April 9, 1968 M. K. GILL 3,376,841

RIGID BARGE

Filed March 15, 1966 3 Sheets-Sheet 1

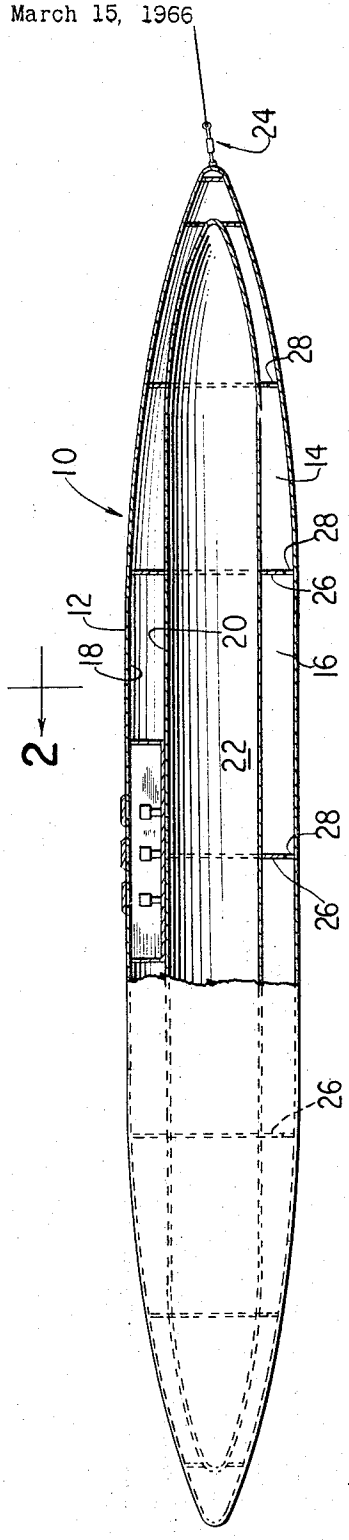


FIG. 1

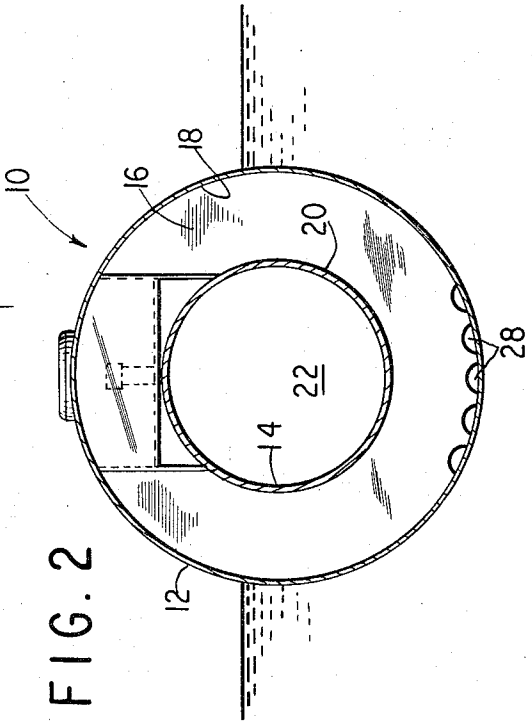


FIG. 2

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RIGID BARGE

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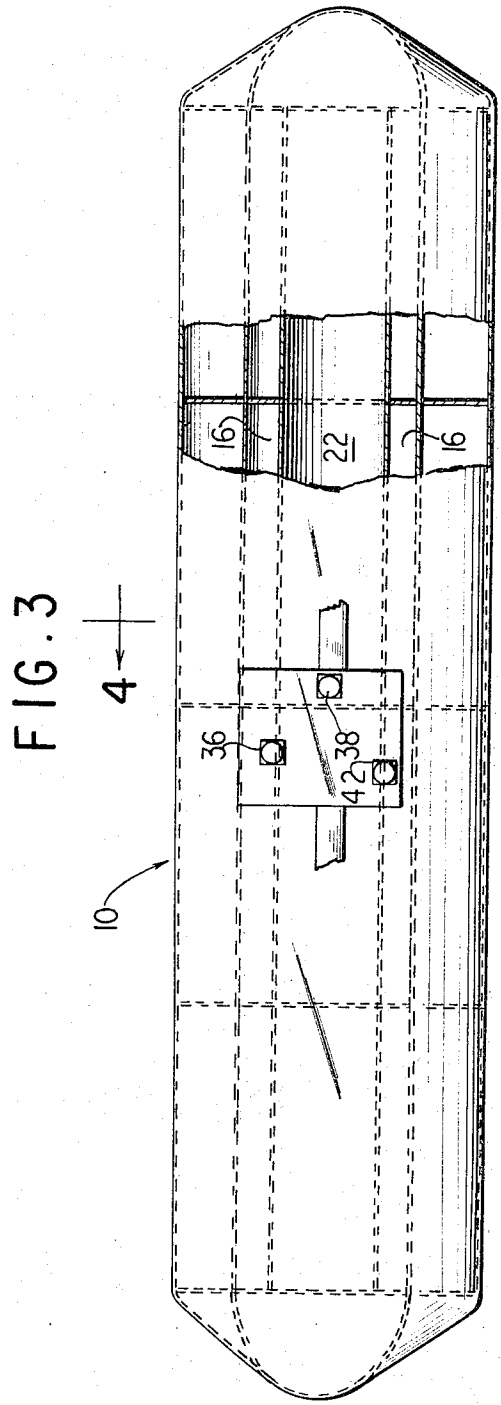


