Aug. 3, 1965 A. I. LIVAS 3,198,157

DRAFT REDUCING DEVICE FOR VESSELS

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Fig. 1

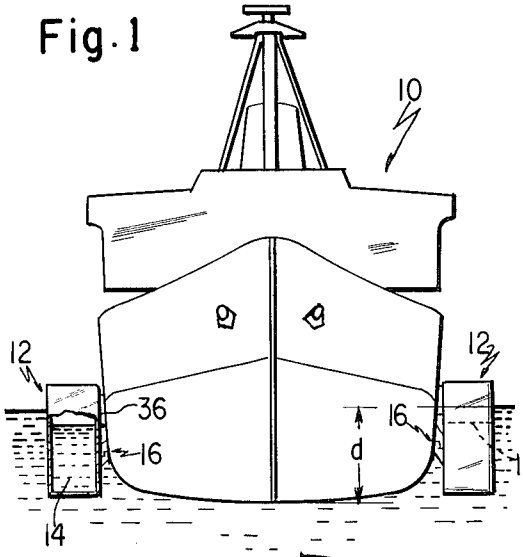


Fig. 2

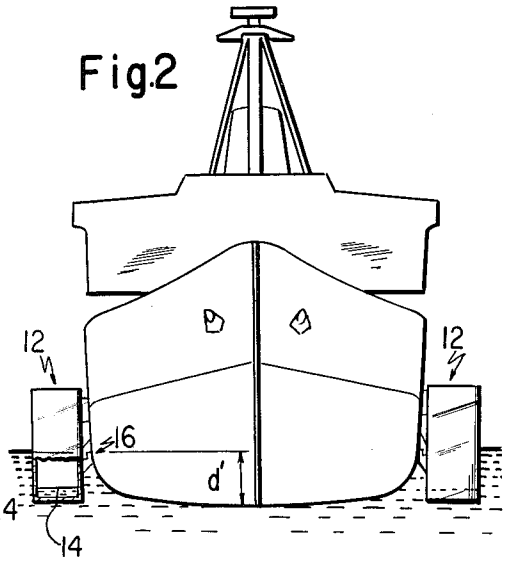


Fig. 3

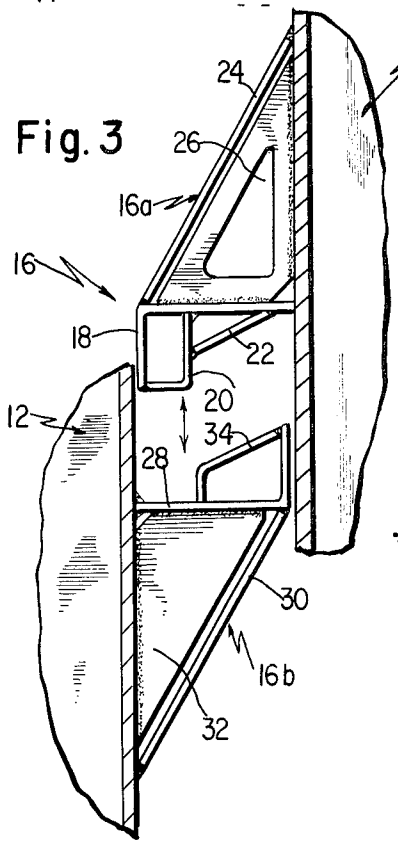


Fig. 5

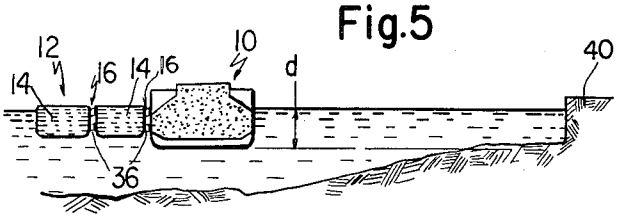
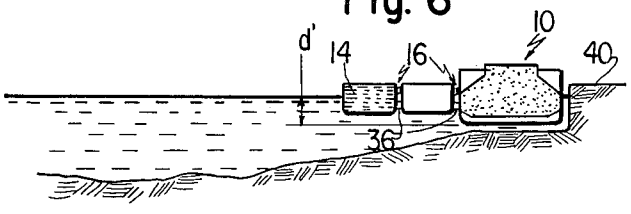


