United States Patent [19]

King

[11] **3,895,592**

[45] **July 22, 1975**

[54] **BOAT LIFT**

[76] Inventor: **Arthur Shelley King,** 8021 Cherokee Ln., Leawood, Kans. 66206

[22] Filed: **Jan. 9, 1974**

[21] Appl. No.: **431,855**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 326,536, Jan. 24, 1973, abandoned.

[52] **U.S. Cl.** ..... **114/45;** 61/65; 214/1 A

[51] **Int. Cl.** **B63c 1/6**

[58] **Field of Search**..... 114/45, 49, 43.5; 9/1 T; 214/1 A; 61/65

[56] **References Cited**

UNITED STATES PATENTS

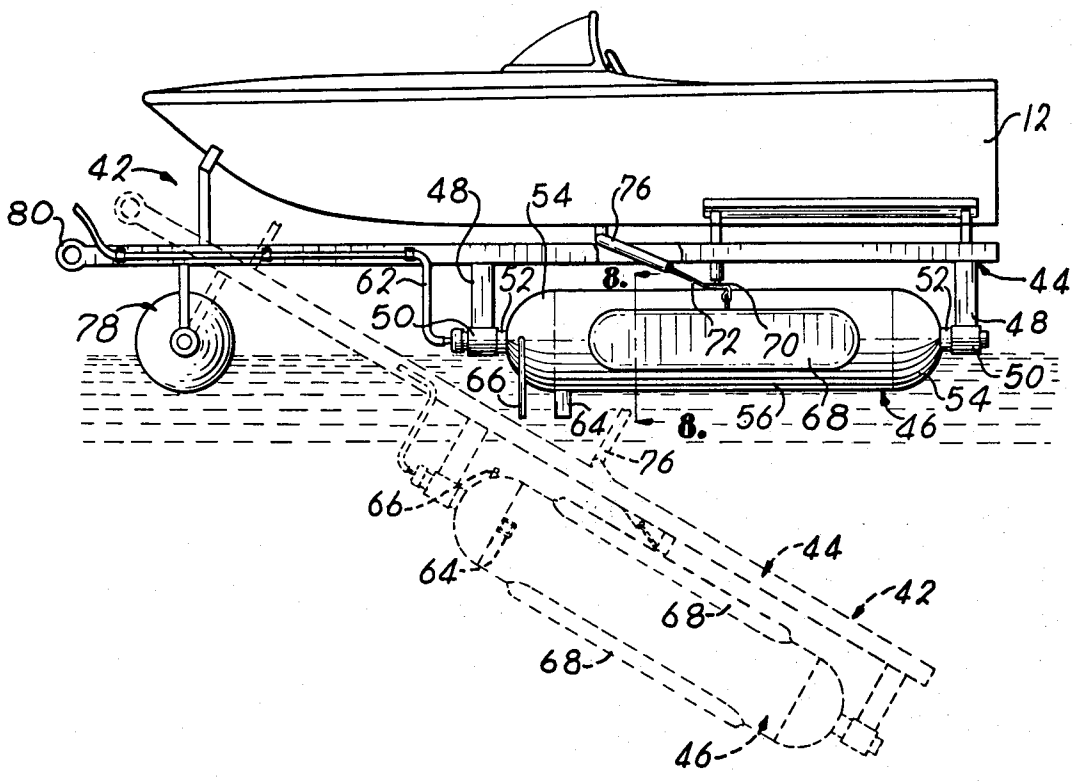
1,264,257	4/1918	Beckwith	114/49
3,406,649	10/1968	Burkhart	114/45
3,727,415	4/1973	Williams	61/65
R27,090	3/1971	Rutter	61/65

Primary Examiner—Trygve M. Blix
Assistant Examiner—Charles E. Frankfort
Attorney, Agent, or Firm—Schmidt, Johnson, Hovey & Williams

[57] **ABSTRACT**

One embodiment of a boat lift utilizes elongated, upendable floats of polyurethane material which project more deeply into the water when the floats are upright than when they are prone. Attachment of the carriage of the lift to the floats adjacent their "sinking ends" causes the carriage to be submerged when the floats are upright and to be raised for supporting a boat when the floats are in their prone positions. A second embodiment of the lift utilizes hollow pontoons which may be filled with water or air to cause submersion or flotation of the lift and which are rotatable between float positions in which air supplied to the pontoons is trapped therein, and sink positions in which air is allowed to exhaust from the pontoon while water flows thereinto. Diametrically opposed air pockets on the outside of the pontoons cause automatic return thereof from their sink positions to their float positions, and outlet tubes projecting downwardly from the pontoons when the latter are in their float positions prevent air from escaping from the pontoons during rough water conditions.