FIG. 3

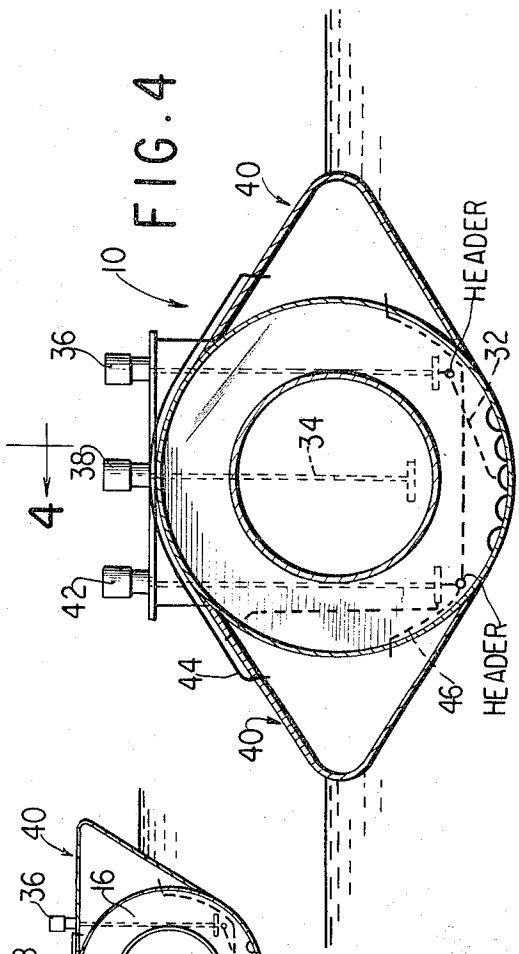


FIG. 4

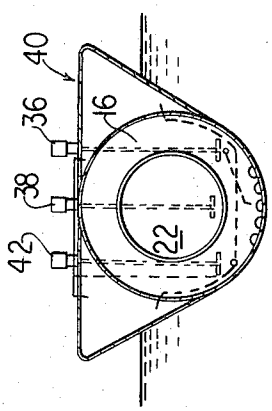


FIG. 5

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RIGID BARGE

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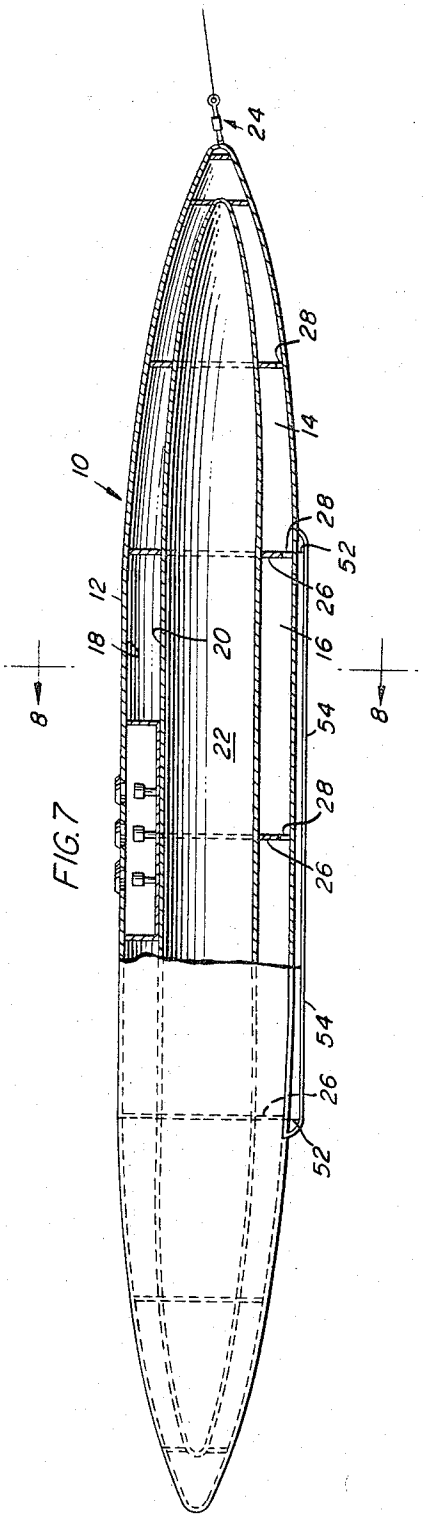


