

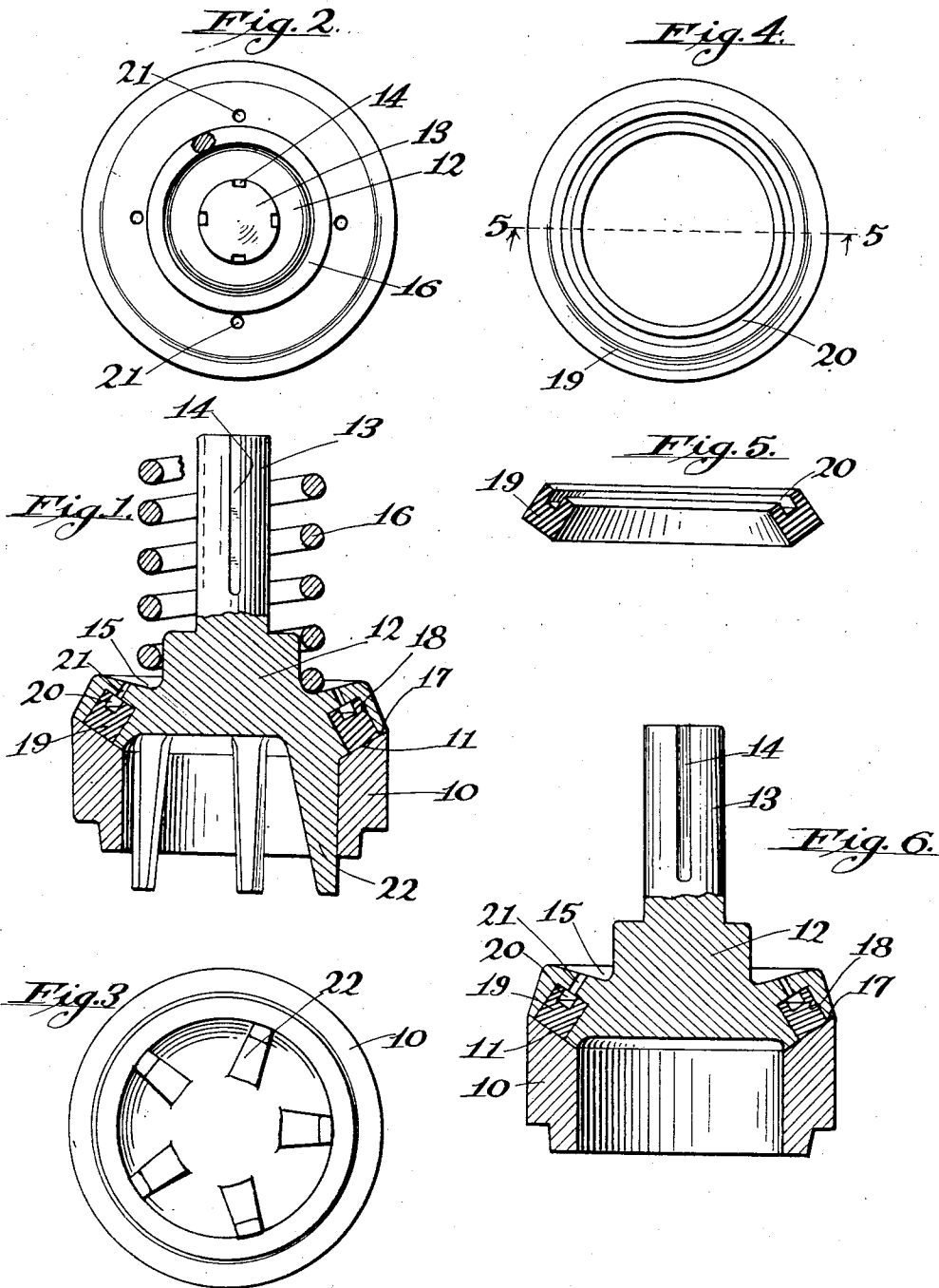
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MUD PUMP VALVE

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UNITED STATES PATENT OFFICE.

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MUD-PUMP VALVE.

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This invention relates to improvements in valves for mud pumps and the like.

