June 15, 1943. F. R. HARRIS 2,321,811

CONCRETE OIL BARGE

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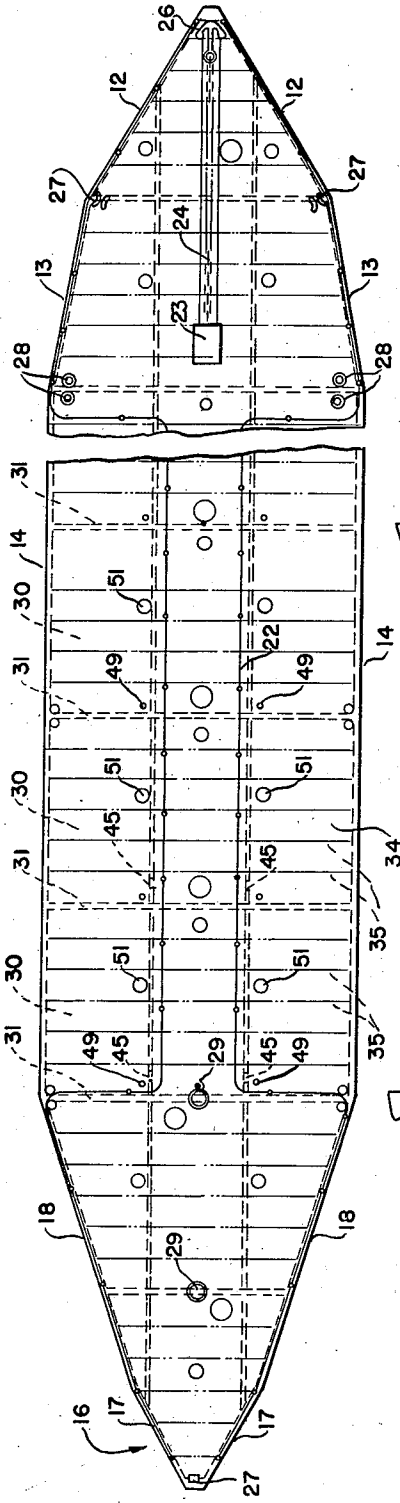