Fig. 6



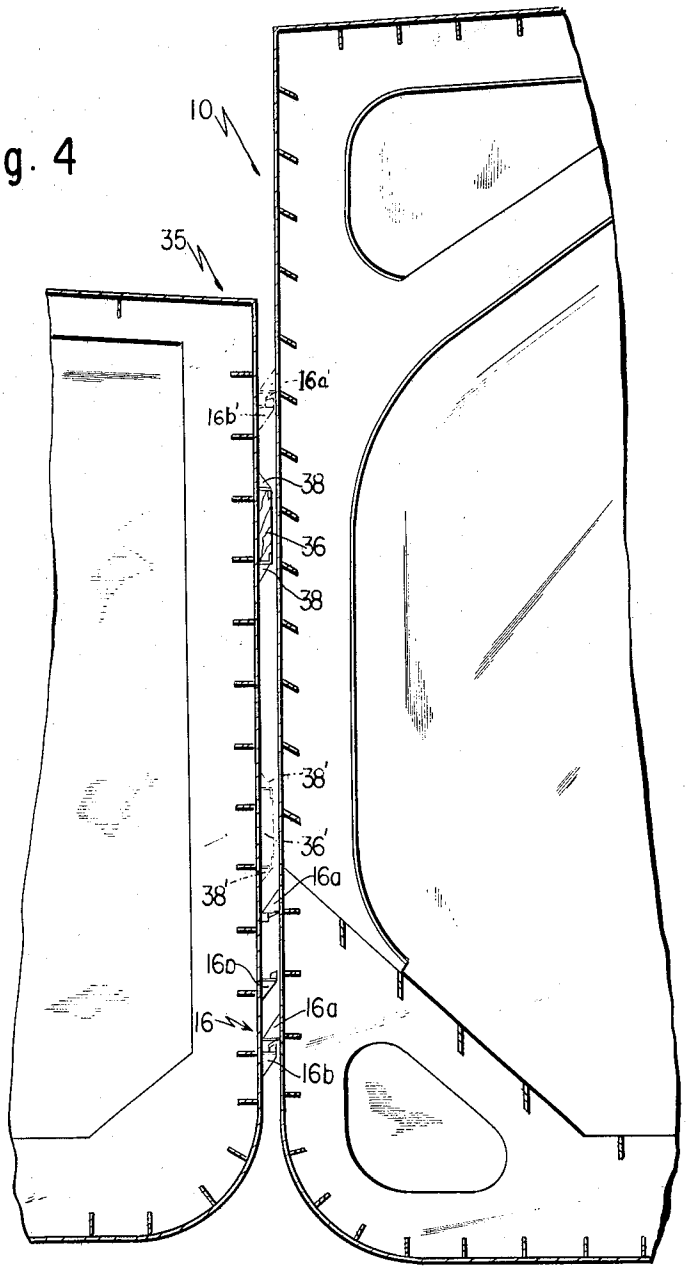
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DRAFT REDUCING DEVICE FOR VESSELS

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Fig. 4



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DRAFT REDUCING DEVICE FOR VESSELS

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Filed Oct. 31, 1963, Ser. No. 320,405
4 Claims. (Cl. 114—123)

This invention relates to method and apparatus for reducing the draft of ships when they are leaving or entering a harbor having insufficient water depth for accomodating such sea-going vessels.

In particular, this invention is directed to adapting a sea-going ship of standard design with a draft reducing device or devices as distinguished from modifying or reconstructing the ship's hull (or designing a special hull for a new special purpose ship) when the problem at hand is to load and transport a ship for an economical sea-going voyage to the extent where it cannot enter a specific harbor having insufficient water depth.