An object of the invention is to provide a valve of improved construction wherein there is a metallic valve and a metallic valve seat with a resilient sealing ring mounted on at least one of these parts, so that when the valve and valve seat are in engagement, there will be a metal to metal contact as well as resilient material to metal contact between the valve and valve seat. In mud pumps and similar constructions a dirty fluid containing sand, grit and other foreign substances is pumped under a high pressure, and because of the high pressure the sand tends to cut away the valves and valve seats. By the improved construction the metal to metal contact affords a firm rigid seat, and the resilient material to metal contact provides a seal preventing any escape of fluid between the valve and valve seat. It will be readily understood that a small amount of leakage between the valve and the valve seat of the sand and grit carrying fluid under the high pressure would quickly cut away these parts.

A further object of the invention is to provide a valve for mud pumps and the like, in which there is a valve and valve seat with a resilient sealing ring mounted on one of these parts, and to provide means whereby this sealing ring may be expanded or urged toward the other part by the fluid pressure developed within the mud pump. With the foregoing and other objects in view which will be made manifest in the following detailed description and specifically pointed out in the appended claims, reference is had to the accompanying drawings for an illustrative embodiment of the invention, wherein:

Figure 1 is a side elevation of the improved valve, the major portion of which is broken away and shown in vertical section,

Fig. 2 is a top plan view of the valve shown in Fig. 1,

Fig. 3 is a bottom plan view of the valve shown in Fig. 1,

Fig. 4 is a plan view of the resilient sealing ring,

Fig. 5 is a diametrical section taken on the line 5-5 of Fig. 4, and

Fig. 6 is a view similar to Fig. 1 showing a slightly modified form of construction.

Referring to the accompanying drawings wherein similar reference characters designate similar parts throughout, the improved valve consists of an annular valve seat 10 which may be of somewhat conventional construction, and which has a beveled seating surface 11, which may be described as being inclined to the longitudinal axis of the valve seat 10. A valve is provided as indicated at 12 having a valve stem 13 shown as provided with grooves 14, as is required in certain types of constructions receivable in the conventional valve guide. In the base of the valve stem an annular recess 15 is formed constituting a spring seat for the coil spring 16 which urges the valve 12 into seating position. The valve 12 has a seating surface 17 complementary to the seating surface 11 and which may also be described as being inclined to the longitudinal axis of the valve 12. A groove 18 is formed approximately at the center of the seating surface 17 and is preferably arranged to have straight sides which are substantially perpendicular to the seating surface 11 and which are inclined to the axis of the valve.

Within the groove 18 there is disposed a sealing ring 19 formed of resilient material, such as rubber or a composition containing rubber. The sealing ring 19 is a closed ring as shown in Fig. 4, and at its top there is formed a groove 20. Apertures 21 are formed in the valve and communicate with the groove 18 and with the groove 20 in the sealing ring. Suitable valve guides 22 may be formed integral with the valve and depend therefrom within the valve seat 10, fitting against its interior surface and serving to keep the valve properly centered with respect to the valve seat.

By the improved construction it will be noted that there will be a metal to metal contact between the seating surfaces 17 and 11 on both sides of the resilient sealing ring 19, which establishes a resilient sealing ring to metal contact with the seat. The function of the apertures 21 is to admit fluid pressure developed within the pump to the interior of the groove 18 and to the interior of the sealing ring when the valve is seated on the valve seat. This fluid pressure urges the sealing ring toward the valve seat 10, thus forming a seal, preventing any escape of fluid between the valve and the seat which

might occur if there were only a metal to metal contact between the valve and the seat. Furthermore, this fluid pressure expands the resilient flanges formed by the groove 20, preventing any escape of fluid over or around the sealing ring 19 within the groove 18.

From the above described construction it will be appreciated that an improved mud pump valve is provided wherein the leakage is effectively prevented when the valve is seated. A sealing ring 19 is positioned within the groove 18 by slipping it over the valve guides 22 and then stretching it, permitting it to enter the groove 18 and then slightly contract to its normal position on fitting into the groove 18. By this construction it will be readily appreciated that when the valve is lifted or disengaged from its seat, the sealing ring will not drop out of the groove 18. Furthermore when the valve is lifted, the fluid pressures both above and below the sealing ring will be equalized, so that there will be no resultant pressure tending to urge the sealing ring 19 out of the groove 18 when the valve is off its seat.

In the construction shown in Fig. 6, the construction of the valve and the seat is identical with that shown in Fig. 1, except the valve guides 22 are omitted. In certain types of pumps there is no considerable lateral pressure on the valve, and the beveled seating surface 11 tends to center the valve on the valve seat, thus permitting the guides to be omitted.