11 Claims, 8 Drawing Figures



PATENTED JUL 22 1975

3,895,592

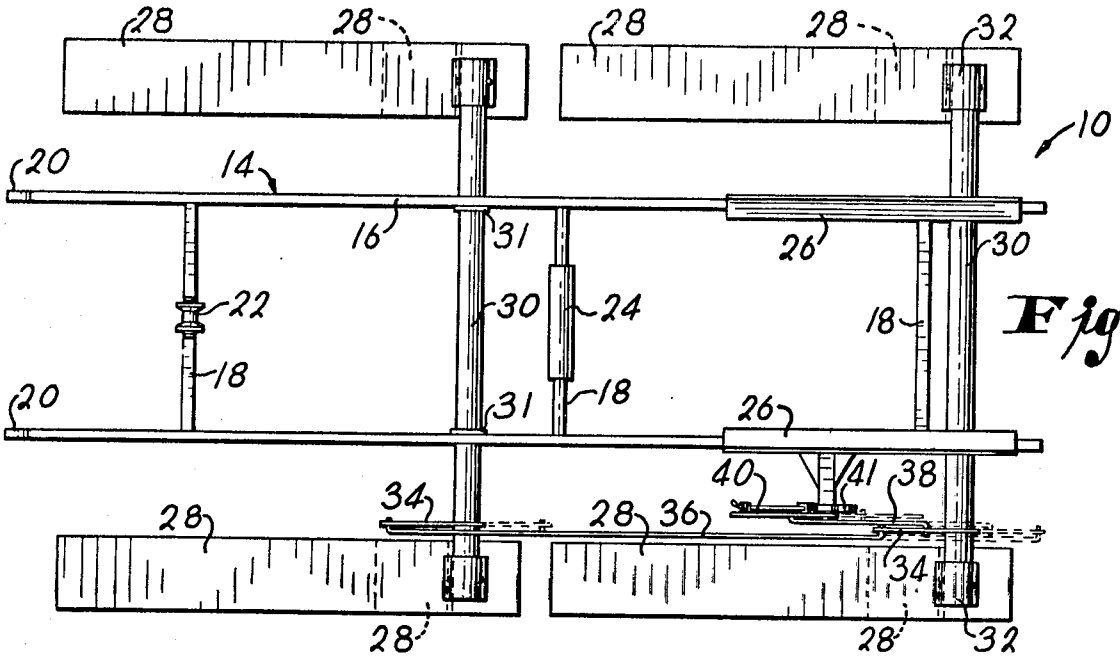


Fig. 2.

Fig. 4.

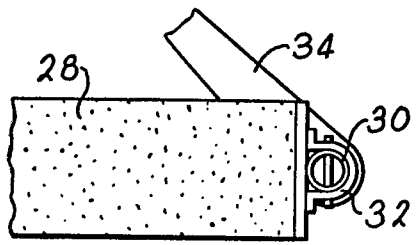


Fig. 1.