FIG. 1

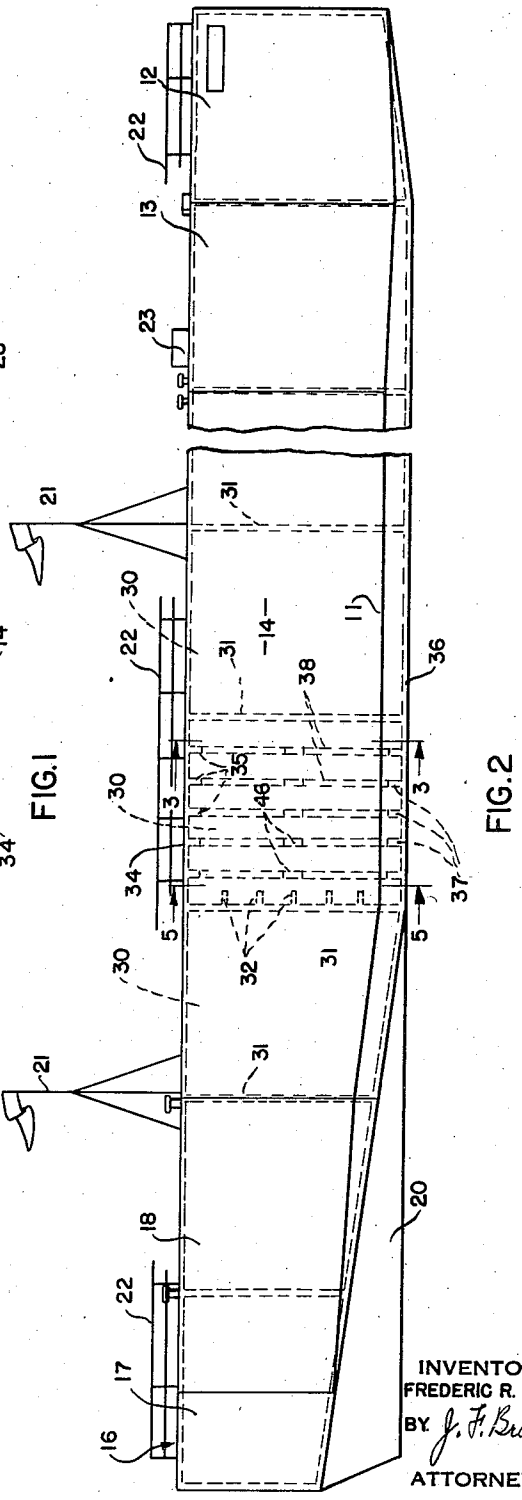

FIG. 2

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FIG. 3

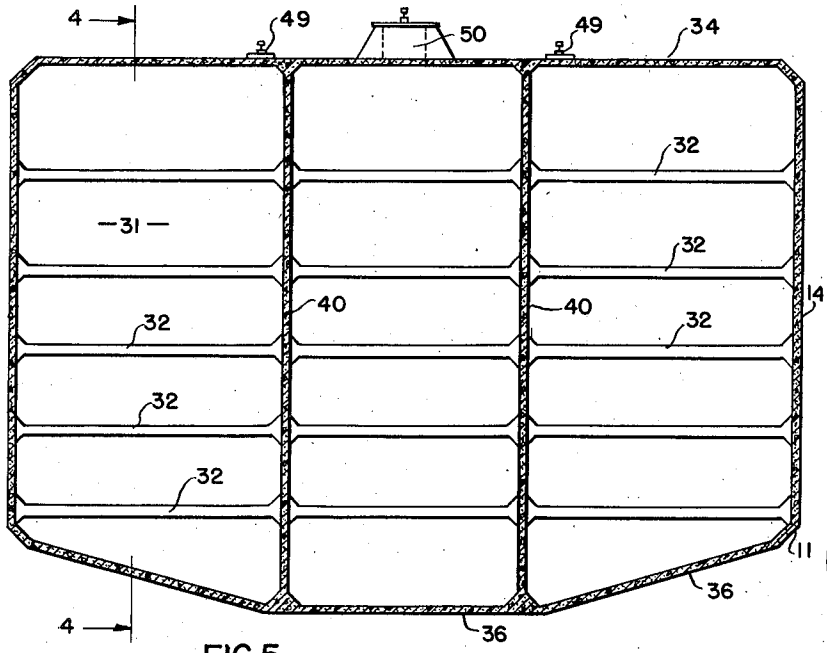


FIG. 4

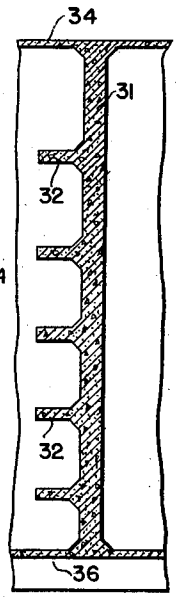


FIG. 5

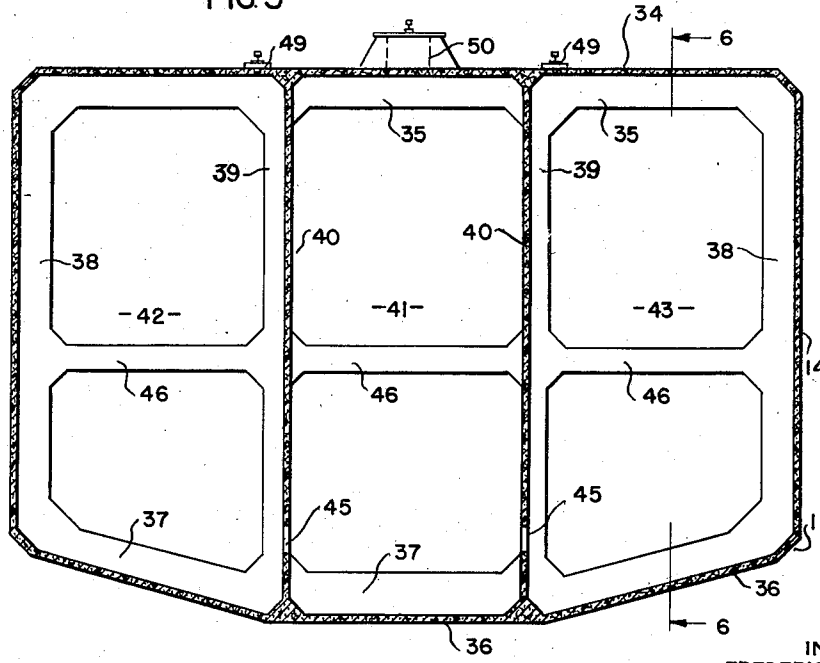
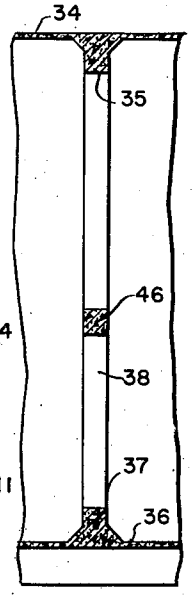


FIG. 6



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CONCRETE OIL BARGE

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3 Claims. (Cl. 114—65)

This invention relates to hull construction and more especially to oil barges.

It is an object of the invention to provide an oil barge of such construction that it can be made entirely of reinforced concrete, and one which, without excessively heavy sections, is strong enough for sea-going service. In accordance with one feature of the invention the barge is made with lines that simplify the forms necessary for holding the concrete during construction.

Another object of the invention is to increase the stability of an oil barge by a novel construction that produces an air cushioning of surging oil masses. Spaced lateral bulkheads divide the hull into a number of sections, and each of the sections is divided into three compartments by longitudinally extending bulkheads. These compartments communicate only near their bottoms and the air trapped above the liquid in each compartment limits the surging of liquid from one compartment to another, and thereby gives the barge good stability, even when rolling in a beam sea.

The longitudinal bulkheads are continuous and serve not only to partition sections of the barge into compartments, but take the place of a keel in giving rigidity to the hull. With the interior hull construction of this invention, no keel is necessary, though the barge is preferably provided with a skeg aft.

Although the upper portions of the oil compartments are closed to obtain the air cushioning feature already described, means are provided for ventilating the compartments when empty to effectively free the cargo-hold of gas.

