Sept. 8, 1936. L. D. MOWREY 2,053,917

VALVE

Filed Nov. 23, 1933

FIG. 1.

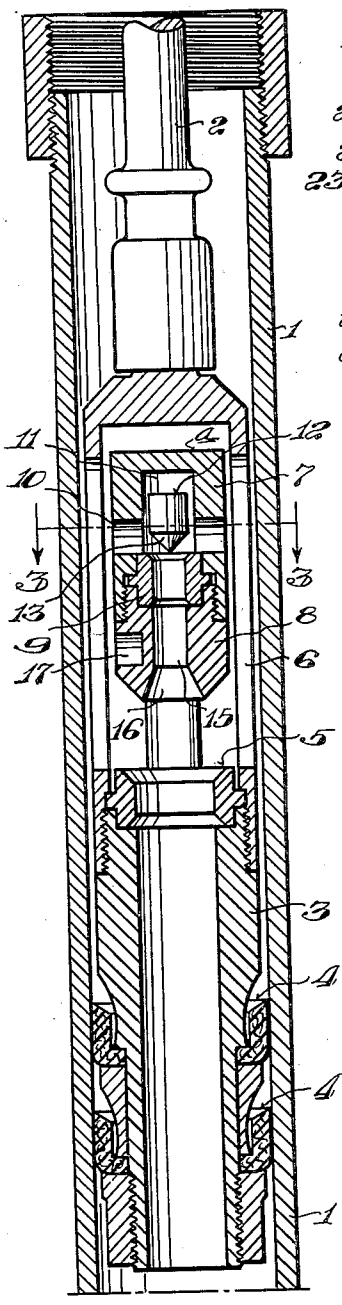


FIG. 2.

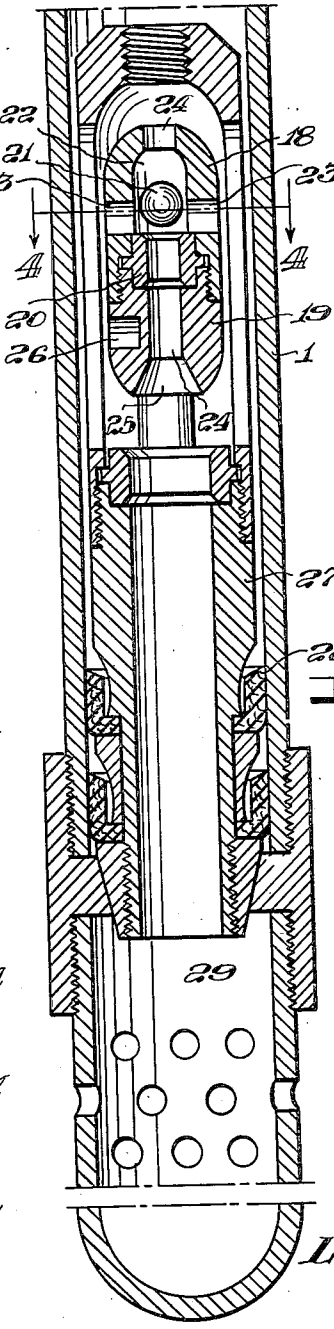


FIG. 3.

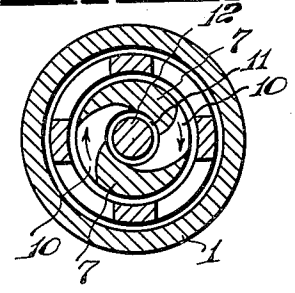


FIG. 4.

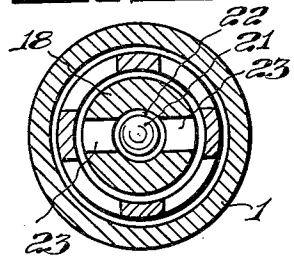


FIG. 5.

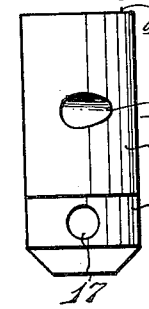
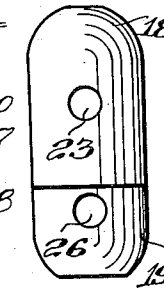


FIG. 6.



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2,053,917

UNITED STATES PATENT OFFICE

2,053,917

VALVE

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Application November 23, 1933, Serial No. 699,323

3 Claims. (Cl. 277—44)

This invention relates to valves and it has particular reference to a type of ball check valve, primarily adapted for use in connection with handling fluid in wells.