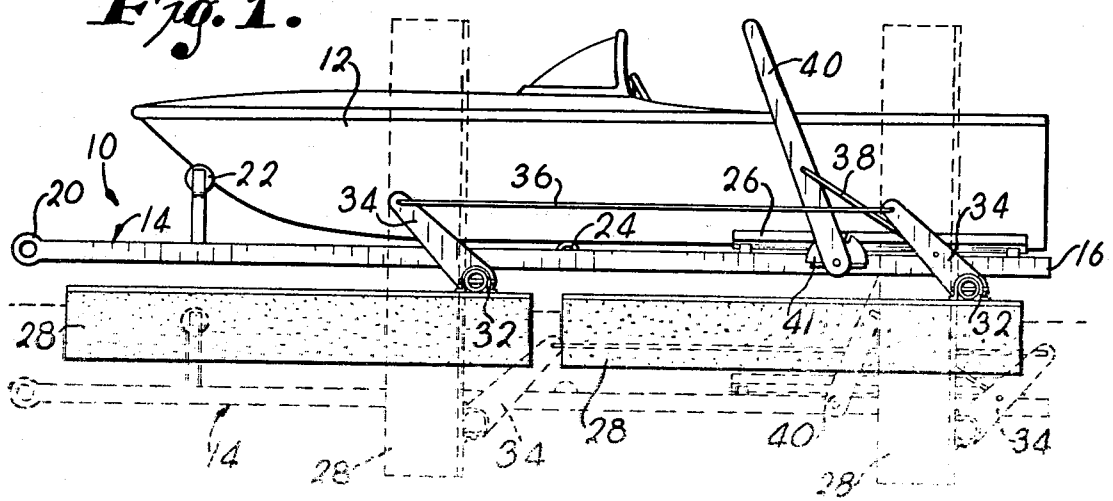
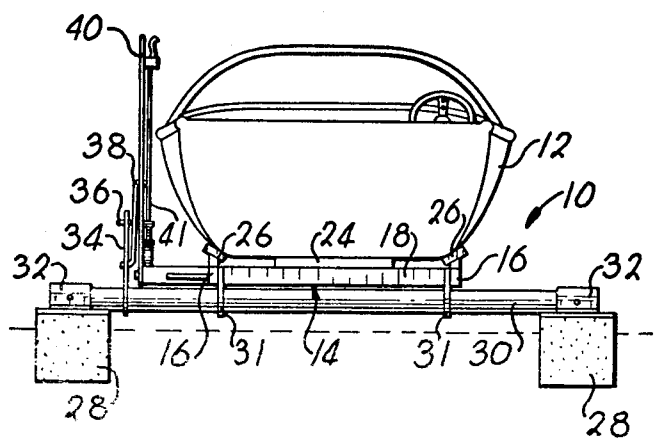


Fig. 3.



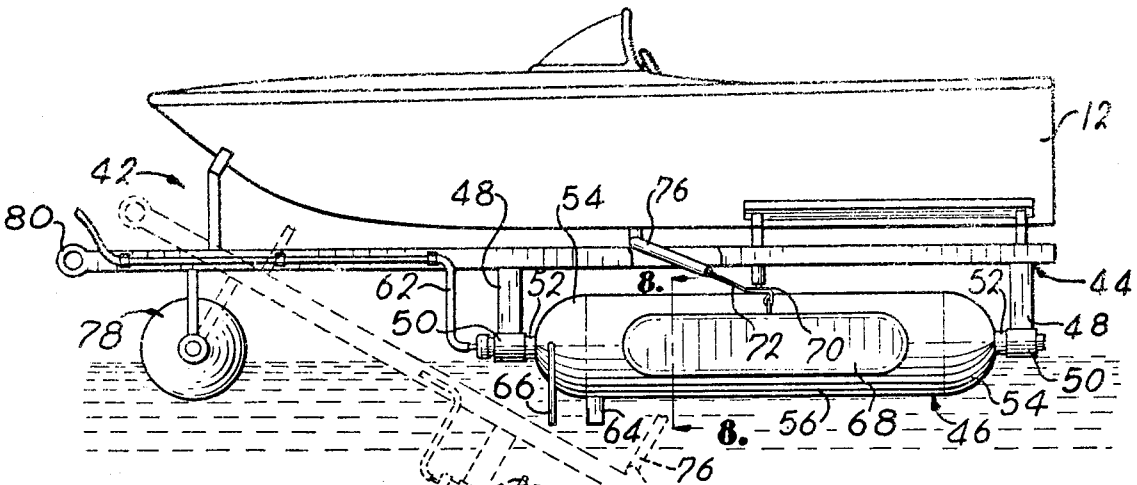


Fig. 5.

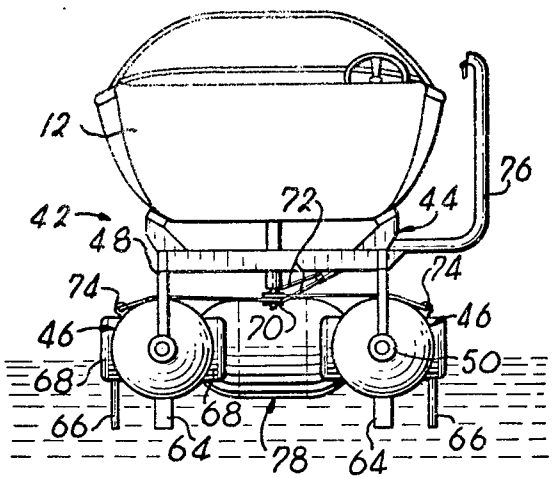
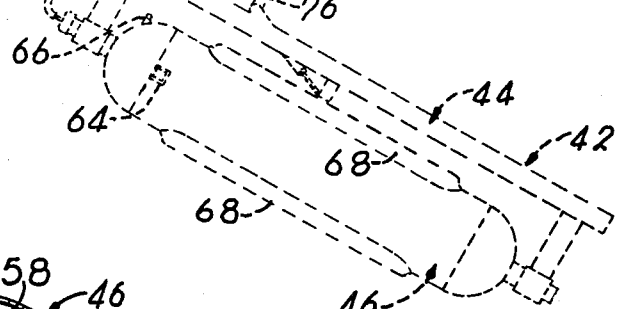


Fig. 6.



