Sept. 26, 1933. E. R. WILLIAMS 1,928,146

FLUID CONTROL DEVICE

Filed Feb. 24, 1931 2 Sheets-Sheet 1

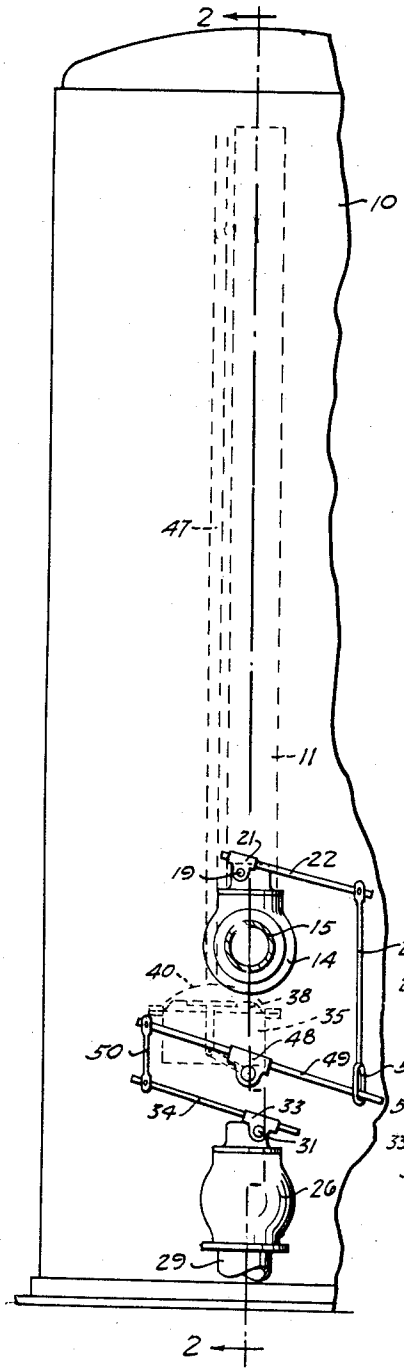


Fig. 1

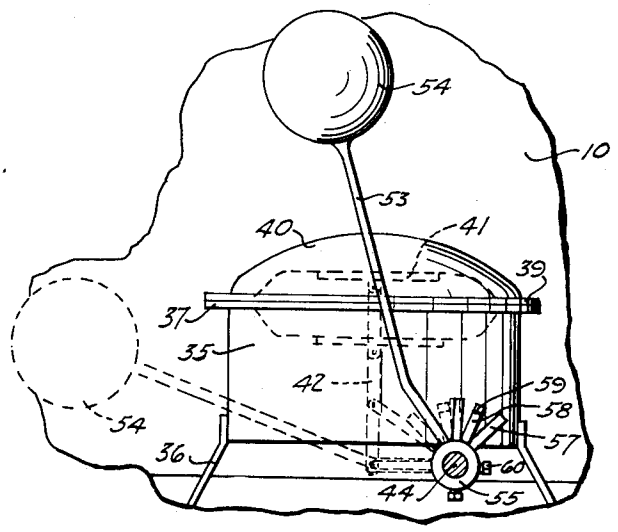


Fig. 3

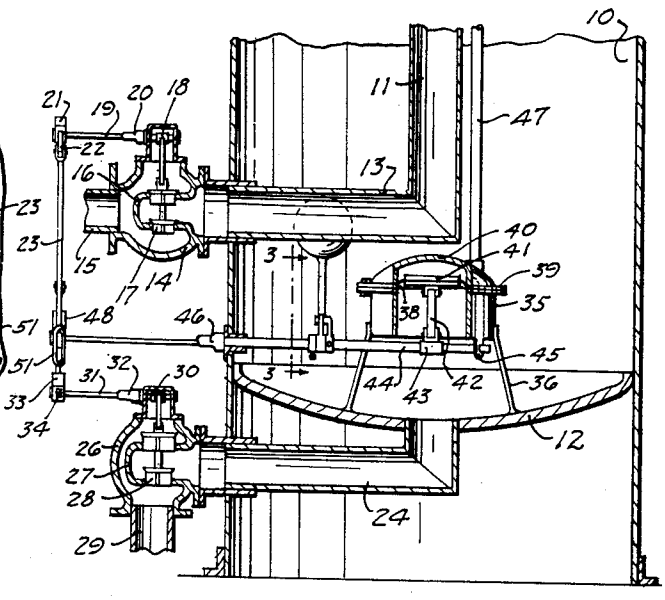


Fig. 2

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FLUID CONTROL DEVICE

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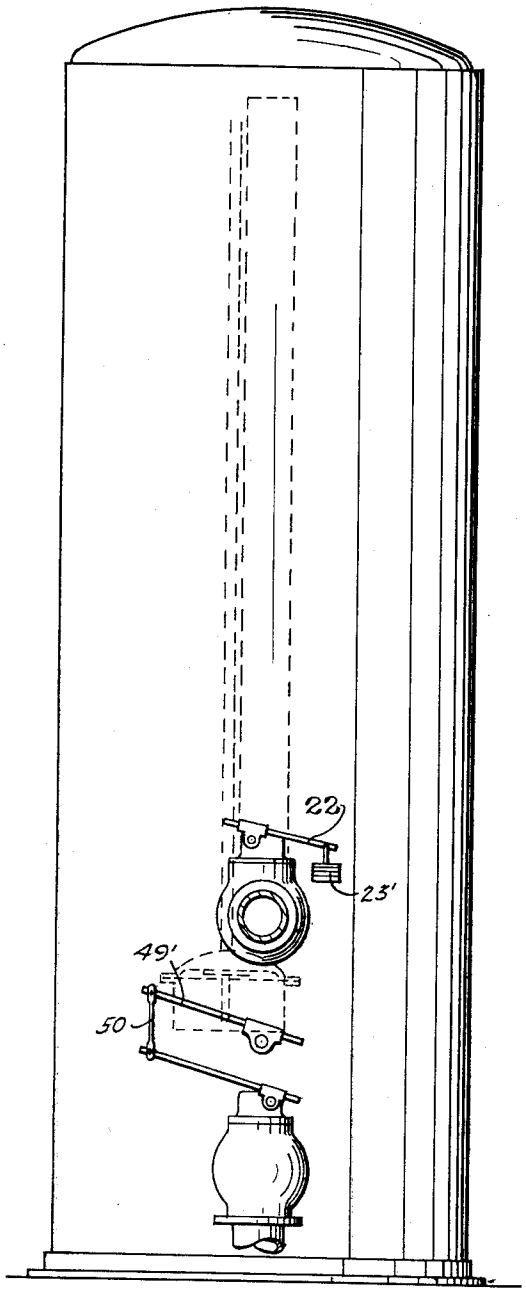


Fig. 6

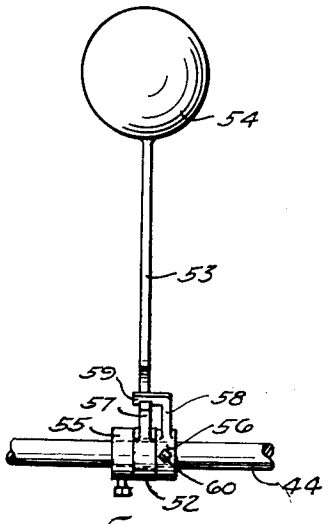


Fig. 5

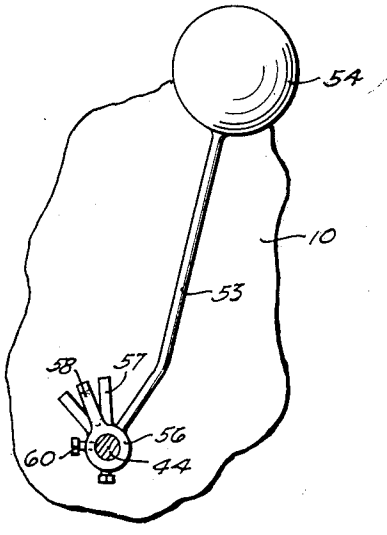


Fig. 4

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UNITED STATES PATENT OFFICE

1,928,146

FLUID CONTROL DEVICE

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Application February 24, 1931. Serial No. 517,784

4 Claims. (Cl. 183—2.7)

This invention relates to new and useful improvements in fluid control devices.

One object of the invention is to provide means for assisting in closing the fluid valve and also in returning the diaphragm, which may be used instead of the usual counterweights.

A further object of the invention is to provide a float device and a coupling for connection with the diaphragm control shaft, whereby the float acts as a weight in restoring the diaphragm and closing the liquid valve, but functions as a float to aid in closing the fluid valve upon the accumulation of an excess of liquid.

Another object of the invention is to provide a float so arranged as to become operative after the liquid valve has opened and act to further open the liquid valve.

A construction designed to carry out the invention will be hereinafter described together with other features of the invention.

The invention will be more readily understood from a reading of the following specification and by reference to the accompanying drawings in which an example of the invention is shown, and wherein:

Figure 1 is a partial elevation of a container equipped with a device constructed in accordance with the invention,

Figure 2 is a transverse vertical sectional view of the lower portion of the container,

Figure 3 is a detail of the float and coupling,

Figure 4 is a side elevation of the same,

Figure 5 is a front elevation of the coupling, and

Figure 6 is an elevation of a modified form of the invention.