The principal object of the invention is to provide a valve proper in which is contained a pilot valve and seat, the pilot valve being initially subjected to the action of fluid pressure thereby making for greater efficiency in operation and minimizing the impact of the valve proper with its seat in the handling of fluid of considerable volume.

Another object of the invention is to provide an improved type of valve which, in effect, serves the purpose similar to that for which the usual ball valve is adapted but is capable of being displaced more quickly, due to the fact that the valve proper is not required to be lifted from its seat until after the seal is broken by the lifting action of the fluid upon the pilot valve contained within the valve proper. In the case of oil wells or the like, the invention is greatly effective in minimizing the enormous stresses ordinarily imposed upon the rods and joints of the pumping equipment by the pounding of the bal valves, thereby lending materially to the usefulness of the equipment and saving considerable time ordinarily consumed in making repairs thereto.

Still another object of the invention is to provide a valve capable of effective use also as a standing valve since only the pilot valve is required to be responsive to the suction created by the traveling valve to expose the valve proper to the full head of fluid drawn into the tubing. Important also among the objects of the invention is the fact that the pilot valve, in view of the lightness thereof as compared to the valve proper, prevents the accumulation of gas between the traveling and standing valve to interfere with the proper handling of the fluid and otherwise making pumping difficult.

Still another object of the invention is to provide for rotation of the valve proper on its seat, which is made possible through the provision of the pilot valve, that is to say, through the provision of the association of a pilot valve with the valve proper to allow fluid with increased velocity to act upon the valve proper prior to the seating of the pilot valve, to effect rotation of the valve proper, to thereby constantly renew its position on the seat, making for greater efficiency and longevity.

With the foregoing objects as paramount, the invention has particular reference to its salient features of construction and arrangement of parts, which will become manifest as the description proceeds, taken in connection with the accompanying drawing, wherein:—

Figure 1 is an axial sectional view of the pump barrel operatively assembled within the tubing of an oil well, showing the improved valve therein.

Figure 2 is a view similar to Figure 1 showing a standing valve and strainer with the invention therein.

Figure 3 is a transverse section on line 3—3 on Figure 1.

Figure 4 is a transverse section on line 4—4 on Figure 2.

Figure 5 is an elevation of the valve shown in Figure 1.

Figure 6 is a view of the valve proper embodying the invention.

Continuing with a more detailed description of the drawing, reference will be made primarily to Figures 1 to 6 inclusive, wherein the invention is shown as applied in the pumping of oil wells and the like. In this connection, 1 designates the well tubing assembly, in which the pump rod assembly is designated at 2 and which suspends for reciprocating movement the traveling valve.

This valve is made up of the body 3 with the customary series of packing tubes 4 and in the upper end of the body 3 is mounted the beveled valve seat 5. As is ordinarily the case, the valve seat 5 is held in position by means of an annular shoulder carried upon the lower end of the valve crown 6 and which shoulder engages against an annular projection integral with the valve seat 5.

Referring specifically to the invention and its associated elements, the valve proper is defined by the valve body shown in cross section in Figure 1 in two sections 7 and 8. These sections are threaded together to encase the valve seat 9 in a manner similar to that for retaining the larger valve seat 5. The upper portion 7 of the valve proper has a tangential passage 10 therethrough, which communicates with an inner cylindrical cavity 11 containing the pilot valve 12. In the present case, the valve 12 is comprised of a cylindrical piece of hardened metal having a coniform lower end to be conformably received in the beveled seat 9. The upper section 7 of the valve proper is likewise flattened at its top at *a*.

A lower portion or section 8 of the valve body has a passage 15 axially therethrough which communicates with the passage through the seat 9 and in turn, with the cavity 11 which contains the pilot valve 12. The lower end of the passage 15 is flared at 16 as shown in Figure 1 to increase the velocity of fluid through the orifice or passage in

the valve seat 9 to impart rotation to the valve proper.

In this manner, frictional wear of the valve proper and its seat 5 will have little or no effect in creating an improperly seated condition. The lower portion 8 of the valve body is provided with a recess 17 to accommodate a wrench or other suitable tool for assembling or dismantling the sections of the valve body.

