# United States Patent

[11] **3,581,763**


[72] Inventor **Henry Leo Smith**
**Route 4, Box 63, Springfield, Tenn. 37172**



[21] Appl. No. **704**
[22] Filed **Jan. 5, 1970**
[45] Patented **June 1, 1971**


[54] **LOW WATER CONTROL DEVICE FOR A WELL FOOT VALVE**
**7 Claims, 2 Drawing Figs.**


[52] **U.S. Cl.** ..... **137/430**
[51] **Int. Cl.** ..... **F16k 31/20**
[50] **Field of Search** ..... 137/393, 398, 399, 401, 404, 408, 410, 429, 430; 417/61, 211.5



[56] **References Cited**

UNITED STATES PATENTS

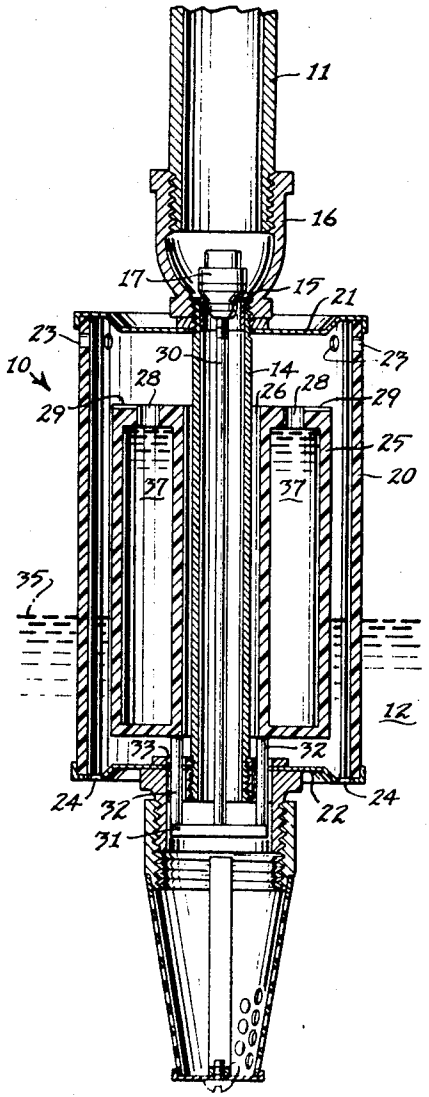
| | | | |
|---|---|---|---|
| 2,251,086 | 7/1941 | Van Dyke et al. | 137/433X |
| 2,935,081 | 5/1960 | Kryzer | 137/433X |
| 3,495,617 | 2/1970 | Zifferer | 137/433 |



*Primary Examiner*—M. Cary Nelson
*Assistant Examiner*—David R. Matthews
*Attorney*—Harrington A. Lackey



**ABSTRACT:** A foot valve for a well adapted to open and close a water inlet to the suction or tailpipe of the well pump when the pump is operative and inoperative respectively. A float body mounted in the well water to function as a float for all levels of well water above a predetermined safe low-water level, and to function as a weight or sinker for all water levels below the safe level, and a valve actuator adapted to be operatively engaged by the float body to hold the foot valve closed for water levels below the safe level.

