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FLOAT SHOE

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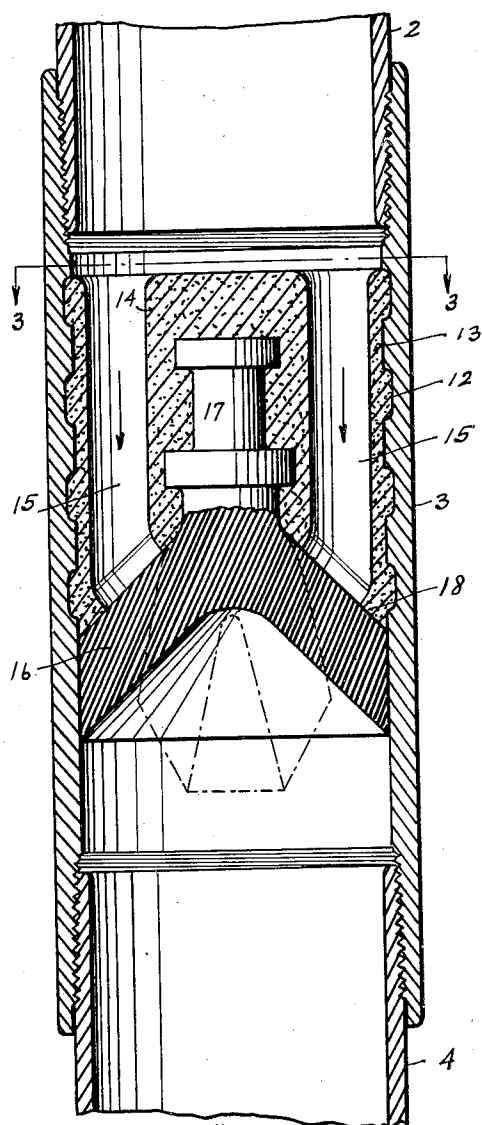


Fig. 2.

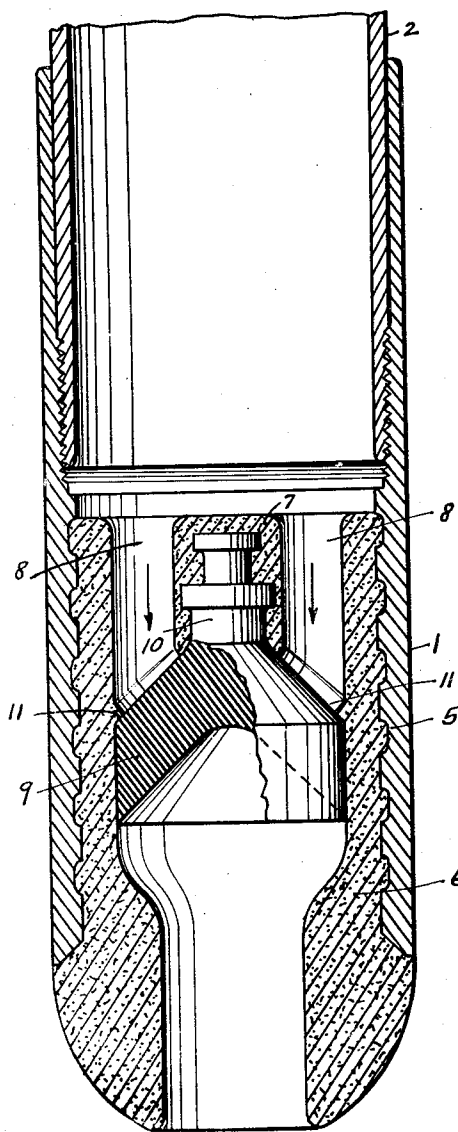


Fig. 1.

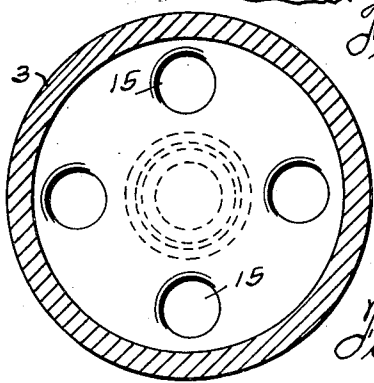


Fig. 3. By

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FLOAT SHOE

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2 Claims. (Cl. 166—9)

This invention relates to a float shoe.

An object of the invention is to provide a device of the character described adapted to be attached to the lower end of a pipe or casing to be lowered into a well and which is of such construction as to prevent the fluid in the well from entering the pipe or casing as the same is lowered and which will sustain a part of the load being lowered and thus partially relieve the derrick from such load.

Another object of the invention is to provide a float shoe containing a novel type of valve which will maintain the lower end of the casing closed while the same is being lowered and which may be readily collapsed when the casing is lowered to the desired location so as to permit a washing fluid, or plastic cement, to be forced by a pump down through the pipe or casing past said valve and around the lower end of the casing but will prevent the back flow thereof into the casing when the pump pressure is cut off.

A further feature of the invention is to provide in a float shoe a novel type of valve.

With the above and other objects in view, the invention has particular relation to certain novel features of construction, operation and arrangement of parts, examples of which are described in this specification and illustrated in the accompanying drawing, wherein:

Figure 1 shows a vertical sectional view of the float shoe.

