June 14, 1938. W. S. MACDONALD 2,120,286

BARGE

Filed May 23, 1936 3 Sheets-Sheet 1

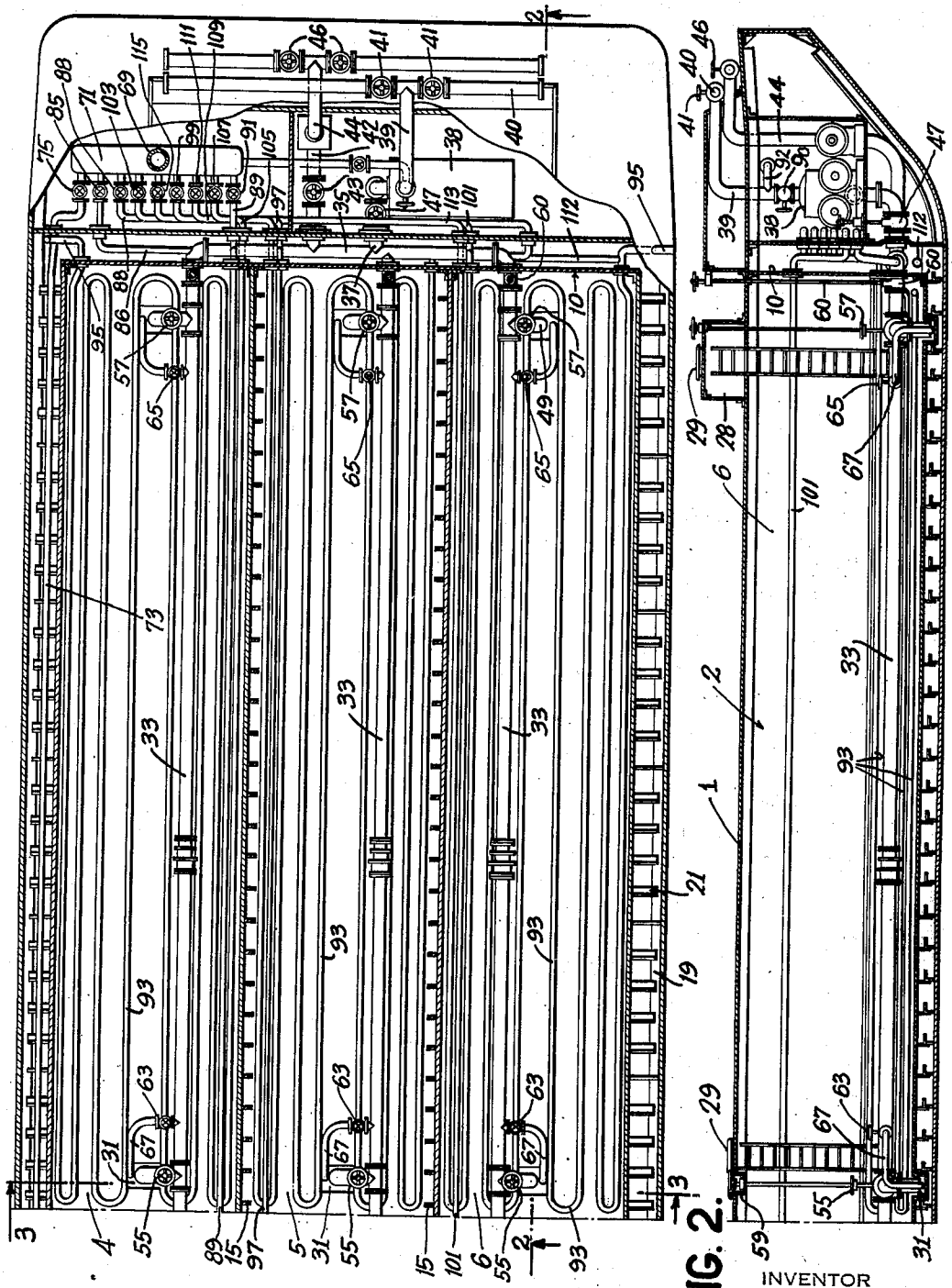


FIG. 1.

FIG. 2.

