers composed of two or three end-connected sections can be coupled together side-by-side to support the junction of a landing bay with a floating bay, such junction being disposed above the centre-line of the coupled piers. The system makes it unnecessary to provide for transverse distribution of the load, at least for loadings up to 60 tons maximum which can be accommodated by four piers of three sections each.

The junction between two floating bays of the bridge is conveniently made by introducing connecting posts between the main girder panels and supporting the latter upon two or three piers each of two or three sections,

with allowance for a limited articulation of the bridge at each junction.

Articulation of the piers themselves may be arranged for, if necessary, by omitting an occasional lug 22 or 23, or by connecting the upper lugs 26, 27 through the medium of suitable spacing members.

Landing stages for unloading stores from ship for shore, rafts for use in pile-driving, well-boring and other civil engineering operations, as well as ferry-boats or other vessels can be constructed from any number of pontoon sections connected together either directly or by means of the components 41, 42 and provided with appropriate decking as above described.

The decks 18 of the pontoon sections 10 may be provided with lifting eyes or rings 47, whilst the bow sections may carry bollards 48 for mooring purposes.

The hatches 21 provided enable any or all of the internal compartments of each pontoon section 10 to be flooded if so desired, a partial flooding being often desirable for adjusting the overall trim when dealing with off-centre loads on landing stages or rafts. Each compartment is also provided with non-return valves so that, after replacement of the hatch 21, any water therein may be expelled by compressed air.

It will be appreciated that such provision enables a raft assembled from the pontoon sections to be used for floating a bridge bay into position and depositing the same upon prepared static foundations. Alternatively the pontoon sections may be utilized as "camels" for various lifting operations, or they may be coupled together by suitable triangular connectors to form the sides and bottom of a floating dock.

I claim:

1. A pontoon comprising a plurality of self-contained buoyant closed tanks in longitudinal alinement, means for connecting adjacent ends of said tanks comprising complementary bottom hooks on said ends in alinement, one hook opening upwardly and the other hook opening downwardly, said hooks adapted to override each other and interlock, vertically disposed male and female lugs in alinement at said adjacent ends at the tops of said tanks and adapted to interfit, holes in said male and female lugs, and a pin passing through said holes to lock the sections of said pontoons together, and wherein at least one of the sides and said ends of at least some of the tanks is provided with a set of two hooks and two lugs arranged so as to define the corners of a rectangle.

2. A pontoon comprising a plurality of self-contained buoyant closed tanks in longitudinal alinement, means for connecting adjacent ends of said tanks comprising complementary bottom hooks on said ends in alinement, one hook opening upwardly and the other hook opening downwardly, said hooks adapted to override each other and interlock, vertically disposed male and female lugs in alinement at said adjacent ends at the tops of said tanks and adapted to interfit, holes in said male and female lugs, and a pin passing through said holes to lock the sections of said pontoons together, and wherein at least some of said tanks are each provided with six of said sets of lugs and hooks, one set at each of the ends thereof and two sets laterally spaced on each of the sides thereof.

3. A sectional pontoon comprising a plurality of self-contained buoyant closed tanks in longitudinal alinement, means for connecting adjacent ends of said tanks comprising complementary bottom hooks on said ends in alinement, one hook opening upwardly and the other hook opening downwardly, said hooks adapted to override each other and interlock, vertically disposed male and female lugs in alinement at said adjacent ends at the tops of said tanks and adapted to interfit, holes in said male and female lugs, and a pin passing through said holes to lock the sections of said pontoons together, and in which there is interposed between said sections a non-buoyant section having said hooks and lugs to interlock with the hooks and lugs of said pontoon sections.

4. A pontoon comprising a plurality of self-contained buoyant closed tanks in longitudinal alinement, means for connecting adjacent ends of said tanks comprising complementary bottom hooks on said ends in alinement, one hook opening upwardly and the other hook opening downwardly, said hooks adapted to override each other and interlock, vertically disposed male and female lugs in alinement at said adjacent ends at the tops of said tanks and adapted to interfit, holes in said male and female lugs, and a pin passing through said holes to lock the sections of said pontoons together, and wherein said interlocking hooks have blunted V-faces which are adapted to make contact to cause overriding thereof.

5. A pontoon comprising a plurality of self-contained buoyant closed tanks in longitudinal alinement, means for connecting adjacent ends of said tanks comprising complementary bottom hooks on said ends in alinement, one hook opening upwardly and the other hook opening downwardly, said hooks adapted to override each other and interlock, vertically disposed male and female lugs in alinement at said adjacent ends at the tops of said tanks and adapted to interfit, holes in said male and female lugs, and a pin passing through said holes to lock the sections of said pontoons together, and wherein said interlocking hooks have a substantially vertical face inside the hollow thereof at the free end thereof and a face at an angle to said vertical face at the attached end thereof.

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