In Figure 2, the same general idea defined in the preceding description and embodied in the valve shown in Figure 1, is shown as applied in the case of a standing valve for oil wells and the like. There is little difference in the two structures aside from the fact that the last named valve contains a ball functioning as the pilot valve and the body is oblong in shape rather than flattened as in the preceding instance. The valve shown in Figure 2 has a body comprised of sections 18 and 19 with an intermediate valve seat 20. A ball 21 cooperates with the seat 20 within the cavity 22. Communicating with the cavity 22 are ports 23, likewise a port or passage 24, entering the top of the upper section 18 of the valve body. Also as in the preceding instance, a vertical passage 24 communicates with the passage through the valve seat 20 and in turn, with the cavity 22. The passage 24 is flared at 25. A recess 26 is provided for a wrench or the like to expedite operation of the sections 18 and 19 when this becomes necessary.

The body of the standing valve is conventional and is comprised of the tubular element 27 about which is mounted packing tubes 28. Below the body 27 is suspended a conventional strainer 29. Further reference to the valve shown in Figures 1 and 2 will be made during the course of description of operation.

Referring again to Figures 1 and 2 and to the operation of the preferred form of the invention shown therein; upon the downward stroke of the traveling valve, fluid will enter the passage 15 of the valve body 8 and will lift the pilot valve 12 from its seat before displacing the valve proper. In so doing, the pressure of the fluid is not constrained on the valve body, hence the latter is lifted with less violence than would be the case were the valve subjected to the full fluid pressure. Pounding of the valve against the top of the cage is overcome. Fluid entering the ports 10 in the sides of the valve body will effect rotation of the body by virtue of the fact that they are tangential with respect to the axis of the body.

Upon the upward stroke of the traveling valve, suction below the same will displace the ball or pilot valve 22 in the standing valve shown in Figure 2. In so displacing the pilot valve, the valve body may be lifted more readily, as in the preceding instance and without the usual pounding which obviously shortens the period of usefulness of the valve. As the traveling valve is moved initially upward, the valve proper or main valve settles upon its seat 5 with little or no impact, since this is done mostly by gravity aided perhaps slightly by the pressure of fluid thereon, then the pilot valve 12 is seated and takes the impact load. The difference in impact between this and other types of valves is the difference in area between the large valve and pilot valve openings.

Manifestly, the construction shown is capable of considerable modification and such modification as is considered within the scope and meaning of the appended claims is also considered within the spirit and intent of the invention.

What is claimed is:

1. A pump valve and perforated cage including a main valve body comprised of exteriorly smooth sections movable bodily in said cage relative to a fixed seat provided with a passage, said body having an axial fluid passage and further having a central cavity and passages communicating with said cavity and said axial passages above the seat of said main valve whereby to provide minimum resistance of said main valve to the pressure of fluid during initial movements, a valve seat at the base of said cavity having a passage with an area less than one-fourth the area of the passage of said main valve seat and a floating pilot valve normally resting on said seat having a fluid discharge common to that of said main valve and capable of being actuated prior to the opening movement of said main valve and subsequent to the closing action of said main valve by fluid entering said cavity whereby to minimize the maximum acceleration and de-celeration of said valve in its travel.

2. A pump valve including a main valve body in sections having an attendant seat provided with a fluid passage, said body being constrained against other than vertical and rotative movement, said body also having an axial passage whose lower end is greater in diameter than its upper end and fluid openings entering its sides at points above the closure of said main valve whereby to minimize its resistance to fluid pressure, each of said openings communicating with a central cavity in said body, a valve seat in the base of said cavity having a passage whose area is less than one-fourth the area of the passage of the seat of said main valve, a floating pilot valve normally resting on said seat and exposed at all times to fluid pressure below and above said main valve and having a fluid discharge common to that of said main valve, said pilot valve being capable of yielding to fluid pressure below said valve body whereby to modify the action thereon by said fluid during the initial opening movement of said valve body, said pilot valve being held in suspension during the initial closing action of said valve body to relieve said body of the maximum pressure of said fluid.

3. A pump valve and an open cage including a main valve body in sections movable bodily in said cage relative to a fixed seat provided with a passage, said body having an axial fluid passage entirely therethrough, said body further having a central cavity and passages communicating with said cavity and said axial passages above the seat of said main valve whereby to provide minimum resistance of said main valve to the pressure of fluid during initial movements, a valve seat at the base of said cavity having a passage within an area less than one-fourth the area of the passage of said main valve seat and a floating pilot valve normally resting on said seat having a fluid discharge common to that of said main valve and capable of being actuated prior to the opening movement of said main valve and subsequent to the closing action of said main valve by fluid entering said cavity whereby to minimize the maximum acceleration and deceleration of said valve in its travel.

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