Dec. 22, 1931. H. E. LAKE 1,837,780

DOWN-FLOW DEVICE FOR FOOT VALVES

Filed May 24, 1929

Fig. 1.

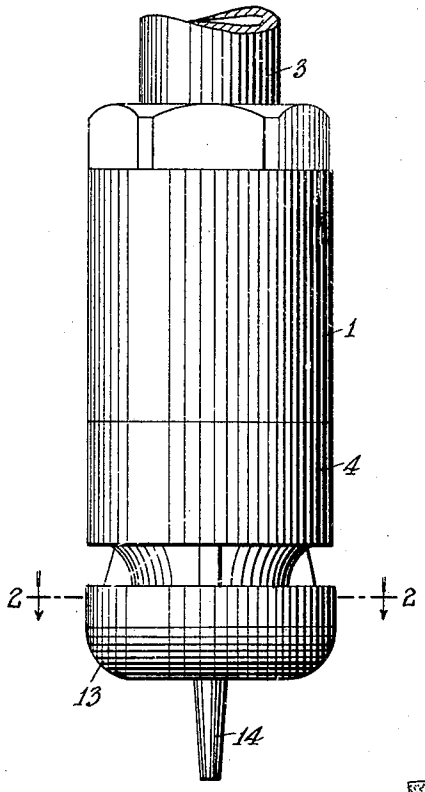


Fig. 3.

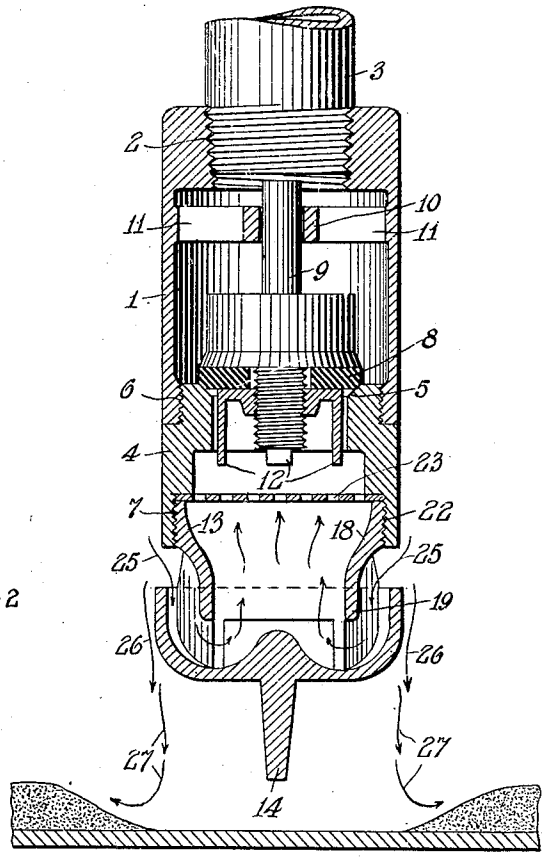


Fig. 2.

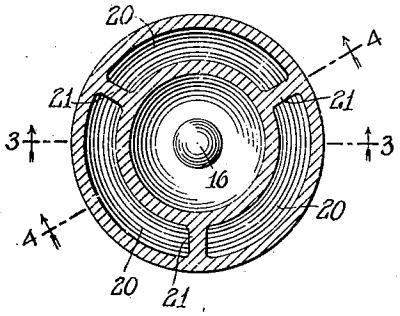
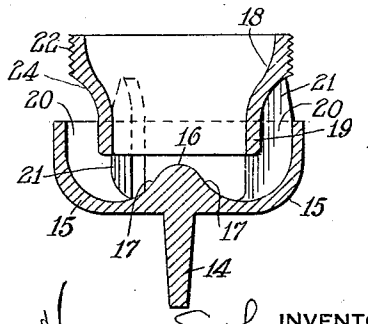


Fig. 4.



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UNITED STATES PATENT OFFICE

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DOWNFLOW DEVICE FOR FOOT VALVES

Application filed May 24, 1929. Serial No. 365,664.

My invention consists in the novel features hereinafter described, reference being had to the accompanying drawings, which illustrate one embodiment of the same, selected by me for purposes of illustration, and the said invention is fully disclosed in the following description and claims.