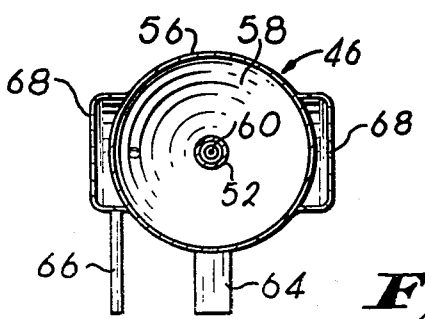


Fig. 8.

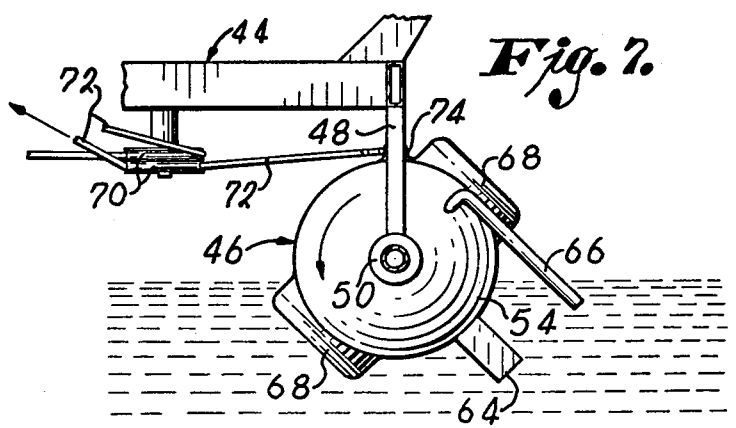


Fig. 7.

BOAT LIFT

CROSS REFERENCES

This is a continuation-in-part of my co-pending application Ser. No. 326,536, filed Jan. 24, 1973, entitled "BOAT LIFT" and now abandoned.

This invention relates to an improved boat lift for use in storing a boat in an elevated position, above the water, so that the boat may remain free of algae and similar collections about its hull when not in use.

An important object of the present invention is to provide a boat lift which is not only extremely effective in raising boats of various sizes and displacements, but is also relatively inexpensive to fabricate and relatively simple to operate.

Another important object of this invention is to provide a boat lift which eliminates the need for pneumatic equipment often associated with conventional lifts for pumping air or water into and out of flotation compartments of the lift through the provision of one or more upendable floats which serve to raise or lower the lift by virtue of the difference in their flotation properties when the floats are upright as compared with a prone position. To this end, advantage has been taken of the fact that the floats must displace the same amount of water in either an upright or a prone position, but a selected point on one of the floats may change positions drastically from above the water to well below the same when the float is shifted from one position to the other. Therefore, by connecting the floats to the boat carriage of the lift at such preselected points on the floats, the carriage will move in accordance with its mounting points between submerged and elevated positions when the floats are operated between their upended and prone positions.

An additional important object of the present invention is to provide a boat lift embodying the flotation concepts above set forth wherein all floats of the lift may be operated in unison and by an individual positioned within a boat overlying the lift.

A further important object of the instant invention is the provision of a second type of boat lift, pneumatically operated, wherein pontoons of the lift are rotatable between float positions in which air is trapped within the pontoons to maintain the boat out of the water and sink positions in which the trapped air is exhausted from the pontoons and water is allowed to fill the same for submerging the lift.

A still further important object of this invention is to provide pneumatically controlled pontoons as aforesaid, having means for resisting the escape of trapped air from the pontoons even during rough water conditions when the pontoons tend to rise and fall, leaving the undersides thereof periodically open to the atmosphere.

Another important object of this invention is the provision of means for automatically returning the pneumatic pontoons from their sink positions to their float positions.

An additional important object of the instant invention is the provision of a pneumatic boat lift which may be submerged by an individual located within a boat supported by the lift.