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BARGE

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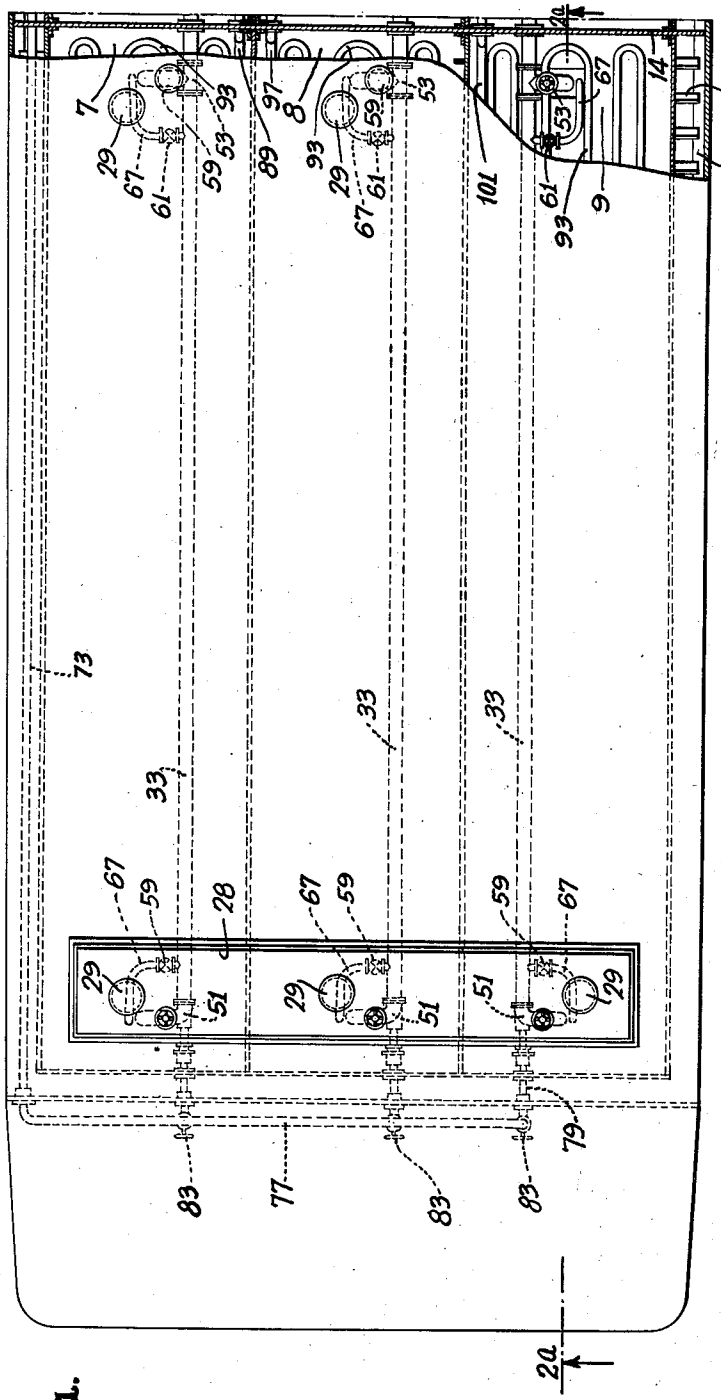


FIG. 1a.

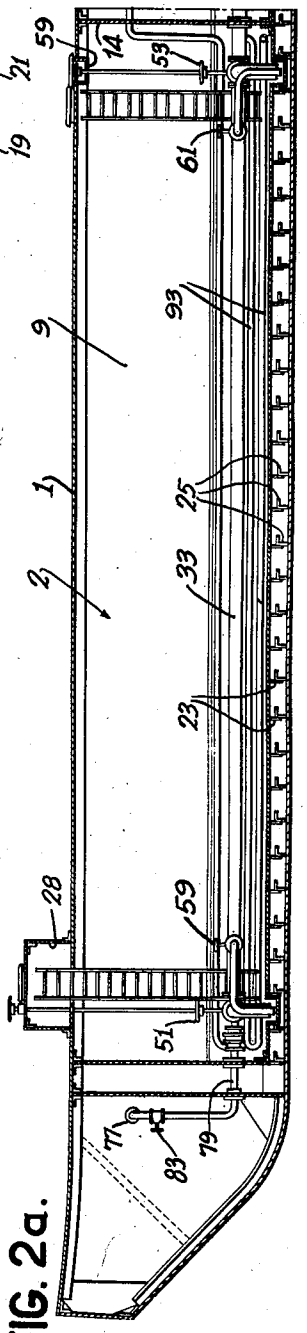


FIG. 2a.