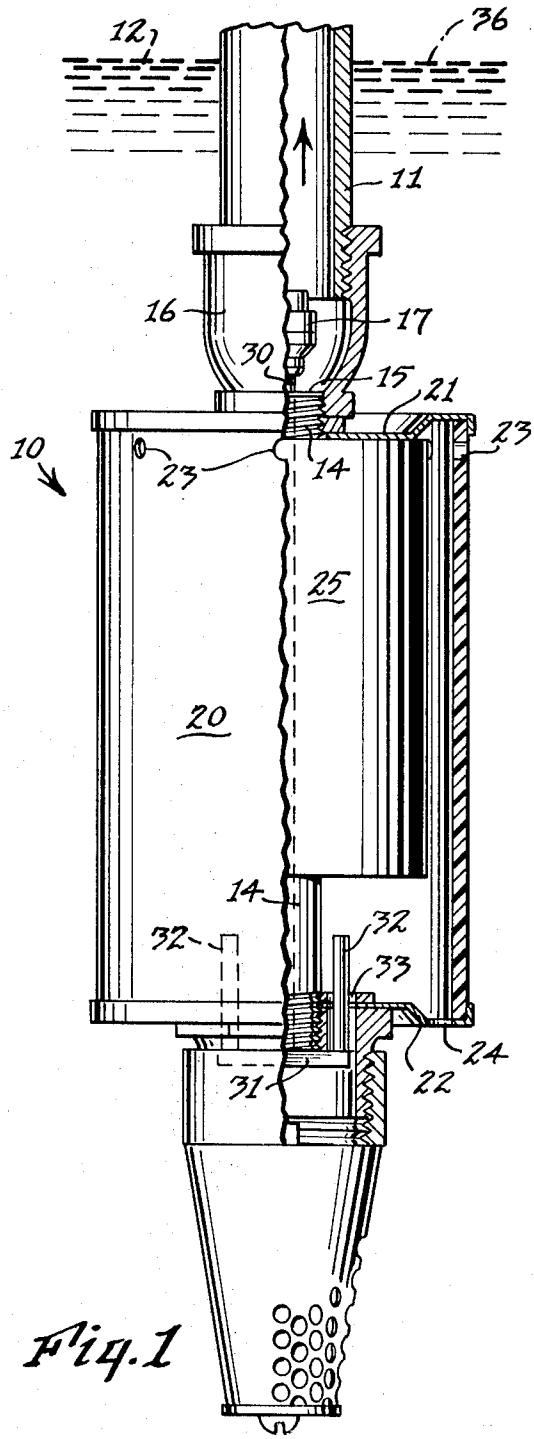



Fig. 1

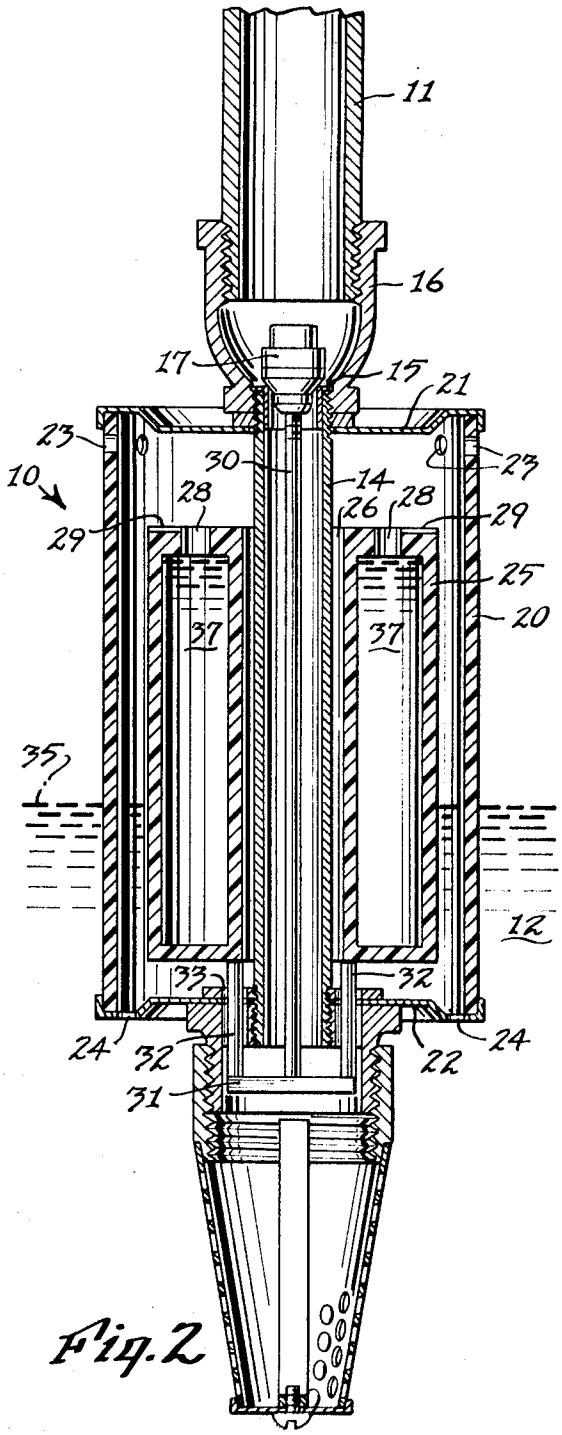



Fig. 2

INVENTOR:
HENRY LEO SMITH
BY
Harrington A. Lackey
ATTORNEY

# LOW WATER CONTROL DEVICE FOR A WELL FOOT VALVE

## BACKGROUND OF THE INVENTION

This invention relates to automatic foot valves for well pumps, and more particularly to a low-water control device for a well foot valve.

