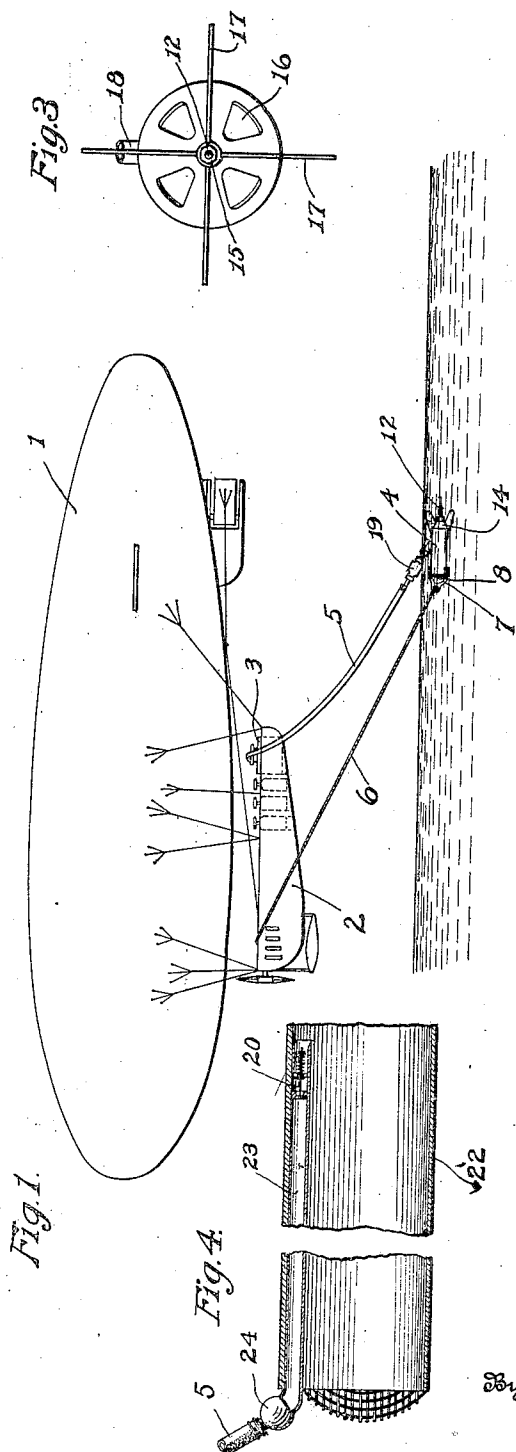
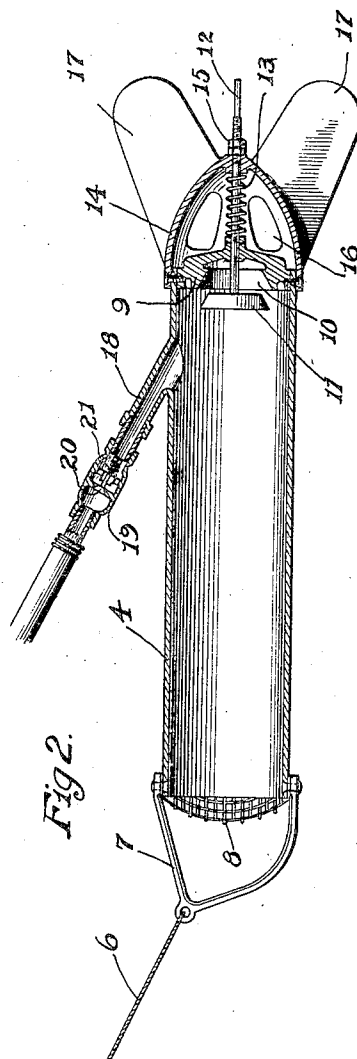


1,430,868.

Patented Oct. 3, 1922.



Inventor
 Warren B. Weyrick

R. D. Troegner
 Attorney

UNITED STATES PATENT OFFICE.

WARREN B. WEYRICK, OF AKRON, OHIO, ASSIGNOR TO THE GOODYEAR TIRE & RUBBER COMPANY, OF AKRON, OHIO, A CORPORATION OF OHIO.