FIG. 7

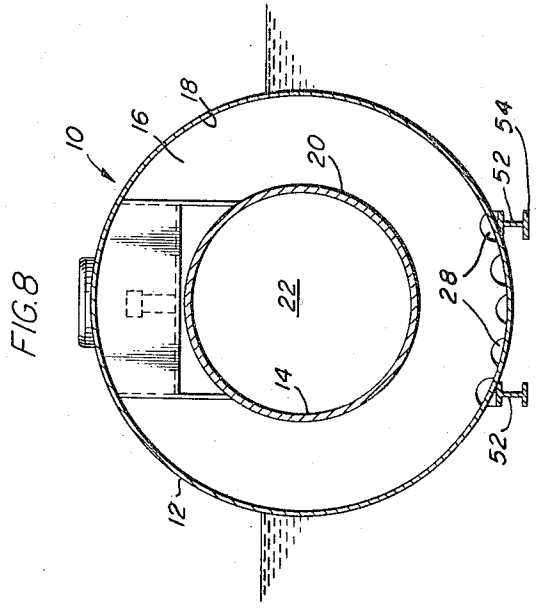


FIG. 8

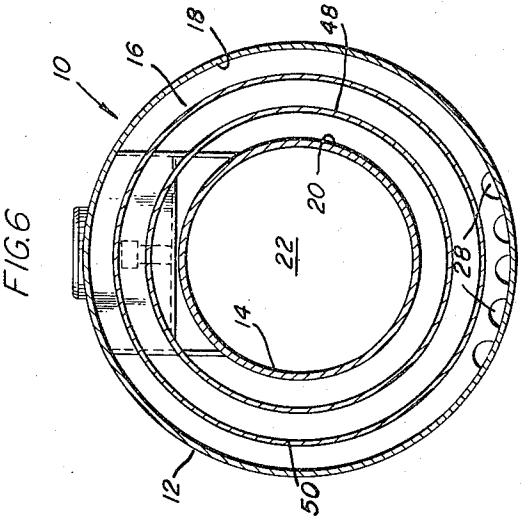


FIG. 6

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3,376,841

RIGID BARGE

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13 Claims. (Cl. 114—73)