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BARGE

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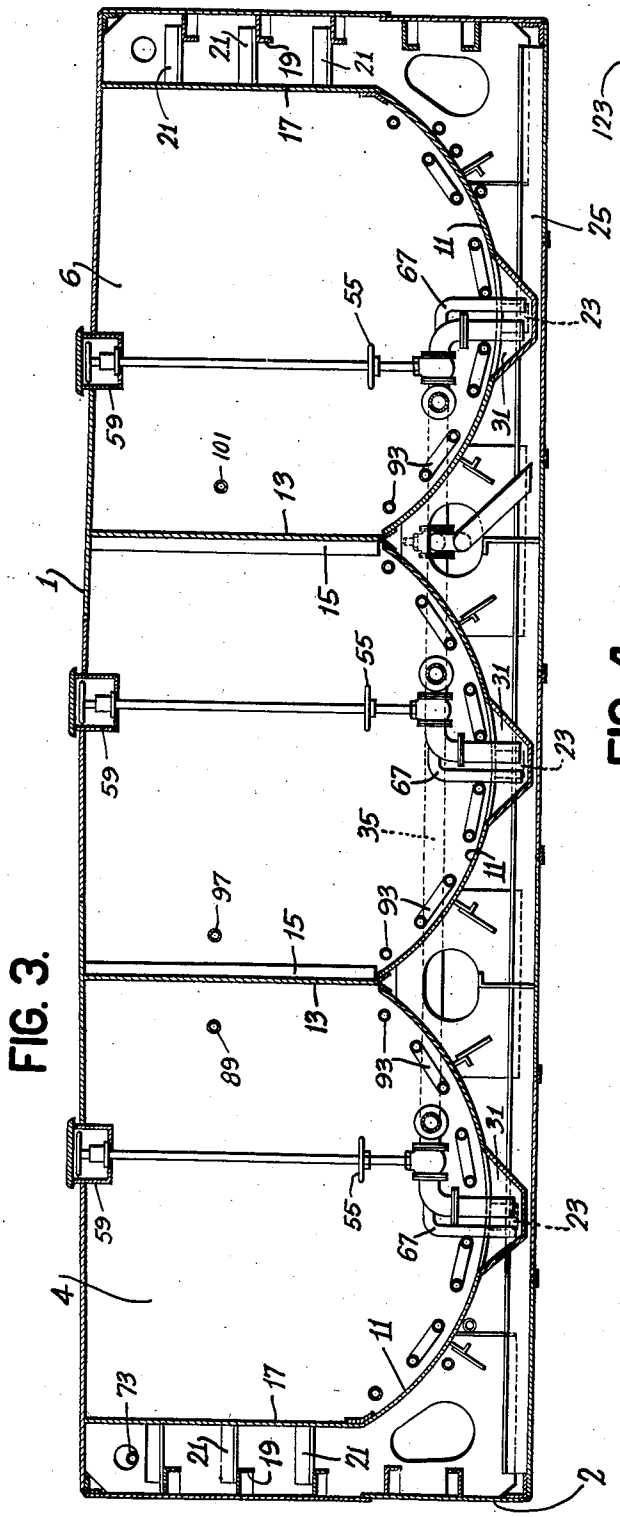


FIG. 3.