Up to the present time, it has been the practice to meet such problem by: (a) building a new ship of special hull design, or (b) extensively modifying a general purpose ship, or (c) reducing the cargo loaded at the beginning of the sea-going voyage, or (d) unloading a portion of a fully loaded ship after the sea-going voyage and before entering the harbor until the draft has been sufficiently reduced to permit the ship to enter. The same solutions have also been applied to ships loaded with cargo for sea-going voyage which must cross shallow water within a harbor before reaching the high seas.

In accordance with apparatus of the present invention, there is provided draft reducing means for a ship which comprises a first bracket means which is adapted to be secured to the sides of the ship and having a portion extended downwardly from an outboard position thereof, a floatable body and a second bracket means secured to the sides of the floatable body and having an extension depending upwardly from an outboard portion thereof, the upper profile of the second bracket means being interlockable with the lower profile of the first bracket.

In accordance with the invention there is also provided a method for reducing the draft of a ship which includes the steps of moving a hollow buoyant body in close proximity to the ship, interlocking the adjacent sides of the hollow buoyant body and the ship, and increasing the buoyancy of the floatable body.

The prior art for at least the last one hundred years is replete with devices for temporarily decreasing the ship's draft by various pontoon arrangements which are attached to the sea-going ship by chains passing under the keel of the ship and/or pontoons which are attached to arms pivoted to the ship's deck or the ship's side so that they can be swingable from a position above the ship's water line to a position at or below the ship's water line. Some of the disadvantages of the latter solution were the complicated mechanical arrangement and the high power transmission system required to transfer the ship's weight to the pontoons. It is significant to note that in spite of tremendous efforts expended by commercial interests to solve the very real and commonly prevailing problems, there nevertheless has not evolved, prior to the present invention, a solution which has received any practical commercial acceptance. This invention is specifically directed to the long-needed practical solution to the long outstanding problem. For instance, according to this invention, there is no need to construct cavities into the side of the ship either below or above the water line. Hence the present inventive draft reducing means can be fitted with relatively little expense to the sides of existing ships with side and hull contours designed for economical speeds and general sea-going duties. As a practical commercial consideration, the draft reducing means of

the present invention can be carried upon the ship's sides during an ocean-going voyage without materially affecting the ship's speed in a troubleless manner so that it is immediately available for its intended purpose to reduce the ship's draft. Also, and very important, according to the present invention there is no need for the sea-going ship to have any special power equipment for effecting the lifting of the ship in order to reduce its draft. Even the hollow buoyant bodies which are moved into position adjacent the sides of the sea-going ship when the latter reaches its intended harbor require no complicated apparatus to attach them to the sea-going ship or to increase the buoyancy of the hollow buoyant bodies. An ordinary power driven water pump is all the power transmission system that is required to reduce the draft of the ship.

Other objects and features of the present invention will be set forth or apparent in the following description and claims and illustrated in the accompanying drawings, which disclose by way of example, and not by way of limitation, in a limited number of embodiments, the principal of the invention and structural and method implementations of the inventive concept.

In the drawings, in which like reference numbers designate like components in the several views:

FIG. 1 is a front elevation view of a ship having excessive draft prior to having its draft reduced according to the invention;

FIG. 2 illustrates the ship of FIG. 1 after its draft has been reduced;

FIG. 3 is an elevation view of the coupling devices employed in FIGS. 1 and 2;

FIG. 4 is a sectional elevation view illustrating how the ship is coupled to one or more tankers or hollow buoyant bodies for effecting draft reduction;

FIG. 5 is a sectional elevation of a heavily loaded ship being coupled to hollow buoyant bodies in an alternate arrangement according to the invention; and

FIG. 6 illustrates in a sectional elevation view the vessel of FIG. 5 tied up to a pier for unloading.