ABSTRACT OF THE DISCLOSURE

A rigid type barge which can navigate on oceanic bodies or inland waterways having concentric cylinders capable of transporting fluids or fluidizable solids. Appropriate concentric chambers are loaded with cargo on the initial voyage, while the remaining chambers are empty, in order to supply sufficient buoyancy to maintain a reasonable draft. On the return voyage the previously empty storage chambers may be loaded with a dissimilar material from that carried in the storage chambers on the initial trip. To improve the stability of said barge and to prevent it from overturning, buoyant means are attached to the exterior of the barge in the form of outriggers. The draft of said barge may be raised or lowered by charging or discharging ballast fluid from said outriggers.

The present invention relates to vessels for transporting liquids or fluidizable solids. More particularly it relates to a novel rigid type barge which can navigate on oceanic bodies and on inland waterways to transport liquids or fluidizable solids. By "fluidizable solids" is meant granular or like solids which can be caused to flow under the action of a fluid such as compressed air or water.

Although barge transportation of materials is extensively employed in commerce, certain features of this system of transportation present problems which this invention successfully solves. Oftentimes, the barge will depart on the initial leg of its trip carrying a single specific cargo. Upon reaching its destination and unloading, it is naturally desirous, from an economical viewpoint, that upon the return leg of the journey the barge also be laden with cargo. As is frequently the case, on the return leg of the trip the barge usually will carry a material which is dissimilar to and not compatible with the material carried on the initial leg of the trip. If the other material were loaded into the cargo carrying space, without first thoroughly cleaning the cargo space, the material carried on the return trip would be contaminated and thus rendered unusable. At this juncture various alternatives are presented. Either the barge must return unladen with cargo or extensive and thorough cleaning of the cargo carrying space must be done prior to loading of the dissimilar material. The choice of either alternative, it can be appreciated, will detract from profitability and will be time consuming. Another problem which is frequently encountered in barge transport is in maintaining the barge in a stable condition so that it will not overturn during transit, irrespective of the waters it is transversing or the materials which are being transported.

It is an object of the present invention to provide an improved barge for transporting liquids and fluidizable solids.

An object of the present invention is to provide a barge which can be employed in the oceanic transportation of materials, as well as in transporting materials on inland waterways.

Another object of this invention is to provide a rigid barge which can transport one type of material on its

initial trip and another type of material on its return trip, without contact or contamination of the one material by the other material, thus avoiding the need for any cleaning operations.

Yet another object of the present invention is to provide means for stabilizing a rigid type barge so that it does not overturn in transit, irrespective of the cargo it is carrying, or the waters it is traversing.

With these objects in mind, and other objects which will appear as the description of the invention proceeds, the present invention comprises a barge having two concentric cylinders defining two separate cargo carrying chambers. On the initial trip, the inner chamber or the outer chamber is filled with the material to be transported, which chamber is filled initially is immaterial, while the other chamber, which is empty, serves to supply suffcient buoyancy to maintain a reasonable draft of the barge. On the return trip, the chamber which was empty on the initial trip is ladened with the dissimilar material to be transported, and the chamber which is now empty by virtue of the cargo having been unloaded serves to supply buoyancy so as to maintain a reasonable draft of the barge. The term "draft" as used herein, is defined as the depth of water the barge draws, especially when laden. The dimensions and the volumes of each of the cylinders is dependent upon a variety of factors. Illustrative of the factors which must be taken into account in the construction of the novel barge of the present invention are: (1) the body of water it is to travel upon, (2) the type of materials which are to be transported in each direction, (3) the desired capacity of the barge, (4) the materials employed in the construction of the barge, and (5) the allowable draft of the barge.

The present invention will be best understood from the following description of a preferred embodiment of the invention when read in conjunction with the accompanying drawings, in which:

FIGURE 1 is a side view, partly in elevation and partly in cross section, of the rigid barge according to the invention.

FIGURE 2 is a sectional view taken along the line 2—2 of FIGURE 1.

FIGURE 3 is a plan view, partly in cross section of the rigid barge according to the invention.