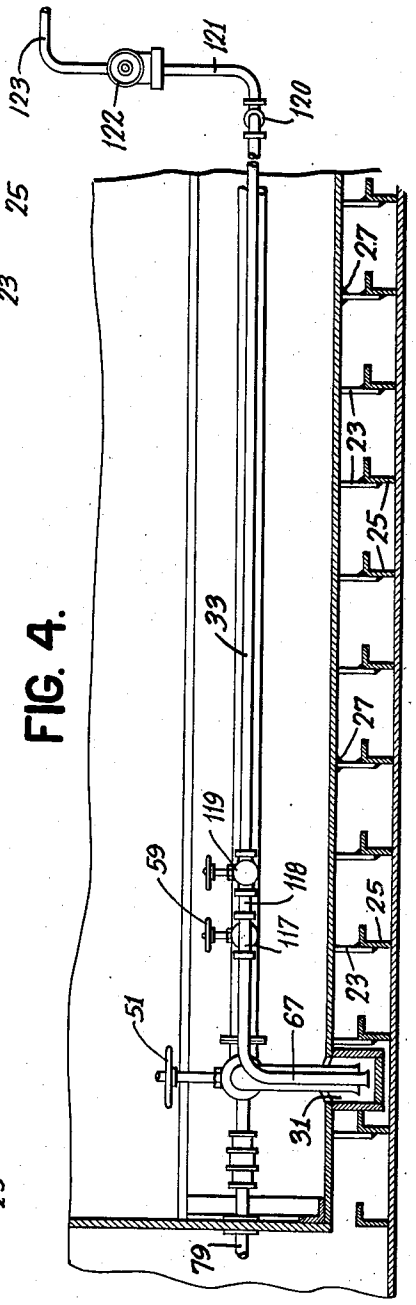


FIG. 4.

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2,120,286

BARGE

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Application May 23, 1936, Serial No. 81,393

6 Claims. (Cl. 114—74)

This invention relates to tank barges of the kind adapted to transport liquids of various kinds and, more particularly, to such tank barges adapted also to carry a deck load.

One object of the invention is to provide a tank barge in which the contents may be maintained at a desired temperature, in transit.

Another object of the invention is a tank barge containing a plurality of tanks, each one of which may be readily filled and emptied.

It is also an object of the invention to provide, in a tank barge, tanks which may be readily cleaned.

A further object of the invention is a tank barge having means for readily cleaning the conduits through which the tank contents is admitted and removed.

The invention also seeks a tank barge construction which avoids the application of strains and stresses, set up, for instance, by the loaded tanks, to the hull.

Yet another object of the invention is a tank barge having the requisite structural strength with the avoidance of excessive cost or weight.

A further object of the invention is tanks in a tank barge adapted to have the requisite strength without bracing.

Still another object of the invention is the provision of a tank barge which is adapted to carry a deck load without necessitating change or alteration of any kind.

The invention further seeks a tank barge in which the expansion trunks of the various tanks are disposed transversely of the barge at one or opposite ends thereof to afford the maximum space therebetween for deck load.

It is also another object of the invention to provide a tank barge in which there is a minimum loss of heat from the tank contents in transit.

Yet a further object of the invention is a tank barge in which the tanks are so constructed, arranged and supported as to permit freedom of expansion and contraction thereof.

There is further sought by this invention a tank barge in which there is no loss of cargo space resulting from the provision of a plurality of individual tanks. To this end, provision is made for filling the space between the hull and tanks, where the character of the cargo permits.

These and other objects of the invention and the means for their attainment will be more apparent from the following detailed description, taken in connection with the accompanying drawings illustrating one embodiment by which the invention may be realized, and in which:

Figures 1 and 1*a* are views looking from above and showing the tank barge of this invention, in plan, parts being broken away to show details of the interior;

Figures 2 and 2*a* are views in longitudinal vertical section of the tank barge of Figure 1, taken on the line 2—2*a* of Figures 1, 1*a* looking in the direction of the arrows;

Figure 3 is a transverse vertical sectional view taken in the plane indicated by the line 3—3 of Figure 1, looking in the direction of the arrows and showing particularly the tanks and their method of support and heating; and

Figure 4 is a fragmentary view, in vertical section and on an enlarged scale, showing details of the after end of an after tank and a modified cleaning means.

In the illustrated embodiment, the tank barge of this invention is shown as having a flat deck 1 upon which a deck load may be carried. Within the hull, generally indicated at 2, are six tanks 4, 5, 6, 7, 8 and 9, three of which, 4, 5 and 6, are side by side in the forward half of the barge and three tanks, 7, 8 and 9, similarly disposed in the after portion of the barge.