One of the advantages of the concrete barge construction of this invention is the smooth interior walls of the oil compartments which are free of rivets, laps, or complicated bracing. The compartments are, therefore, easily cleaned.

Other objects, features, and advantages of the invention will appear or be pointed out as the specification proceeds.

In the accompanying drawings, forming part hereof:

Fig. 1 is a top plan view of a concrete oil barge made in accordance with this invention.

Fig. 2 is a side elevation of the oil barge shown in Fig. 1.

Fig. 3 is an enlarged sectional view taken on the line 3—3 of Fig. 2.

Fig. 4 is a sectional view on the line 4—4 of Fig. 3.

Fig. 5 is an enlarged sectional view taken on the line 5—5 of Fig. 2.

Fig. 6 is a sectional view on the line 6—6 of Fig. 5.

Figs. 1 and 2 show a barge with sides that extend substantially vertically from a chine line 11. In order to avoid the use of curved forms for the concrete, the bow is made with plane port and starboard sections 12 that converge toward the stem at a fairly sharp angle; and other plane sections 13 that converge at a smaller angle and that are located between the parallel sides 14 and the forward bow sections 12.

The sections 13 join the parallel sides 14 of the barge in the illustrated embodiment of the invention, but if it is desired to have the bow approach more nearly to a fair form, a larger number of plane sections converging at successively smaller angles can be used. The shape illustrated with only two angularly related sections on each side of the bow and with the angular relation of the sections 12 approximately 65 degrees, and that of the sections 13 of the order of 20 degrees, gives the greatest simplicity for the concrete forms and produces a bow shape suitable for towing at moderate speeds.