In the drawings the numeral 10 designates an upright tank having a false bottom 12. A gas discharge pipe 11 extends upwardly in the tank and a lateral pipe 13 extends through the side of the tank well above the bottom and is connected into one side of a gas valve casing 14 from the other side of which a gas pipe 15 extends. The gas valve is of the usual construction common in this art and forms no particular part of the invention. It is shown as a double valve having therein a bonnet 16 carrying the valve seats for the valves 17, which are suspended in the usual manner from the crank 18, as is shown in Figure 2.

The crank is fastened on a rock shaft 19 extending through a packing box 20, as is shown in Figure 2. On the outer end of the shaft is fastened a collar 21 which has a lever 22 adjustably secured therein. A link 23 has its upper end pivoted to the outer end of the lever 22.

An oil discharge pipe 24 leads from the false bottom 12 through the side of the tank. The outer end of the pipe 24 is fastened into the casing 26 of an oil outlet valve similar to the valve 14. The casing 26 has a bonnet 27 connected with the pipe 24 and carrying the valve seats for receiving the valves 28. A discharge pipe 29 leads from the bonnet of the casing. The valves are suspended from the end of a crank 30 fastened on the end of a rock shaft 31 within the casing. The shaft 31 extends through a stuffing box 32 and has a collar 33 fastened on its outer end in the usual manner. The collar 33 receives a lever 34 which with the lever 22 is connected with the operating means to be hereinafter described.

It will be seen that so long as the valves 28 are closed no oil can escape from the tank and a predetermined oil level may be carried. The gas valves 17 are shown in Figure 2 as partially opened. This permits a limited escape of gas from the pipes 11 and 13. It is obvious that if the gas valves were set to carry a pressure of twenty-five pounds in the separator, an excessive gas pressure in the tank could not be relieved unless the valves were further opened, and also that if the gas valves are entirely closed any desired gas pressure (within safe limits) may be built up in the tank. By arranging the oil valves 28 to open in advance of any change in the position of the gas valves, an excess of oil in the tank may be discharged without disturbing the adjustment of the gas valves or altering the gas pressure. Should the oil rise to an excessive height the gas valve would be further closed to build up more gas pressure to expel the oil.

It will be noted by observing Figures 1 and 2, that when the lever 22 is rocked in a counter-clockwise direction the gas valves 17 will be opened and when the lever 34 is likewise rocked the oil valves 28 will be closed, the said levers extending in opposite directions. Within the tank I mount a cylindrical shield 35 on legs 36 secured to the bottom 12 at the center of the tank. The shield has an outwardly directed flange 37 at its top. A circular diaphragm 38 is clamped on the flange 37 by the annular flange 39 of a dome 40. The flanges are suitably secured together.

A clamp 41 is secured to the center of the diaphragm and a depending link 42 has its upper end pivoted thereto. The lower end of the link is pivoted to a crank 43 fastened on a rock shaft 44. The shaft has its inner end journaled in an ear 45 hanging from the shield. The shaft ex-

tends through the side of the tank and a stuffing box 46. A gas pipe 47 leads from the dome to the upper portion of the tank.

When liquid supplied to the tank rises to a level above the lower end of the shield 35, air will be trapped in the shield below the diaphragm. As the liquid level rises in the tank and its weight is thus increased, the trapped air will be compressed and the weight of the liquid thus becomes a force for operating the diaphragm. The gas pressure from the upper part of the tank will be exerted by the gas supplied by the pipe 47 upon the upper side of the diaphragm, thus the gas pressure above the liquid and on the upper side of the diaphragm is equalized.

On the outer end of the rock shaft 44 is secured a collar 48 in which a lever 49 is adjustably secured. One end of the lever 49 is connected to the outer end of the lever 34 by a pivoted link 50. The opposite end of the lever 49 engages in a loop 51 on the lower end of the link 23. By this arrangement the lever 49 may be swung a limited distance and thus operate the liquid discharge valves 28 without effecting the gas or fluid valves 17.

This device is similar to that set forth in my copending application filed January 26, 1931, Serial No. 511,304, except that the counter weights are used and of course no claim is made herein to the elements claimed in said application. The important feature of the present invention is means for actuating the rock shaft independently of the diaphragm.

The hub 52 of the arm 53 of a ball float 54 is journaled on the shaft 44 between a collar 55 and a collar 56 (Figures 3, 4 and 5). The float being on the outer end of the arm swings the latter as the liquid rises and falls. Radial lugs 57 extend upwardly from the hub.