Each tank 4–9 has an end 10 and a substantially semi-cylindrical bottom 11 with parallel vertical side walls 13 suitably welded thereto. The side walls 13 of the middle tank 4 and 8 are common to the tanks on either side thereof. A transverse wall 14 forms a common end for the forward and the after tanks. The ends 10 are shaped to correspond to the transverse outline of the three tanks and are not supported from the hull but solely by their connection with the tanks. The tanks thus have the greatest freedom and flexibility for expansion and contraction. The partition 14 extends from side to side and is inserted with the hull at each side as shown. The forward and rear extremities of the tanks are thus free to offer the greatest freedom of movement in expansion and contraction of the tanks. The side walls 13 are preferably stiffened by vertical plates 15 welded thereto. On the outer sides of the outer tanks 3, 5 and 7, 9, the walls 17 are supported from the side frames 19, from which they are inwardly spaced, by angle pieces 21 welded to the frames 19 but not to the side walls 17 of the respective tanks, whereby relative movement between the tank and hull 2, due to expansion and contraction, is permitted and no strains and stresses are set up. The semicylindrical shape of the tank bottom affords the requisite strength with minimum bracing.

The bottom 11 of each tank is supported by

plates 23 welded, say, to the cross-frame members 25. The plates 23 are welded to the bottom of the tanks at intervals, say, of every ten feet, as at 27, and particularly for the ten feet inwardly from the forward and aft ends to afford a degree of flexibility to allow for contraction and expansion. There is thus provided what is in effect an outer shell (the hull 2 and deck 1) and an inner shell (the tank structure comprising common walls) suitably and sufficiently connected by the frame members or built together to afford practically a double hull to the barge with the advantages inherent therein of strength.

In order to afford space for a deck load, the expansion trunk 28, in accordance with this invention, is disposed transversely of the barge and is common to those tanks, shown as three in number, that lie side by side. The expansion trunk for the after tanks is disposed at the after end of the barge, while the expansion trunk for the forward tanks is disposed at the forward end of the barge, as shown, leaving a clear space therebetween. Access is gained to each tank through a hatch 29 to permit entry into the tank for cleaning and inspection. The hatch 29 has a corresponding opening 30, of course, in the deck 1 immediately therebeneath within the expansion trunk 28.

A description of a forward tank 5 and the after tank 8 and the conduits for emptying and cleaning the same will suffice since the three series of tanks are identical and like reference characters are applied to like parts.

Each tank may, if desired, be also filled with liquid through its manhole 29. Each tank is provided in its bottom, at the lowest point thereof, and at the forward and after ends, with a sump 31. The liquid tank contents is withdrawn from the tank from these sumps. Lengthwise of each tank, near the bottom thereof, is a pipe 33 of relatively large capacity which extends through both the forward and after tanks to a manifold 35 outwardly of the forward end of the forward tanks and from which a manifold 35 and pipe 37 leads to a pump 38 in the forward part of the barge, forwardly of the end wall 10. The pump 38 draws fluid from the tanks and delivers it through a pipe 39 to a transverse pipe 40, to either open end of which a delivery hose line may be attached. Both outlets of this transverse pipe 40 are controlled by valves 41. A pipe 42 controlled by valve 43 also leads from manifold 35 to an auxiliary transverse outlet pipe 44 controlled by valves 46.

The pipe 37 is also controlled by a valve 47. At each sump 31, a pipe 49 extends downwardly from the pipe 33 to a point near the bottom of the sump. The pipe 49 in the after end sump of the after tank 9 is controlled by a valve 51 and the pipe 49 at the forward sump of the after tank 9 is controlled by a valve 53. The pipe 49 in the after sump of the forward tank 5 is controlled by a valve 55 and the pipe 49 in the forward sump of the forward tank 5 is controlled by a valve 57. The valve stems of these valves 51, 53, 55 and 57 extend to a point proximate the deck 1, say, in a well 59 for ease of manipulation where a tank is to be emptied. There is also in each pipe 33 a main cut-off valve 60 forwardly of the valve 57, the stem of which extends above the deck 1 so that the particular line 33 can be controlled at that point.

To empty any tank, say tank 5, the appropriate valves, say, those indicated at 55, 57, 47 and 41 are opened and a hose (not shown) being connected to the end 40, the pump 38 is started and the liquid withdrawn and delivered through the hose.