The object of my invention is to provide a downflow deflector for foot valves, such as is used in connection with an uptake pipe in gasoline tanks, oil tanks, water tanks, wells, etc., for withdrawing a liquid therefrom.

In the operation of foot valves generally, the flow of the liquid into the uptake pipe, whether produced by pressure on the surface of the liquid or by pump or otherwise, such as other suction means, with which the uptake pipe is connected, is usually in an upward direction. This produces a flow of the liquid laterally toward the lower end of the foot valve, tending to draw sediment toward the foot valve, and upwardly therethrough, and the presence of such sediment frequently prevents the foot valve from seating, as well as delivering through the uptake pipe foreign matter in the liquid.

According to my present invention, I provide the lower end of the foot valve, below the valve proper, with a downflow deflector, comprising a cup-shaped member, which is preferably provided with means for insuring that it shall be supported above the bottom of the tank, well, or receptacle, and having a centrally located tubular member having portions of less diameter than the cup-shaped member extending below the upper edge of the cup-shaped member and providing a substantially annular inlet surrounding the said tubular member, so that the liquid drawn into the uptake pipe will be drawn downwardly into the cup-shaped member, around the lower end of the inner tubular member, and then discharged upwardly into the foot valve. The exterior of the cup-shaped member is preferably curved to form an exterior annular deflecting surface and as the liquid is drawn downwardly into the annular inlet, other portions of the liquid are set in motion and will pass down around the outer face of the cup-shaped member and around the said deflecting surfaces, coming in contact with the bottom of the tank or receptacle and tending to sweep away any solid particles or sediment, and prevent the collection of sediment adjacent to and below the device. The two members of the device are conveniently connected at intervals by suitable webs, so as not to interfere with the freedom of movement of the liquid, and the central portion of the bottom of the cup member is preferably curved upwardly in all directions to form a central upwardly projecting portion, tending to direct the incoming liquid vertically, to the foot valve. The upper end of the tubular member is conveniently provided with means for attaching it to the foot valve, and a screen of any desired type, according to the character of the liquid with which the device is used, may be provided between the downflow deflector and the lower end of the foot valve, to prevent, as far as possible, any solid particles or sediment which may find its way into the deflector, from being carried up into the foot valve and uptake pipe.

Referring to the accompanying drawings, which illustrate one embodiment of the invention, selected by me for purposes of illustration,

Fig. 1 is a side elevation of a foot valve provided with my improved downflow deflector.

Fig. 2 is a horizontal section through the deflector, on the line 2—2 of Fig. 1.

Fig. 3 represents a vertical section, on the line 3—3 of Fig. 2, of the foot valve and downflow deflector shown in Fig. 1, a portion of the tank being indicated in connection therewith.

Fig. 4 is a detail section through the downflow deflector, on the line 4—4 of Fig. 2.

In the accompanying drawings, 1, represents the main body of the foot valve, provided at its upper end with a threaded aperture, 2, to enable it to be screwed onto the lower end of the uptake pipe, indicated at 3. In this instance the foot valve is provided with a lower portion, 4, having a valve seat, 5, at its upper end, the upper portion of the part, 4, being threaded, as at 6, to en-