Foot valves for well pumps are well known in the art. A typical foot valve is mounted at the water inlet to the suction or tailpipe of a well pump, and is adapted to seat itself by gravity in a valve seat in order to close the water inlet when the pump is inoperative. After the pump has started, the suction created in the tailpipe will open the foot valve to permit the passage of water through the tailpipe upward to the pump.

However, when the water levels in wells become quite low, and particularly when they drop below the bottom or inlet end of the tailpipe, operation of the well pump will draw only air through the tailpipe. Furthermore, even when the water is slightly above the bottom of the tailpipe, the water drawn through the tailpipe is likely to have more sediment in it than desirable or healthful.

## SUMMARY OF THE INVENTION

It is therefore an object of this invention to provide a low-water control device for a foot valve to hold the foot valve closed when the water level drops below a predetermined safe level, regardless of whether the well pump is on or off.

The low-water control device made in accordance with this invention includes a float body having a density slightly less than that of water, but substantially greater than that of air, and mounted to rise and fall with the level of the water. A valve actuator is connected to the valve and includes a laterally projecting actuator arm in the path of the float body. The density of the float body, as well as the location of the actuator arm is such that when the predetermined, safe low-water level is reached, the float body engages the actuator arm, and by its weight holds down the actuator and foot valve so long as the well water is below the safe level. However, when the water rises above the safe level, the float body becomes buoyant, rising with the water level and disengaging the actuator bar, so that the foot valve functions independently of the float body to open and close the tailpipe in response to the operation of the well pump.

The specific form of float body employed in this control device is a hollow body made from a very buoyant material having a density substantially less than that of water, with the hollow chamber of the body being filled with well water through ports in the top of the body.

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevation of the device mounted on the bottom end of a tailpipe, with portions broken away to show the float body in an elevated, buoyant position, when the well water is above the safe low-water level; and

FIG. 2 is a sectional elevation of the device disclosed in FIG. 1 showing the float body in operative position holding the foot valve closed when the well water is below the safe low-water level.

## DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings in more detail, the foot valve control device 10 made in accordance with this invention is disclosed in the drawings connected to the bottom end of a conventional tailpipe 11 which is connected to a well pump of any conventional design, not shown, for pumping the water 12 from the bottom of the well upward through the tailpipe 11.

The device 10 includes a vertically depending inlet pipe 14 the upper end of which constitutes a valve seat 15. The upper end of the inlet pipe 14 is threaded to engage a coupling 16 which in turn threadedly engages the bottom end of the tailpipe 11.



As best disclosed in FIG. 2, a foot valve 17 normally seats on the valve seat 15 by its own weight, when the well pump is inoperative. The foot valve 17 responds to the suction created in the tailpipe 11 by an operating well pump by rising above and disengaging the valve seat 15 to permit the flow of well water through the inlet pipe 14 and into the tailpipe.

Fixed to the exterior of the inlet pipe 14 is a cylindrical shield or casing 20 having a top wall 21 and a bottom wall 22. The casing 20 extends substantially the full length of and is concentric with the inlet pipe 14. Ports 23 and 24 extend through the upper portion of the casing wall 20 and through the bottom wall 22 respectively, to permit free passage of water into the hollow interior of the casing, and thereby provide equalized water pressure on the inside and outside of the casing 20.

Mounted for free vertical reciprocation within the cylindrical casing 20 and upon the inlet pipe 14 is a float body 25. The float body 25 is preferably, through not necessarily, cylindrical and has a vertical central opening 26 therethrough for receiving the inlet pipe 14 to form a guide for the float body 25. The height of the float body 25 is less than that of the casing 20 to permit the float body 25 to move vertically between limits provided by the top wall 21 and the bottom wall 22 of the casing 20. The overall density of the float body 25 must be slightly less than that of water and substantially greater than that of air, or, in other words, the specific gravity must be slightly less than one.