A radial shank or post 58 extends upwardly from the collar 56 and has a laterally directed finger 59 at its upper end extending between the lugs 57 and in the path thereof. The collar 56 is fastened on the shaft by a set screw 60. It will be seen that so long as the lugs 57 do not engage and move the finger 59, the swing of the arm 53 will not actuate the shaft 44. Consequently the liquid level in the tank may vary to a limited extent without causing the float to actuate the shaft.

When the liquid in the tank exceeds a predetermined level the increased weight will cause an upward movement of the diaphragm, whereby the shaft 44 will be rocked and the liquid valves 28 will be opened. As the liquid recedes or lowers the float 54 will fall, thus swinging the arm 53 downward. Until the finger 59 is engaged by the upper lug 57, no rotation of the shaft would be caused by the float.

It is apparent that when the liquid reaches a low level and the upper lug 57 engages the finger 59, said float and its arm become a weight and continued downward swing reverses the rocking of the shaft 44, so that the valves 28 are closed and the diaphragm is pulled down to its normal position. The float acting as a weight assures a positive closing of the liquid valves. Should the liquid on the other hand, rise above its normal high level the float will rise and its upper lug 57 will engage the finger 59, thereby rocking the shaft 44 in a clockwise (Figures 1 and 3) direction and thus aid the diaphragm 38 in closing the fluid valves 17 by means of the lever 49 and link 23.

From the foregoing it will be apparent that between certain levels of the liquid, the swing of the float will have no effect upon the operation of the diaphragm or the shaft and by adjusting the collar 56 these levels may be varied. By use of the float and coupling, exterior counter weights are eliminated and its buoyancy is available to aid the diaphragm in closing the fluid valves. It is pointed out that the float 54 is preferably made of heavy material having only sufficient buoyancy to float and thereby it is caused to act more effectively as a weight.

In Figure 6 I have illustrated a modified form of the invention wherein the gas valve is not operated automatically or in conjunction with the diaphragm. In place of the lever 49 a short lever 49′ is secured in the collar 48, but has its outer end pivoted to the link 50 the same as the lever 49. The link 23 is omitted and in place thereof counterbalancing weights 23′ are hung on the end of the lever 22.

By this arrangement the oil valves 28 will be opened and closed and operated the same as in the other figures, but the gas valves 17 (which are of the unbalanced type) will be operated only by the gas pressure and the weights 23′. The weights will be such as to resist a certain pressure, but to permit an excessive gas pressure to open the valves 17 in a manner as is now common practice with separators. Under some conditions this form of the invention will prove very satisfactory.

Various changes in the size and shape of the different parts, as well as modifications and alterations, may be made within the scope of the appended claims.

Having illustrated and described preferred forms of the invention, what I claim, is:

1. The combination with a container and gaseous fluid and liquid outlet valves thereof, of a diaphragm in said container actuated by the rise and fall of the liquid in said container, an operator connected with the diaphragm and said valves, and bouyant means in the container having connection with the operator, whereby it imparts movement in conjunction with the diaphragm to the operator at predetermined levels of the liquid and swings independently of the operator at intermediate levels of the liquid.

2. The combination with a container and the liquid and gas valves thereof, of a diaphragm in said container actuated by the rise and fall of the liquid therein, an operator connected with the diaphragm and said valves and including a rock shaft, a hub rotatable on said shaft and having spaced projections, a support fastened on the shaft and having an element extending between the hub projections, and a float attached to the hub for swinging said hub to rotate the shaft at predetermined liquid levels in conjunction with the diaphragm and for swinging without rotating the shaft at intermediate liquid levels.

3. The combination with a container and the liquid valve thereof, of a diaphragm in said container actuated by the rise and fall of the liquid therein, an operator connected with the diaphragm and said valve and including a rock shaft, a hub rotatable on said shaft and having spaced projections, a support fastened on the shaft and having an element extending between the hub projections, and a float attached to the hub for swinging said hub to rotate the shaft at predetermined liquid levels in conjunction with the diaphragm and for swinging without rotating the shaft at intermediate liquid levels.

4. The combination with a container and the liquid outlet valve thereof, of a diaphragm in said container actuated by the rise and fall of the liquid therein, an operator connected with the diaphragm and the liquid outlet valve, and buoyant means in the container having connection with the operator, whereby it imparts movement in conjunction with the diaphragm to the operator at predetermined liquid levels and swings independently of the operator at intermediate levels of the liquid, the said buoyant means having sufficient weight to restore the diaphragm when the liquid level recedes and said means swings downwardly below its area of independent swinging.

ELMER R. WILLIAMS.