Jan. 22, 1929. 1,699,954

F. B. CONNELL ET AL

FOOT VALVE

Filed July 25, 1927

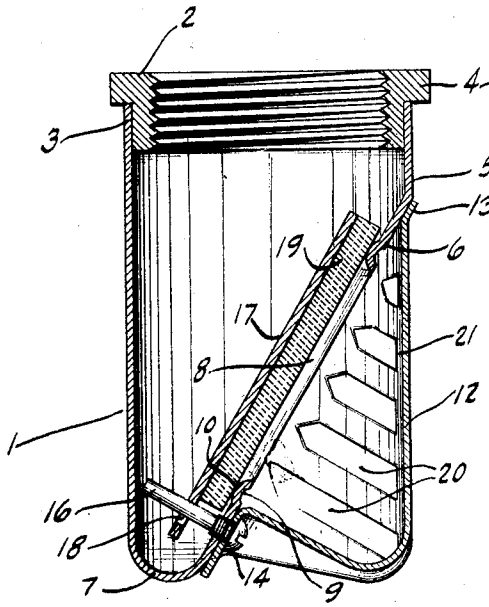


Fig. 1

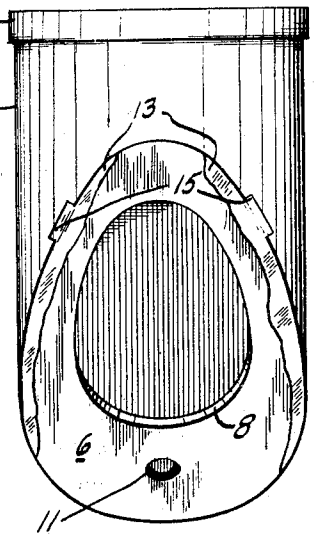


Fig. 2

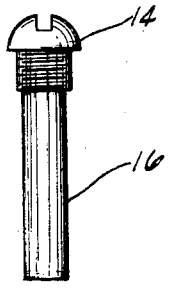


Fig. 3

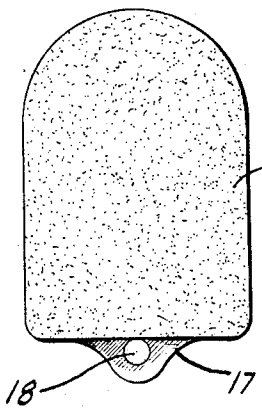


Fig. 4

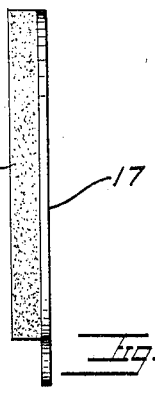


Fig. 5

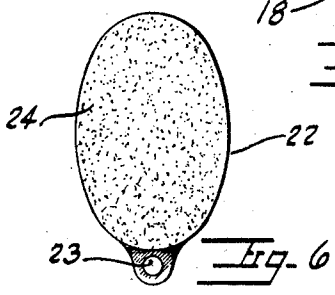


Fig. 6

INVENTOR.
FRANCIS B. CONNELL
EDWIN V. KELLEY
BY Harry D. Semmes
ATTORNEY

Patented Jan. 22, 1929. 1,699,954

UNITED STATES PATENT OFFICE.

FRANCIS B. CONNELL AND EDWIN V. KELLEY, OF BERKELEY, CALIFORNIA.

FOOT VALVE.

Application filed July 25, 1927. Serial No. 208,218.

Our invention relates to such valves, commonly known as foot valves, as are adapted to be connected at the lower end of a pipe for preventing a liquid's escaping from the pipe and for allowing a liquid to be drawn upward thru the valve and thru the pipe by the action of a suitable pump attached to the pipe.

One object of our invention is to so construct a foot valve and arrange a valve member therein that only a minimum lifting power is required of the pump used in conjunction with the foot valve for forcing liquid upward thru the valve, and that the valve member is adapted to be lifted quickly and evenly from, and to be returned quickly and evenly to, its seat, thus increasing the efficiency of the pump and materially assisting in making the pump action uniform.