It will be noted that a characteristic feature of my invention is that there is no sliding fit of the valve seat and the contacting surface of the valve in an axial direction, in other words when these elements bear together the motion of the valve is stopped and when pressure is brought on the valve that there is a direct metal contact between the inside and outside part of the valve in contact with the seat and also of the packing against the seat. The surface of the seat and the contacting surface of the valve form an annulus and it is to be understood that the relative positions of the contacting surface of the seat and the valve structure may be changed to suit different requirements. The packing through the medium of the apertures 21 leading to the groove in the sealing ring is caused to expand tightly against the valve seat. My invention distinguishes from structures of the cylinder and piston type in which a piston or a valve has a sliding motion in a cylinder with packing on the piston and in which cases possibly the metal enclosing the packing may form a contact with the cylinder, but in such types there is a sliding motion in an axial direction between the contacting surface of the cylinder and the packing of the piston or valve.

It will be understood that various changes

may be made in the detail of construction without departing from the spirit or scope of the invention as defined by the appended claims.

I claim:

1. A poppet valve for mud pumps and the like comprising an annular seat, a valve adapted to seat thereon, there being a groove formed upon the seating surface of one of the mentioned parts, a ring of resilient material imbedded in said groove whereby when the valve and seat are in engagement, there will be a resilient material to metal contact between them and a metal to metal contact between the valve and seat on both sides of said ring, and means for conveying fluid pressure to the back of said ring so as to urge it into seating position when the valve is seated.

2. A poppet valve for mud pumps and the like comprising an annular valve seat, a valve adapted to seat thereon, a ring formed of resilient material mounted upon the valve, said ring being so arranged that when the valve and seat are in engagement, there will be a resilient material to metal contact between them and a metal to metal contact between the valve and seat on both sides of said ring, there being ports formed in the valve for conveying fluid pressure behind the ring to urge it against said seat when the valve is in seated position.

3. A poppet valve for mud pumps and the like comprising an annular valve seat having a beveled seating surface which is inclined downwardly toward the center of the seat, a closure having a seating surface complementary to the seating surface of the seat, there being an annular groove formed on the closure and arranged at approximately the center of its seating surface, said groove having its sides inclined to the axis of the valve, a ring of resilient material fitting in the groove, there being apertures formed in the closure constituting ports for conveying fluid pressure to the groove behind the ring whereby when the closure is seated the ring will engage the seat and the body of the closure will engage the seat on the inside and outside of said ring and fluid pressure in the groove behind the ring will force the ring towards the seat.

4. A poppet valve for mud pumps and the like comprising an annular valve seat having a beveled seating surface which is inclined downwardly toward the center of the seat, a closure having a seating surface complementary to the seating surface of the seat, there being an annular groove formed on the closure and arranged at approximately the center of its seating surface, said groove having its sides inclined to the axis of the valve, a ring of resilient material fitting in the groove, there being apertures formed in the closure constituting ports for convey-

ing fluid pressure to the groove behind the ring whereby when the closure is seated the ring will engage the seat and the body of the closure will engage the seat on the inside and outside of said ring and fluid pressure in the groove behind the ring will force the ring towards the seat, there being a groove on the back of said ring defining flanges which are adapted to be expanded against the sides of the mentioned groove by the fluid pressure.

5. An insert for valve closures comprising a ring of pliable material, said ring being rectangular in cross section and having most of its sides other than parallel or at right angles to the axis through the ring, said ring having a groove upon its back defining spaced flanges between which fluid pressure may be applied.

6. A mud pump poppet valve comprising an annular valve seat, a valve closure having a seating surface adapted to engage the seat, there being a groove formed in the seating surface of one of the mentioned parts, a ring of resilient material disposed in the groove whereby there will be resilient material to metal contact between the closure and seat and metal to metal contact between the closure and seat on the inside and the outside of said ring, said ring and groove being so formed that it is necessary to deform the ring diametrically in application so that after having been applied the ring cannot be easily removed, and means other than the mere compression of the ring for urging the ring into engagement with its seating surface when the valve is closed.

7. A mud pump poppet valve comprising an annular valve seat, a valve closure having a seating surface adapted to engage the seat, there being a groove formed in the seating surface of one of the mentioned parts, a ring of resilient material disposed in the groove whereby there will be resilient material to metal contact between the closure and seat and metal to metal contact between the closure and seat on the inside and the outside of said ring, said ring and groove being so formed that it is necessary to deform the ring diametrically in application so that after having been applied the ring cannot be easily removed, and means for admitting fluid pressure to the groove behind the ring for urging the ring into engagement with its seating surface when the valve is closed.