Each side of the stern 16 is made up of two plane side sections 17, 18, at different angles, to approximate a fair form aft. The sections 17 converge toward the stern with an included angle of the order of 60 degrees, and the sections 18 with an angle of about 32 degrees. The angles at both the bow and stern are given as illustrative and not limiting. There is a skeg 20 at the stern.

The barge is shown with masts 21 and a railing 22 along a center deck space. The railing 22 spreads out to include the full width of the deck at the bow and stern where space is required for operating a windlass 23 that hauls in a chain 24 of an anchor 26, and for manipulating ropes or tow lines that are passed through chocks 27 to towing bits 28 or bollards 29.

The hull of the barge is divided into a number of independent sections 30 by transverse bulkheads 31. These bulkheads are stiffened by parallel webs 32, five such webs being shown for a bulkhead of the height illustrated in the drawings.

The deck 34 is stiffened both by the bulkheads 31 and by transverse webs 35 on the under side of the deck. These webs 35 serve as deck beams. The bottom 36 and the sides 14 are similarly stiffened by the bulkheads 31 and by webs 37 and 38 in the bilge and up the sides of the hull, respectively. The webs 37, 38 are in effect ribs of the hull. Fig. 2 shows these webs 35, 37 and

38 in only one section, but it will be understood that the other sections 30 contain the same kind of webs. Webs or flanges 39 run vertically along the sides of the longitudinal bulkheads 40 and unite with the ribs at the bottom and the deck beams 35 at the top.

Two longitudinal bulkheads 40 extend from the bow to the stern of the barge. These longitudinal bulkheads divide each of the sections 30 into three compartments, best shown in Fig. 5. There is a center compartment 41, and port and starboard compartments 42 and 43, respectively. The center compartment 41 communicates with each of the side compartments 42, 43 through an opening 45 in one or the other of the longitudinal bulkheads 40. These openings are located a short distance above the bottom of the bulkheads 40, and are preferably large enough to admit a man into the side compartments for inspecting or cleaning the compartment. On large barges, the sides 14 and longitudinal bulkheads 40 are further braced against bending inward or outward by the beams 46 extending across the compartments 41—43 under each of the deck webs 35.

The entire hull, including the sides, deck, bottom, bulkheads, and tie beams, is made of reinforced concrete, and the reinforcing in the different parts extends around corners and into connected parts. For example, some of the reinforcing members of the sides 14 are bent to extend into the transverse bulkheads 31, and reinforcing members of the transverse bulkheads 31 are bent to extend into the longitudinal bulkheads 40, to make the barge an integral reinforced concrete unit.

The longitudinal bulkheads 40 give the hull the rigidity fore and aft that is ordinarily imparted by a keel, but the construction of this invention with two longitudinal bulkheads spaced from one another transversely, has special advantages. The effect is that of two keels and the overhang of the hull beyond the center stiffening of the hull is very much reduced in comparison with that of a hull having a keel. This is particularly important when the barge is put in dry dock.

The transverse bulkheads 31 brace the hull securely against weaving at sea. The interior bracing and stiffening members are of simple design to facilitate the construction of the forms that hold the concrete when the barge is being cast. The inside surfaces of the hull are made smooth so that they can be easily cleaned, and the concrete sides are free of overlaps and rivets such as encountered in steel hulls.

At the various points between the transverse bulkheads, the webs 37 and 38 forming the ribs, the deck beams 35, the webs 39 and beams 46 are especially useful in strengthening the hull and all its parts. Considering either bulkhead 40 (Figure 5) one will see that the two spans of the beam 46 on either side of it, the associated web 39 on the bulkhead, the webs 35 and webs 37 on each side of it, the adjacent web 38, and the web 39 of the other bulkhead 40 constitute at the location of each rib a panel or closed cross-frame the center of which is at the bulkhead and about midway between its top and bottom. This cross-frame is integral with the bulkhead over its full height. Each bulkhead is thus strongly reinforced and stiffened by the short spans of the beams 46, which add greatly to the reinforcing effect of the webs 37 and 38 for resisting bending inward or outward at the sides or bottom, as well as offsetting any forces tending to bend this beam or the webs connected to it. The net result is to enable the hull to withstand advantageously all stresses that would produce deformation.