In FIG. 1, a loaded ship **10** arrives at a harbor with an excessive draft *d* for the existing water depth between it and its intended wharf or pier. According to one embodiment of the invention, a pair of hollow buoyant bodies **12**, each loaded with sea water ballast **14**, is moved, as by tugboats, to positions adjacent to and along opposite longitudinal sides of the ship **10**. Thereafter, the hollow buoyant bodies **12** are mechanically coupled to the sides of the vessel **10** with devices shown in FIG. 3 by pumping water ballast **14** out of the hollow buoyant bodies **12** (by mechanism not shown) so that the draft of the combination of the ship **10** and the hollow buoyant bodies **12** is reduced to *d'* as shown in FIG. 2. The new draft *d'* is selectively predetermined so that the ship **10** can navigate through shallow water existing between it and its intended pier or wharf. After the ship **10** again reaches deep water or its intended pier where the water depth is proper to accommodate the ship's full draft, sea water can be pumped into the hollow buoyant bodies **12** for uncoupling the hollow buoyant bodies from the ship's side so that the hollow buoyant bodies can be moved, as for instance with tugboats, to assist other heavily loaded ships.

The hollow buoyant bodies **12**, according to the invention, can be old tankers, such as the T2, which are no longer useful for transporting petroleum products but which have tank holds still suitable for taking on and discharging sea water in accordance with this invention. The propulsion equipment of the tankers would then obviate the need for any tugboat assistance. Alternatively, the hollow buoyant bodies **12** can be salvaged from

old tankers having worn out or damaged propulsion equipment. That is to say, portions of the old tankers can be removed leaving only the tank portions which would then serve as hollow buoyant bodies to be moved to and from the ship **10** by tugboats.

FIG. 3 illustrates one embodiment of the device **16** for coupling the sides of hollow buoyant bodies **12** to the sides of the ship **10**. Coupling device **16** comprises a first bracket number **16***a* attached to the sides of ship **10** and a second bracket number **16***b* secured to the sides of the hollow buoyant bodies **12**.

First bracket member **16***a* comprises an angle iron **18** welded to the ship's side **10** with one arm horizontal and the other arm extending downwardly. A second angle iron **20** is welded to the first angle iron **18** to form a rectangular profile at the outboard portion of angle **18**. A first strut **22**, such as a flat plate, is welded in an oblique position between the vertical arm of angle **20** and the horizontal leg of angle **18**. Another strut **24**, such as a flat plate, is welded between the outboard end of angle **18** and the side of ship **10**, such strut plate being reinforced by spaced webs **26**.

Second bracket member **16***b* comprises an angle iron **28** welded to a side of the hollow buoyant body **12** with one leg horizontal and the other leg outstanding upwardly. Angle iron **28** is reinforced with a strut **30**, such as a flat plate, welded between **12** and an outboard portion of angle **28** and spaced webs **32**. A selectively shaped member **34** is obliquely welded between the outstanding and the horizontal legs of angle iron **28**. Member **34** is fabricated and positioned so that the upper profile of second bracket member **16***b* is similar to the lower profile of the first bracket member **16***a*.

Accordingly, the second bracket member **16***b* is interlockable with the first bracket member **16***a* when the hollow buoyant bodies **12** are selectively loaded by sea water ballast **14** to permit the uppermost portion of angle iron **28** to pass under the lowermost portion of angle iron **18**. When the draft of the hollow buoyant body **12** is reduced as by pumping out its water ballast **14**, bracket member **16***b* will interlock with bracket member **16***a* and further pumping out of water ballast **14** will effect the lifting of the ship **10** and thereby reduced its draft to *d'* as shown in FIG. 2.

As shown in FIG. 4, the interlocking mechanical coupling devices **16** can be secured to the sides of the ship **10** and the sides of a T2 tanker **35** (replacing hollow buoyant body **12** in FIG. 1 and 2) in vertically spaced arrangements for two purposes. In the first place, the load upon the individual bracket members can be reduced by sharing it with other bracket members in other vertically spaced divisions. Secondly, more flexibility is provided for accommodating different sizes of vessels with a single pair of tankers **35** or floatable bodies **12** since the levels at which the mechanical coupling is effected can be selected according to the physical dimensions of the ship and the tankers or the hollow buoyant bodies.

Optionally, as shown in FIG. 4, a fender **36** is carried by the tanker **35** at a position above the mechanical coupling devices **16***a*, **16***b*. This arrangement is especially useful when two tankers **35** or hollow buoyant bodies **12**, one on each side of the ship **10**, are employed. The fender **36** is preferably carried in angle irons **38** secured to the side of tanker **35** so that it can be removed by sliding it horizontally.