It is then necessary to clean the tank. Let it be assumed that tanks 8 and 5 are to be cleaned. The hatch 29 is opened, a man descends and opens valves 59, 61, 63 and 65 on pipe 67 of smaller capacity leading from the pipe 33 to the very bottom of the sump. The pump 38 is again started and as the walls of the tank 9 are cleaned with the aid usually of a suitable cleansing liquid, the cleansing liquid is pumped out as fast as it collects in the sumps 31. When all liquid is out of the sumps 31, all valves are closed, the pump of course being stopped.

It is then desirable to clean out the suction lines. Steam or air is used for this purpose, conveniently by a steam line from a tug boat, and connected to a pipe 69 leading to a steam manifold 71, also conveniently in the forward end of the barge. Obviously hot air or, in fact, any fluid may be used.

A pipe 73, conveniently extending along one side of the barge between the tanks, say, 3 and 7, and the hull and from bow to stern is connected forwardly through a valve 75 to the steam manifold 71. At the stern it crosses the barge, as at 77, and from the pipe section 77 lead pipes 79 through the end wall of the tanks and into the valves 51 on the after ends of the pipes 33 in each series of tanks 7, 4, 8, 5 and 9, 6. Each of these pipes 79 is controlled by a valve 83. All the valves in lines 33 are closed except valve 51. By opening valve 83, the valve 75 being open, and steam at suitable pressure in the manifold 71, steam is admitted through the valve 51 into the length of pipe 33 between valves 51 and 53.

The steam blows the liquid before it. A pet cock (not shown) at valve 53 may be opened to show when the liquid reaches and passes that point. The attendant, moving to the valve 55 uses a pet cock there to determine when the liquid has reached that valve. This operation is repeated through the several valves 55, 57, 47 and 41, seriatim, until the liquid and steam is discharged overboard through the pipe 40.

In order to thoroughly clean manifold 35 steam may be blown into each end thereof, The valves 41 and 47 being open and valves 60 closed, valves 85, 87 may be opened in the respective pipes 86 and 88 leading from the steam chest 71. Steam pipe 86 leads to one end of the manifold 35 and steam pipe 88 to the other end, as shown. After pump 38 is cleaned, a valve 90 may be closed and steam admitted through the valve controlled line 92.

It will be readily apparent that the tanks, being spaced from the hull, are surrounded by a dead air space which will serve to insulate the tank contents and maintain such contents substantially at the temperature in which such contents was introduced into the tanks. If this is not sufficient to maintain the temperature as desired, coils may be disposed in each tank. This outer space may be utilized as a cargo space where a liquid is carried which need not be maintained at a predetermined temperature, such as gasoline. Thus liquid delivered to the tanks may also be fed into the outer spaces.

These coils may obviously carry refrigerating fluid but, for purposes of illustration, are shown as carrying steam. A pipe 89, controlled by a valve 91 leads from the steam manifold 71 through tank 4 to the tank 7 where it is reversely bent a desired number of times proximate the

bottom as shown at 93 in all the tanks (see Fig. 1) and then led overside to exhaust as at 95 The tank 4 is similarly heated by a coil 93 from a similar steam pipe 97 controlled by a valve 99. The tank 8 is similarly heated by a coil 93 from a similar steam pipe 101 controlled by a valve 103 from the steam manifold 71. The tank 3 is similarly heated by a coil 93 from a similar steam pipe 105 controlled by the valve 107. The tank 4 is similarly heated by a coil 93 fed by a pipe 109 controlled by the valve 111. The coil 93 of the middle tanks is conveniently exhausted by pipes 112 leading to the overside exhaust 96 of the side tanks 5 and 8. The tank 5 is similarly provided with a coil 93 fed by a steam pipe 113, controlled by valve 115, from the steam manifold 71 and exhausts over the side at 96.

As shown in the modification of Figure 4, if desired, and particularly where easily contaminated liquids may be carried in the tanks, the little line 67 may be continued directly to a separate stripping pump. As there shown, the line 67 extends to a T 117, one arm of which connects with the valve 59 while a pipe 118, valve controlled if desired at 119, continues to the manifold 120 from which a pipe 121 conducts the fluid to the stripping pump 122 by which the fluid is delivered overside through, say, the pipe 123.