In particular, the members 39 and 46 of each panel frame, being fixed at all four ends, and the webs 39 being integral with the bulkheads 40, all the forces that might produce twisting, as for example, at the junction of the bottom and side, due to the preponderance of the moment of water pressure on the bottom over the same force on the side, are completely balanced.

Each of the sections to be loaded is filled through its center compartment 41. Valves 49 at the tops of the side compartments 42, 43 are preferably open during the filling of the compartments. Oil flows from the center compartment 41 through the openings 45 into the side compartments 42, 43, and when the oil level rises to a predetermined load line in these side compartments, the valves 49 are closed to shut off egress from the upper part of these compartments and the air above the oil is trapped in the compartment.

This air provides a cushion above the oil in the side compartments 42, 43 and increases the stability of the barge. When the hull is rolling at sea, the oil would surge from one side compartment to the other, since the compartments are in communication through the openings 45, but any surging of the oil raises the level of the oil in the compartment into which the oil moves and the compression of the air cushion above the oil resists any further rise in the oil level.

The valves 49 are also opened during discharge of oil when unloading. After the compartments have been emptied, a vacuum line may be attached to the open valves 49 to suck fresh air through an access opening or manhole 50 of the center compartment for gas-freeing the empty compartments. Other openings for air to ventilate the side compartments may be provided, such as manhole openings 51 in the deck. These openings 51 may be at the opposite end of the compartments from the openings 45 for better ventilating the compartments. The openings 51 are tightly closed by covers, except when oil fumes are to be expelled from the compartments.

The vessel set forth herein is very strong, stable and difficult to sink. The reinforcing webs or flanges 35, 37, 38 and 39, and the crossbeams 46, the latter being especially useful in strengthening the sides of the hull, add greatly to the toughness and durability of the ship. In the event of damage to any part of the hull the effects will be localized in one or more adjacent compartments and the vessel can easily remain afloat.

The preferred embodiment of the invention has been illustrated and described, but changes and modifications can be made and some features of the invention can be used without others.

I claim:

1. A concrete barge structure comprising a hull with transverse bulkheads dividing the hull into a number of different sections, longitudinal bulkheads dividing the respective sections into three compartments that have communication with each other through openings in the lower portions of the longitudinal bulkheads, a hatchway opening into the central one of the compartments for access to all of said compartments, and air valves that can be opened for putting the top portions of the side compartments into commu-

nication with the outside air, or closed to keep air trapped in the compartments.

2. A concrete hull having bottom, sides, and deck, a longitudinal bulkhead on each side of the center of the hull extending from deck to bottom and from bow to stern, said bulkheads dividing the width into three substantially equal parts, transverse bulkheads in the hull extending from side to side, substantially vertical webs on the longitudinal bulkheads between the transverse bulkheads, webs forming ribs and deck beams united to the webs on the longitudinal bulkheads, and bracing beams extending from side to side between bottom and deck rigid at both ends with said ribs, and the webs on the longitudinal bulkheads, said beams and all of said webs forming panel cross-frames at the location of the ribs for each longitudinal bulkhead, rigid therewith and with centers in the vertical web thereon.

3. A concrete vessel comprising a hull having sides, bottom and deck, a longitudinal bulkhead in the hull at each side of the center line of the hull, said longitudinal bulkheads extending from bottom to deck and from bow to stern and dividing the width of the hull into three approximately equal parts, and transversely extending means to reinforce the bulkheads comprising webs at a number of points along the length of the hull forming ribs at the sides and deck beams at the top of said ribs, said longitudinal bulkheads having substantially vertical webs on the sides connected to said ribs and deck beams, and transverse bracing beams below the deck beams and above the bottom and joined to the longitudinal bulkheads and said ribs at both sides of the hull, said beams and said webs forming panel cross-frames at the location of the ribs with centers at the bulkheads and cross arms thereof rigidly secured in place.

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