Another object of the invention is to construct a foot valve so that it cannot easily get out of order and that therefore the valve can be in operation for a maximum length of time.

An object of the invention is also to construct a foot valve and to provide it with a guard in such a manner that the guard may be attached to the valve casing by a single attaching means, and to provide the guard with means for preventing it from turning from its position when attached, so that the guard will efficiently prevent coarse substances from being drawn into the valve by the action of the pump, to which the guard may be attached.

An additional object of the invention is to construct a foot valve so that it is quickly and easily assembled or disassembled, and so that it is adapted to be quickly and easily connected with, or removed from, a pump.

A further object of the invention is to construct a foot valve of a minimum number of parts so that the valve can be manufactured cheaply and that it therefore can be sold at a low price.

Still further objects and advantages of the invention will be understood from the following detailed description, illustrated in the accompanying drawings, in which:

Figure 1 is a mid-sectional view of our improved foot valve, the view being taken longitudinally of the valve and showing the guard attached to the valve casing and the valve member resting upon its seat in the casing;

Figure 2 is a front elevation of the valve casing secured to the flanged end member, the lug-carrying portion of the guard being placed in position on the flat wall of the casing in order to show how the lugs prevent the guard from turning upon the valve casing;

Figure 3 is an enlarged side elevation of the screw by which the guard is attached to the valve casing and by which the valve member is guided in its movements to and from the seat therefor;

Figure 4 is a bottom plan of the valve member;

Figure 5 is a side elevation thereof; and

Figure 6 is a bottom plan of a valve member of a modified form, the view being on a smaller scale than Figures 4 and 5.

In carrying out the principle of our invention, we provide a foot valve 1 with an end member 2, which is internally threaded and thereby adapted to be screwed upon any suitable pipe connection with a pump, not shown. This end member is preferably formed with a reduced, cylindrical portion 3 and a flange 4, and upon the reduced portion is pressed or otherwise suitably secured, so as to bear against the flange, one end of a casing 5, which is of a general cylindrical shape but has a substantially flat wall 6 extending obliquely to the axis of the casing from this end toward the other end, at which it is preferably joined by a curved portion 7 to the cylindrical wall of the casing. In the wall 6 is formed a large valve opening 8, which is preferably bounded by a flanged portion 9, curving into the interior of the casing beyond the flat wall and recurving therefrom so as to form thereon a round-edged valve seat 10.

Between the opening 8 and the curved portion 7, the wall 6 has therein a threaded opening 11, and a guard 12, which is preferably of a general cylindrical shape and bounded by an oblique, substantially flat flange 13 adapted to fit upon the wall 6, has in the flange an opening adapted to register with the threaded opening 11 and providing clearance for a screw 14, so that the guard may thereby be secured to the casing, lugs 15 being formed on the flange for engaging the edges of the

wall 6 so as to prevent the guard from turning upon the casing when the screw is screwed home therein. The screw 14 has formed thereon a reduced pin 16, which extends from the threaded portion of the screw, and a virtually flat valve-member 17 is formed with an opening 18, so as to be adapted to slide freely on, and to be guided by, the pin 16, and has cemented to one side or otherwise suitably secured thereto an element 19 of a soft, liquid-proof, elastic material, such as rubber or a rubber composition, for engagement with the valve seat 10.