gage a threaded aperture at the lower end of the main body, 1. The lower portion of the part, 4, is provided with an interiorly threaded recess, indicated at 7. 8 represents the foot valve proper, which may be of a usual or preferred form, and which engages the valve seat, 5, the said valve having a guiding stem, 9, engaging a guide, 10, supported by an inwardly projecting arm, 11. The valve is also provided with downwardly extending guiding projections, 12, below the seat, in a well known way. The downflow deflector comprises the cup-shaped member, indicated at 13, having a substantially vertical axis, and provided with means for preventing the foot valve from being placed too close to the bottom of the tank or container, above the bottom of the tank or receptacle, such means being in this instance a downwardly extending centrally located stud, 14. The foot valve is ordinarily supported by the pipe, 3, and the spacing means, 14, insures that the cup member, 13, shall be supported above the bottom of the tank a distance equal to or greater than the length of the stud, 14. The exterior faces of the cup-shaped member are preferably curved to form deflecting surfaces, indicated at 15. Within the cup-shaped member, 13, the bottom portion is curved upwardly toward the center in all directions, to form a central, upwardly extending projection, indicated at 16, the curved faces, 17, of which tend to deflect the liquid upwardly therefrom. 18 represents the upper tubular member of the downflow deflector, the lower end, 19, of which projects below the upper edge of the cup-shaped member, 13, and is of considerably less diameter, so that a downwardly extending substantially annular passage, 20, is provided between the upper tubular member and the lower cup member of the device. The two members of the device are conveniently connected and held in proper relative positions in any suitable manner, preferably by a plurality of webs, 21, in this instance three in number, which do not materially restrict the downwardly extending inlet passage, 20, before referred to. The upper end of the tubular member, 18, is provided with means for connecting it with the lower end of the foot valve. In this instance I have shown the upper end of the member, 18, provided with exterior screw threads, as at 22, which enable it to be screwed into the threaded recess, 7, in the lower end of the foot valve, but I do not limit myself to this construction. In some instances I find it convenient to provide a suitable screen, indicated at 23, which is preferably supported between the upper end of the downflow deflector and the lower end of the foot valve, as indicated in Fig. 3. This screen may or may not be used, as preferred. When the downflow deflector is secured in place at the lower end of the foot valve, the upper edge of the cup-shaped member, 13, will be spaced a distance away from the lower end of the foot valve, substantially equal to the width of the substantially annular downflow passage, 20, and provides an annular inlet for the liquid communicating with said downflow passage, 20. The exterior surface of the tubular member, 18, is preferably curved inwardly, as indicated at 24, to assist in deflecting the liquid downwardly into the downflow passage, or passages, 20.

When the parts are in operative position, as shown in Fig. 3, for example, whenever liquid is withdrawn from the tank into the uptake, 3, either by means of a pump or other suction device, or by means of pressure on the surface of the liquid, or otherwise, the liquid will be drawn into the deflector in a downward direction, as indicated by the arrows, 25, and will thence pass downwardly through the passage or passages, 20, around the lower end, 19, of the tubular member, 18, and thence being deflected upwardly by the central projection or deflector, 16, into the foot valve and uptake pipe, 3. The liquid being drawn downwardly from a point above the bottom of the tank, well or other receptacle, will normally be free from sediment or foreign matter, and as the liquid is thus drawn in a downward direction, into the downflow deflector, the surrounding liquid will be caused to move downwardly, in the direction of the arrows, 26 and 27, passing downwardly around the outside of the cup-shaped member, 13, with the result that these exterior currents so produced tend to sweep away and prevent the collection of sediment immediately below the downflow deflector, instead of attracting the sediment toward the foot valve, as would otherwise be the case. The liquid can thus be pumped practically clear and free from sediment, continuously from the tank, well or other receptacle, and in the case of tanks, the sediment which may collect at the bottom thereof by precipitation, can be removed at intervals, and thus will not pass into the uptake at any time. This is particularly important in tanks for the storage and delivery of gasoline, oil and the like, in which any sediment is likely to interfere with the operation of the engine, burner or other apparatus in which the fluid is subsequently used.

It will be understood that the particular construction of the foot valve forms no part of my present invention, it being only necessary that the foot valve and the downflow deflector should be provided with suitable means for connecting them together, and such means may be of any usual or desired character.

It will be understood that where a foot valve is provided with my improved downflow deflector, the correct and satisfactory operation of the foot valve at all times is prac-

tically insured, as it is practically impossible that sediment will collect on the valve seat and interfere with the proper seating of the valve. This is a very important matter, particularly in the case of foot valves in tanks for supplying oil for burners, for example, in which the clogging of the foot valve necessitates the uncovering of the tank and the removal of the uptake pipe and foot valve, a difficult and expensive operation.

What I claim and desire to secure by Letters Patent is:—

1. A downflow deflector comprising a cup member having a substantially vertical axis and provided with depending spacing means, an upper tubular member having a central vertical discharge passage, the lower end of said member being reduced at the entrance into said cup member and extending into said cup member and below the upper edge thereof, to form an annular uninterrupted inlet, and a substantially annular downwardly extending passage therefrom connecting said inlet with the lower end of said tubular member, the upper end of said tubular member being provided with means for connecting it to a hollow body, and means for rigidly connecting said members together.

2. A downflow deflector, comprising a cup member having a substantially vertical axis and provided with depending spacing means, and provided interiorly with a central deflecting projection extending upwardly from its bottom, and an upper tubular member having a portion of smaller diameter than the cup member extending into the same, and forming an annular uninterrupted inlet above the lower end of said tubular member, and a substantially annular downwardly extending passage connecting said inlet with the lower end of said tubular member, integral webs connecting said members, said tubular member being provided with threaded portions for connecting it with a hollow body, and a removable screen extending across said tubular member.