At various times, there may be insufficient water depth near a pier or wharf for permitting the uncoupling of the hollow buoyant bodies **12** from a heavily loaded ship. In such cases and according to the invention, both hollow buoyant bodies **12** are arranged in deep water on one side of the vessel **10** as shown in FIG. 5, the three floating bodies being mechanically coupled together with devices **16** according to FIG. 3. However, preferably, the vertical positions of the coupling devices **16** and fenders **36** are

interchanged. That is to say, referring again to FIG. 4, upper bracket members **16***a'* and **16***b'* are engaged for the coupling **16** and a lower fender **35'** is positioned in angle irons **38'**. When it is desired to move the ship **10** through shallow water and to the side of a pier **40** for unloading cargo, water ballast **14** in the inboard hollow buoyant body **12** is pumped out as shown in FIG. 6.

By preselecting the locations of coupling devices **16** and fenders **36**, the three floating bodies will distribute the loads along their sides in a selected manner to effect the required lifting of ship **10** without damage to the sides of the ship **10** or either of the two hollow buoyant bodies **12**.

It is to be observed that the vessel **10** is merely adapted, and not reconstructed, by welding bracket members **16***a* to its sides. Also that such bracket members may be permanently placed without materially reducing the ships normal cruising speed, especially when holes or passages are made in the web members **26**.

While there has been described and pointed out the fundamental novel features of the invention as applied to preferred embodiments, it will be understood that various omissions and substitutions and changes in the form and details of the devices illustrated and its operation may be made by those skilled in the art, without departing from the spirit of the invention. It is the intention, therefore, to be limited only as indicated by the scope of the following claims.

What I claim is:

1. An apparatus for reducing the draft of a ship comprising a pair of normally remote hollow buoyant bodies having a predetermined quantity of water ballast therein, which are adapted to be moved into position alongside a ship, one adjacent each side thereof; a first pair of elongated brackets one of which is secured in fixed horizontal position to one side of each of said buoyant bodies and extends outwardly therefrom toward said ship when said bodies are disposed alongside said ship; a second pair of elongated similar brackets one of which is adapted to be secured in horizontally disposed outwardly extending position on each side of said ship in position for the under surface thereof to be engaged by the upper surface of the said one of said first brackets secured to the side of the adjacent buoyant body whereby the weight of said ship is partially supported by said hollow buoyant bodies when the draft of said buoyant bodies is decreased by removing ballast therefrom.

2. An apparatus as defined by claim **1** in which said first pair of brackets and said second pair of brackets are provided with opposed complementary interlocking surfaces which cooperate with each other to maintain said hollow buoyant bodies alongside said ship as ballast is being removed therefrom.

3. An apparatus as defined by claim **1** in which the upper surface of each of said first pair of brackets is inclined upwardly and outwardly from the side of the buoyant body to which the bracket is secured, and in which the lower surface of each of said second pair of brackets is inclined downwardly and outwardly from the side of a ship to which they are secured, the inclined surfaces of said first and said second pairs of brackets cooperating with each other to wedge said hollow buoyant bodies toward the sides of said ship during and after the removal of ballast from said bodies.

4. The method of reducing the draft of a ship which comprises securing an elongated horizontally disposed outwardly extending bracket to each side of said ship; providing a pair of hollow buoyant bodies having a predetermined quantity of water ballast therein, each of said buoyant bodies having an elongated horizontally disposed outwardly extending bracket secured to one side thereof; moving said bodies alongside said ship, one adjacent each side thereof, in position for the brackets secured thereto to engage under the brackets secured to the sides of said

ship; removing ballast from said buoyant bodies to increase the buoyancy thereof to cause said buoyant bodies to rise until the brackets secured thereto engage the brackets secured to said ship; and then removing additional ballast from said bodies to further increase the buoyancy thereof to cause said bodies to partially support the weight of said ship thereby increasing the buoyancy of said ship and reducing the draft thereof.

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