BALLAST DEVICE.

Application filed September 29, 1920. Serial No. 413,555.

To all whom it may concern:

Be it known that I, WARREN B. WEYRICK, a citizen of the United States, residing at Akron, in the county of Summit and State of Ohio, have invented new and useful Improvements in Ballast Devices, of which the following is a specification.

My invention relates to devices for replenishing the ballast of air craft, particularly such air craft as dirigible balloons, and it has for its primary object the construction of a device which shall permit of replenishing the liquid ballast of air craft without interrupting the travel thereof.

It is well known that in operating dirigible balloons as the fuel is consumed by the driving engine the weight of the structure is materially decreased, thereby causing the balloon to rise to a higher altitude. This, of course, is undesirable particularly in the operation of dirigible balloons carrying passengers, where it is necessary to maintain an altitude best suited for their comfort. In order to compensate for the decreased weight of the dirigible caused by the fuel consumption, it is necessary to employ a ballast. It will be appreciated that the ballast necessary at the start of the journey and at intervals thereafter will be quite different.

One object of my invention, therefore, resides in the provision of a device by means of which water may be transferred from a body of water passed over during the flight of the balloon to a container carried in the balloon carriage.

A further object of my invention resides in the provision of a device of the character above designated which shall be entirely automatic in its operation, and which shall be actuated by the movement of the dirigible balloon to which it is attached.

A still further object of my invention is to provide a ballast replenishing device which shall be so constructed as to obviate its becoming inoperative because of accumulated foreign matter likely to be found in the water in which the device is immersed.

With these and other objects in view, my invention will be more fully described, illustrated in the drawings, and then more fully pointed out in the claims.

In the drawings:

Fig. 1 is a side elevation of a conventional type of dirigible balloon having a ballast

replenishing device attached thereto which is constructed in accordance with my invention.

Fig. 2 is a sectional view, on a larger scale, of the ballast replenishing device shown in Fig. 1,

Fig. 3 is an end view of the device, and

Fig. 4 is a sectional view, parts being broken away, of a modification of my invention.

Since it is necessary to employ ballast in air craft, such as dirigible balloons, and since the ballast most easily handled, which is less expensive than any other, is a liquid, such as water, I have constructed a device which is particularly adapted to automatically pump water to a dirigible balloon when the device is lowered and dragged through a body of water over which the balloon is passing in the course of its flight. The device depends for its operation upon the pressure created in an elongate hollow body provided with a transverse bulkhead disposed at one end of the body, the other end being open to permit the entrance of water through which the device is drawn. The bulkhead is provided with a central opening which is adapted to be closed by a valve-head which has a stem suitably disposed within a spring, which tends to maintain the valve in open position. The valve above described is closed by the impacts of sudden surges of water, which create a pressure sufficient to force the water contained in the hollow body through a check valve disposed in a passage connecting the hollow body with the container carried by the air craft.

In order to insure a clear and accurate understanding of my invention a dirigible balloon 1 of standard design is shown in Fig. 1. The balloon is provided with the usual carriage 2 containing the power plant and suitable containers 3 to receive liquid ballast. A ballast replenishing device 4 is suitably connected by a flexible conduit 5 to the container 3 carried by the balloon 1. The device 4 may be suspended from the carriage 2 and drawn along by the balloon by means of a cable 6 secured to a bracket member 7, which is attached to the forward end of the device 4.

As best shown in Fig. 2, my improved ballast replenishing device comprises an elongate hollow body which is open at one

end and is provided with a straining device 8, which may be a screen of suitable mesh disposed adjacent the open end of the body. The opposite end of the hollow body is closed by a transverse bulkhead 9 provided with a central opening 10 in which a valve-head 11 having a stem 12 is adapted to seat and close the opening. The valve-head 11 is normally maintained in open position by means of a spring 13 disposed about the stem 12 between the bulkhead and a streamline tail piece 14 suitably secured to the device 4. The valve stem 12 is threaded to permit adjustment of the pressure exerted by the spring 13 by means of a plurality of nuts 15 which are threaded upon the valve-stem to engage the tail piece 14. The tail piece 14 is provided with openings 16 to permit the passage of water when the valve 11 is in its open position, and it is also preferably formed with stabilizing fins 17 which maintain the device 4 in the proper operative position during its passage through water.