FIGURE 4 is a sectional view taken along the line 4—4 of FIGURE 3.

FIGURE 5 is a transverse section of an alternate embodiment of the rigid barge according to the invention.

FIGURE 6 is a transverse section of an alternate embodiment of the rigid barge according to the invention.

FIGURE 7 is a side view, partly in elevation and partly in cross-section, of the rigid barge according to an alternate embodiment of the invention.

FIGURE 8 is a transverse section of an alternate embodiment of the rigid barge according to the invention.

The rigid barge **10** of the present invention, as can be seen by reference to FIGURE 1, is cylindrical in shape and tapers at each end. The barge is constructed employing steel, but other materials such as wood could also be used as the fabricating material for the barge. The overall length of the barge will vary depending upon certain factors. Principal among these factors are the bodies of water it will traverse e.g., oceans, gulfs, or inland waterways, the density of the liquids and fluidizable solids which are contemplated to be transported, the volume of material which can be transported taking considerations of draft into account, etc.

The external cylinder **12** is defined by the exterior of the barge **10**. The internal cylinder **14** is concentric with the external cylinder **12**. The annular, or outer, storage chamber **16** is defined by the interior surface **18** of the

external cylinder 12 and the exterior surface 20 of the internal cylinder 14. The internal cylinder 14, as can be seen by reference to FIGURE 1, is elongated and cylindrical in shape and is tapered at each end thereof. Thus, this self-contained internal cylinder 14 forms a second, or inner, storage chamber 22. Although it is preferred that the barge 10 and consequently the external cylinder 12, be tapered in its shape, as well as the internal cylinder 14, other shapes for the barge and the cylinders may be adapted with equal facility to the present invention. A choice of the tapered shape minimizes turbulence and enables the barge to be towed more readily through water. At the forward end of the barge 10 there is provided pivot means 24 to which the towing rope is attached at one end with the other end of the towing rope being attached to the towing vessel. Supporting members 26, e.g. bulkheads, are affixed to the interior surface 18 of the external cylinder 12 and extend through said outer, or annular, chambers 16 and are affixed at their opposite ends to the exterior surface 20 of the internal cylinder 14. The supporting members 26 and intermediate web framing as required, not shown, for both the external and internal cylinders are located at intervals along the length of the barge 10 and serve to add rigidity and structural reinforcement to the barge. It is contemplated that when the barge is being used, the outer storage chamber 16, or the inner storage chamber 22, depending upon which chamber is employed to transport the liquid or fluidisable solid, will be filled to capacity. In the event that less than a capacity cargo is being transported and the inner chamber 22 is being utilized, supporting members which pass through both chambers may be employed. This would prevent the movement or sloshing of the material being carried in the inner chamber 22 and thus serve to compartmentalize that particular material. Thus, while in its preferred embodiment, the supporting members 26 will serve only as rigid reinforcing members, by extending the supporting members so that they pass through the inner storage chamber 22, effective compartmentalization may also be obtained. In the preferred embodiment, where the supporting members 26 are used only to provide rigidity, a plurality of small semi-circular apertures 28 are provided at the lower end of the supporting members 26. These apertures serve to establish communication between the segments defined by each supporting member and thus aids in the charging and discharging of cargo from the outer storage chamber 16. When supporting members which pass through both chambers are employed, apertures, be they semi-circular, circular, etc., would also be present in the portion of the supporting member which passes through the inner storage chamber 22; thus these apertures would also serve to establish communication between the segments defined by each supporting member so as to aid in the charging and discharging of materials from the inner storage chamber 22 and reduce cargo surge. Intermediate web frames in the outer and inner cylinders would also be provided with apertures. In another embodiment additional elongated internal cylinders 48, 50, co-centrically supported within annular chamber 16 by supporting members 26 are provided in order to increase the number of cargo carrying chambers of the barge.