In the drawings:

FIG. 1 is an elevational view showing one version of the lift of the present invention with a boat in position thereon, alternative positions for the upendable floats of the lift being indicated by solid lines and in broken lines respectively;

FIG. 2 is a top plan view of the lift;

FIG. 3 is a rear elevational view of the lift and boat;

FIG. 4 is an enlarged, fragmentary elevational view of one of the floats showing the pivotal axis of the float located at one end thereof rather than between its ends as in FIGS. 1–3;

FIG. 5 is a view similar to FIG. 1 of a second version of the lift, alternative positions of the lift being indicated by solid lines and broken lines respectively;

FIG. 6 is a rear elevational view of the lift and boat of FIG. 5;

FIG. 7 is an enlarged, fragmentary end view of one of the pontoons illustrating its manner of operation; and

FIG. 8 is an enlarged, cross-sectional view of one of the floats taken along line 8—8 of FIG. 5.

The lift 10 illustrated in FIGS. 1–4 is designed to accommodate a boat 12 and has a main frame or carriage 14 provided with a pair of fore-and-aft extending, laterally spacedapart sections 16 which are interconnected by a number of cross-pieces 18. Rings 20 or the like at the forward ends of carriage sections 16 adapt the lift 10 for securance to a dock or the like, and suitable roller and guiding structures 22, 24 and 26 engage the hull of boat 12 when it is supported by carriage 14.

Four upendable, elongated floats 28, preferably blocks of polyurethane material, are swingably mounted on carriage 14 by virtue of a pair of fore-and-aft spaced, transversely extending torque members 30, each of which is rotatably mounted on the sections 16 by suitable bearing means 31. Each member 30 has a pair of mounting plates 32 at opposite ends thereof for rigid attachment to corresponding floats 28 at preselected points along the lengths of the floats 28 for movement with the members 30 when they are rotated. Each pair of the floats 28 interconnected by the member 30 is provided with a crank 34 rigidly affixed to its corresponding member 30 for applying torque thereto when crank 34 is actuated. A fore-and-aft extending link 36 operably interconnects the two cranks 34, and a second link 38 operably connects the rearmost crank 34 with a hand lever 40 pivotally coupled with carriage 14, whereby cranks 34 may be operated in unison upon swinging of lever 40. Preferably, the lever 40 is so situated that a person disposed within boat 12 may conveniently operate the same to actuate cranks 34. A spring-loaded latch assembly 41, associated with hand lever 40, releasably holds lever 40 in either its forwardmost position illustrated in FIGS. 1 and 2, or its rearmost position shown in phantom in FIG. 1, thereby retaining the floats 28 in either their prone or upright positions.

As above set forth, the members 30 may be secured to the floats 28 at any of a number of selected positions along their lengths, the position chosen being determined after due consideration to the size and weight of the boat which will be accommodated by lift 10. In this respect, FIGS. 1–3 illustrate the members 30 joined to their corresponding floats 28 at points between the opposed ends of the floats 28, while FIG. 4 illustrates an arrangement wherein a member 30 is secured to its float 28 on one end of the latter. The point of attachment of members 30 to their floats 28 is important inasmuch as such attachment points serve as the axes of rotation for the floats 28, thereby positively affecting the

degree of flotation of the lift **10** in the manner hereinafter made apparent.

Operation of the lift **10** is based upon the fact that the floats **28** will extend more deeply into the water when placed on end than when laid on their sides in prone positions. While it is, of course, understood that the displacement of the floats **28** is the same regardless of whether they lie in prone positions against the water or stand on end in upright positions, nonetheless, by careful selection of points adjacent the sinking ends of the floats **28** for attachment of the carriage **14**, the latter may be held out of the water as shown in FIGS. **1** and **3** when the floats are in their prone positions, and held in a submerged condition as shown by broken lines in FIG. **1** when the floats **28** are in their upended positions. Therefore, it is but necessary to select a point of attachment of carriage **14** to the floats **28** which is sufficient to accommodate the weight of the boat intended to be used in connection with lift **10.** It should be apparent that by selecting a connection point on the very end of each float **28** as shown in FIG. **4**, the carriage **14** will be more deeply submerged and will rise slightly less out of the water than when the carriage **14** is attached in the manner of FIGS. **1–3.**

When it is desired to remove the boat **12** from the water it is but necessary to shift the hand lever **40** rearwardly from its FIG. **1** position so that the cranks **34** operate in unison to swing floats **28** from their prone positions to their upright positions. The carriage **14** is thereby fully submerged, and the upright floats **28** provide guides for centering boat **12** is overlying relationship to the submerged carriage **14.** The boat operator need then only swing the hand lever **40** forwardly to lower floats **28** to their prone positions, hence raising carriage **14** and lifting boat **12** completely out of the water.