Figure 2 shows a vertical sectional view of the float collar, and

Figure 3 shows a cross sectional view taken on the line 3—3 of Figure 2.

Referring now more particularly to the drawing, wherein like numerals of reference designate similar parts in each of the figures, the numeral 1 designates the set shoe which may be attached directly to the lower end of the casing 2 to be floated in; or the lower end of the casing 2 may have the float collar 3 attached thereto and a nipple 4 employed to connect said float collar to the float shoe 1.

The float shoe 1 is approximately cylindrical in form, and has the inside annular grooves 5 at its lower end. There is a cementitious liner 6 within the lower end of the float shoe 1 which is moulded into said grooves 5 and thereby secured in place and whose lower end is extended beneath the shoe 1 and formed oval. The upper end of the liner 6 has a solid central portion 7 surrounded by the vertical channels 8. There is an inverted cup shaped valve 9 formed of rubber or other collapsible material and this valve has an upstanding stem 10 embedded with-

in the solid portion 7 whereby the valve is anchored in place so as to normally close the lower ends of the channels 8 against the back flow of liquid into the casing. The lower portion of the valve is cylindrical to fit closely within the liner 6 and above said cylindrical portion is tapered upwardly and fits closely against a corresponding annular upwardly tapering seat 11 in the liner 6 so as to form a close fit around the lower ends of the channels 8.

As hereinabove indicated the float shoe may be attached directly to the lower end of the casing 2 and as such casing is lowered into the well bore the valve 9 will form a close fit within the liner 6 and will prevent the inflow of the liquid in the well into the casing so that a portion of the weight of the casing will be sustained by the float shoe and the derrick thus relieved. When the casing is located in the well at the desired place, liquid may be forced, by a pump, down through the casing and through the channels 8 and the pressure will collapse the valve 9 so as to permit the liquid to pass on out into the bore and up around the casing and/or plastic cementitious material or slurry may be forced down through the casing past the valve 9 and out into the bore around the lower end of the casing. When the pump pressure is relieved the back pressure of the slurry will expand and close the valve 9 so as to prevent any back flow. As above stated the float collar 3 may be connected by the nipple 4 into the string above the float shoe and the casing 2 connected to the upper end of said collar as shown in Figure 2.

The float collar has the inside annular grooves 12 and the cementitious plug 13 is molded into said collar and into the grooves 12 thereof, said plug having the solid central portion 14 and the vertical channels 15. There is an inverted cup shaped valve 16 having a stem 17 embedded in the plug 13 whereby said valve is anchored in place. The lower end of the valve 16 has an external cylindrical shape to fit closely within the floating collar 3 beneath the plug 13 and its upper portion is tapered upwardly to fit closely within the upwardly tapering or conical shaped seat 18 into which the lower end of the plug 13 is formed so as to seat closely around the lower ends of the channels 15.

When liquid or cementitious slurry is forced down by the pump as hereinabove explained, the valves 16 and 9 will be collapsed into position indicated in dotted lines in Figure 2 so as to permit a full and free opening of the passages 8 and 15,

but when the pump pressure is relieved, the back pressure will expand the valve 9 and completely close the set shoe or if for any reason said valve 9 should not be completely closed the back pressure will operate to cause the valve 16 to close.

As stated the valves 9, 16 are formed of rubber or similar material so that they will collapse when subjected to pressure from above and when said pressure is relieved these valves have sufficient resiliency to automatically expand and close the channels 15 but the pressure from beneath will force said valves out closely against the surrounding walls so as to form effective seals. The valves are of sufficient thickness to give them the required strength so that the pressure will not force them up into the channels above.

It is to be understood that the float shoe 1 may be used alone or the float collar 3 may be connected to the lower end of the casing as desired.

The liners 6, 13 and the valves 9, 16 are formed of such material that they may be readily drilled out when the cement around the casing has set and operations are then carried on through the casing in the well beneath.

The drawing and description disclose what is now considered to be a preferred form of the invention by way of illustration only while the broad principle of the invention will be defined by the appended claims.

What I claim is:

1. A device of the character described comprising a tubular member, a cementitious liner therein having a passageway therethrough and formed with a flared valve seat, a valve formed of yield-

able material and anchored in said member and having a cylindrical face to fit the walls of the tubular member and being flared to conform to the shape of and to fit closely against the seat to close the passageway, said valve being shaped to yield to the pressure of liquid, exerted in one direction, to open the passageway and to be expanded by such pressure, exerted in the other direction, to securely close the passageway the walls of the valve being of sufficient thickness to prevent deformation of the valve by the pressure exerted in said other direction.

2. A float shoe adapted to be connected to the lower end of the pipe to be lowered into the well containing fluid and comprising a tubular member having a downwardly diverging seat and having a passageway through said seat, a valve anchored in the member and formed of yieldable material, said valve being shaped to fit closely against said seat and having an annular cylindrical face shaped to fit closely against the walls of said member beneath the seat, the lower end of the valve terminating in an annular lip, said valve being formed of yieldable material of sufficient thickness to prevent deformation of the valve by the pressure of the liquid thereagainst while the pipe is being lowered through said liquid into the well, said valve being arranged to yield to the pressure of the liquid flowing downwardly through the tubular member to open the passageway whereby liquid is permitted to flow under pressure downwardly through said passageway but prevented from backflowing upwardly through said passageway.

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