The body 25 preferably has cylindrical inner and outer walls to form a hollow cylindrical annulus adapted to be filled with water. The body walls are preferably made of a material quite buoyant in water, such as various types of plastic, and provided with holes 28 in the top thereof to permit filling of the interior of the body 25 with well water when the body 25 is immersed in the water in the bottom of the well. Although the water holes 28 are not normally closed when the float body 25 engages the top wall 21, as disclosed in FIG. 1, nevertheless, laterally directed water grooves 29 may be formed in the top of the float body 25 to permit a clear water passage between the interior of the float 25 and the interior of the casing 20.

An elongated valve stem 30 is fixed to and projects from the bottom of the foot valve 17 below the bottom of the inlet pipe 14. Attached to the bottom end of the valve stem 30 and extending diametrically across and beyond the periphery of the bottom of the inlet pipe 14, is a lateral actuator arm 31, the extremities of which form a pair of actuator pins 32, which project upward through guide holes 33 in the bottom wall 22. The lateral actuator arm 31 does not block the passage of water through the bottom end of the inlet pipe 14, regardless of its vertical position.

The overall density of the float body 25 and its location within the casing 20 relative to the actuator pins 32 is such that, when the well water 12 is above a predetermined, safe low-water level 35, such as a high-water level 36 (FIG. 1), the float body 25 is buoyant, because of the equalized water pressure inside and outside the float body 25. Accordingly, the float body 25 rises to its upper limit against the top wall 21, as disclosed in FIG. 1. In this upper position, the float body 25 will completely disengage the actuator pins 32 so that the foot valve 17 is fully responsive to, and controlled by, the operation of the well pump, not shown. However, when the well water 12 drops to the vicinity of the safe low-water level 35, the level of the water 37 within the float body 25 is sufficiently greater than the low-water level 35 to cause the float body 25 to function as a sinker weight. Accordingly, the float body 25 descends until it engages and forces down the actuator pins 32, causing the foot valve 17 to be firmly seated in closed position against the valve seat 15. As long as the level of the well water 12 is equal to or below the low-water level 35, the combined weight of the float body 25 and the volume of water 37 above level 35 will hold the foot valve 17 closed, regardless of the operation of the well pump.

As the water in the well rises above the safe low-water level 35, the float body 25 again becomes buoyant and rises with

the water **12** to disengage the actuator pins **32**, so that the foot valve **17** will again function independently of the float body **25** and will respond to the operation of the well pump.

The safe low-water level **35** may be determined by the position of the device **10** in the bottom of the well, by the selection of the density of the float body **25**, and the relative dimensions of the various parts of the device **10**.

What I claim is:

**1**. A low-water control device for a well foot valve comprising:

a. a water inlet having a valve seat and adapted to be connected to the tailpipe of a well pump, said water inlet being adapted to be in communication with well water,

b. a foot valve, means biasing said foot valve into engagement with said seat when the pump is inoperative, said biasing means being overcome by pump suction to open said inlet when the well water is above a safe level and when the pump is operative,

c. a float body having a density slightly less than that of water and substantially greater than that of air,

d. means adapted to mount said float body in well water so that said body is buoyant in said water at a predetermined safe low-water level, said body tending to sink when said water is below said safe level, and

e. a valve actuator connected to said foot valve and supported to be operatively engaged by said body to hold said valve in closed position only when the water is below said safe level.

**2**. The invention according to claim **1** in which said float body is hollow, and filled with water, the walls of said body being made of a buoyant material having a density less than that of water.

**3**. The invention according to claim **2** further comprising holes in the top of said body to permit the passage of water into said body.

**4**. The invention according to claim **1** in which said actuator comprises a stem fixed to and depending from said valve through said water inlet, a lateral actuator arm fixed on said stem and engageable by said float body.

**5**. The invention according to claim **4** in which said water inlet comprises a depending inlet pipe, said stem depending through said pipe, said lateral arm projecting radially outward from said pipe, said float having a vertical guide opening therethrough for receiving said pipe for free vertical reciprocable movement of said float on said pipe.

**6**. The invention according to claim **5** further comprising a hollow casing fixed on said pipe and enclosing said float to permit said float to reciprocate between an upper inoperative position disengaging said lateral arm and a lower operative position engaging said lateral arm, at least one aperture through said casing to equalize the water pressure inside and outside said casing.

**7**. The invention according to claim **6** in which said pipe extends below the bottom of said casing, said lateral arm projects radially outward below said pipe, and at least one actuator pin on the lateral extremity of said arm projecting upward through the bottom of said casing for engagement by the bottom of said float in operative position for holding said foot valve closed.