The boat **12** and lift **10** may be left in this condition for prolonged periods with the assurance that the boat **12** will remain "high and dry".

It has been found that an additional benefit is obtained by locating the attachment points of the carriage **14** to floats **28** closely adjacent or at the sinking end of the floats **28.** This advantage is noted during swinging of the floats **28** from their upended positions to their prone positions at which time the floats **28** tend to return themselves to their prone positions once their respective centers of gravity have passed a true vertical relationship with the pivot point of the floats **28.** In this manner, the effort required to shift lever **40** is held to a minimum, hence facilitating the overall operation of lift **10** and making it possible for individuals of all ages and physical characteristics to use the same.

It is to be further noted that the floats **28,** because of their convenient locations on opposite sides of carriage **14,** may serve as convenient walkways for persons entering or leaving boat **12** when the latter is raised. In this respect, it is of course desirable that the floats **28** be of sufficient size to locate their upper surfaces above the waterline when floats **28** are in their prone positions. Moreover, a rectangular configuration for the floats **28** provides a flat walking surface compared to other nonpolygonal configurations.

With reference now to FIGS. **5–8,** a second embodiment of the boat lift is therein disclosed and denoted by the numeral **42** for supporting the boat **12.** The carriage **44** of lift **42** is substantially identical to carriage **14** with the exception that carriage **44** is adapted for use not with the solid upendable floats **28** of lift **10,** but rather for use with pontoons **46** which are responsive to the introduction of air or water thereinto to control raising and lowering of the lift **42.** To this end, the carriage **44** has, along each side thereof, a pair of fore-and-aft, spaced-apart, downwardly extending struts **48** having bearing units **50** at their lower ends for journaling a shaft **52** which projects from the proximal end of a pontoon **46,** thus rotatably supporting the pontoon **46.**

EAch pontoon **46** is of elongated, generally tubular configuration having hemispherical end closures **54** and a continuous peripheral wall **56** which defines an air or water chamber **58** within the body of pontoon **46.** The rearmost of the end closures **54** of each pontoon **46** is completely closed at its junction with the shaft **52,** but the forward closure **54** is provided with an air inlet **60** therein disposed in concentric relationship to the proximal shaft **52** and adapted for coupling with a supply line **62** associated with the bearing **50** which leads to an air pump (not shown). As illustrated, each pontoon **46** is mounted for rotation about its longitudinal axis, such axis coinciding with that of the shafts **52,** inlet **60** and bearings **50.**

Each pontoon **46** is also provided with a pair of inlet-outlet tubes **64** and **66** which are secured to the outside of wall **56** in communication with chamber **58** for the passage of air and water into and out of chamber **58** during floating and sinking operations of the lift **42.** The tube **64** is of larger capacity than tube **66** and projects radially from pontoon **46** for protrusion downwardly into the water when the pontoon **46** is in the position of FIGS. **5, 6** and **8.** On the other hand, the tube **66** is slender and is circumferentially spaced from tube **64** so that when pontoon **46** is rotated in the direction illustrated in FIG. **7,** tube **66** leads tube **64** and breaks the surface of the water before the pontoon **46** has been rotated a full **90°.** Tube **66** extends generally in parallelism with tube **64** for projection with the latter downwardly into the water when the pontoon **46** is in the position of FIGS. **5, 6** and **8.**

A pair of air pockets **68** are disposed in diametrically opposed positions on each pontoon **46.** The pockets **68** are located on the outside of pontoons **46** and are sealed from the chambers **58** of the latter by the walls **56** of the pontoons **46.** As hereinafter explained, pockets **68** serve the purpose of returning the pontoons **46** to their normal float positions from their sink positions approximately **45°** beyond the rotative position illustrated in FIG. **7.**

Rotation of the pontoons **46** in unison is effected by a cable arrangement which includes a pair of side-by-side, individually rotatable pulleys **70** (FIG. **7**) mounted beneath carriage **44,** each of the pulleys **70** having a cable **72** from a corresponding pontoon **46** entrained therearound. An off-center lug **74** on each pontoon **46** secures one end of the corresponding cable **72** to the pontoon **46,** and a conduit **76** receives the two cables **72** after entrainment around the pulleys **70** for guiding cables **72** during actuation thereof and for locating their opposite ends at convenient location above carriage **44** for actuation by a person located within boat **12.** Preferably, the actuatable ends of the cables **72** are joined to a common gripping element (not shown) which not only facilitates manipulation of cables **72,** but also precludes accidental release of the cable **72** through conduit **76.**