As can be seen by reference to FIGURES 3 and 4, means are provided for the charging and discharging of the cargo to be transported. For purposes of illustration only, and in order to give a clearer understanding of the nature of the invention, it is to be assumed that a fluidisable solid is being carried in the inner chamber 22 on the initial trip. On the return trip, it is to be assumed that a liquid is being carried in the outer chamber 16. As can be seen by reference to FIGURES 3 and 4, header 32 is provided for the charging and discharging of liquids to and from the outer chamber 16. Line 34 is provided for the charging and discharging of fluidizable solids from and to the inner chamber 22. Pump 36 is used for the charging and discharging of liquids and pump 38 is used for the charging and discharging of fluidizable solids. The aforementioned pumps are motor driven. Altenratively, air may be used for the loading and unloading of the liquids and fluidizable solids.

In one embodiment of the present invention, see FIGURE 4, outriggers 40 are provided on either side of the exterior of the barge 10. Depending upon the density of the cargo and the draft of the barge in the waterway it is traversing, the outriggers 40 provide added stability and buoyancy to the barge and thus aid, when employed in conjunction with either the inner or outer chamber being empty, to maintain a reasonable draft of the barge 10. The outriggers 40 are affixed, e.g., welded or riveted, transversely with respect to the sides of the barge. The outriggers may be used with or without ballast fluid. When the addition or removal of ballast fluid, e.g. water, is necessary, ballast pump 42 and ballast pump discharge header 44 and ballast pump suction header 46 are provided which communicate with outriggers 40. If the barge is riding low in the water, the removal of ballast fluid from the outriggers 40 will cause the barge to rise and thus move more easily and readily through the water. When the barge 10 is riding too high in the water, due to being laden to less than capacity, and thus resulting in reduced speeds, ballast fluid would be pumped through header 44 by ballast pump 42 so that the barge will then ride lower in the water.

The rigid barge of the present invention may carry a wide variety of liquids and fluidizable solids. Illustratively, on the initial voyage the barge of the present invention could carry phosphoric acid, while on the return voyage it could carry petroleum products. The phosphoric acid could be carried either in the inner chamber or the outer chamber on the initial voyage, and the petroleum products would be carried on the return voyage in the chamber which was empty on the initial voyage. The volumes of the outer chamber and the inner chamber may be the same, or they may be different. In this particular operation, the chamber in which phosphoric acid is transported would preferably have a smaller volume than the chamber in which the petroleum product is being transported. Since the specific gravity of the phosphoric acid is greater than that of the petroleum product, this arrangement provides for the use of the chamber having the larger volume for the purpose of supplying buoyancy during transport of the material having the greater specific gravity. Conversely, the chamber having the smaller volume is used for buoyancy during transport of the petroleum product in the chamber having the greaer volume. A variety of factors would weigh heavily in choosing the particular volume of the respective chambers, namely: the specific gravity of the liquid and of the fluidizable solid contemplated to be carried in each of the respective chambers, the contemplated tonnage capacity of the barge on each leg of the voyage, and the permissible draft of the barge in the waterway it is traversing.

While the present invention has been illustrated and described as embodied in a rigid barge including two concentric cylinders which define two cargo-carrying chambers, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention. Exemplary of such modifications would be the inclusion of additional concentric cylinders and hence an increase in the number of cargo-carrying chambers. Thus, two or more dissimilar materials might be carried at the same time in separate chambers with the remaining chambers being empty so as to supply buoyancy. Additionally, the shape of the cylinders might be blunt, for example, instead of tapered without departing in any way from the scope of the invention.

The flexibility and utility of the present invention is

further illustrated in another embodiment in which supporting legs with runners attached thereto may be affixed to the underside of the barge. Upon emerging from the water the barge could then be pulled onto the shore by means of the aforementioned runners. FIGURES 7 and 8 show supporting legs 52 affixed to the external cylinder 12, with runners 54 attached thereto. The supporting legs 52 will obviously strengthen the rigid external shell of the barge after its removal from the water. Thus, if immediate removal of the transported cargo were not necessary, the barge could serve as a storage container while standing upon the shore. Should it be desirable to transport the barge upon a landing craft to a specific destination so that the barge may then be loaded, the removal of the barge from the landing craft upon its reaching its desired destination would be facilitated by the provision of the aforementioned supporting members with runners attached thereto.