3. The combination with a foot valve casing and foot valve adapted to be positioned in a fluid container, of a downflow deflector comprising a cup member having a substantially vertical axis, and a tubular member connected therewith, and provided at its upper end with means for connecting it with the lower end of the foot valve casing, and having a portion of less diameter than the cup member extending thereinto, below the upper edge thereof, and an annular inlet above the lower end of said tubular member, and a substantially uninterrupted annular passage extending therefrom downwardly to and communicating with the lower end of said tubular member, said cup member being provided with depending spacing means for preventing the foot valve from being placed too close to the bottom of the container.

4. The combination with a foot valve casing, provided at its lower end with an internally threaded recess, of a downflow deflector comprising a cup member, provided with a depending spacing projection, and a tubular member having at its upper end a threaded portion to engage the said casing recess, and at its lower end provided with a tubular portion of less diameter than said cup member, extending into the same, below the upper edge thereof, and forming an uninterrupted annular inlet above the upper edge of said cup member, and a downwardly extending substantially annular passage connecting said inlet with the lower end of said tubular member, said cup member having the inner face of its bottom provided with a central vertical projection to deflect the liquid upwardly toward the foot valve casing.

5. A downflow deflector for a suction pipe comprising a tubular member having a vertical passage therethrough, and a cup member enclosing the lower end of said tubular member, supported in fixed relation thereto, and providing a substantially annular, unobstructed passage for the entrance of the liquid in which the device is immersed directly between the edge of said cup member, and the adjacent portions of the tubular member, whereby on the application of suction to the passage in said tubular member, liquid outside of the device will be drawn in a downwardly direction through said substantially annular unobstructed passage.

6. A downflow deflector for a suction pipe comprising a tubular member having a vertical passage therethrough, said tubular member having its lower end of gradually reduced diameter providing a downwardly and inwardly deflecting surface on its exterior, a cup member enclosing the lower end portion of reduced diameter of said tubular member, and supported in fixed relation thereto, forming a substantially annular passage, unobstructed between said exterior deflecting surface of the tubular member and the outer edge of said cup member, for the direct entrance of liquid in which the device is immersed, whereby on the application of suction to said tubular member, the liquid outside of the device will be drawn in a downward direction directly between the edge of said cup member and said deflecting surface of the tubular member.

7. A downflow deflector, for a suction pipe, comprising a tubular member having a vertical passage therethrough, said tubular member having its lower end of gradually reduced diameter, providing a downwardly and inwardly deflecting surface on its exterior, a cup member enclosing the lower end portion of reduced diameter of said tubular member, and having its upper edge of greater diameter than the portion of said tubular member above said deflecting surface, radial-

ly disposed relatively thin webs integral with the tubular member and rigidly connected with said cup to support said cup in fixed relation with the tubular member, in position to provide a substantially unobstructed passage, between said exterior deflecting surface of the tubular member and the outer edge of said cup member, for the direct entrance of liquid in which the device is immersed, whereby on the application of suction to said tubular member, the liquid outside of the device will be drawn in a downward direction directly between the edge of said cup member and said deflecting surface of the tubular member.

8. A downflow deflector for a suction pipe comprising a tubular member having a vertical passage therethrough, said tubular member having its lower end of gradually reduced diameter, providing a downwardly and inwardly deflecting surface on its exterior, a cup member enclosing the lower end portion of reduced diameter of said tubular member, and having its upper edge of greater diameter than said tubular member above the deflecting surface thereof, radially disposed relatively thin lugs integral with the cup and with the tubular member holding said members in fixed relation with each other and forming a substantially annular passage unobstructed, between said exterior deflecting surface of the tubular member and the outer edge of said cup member, for the direct entrance of liquid in which the device is immersed, whereby on the application of suction to said tubular member, the liquid outside of the device will be drawn in a downward direction directly between the edge of said cup member and said deflecting surface of the tubular member, said cup member being provided with a central deflecting projection on its interior face coaxial with the tubular member, and having a downwardly extending spacing member on its lower exterior surface.

In testimony whereof I affix my signature.

HARRY E. LAKE.