A third pontoon **78** is located adjacent the front of carriage **44** and extends transversely across the latter to form the apex of an imaginary triangle defined by the two rear pontoons **46** and the front pontoon **78.** Pontoon **78** is similar in general construction to pontoons **46,** but it is not rotatable and has a constant supply of air trapped therein for remaining in a continuously floating condition. Thus, as illustrated in FIG. **5,** pontoon **78** serves as a pivot for the remainder of lift **42** during operation thereof. One or more rings **80** may be provided at the forwardmost end of carriage **44** for use in securing the lift **42** to a dock or like structure.

The operation of lift **42** may best be illustrated by assuming that the lift **42** is initially in its raised position supporting the boat **12** out of the water as illustrated by solid lines in FIG. **5** and also in FIG. **6.** Normally, the forward end of the lift **42** will be loosely secured to a dock through rings **80** to permit actuation of the lift **42** to the broken line position of FIG. **5.**

When the lift **42** is in its raised condition, the pontoons **46** thereof are disposed with their inlet-outlet tubes **64** and **66** pointed downwardly into the body of water. Therefore, air that is pumped into the chamber **58** of each pontoon **46** by its supply line **62,** is trapped by the water which surrounds and seeks to enter tubes **64** and **66.** So long as pressure of sufficient magnitude is supplied through line **62,** air within each chamber **58** cannot escape therefrom back through inlet **60** and, accordingly, the lift **42** floats.

To operate lift **42,** it is but necessary for a person situated within the boat **12** to grasp the cables **72** conveniently located at the proper height by conduit **76** anad exert a sufficient pull to rotate the pontoons **46** in opposite directions about their longitudinal axes beyond the intermediate rotative position of FIG. **7** until just less than a full **90°** rotation has been effected. In this respect, suitable stop means (not shown) could be provided to prevent a full **90°** rotation and beyond so that the pockets **68** of each pontoon **46** are never in a true vertical relationship with one another.

Movement of the pontoons **46** in this manner exposes the slender tubes **66** thereof to the atmosphere and allows the air previously trapped therein to escape while water floods the chambers **58** through tubes **64.** Initially, because of the location of each tube **64** on its pontoon **46,** both air and water simultaneously pass through the tube **64,** the water flowing into chamber **58** and the air rushing outwardly therefrom. However, it will be appreciated that this action is brief and that air is exhausted primarily through each tube **66** and water is received primarily through each tube **64.**

Flooding of the chambers **58** of pontoons **46** causes the lift **42** to gradually submerge to its broken line position of FIG. **5** as the carriage **44** pivots about the front pontoon **78.** Thus, as soon as carriage **44** is submerged sufficiently, the boat **12** is released by lift **42** and allowed to float on its own.

Once the pontoons **46** have become sufficiently flooded to lower the lift **42,** the operator may release cables **72** and the lift **42** will continue sinking until reaching its fully lowered position. Such release of cables **72** causes the pontoons **46** to be automatically returned to their float positions in which the tubes **64** and **66** project downwardly by virtue of the return pockets **68** located on opposite sides of each pontoon **46.** It will be appreciated that because of the existence of the pockets **68,** wwhich are always provided with a supply of trapped air, the pontoons **46** tend to seek an orientation in which both pockets **68** of each pontoon **46** are at the same level. Thus, (using the pontoon **46** of FIG. **7** as an example) with one pocket **68** in an approximately 7 o'clock position and the other in an approximately 1 O'clock position when a pontoon **46** is in its sink position to exhaust air and receive water, the pockets **68** force their pontoon **46** to rotate clockwise when cable **72** is slackened until equalization is once again established. Because the pocket **68** at 7 o'clock on pontoon **46** is submerged more deeply than the opposing pocket **68** and yet is the same density and volume, a buoyancy force differential is created that causes the pockets **68** to seek an equalized condition. And because the lower pocket **68** is not in a true vertical relationship with the opposing pocket **68,** its buoyancy force is not divided into equal and oppositely projecting forces from a vertical line that would result in a static condition. Moreover, it will be appreciated that the presence of pockets **68** stabilizes the pontoons **46** when they are in their float positions, such stabilization being especially important when the boat **12** is supported out of the water so that pontoons **46** are prevented from accidentally rotating during rough water to flood their chambers **58** and submerge the lift **42.**