The hollow body of the device 4 is formed with a projecting conduit 18 adjacent the end containing the bulkhead 9. The flexible conduit 5 is connected to the conduit 18 in any suitable manner, as by means of a connecting member 19 provided with a check valve 20, which is normally maintained in closed position by means of a spring 21 disposed about the stem of the valve.

It will be appreciated that whenever it is desired to replenish the liquid ballast of the air craft to which the device is attached it is only necessary to lower it into a body of water over which the craft is traveling. The device may be maintained near the surface of the water in order that advantage may be taken of any wave conditions which may obtain to afford impacts against the valve contained in the bulkhead of the hollow body. It will be apparent that when a surge of water occurs in the hollow body, the valve 11 is closed against the action of the spring 13 and the pressure created in the body causes the water to be forced through the check valve 20 into the flexible conduit 5, and thus into the container carried by the craft. The check valve 20 being disposed in the passage communicating between the ballast container and the replenishing device, obviates the chance of any liquid in the conduit 5 being discharged through the device 4.

The screen disposed at the open end of the device prevents foreign matter from entering the hollow body and so clogging the valves contained therein as to render the device inoperative. The fins constructed integrally with the stream-line tail piece maintain the body in proper operative position by preventing the open or forward end of the device from swinging from side to side.

Although I have set forth that the device is preferably maintained at a position near the surface of the water, it is not necessary to maintain it in this position in order to insure the efficient operation thereof. It is desirable, however, to utilize the impact of the water resulting from the device traveling through waves to effect the transfer of the water from the device to the ballast container of the air craft. Whatever the position of the device in the water may be an intermittent pumping action is effected which is not dependent upon rotating parts.

In Figure 4 is shown a modification of my invention in which a hollow body 22 contains a pipe or conduit 23 having its open end disposed adjacent the bulkhead contained in the hollow body. Its other end projects from the body and is provided with a ball and socket joint, as indicated at 24, by means of which the flexible conduit 5 is attached thereto. The conduit 23 contains the check valve 20, and in fact the modified form of structure, here shown, is provided by lengthening the outlet 18 of the device 4 shown in Figure 2. The conduit 23 may be disposed upon the exterior of the body 22 if desired, but it is preferably secured within the body as shown in Figure 4.

The ball and socket joint, indicated at 24, is provided in order to permit of the conduit 5 assuming different positions with respect to the device as it is drawn through the water. It is possible, if the most advantageous angle has been found, that such a joint might be provided as to fix the conduit 5 in the most desirable position for it to assume while drawing the device through the water.

In the modification of the device above described, the cable bracket 7, as well as its cable 6, are eliminated, and the conduit 5, which serves to carry the ballast from the device to the containers of the air craft, also functions to draw the body through the water, thus obviating the necessity of an additional supporting means. It is, of course, understood that the rear portion of the body, which is not shown in Fig. 4, is of the same construction as illustrated in Fig. 2.

Although I have shown and specifically described a water ballast replenishing device which may be constructed in accordance with my invention, it is obvious that minor changes may be made in the construction of the device without departing from the spirit and scope of my invention, and I desire, therefore, that no limitations shall be imposed except such as are indicated in the appended claims.

What I claim is:

1. A device for replenishing the fluid ballast of aircraft comprising an elongate hollow body open at its forward end adapted to be suspended from an aircraft and to

be drawn through a body of water, flexible means for providing a passage communicating with the body and with a receptacle carried by the craft, and means for effecting the transfer of the liquid in which the body is immersed to the receptacle of the aircraft.

2. A device for providing aircraft with liquid ballast while travelling over an expanse of water comprising an elongate hollow body open at its forward end adapted to be trailed from the craft through the water, a flexible conduit connected to the body and to a container carried by the craft, means for effecting the transfer of water through which the body is drawn to the container, and a check valve disposed in the conduit for preventing discharge of liquid through the device.