Without further analysis, the foregoing will so fully reveal the nature of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of the prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed is:

1. A barge for transporting a liquid or a fluidisable solid on an initial voyage and a dissimilar liquid or fluidisable solid on the return voyage without effecting contact between said dissimilar materials which comprises:

(a) an elongated rigid external cylinder defining the continuous exterior surface of said barge;

(b) an elongated internal cylinder which is concentric with said external cylinder and completely enclosed therein, the volume of said internal cylinder comprising an inner storage chamber, and the annular chamber formed by the interior surface of said external cylinder and the exterior surface of said completely enclosed internal cylinder defining an outer storage chamber;

(c) means on said barge communicating with each of said storage chambers for loading and unloading said liquids and fluidisable solids therefrom whereby one of said storage chambers may be laden on said initial voyage while the other chamber is employed for buoyancy, while on the return voyage the previously empty storage chamber may be laden with the dissimilar material and the other chamber may be empty so as to supply buoyancy to maintain a reasonable draft of said barge.

2. The apparatus as recited in claim 1 in which the relative volumes of said outer chamber and said inner chamber are in essentially reverse proportion to the specific gravity of the liquids and fluidisable solids to be carried therein.

3. The apparatus as recited in claim 1 in which said external cylinder and said internal cylinder are tapered at each of their ends.

4. The apparatus as recited in claim 1 and including supporting members affixed to the interior surface of said external cylinder and adapted to maintain said internal cylinder in concentric alignment with said external cylinder.

5. The apparatus of claim 1 and including more than one elongated internal cylinder concentrically supported within the annular chamber formed by the interior surface of said two or more dissimilar materials might be carried at the same time in separate chambers with the remaining chambers being empty so as to supply buoyancy.

6. The apparatus of claim 5 and including supports to maintain the internal cylinders in concentric alignment with the external cylinder.

7. A barge for transporting a liquid or a fluidizable solid on an initial voyage and a dissimilar liquid or fluidizable solid on the return voyage without effecting contact between said dissimilar materials which comprises:

(a) an elongated rigid external cylinder defining the exterior of said barge;

(b) an elongated internal cylinder which is concentric with said external cylinder, the volume of said internal cylinder comprising an inner storage chamber, and the annular chamber formed by the interior surface of said external cylinder and the exterior surface of said internal cylinder defining an outer storage chamber;

(c) buoyant means mounted on either side of the exterior of said barge and extending transversely thereof whereby the stability of said barge is improved and said barge is prevented from overturning;

(d) means on said barge communicating with each of said storage chambers for loading and unloading said liquids and fluidizable solids therefrom whereby one of said storage chambers may be laden on said initial voyage while the other chamber is employed for buoyancy, while on the return voyage the previously empty storage chamber may be laden with the dissimilar material and the other chamber may be empty so as to supply buoyancy to maintain a reasonable draft of said barge.

8. The apparatus as recited in claim 7 in which said buoyant means are outriggers.

9. The apparatus as recited in claim 7 and including means for charging and discharging ballast fluid from said outriggers whereby the draft of said barge may be raised or lowered.

10. The apparatus as recited in claim 7 in which said external cylinder and said internal cylinder are tapered at each of their ends.

11. The apparatus of claim 7 and more than one elongated internal cylinder concentrically supported within the annular chamber formed by the interior surface of said external cylinder whereby two or more dissimilar materials might be carried at the same time in separate chambers with the remaining chambers being empty so as to supply buoyancy.

12. The apparatus of claim 11 and including supports to maintain the internal cylinders in concentric alignment with the external cylinder.

13. The apparatus of claim 1 including mechanical means affixed to the exterior surface of said barge to support said barge on a solid surface, whereby said barge may be transported on land for unloading, loading, or storage.

References Cited

UNITED STATES PATENTS

933,331	9/1909	Niedringhaus	114—73
2,402,790	6/1946	Vorenkamp	114—.5
3,067,712	12/1962	Doerpinghaus	114—74

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