The projection of tubes **64** and **66** of each pontoon **46** for a substantial distance beyond the wall **56** thereof is important inasmuch as the outer ends of the tubes **64** and **66** are thus not exposed to the atmosphere, even in rough water conditions. In this manner, the pontoons **46** may thus be bounced completely out of water for short distances to expose portions of the undersides thereof without water entering chambers **58** to accidentally sink the lift **42** and hence float boat **12.**

When it is desired to remove the boat **12** from the water it is but necessary to sink the lift **42** in the manner above described and bring the boat into overlying relationship with the submerged carriage **44.**

Air is then pumped into the pontoons **46** to exhaust the water from chambers **58** through tubes **64** and **66** until such time as a flotation condition is reached, thereupon the lift **42** will swing upwardly to engage the hull of boat **12** and raise the same completely out of the water. With the pontoons **46** in their float positions during exhaustion of the water from chambers **58,** it is assured that the air pumped into pontoons **46** will remain trapped therein when the lift **42** has reached its fully raised condition.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent is:

1. A boat lift comprising:

a carriage;

a tubular, essentially closed, elongated pontoon having a continuous outer wall defining a chamber within the pontoon and provided with inlet means and outlet means; and

means rotatably mounting said pontoon on the carriage for rotation of the pontoon about its longitudinal axis between a float position wherein said outlet means is submerged for trapping air within the chamber supplied through said inlet means and a sink position wherein said outlet means is open to the atmosphere for exhausting air from the chamber for entry of water into the latter.

2. A boat lift as claimed in claim **1,** wherein said outlet means includes a tube projecting outwardly from

said wall for protrusion downwardly into the water when the pontoon is in its float position.

3. A boat lift as claimed in claim **2,** wherein said tube both exhausts air and receives water when the pontoon is initially rotated to its sink position.

4. A boat lift as claimed in claim **1,** wherein said outlet means includes a pair of tubes projecting outwardly from said wall, one for primarily receiving water and the other for primarily discharging air when the pontoon is rotated to its sink position.

5. A boat lift comprising:

a carriage;

a tubular, essentially closed pontoon having a continuous outer wall defining a chamber within the pontoon and provided with inlet means and outlet means; and

means mounting said pontoon on the carriage for movement of the pontoon between a float position wherein said outlet means is submerged for trapping air within the chamber supplied through said inlet means and a sink position wherein said outlet means is open to the atmosphere for exhausting air from the chamber for entry of water into the latter,

said outlet means including a pair of tubes projecting outwardly from said wall, one for primarily receiving water and the other for primarily discharging air when the pontoon is moved to its sink position,

said pontoon being mounted on said carriage for rotation between said positions, said other tube being spaced from said one tube along the path of rotation of the pontoon to project out of the water when the pontoon is rotated to its sink position.

6. A boat lift comprising:

a carriage;

a tubular, essentially closed, elongated pontoon having a continuous outer wall defining a chamber within the pontoon and provided with inlet means and outlet means; and

means rotatably mounting said pontoon on the carriage for movement of the pontoon between a float position wherein said outlet means is submerged for trapping air within the chamber supplied through said inlet means and a sink position wherein said outlet means is open to the atmosphere for exhausting air from the chamber for entry of water into the latter,

said pontoon being mounted for rotation about its longitudinal axis between said positions and being provided with means for automatically returning the same from its sink position to its float position.

7. A boat lift as cliamed in claim **6,** wherein said return means comprises a pair of diametrically opposed air pockets on the outside of said pontoon sealed from said chamber.

8. A boat lift comprising:

a carriage;

a tubular, essentially closed pontoon having a continuous outer wall defining a chamber within the pontoon and provided with inlet means and outlet means; and

means mounting said pontoon on the carriage for movement of the pontoon between a float position wherein said outlet means is submerged for trapping air within the chamber supplied through said inlet means and a sink position wherein said outlet means is open to the atmosphere for exhausting air from the chamber for entry of water into the latter,

said pontoon being elongated and being mounted for rotation between said positions about its longitudinal axis, said outlet means being spaced laterally from said axis of the pontoon.

9. A boat lift as claimed in claim **8,** wherein said inlet is located at one end of said pontoon in association with said mounting means.

10. A boat lift as claimed in claim **1,** wherein said carriage is provided with a second rotatably mounted pontoon spaced from said first-mentioned pontoon, said carriage further being provided with means for operating the pontoons simultaneously.

11. A boat lift as claimed in claim **10,** wherein said operating means includes cable means operable from a boat overlying said carriage.

* * * * *