It is also very convenient to fill the tanks through the pipe system described, particularly where highly volatile liquids are being handled. With appropriate valves 41, 47, 60, 57, say, opened, the liquid may be delivered into an open end of pipe 40 and directed into the desired tank.

The method of cleaning may also be reversed and fluid forced under pressure, say, into the manifold 35 and from thence toward the rear through the pipe 33 past successive valves into a sump 31 from which the liquid is removed through the line 67, 118 by the stripping pump 122.

The purpose and function of the tank barge of this invention is apparent from the foregoing description. While the tank barge of this disclosure is applicable to the transportation of any fluid, it is particularly applicable with such liquids as vegetable oils and cocoanut oil that solidify at ordinary temperatures and must be heated to approximately one hundred and fifty degrees Fahrenheit to liquefy them so that they can be pumped. When a tank is to be emptied, the contents may be liquefied by heat from the coil 93 and readily pumped. Again heavy asphalt oils received hot from the refineries are kept at the desired temperature in transit.

Various modifications will occur to those skilled in the art in the composition, configuration and disposition of the component elements going to make up the invention as a whole as well as in the selection of those elements desired for the particular purpose at hand and no limitation is intended by the phraseology of the foregoing description or illustrations in the accompanying drawings except as indicated in the appended claims.

What is claimed is:

1. In a tank barge, a hull, a deck therefor, a substantially centrally disposed transverse bulkhead forming a common end for a plurality of tanks disposed forwardly and aft from said bulkhead and serving as a transverse brace for said hull, U-shaped troughs attached at one end to said transverse bulkhead and closed at the top by said deck, means for positioning the said troughs in the hull comprising supporting saddles and spacing bars permitting expansion of the troughs independently of the hull and a closure for the fore and aft ends of the troughs whereby said tanks are formed.

2. In a tank barge, a hull, a deck therefor, a substantially centrally disposed transverse bulkhead forming a common end for a plurality of tanks disposed forwardly and aft from said bulkhead and serving as a transverse brace for said hull, U-shaped troughs attached at one end to said transverse bulkhead and closed at the top by said deck, means for positioning the said troughs in the hull comprising supporting saddles and spacing bars permitting expansion of the troughs independently of the hull and a closure unsupported by the bottom of the hull for the fore and aft ends of the troughs whereby said tanks are formed.

3. In a tank barge, a hull, a deck therefor, a substantially centrally disposed transverse bulkhead forming a common end for a plurality of tanks disposed forwardly and aft from said bulkhead and serving as a transverse brace for said hull, U-shaped troughs attached at one end to said transverse bulkhead and closed at the top by said deck, means for positioning the said troughs in the hull comprising supporting saddles and spacing bars permitting expansion of the troughs independently of the hull, and a closure for the fore and aft ends of the troughs whereby said tanks are formed, sumps in said tanks, and means to pump a liquid from said sumps.

4. In a tank barge, a hull, a flat cargo accommodating deck free from obstructions except at the ends, a substantially centrally disposed transverse bulkhead forming a common end for a plurality of tanks disposed forwardly and aft from said bulkhead and serving as a transverse brace for said hull, U-shaped troughs attached at one end to said transverse bulkhead and closed at the top by said deck, means for positioning the said troughs in the hull comprising supporting saddles and spacing bars permitting expansion of the troughs independently of the hull and a closure for the fore and aft ends of the troughs whereby said tanks are formed.

5. In a tank barge, a hull, a deck therefor, a substantially centrally disposed transverse bulkhead forming a common end for a plurality of tanks disposed forwardly and aft from said bulkhead and serving as a transverse brace for said hull, a plurality of adjacent U-shaped troughs having common side walls attached at one end to said transverse bulkhead and closed at the top by said deck, means for positioning the said troughs in the hull comprising supporting saddles and spacing bars permitting expansion of the troughs independently of the hull and a closure for the fore and aft ends of the troughs common to the adjacent troughs whereby said tanks are formed.

6. A tank barge having a plurality of longitudinal tanks each having a sump, a discharge system including a pump and a conduit for each tank connected at one end to the pump, a relatively short valve controlled conduit dipping into the sump and connected to the discharge conduit, and means to introduce an expansible fluid axially of the discharge conduit at the end opposite the pump to remove the residual content of the discharge conduit and to supply the expansible fluid to the tank.

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