3. A device for providing aircraft with liquid ballast while travelling over an expanse of water comprising an elongate hollow body open at its forward end adapted to be suspended from the craft and drawn through the water, means for stabilizing the movement of the body through the water, a flexible conduit establishing communication between the body and a container carried by the craft, means for effecting the transfer of a liquid through which the body is drawn through the conduit, and a check valve disposed in the conduit for preventing return flow of the liquid.

4. A device for providing aircraft with liquid ballast while travelling over an expanse of water comprising an elongate hollow body open at its forward end adapted to be suspended from the craft and drawn through the water, a plurality of fins attached to the trailing end of the body to stabilize its movement, a flexible conduit connected to the body and to a container carried by the craft, means for effecting the transfer of a liquid through which the body is propelled to the container, and a check valve disposed in the conduit for preventing return flow of the liquid.

5. A device for providing aircraft with liquid ballast while travelling over an expanse of water comprising an elongate hollow body open at its forward end, a cable receiving bracket attached to the forward end of the body, a bulkhead provided with a central opening disposed adjacent the trailing end of the body, a plurality of stabilizing fins attached to the trailing end of the body, means actuated by the pressure of liquid through which the device is drawn for closing the opening in the bulkhead, a flexible conduit leading from the body in advance of the bulkhead, and means for preventing return flow of liquid through the conduit.

6. A device for providing aircraft with liquid ballast while travelling over an ex-

pense of water comprising an elongate hollow body open at its forward end, a cable receiving bracket attached to the forward end of the body, a bulkhead provided with a central opening disposed adjacent the trailing end of the body, a plurality of stabilizing fins attached to the trailing end of the body, means actuated by the pressure of liquid through which the device is drawn for closing the opening in the bulkhead, a flexible conduit leading from the body in advance of the bulkhead, and means for preventing return flow of liquid through the conduit, said means including a valve normally maintained in closed position by resilient means.

7. A device for replenishing the liquid ballast of aircraft comprising an elongate hollow body open at its forward end, a cable receiving bracket attached to the forward end of the body, a bulkhead provided with a central opening disposed adjacent the trailing end of the body, a plurality of stabilizing fins attached to the trailing end of the body, a valve head adapted to seat within and close the opening in the bulkhead, resilient means tending to force the valve head from its seat in the bulkhead opening, a flexible conduit leading from the body in advance of the bulkhead, and means for preventing return flow of liquid through the conduit.

8. A device for replenishing the liquid ballast of aircraft comprising, an elongate hollow body open at its forward end, means for straining a liquid entering the hollow body disposed adjacent its open end, a cable receiving bracket attached to the forward end of the body, a bulkhead provided with a central opening disposed adjacent the trailing end of the body, a plurality of stabilizing fins attached to the trailing end of the body, means actuated by the pressure of liquid through which the device is drawn for closing the opening in the bulkhead, a flexible conduit leading from the body in advance of the bulkhead, and means for preventing return flow of liquid through the conduit.

9. A liquid ballast replenishing device for aircraft, comprising a tubular body adapted to be drawn through a liquid, means for stabilizing the body during its passage through the liquid and during the passage of liquid therethrough, a conduit leading from the body between its ends, and fluid impact actuated means disposed within the body between the conduit and the rear end of the body for forcing liquid through the conduit.

10. A liquid ballast replenishing device for aircraft comprising a tubular body adapted to be drawn through a body of water and normally permitting the passage of water through it, a conduit leading from the body between its ends, a check valve in the conduit preventing the return flow of

water to the body, a bulkhead disposed across the body between the rear end of the body and the conduit, and a normally open liquid impact actuated valve controlling the flow
5 of water through the bulkhead.

11. A device for replenishing the water ballast of an aircraft comprising a tubular body adapted to be drawn through water and open at its ends, a conduit leading from
10 the body between its ends, a check valve in the conduit and means disposed within the body and actuatable by variations in impact

of the water passing through the body for intermittent forcing of a portion of such water into the conduit and past the check 15 valve.

In witness whereof, I have hereunto signed my name in the presence of two subscribing witnesses.

WARREN B. WEYRICK.

Witnesses:

J. E. KEATING,
PHILIP E. BARNES