In the wall of the guard 12 are formed openings 20, which preferably extend on both sides of a central, longitudinal rib 21 to approximately the same distance from the flange 13, so that the openings gradually decrease in size from the clearance opening for the screw 14, in order that, when the valve member 17 has been placed within the valve casing so that the guide pin 16 of the screw properly engages the opening 18 in the member, and when the guard 12 has been secured to the valve casing 5 by the screw, the guard will serve as a means not only for preventing coarse substances from being drawn into the valve 1 but also as a means for equalizing the lifting action of the pump, to which the valve may be attached. This is evident from the fact that while the pin 16 provides a sliding engagement for the valve member 17 thereon, it also serves as a fulcrum, so that less power is required for lifting the valve member at the point farthest from the pin 16 than at the point nearest thereto. Thus, the comparatively small volume of liquid, which passes thru the openings 20 farthest from the screw 14 and has a tendency to pass thru the valve opening 8 at the top thereof, exerts virtually the same lifting power upon the valve member as the comparatively large volume of the liquid, which passes thru the opening 20 nearest to the screw and has a tendency to be drawn thru the valve opening at the bottom thereof, the opening 20 between the two extremities being proportioned correspondingly, as shown in Figure 1, in order to effect an even lifting of the valve member from its seat at all points, when the pump, to which the valve 1 may be attached, is in operation.

It should also be observed that by our construction the foot valve 1, in which the valve seat 10 is obliquely arranged, has a distinct advantage over foot valves, in which the valve seat is virtually horizontal since, according to the established principles of physics, it takes less power to counteract the weight of the valve member and thus to lift the valve member from its seat, if the valve member is obliquely arranged than if it is arranged horizontally. Furthermore, in our construction, the valve member, on account of its loose engagement with the pin 16, allows the valve member, when the pump action is strong, to assume an almost vertical position, so that the flow of liquid through the valve is unrestricted and that the valve therefore is particularly adapted to cooperate with a pump for effecting a rapid upward pumping of large volumes of liquid.

The valve opening 8, of course, may be formed variously, and the valve member may also be of any suitable contour. The valve member 17, which in Figures 4 and 5 is shown at one end as circular and at its other end as straight-edged and provided with rounded corners, is therefore merely illustrative of one form, preferred in some instances. For a general use, however, the oval-contoured valve member 22—shown in Figure 6 as being at one end provided with an opening 23, similar to the opening 18 in the valve member 17, for a free and sliding engagement with the pin 16, and with an element 24, of a similar composition to the element 19, for engagement with the valve seat 10—may be preferred.

We claim as our invention:

1. In a valve of the character described, a casing having means at one end for attachment to a pump and provided with a wall arranged obliquely to the axis of the casing; a valve seat formed on the interior side of the wall and having a valve opening therein; a valve member removably and slidably fulcrumed within the casing near the other end thereof, so as to be adapted to move to or from the seat; and a guard for preventing coarse substances from being drawn thru the valve, the guard being removably attached to the casing and having means therein for causing the liquid drawn thru the valve by the pump to lift the valve member evenly from, and to return it evenly to, the seat, as, and for the purpose, set forth.

2. In a valve of the character described, a casing having means at one end for attachment to a pump and provided with a wall arranged obliquely to the axis of the casing; a valve seat formed on the interior side of the wall and having a valve opening therein; a valve member removably and slidably fulcrumed within the casing near the other end thereof so as to be adapted to move to or from the seat; and a guard for preventing coarse substances from being drawn thru the valve, the guard being removably attached to the casing and provided with openings which gradually decrease in size from the last mentioned end of the casing, as, and for the purpose, set forth.

3. In a valve of the character described, a casing having means at one end for attachment to a pump and provided with a wall arranged obliquely to the axis of the casing; a valve seat formed on the interior side of the wall and having a valve opening therein; a valve member removably and slidably fulcrumed within the casing near the other end

thereof so as to be adapted to move to or from the seat; and a guard for preventing coarse substances from being drawn thru the valve, the guard being removably attached to the casing at one end thereof and provided with lugs in engagement with the casing for preventing turning of the guard thereon, and the guard also being provided with openings which gradually decrease in size from the last mentioned end of the casing, as, and for the purpose, set forth.

In testimony whereof we affix our signatures.

FRANCIS B. CONNELL.
EDWIN V. KELLEY.