8. A mud pump poppet valve comprising an annular valve seat, a valve closure having a seating surface adapted to engage the seat, there being a groove formed in the seating surface of one of the mentioned parts, a ring of resilient material disposed in the groove whereby there will be resilient material to metal contact between the closure and seat and metal to metal contact between the

closure and seat on the inside and the outside of said ring, said ring and groove being so formed that it is necessary to deform the ring diametrically in application so that after having been applied the ring cannot be easily removed, and means for admitting fluid pressure to the groove behind the ring for urging the ring into engagement with its seating surface when the valve is closed, said ring having flexible flanges at its back adapted to be expanded against the sides of the groove.

9. A mud pump poppet valve comprising an annular valve seat, a valve closure having a seating surface adapted to engage the seat, there being a groove formed in the seating surface on the closure, a resilient ring disposed in said groove whereby there will be a resilient material to metal contact between the closure and seat and metal to metal contact between the closure and seat on the inside and outside of the ring, the sides of the ring and groove being inclined to the vertical whereby it is necessary on application of the ring to deform it diametrically, and means other than the compression of the ring for urging the seating surface of the ring toward the seat when the valve is in closed position.

10. A mud pump poppet valve comprising an annular valve seat, a valve closure having a seating surface adapted to engage the seat, there being a groove formed in the seating surface on the closure, a resilient ring disposed in said groove whereby there will be a resilient material to metal contact between the closure and seat and metal to metal contact between the closure and seat on the inside and outside of the ring, the sides of the ring and groove being inclined to the vertical whereby it is necessary on application of the ring to deform it diametrically, and means for admitting fluid pressure to the groove behind the ring so as to urge the ring into engagement with the seat when the valve is in closed position.

11. A mud pump poppet valve comprising an annular valve seat, a valve closure having a seating surface adapted to engage the seat, there being a groove formed in the seating surface on the closure, a resilient ring disposed in said groove whereby there will be a resilient material to metal contact between the closure and seat and metal to metal contact between the closure and seat on the inside and outside of the ring, the sides of the ring and groove being inclined to the vertical whereby it is necessary on application of the ring to deform it diametrically, and means for admitting fluid pressure to the groove behind the ring so as to urge the ring into engagement with the seat when the valve is in closed position, said ring having flexible flanges at its back adapted to be expanded against the sides of the groove.

12. A poppet valve for mud pumps and the like comprising an annular valve seat, a valve adapted to seat thereon, a ring formed of resilient material mounted upon the valve, said ring being so arranged that when the valve and the seat are in engagement there will be a resilient material to metal contact between them and a metal to metal contact between the valve and seat on both sides of said ring, there being ports formed in the valve for conveying fluid pressure behind the ring to urge it against said seat when the valve is in seated position, said ring being self-sustaining upon the valve even against small inequalities in pressure tending to force the ring out of the groove when the valve is in unseated position.
13. A mud pump poppet valve comprising an annular seat having a beveled seating surface, a closure presenting a complementary seating surface, there being a groove formed in the closure, the sides of which are approximately perpendicular to the beveled surface on the seat, a resilient insert in the groove, there being at least one passage in the body for conveying fluid pressure to the back of the insert in the groove.
14. A mud pump poppet valve comprising an annular seat having a beveled seating surface, a closure presenting a complementary seating surface, there being a groove formed in the closure, the sides of which are approximately perpendicular to the beveled surface on the seat, a resilient insert in the groove, there being at least one passage in the body for conveying fluid pressure to the back of the insert in the groove, there being a groove formed in the back of the insert, the sides of which are approximately parallel and inclined to the axis of the valve defining spaced flanges adapted to be expanded against the sides of the groove in the closure by the fluid pressure.
15. A mud pump poppet valve having a closure in which is formed a groove, a resilient insert fitting between and engaging the sides of the groove, said closure having at least one passage for conveying fluid pressure to the back of the insert, the sides of the groove being so formed as to restrict movement of the insert therein under the influence of fluid pressure to an outward and downward direction.
16. A mud pump poppet valve having a closure in which is formed a groove, a resilient insert fitting between and engaging the sides of the groove, said closure having at least one passage for conveying fluid pressure to the back of the insert, the sides of the groove being so formed as to restrict movement of the insert therein under the influence of fluid pressure to a direction which is other than parallel to the axis of the valve.
17. An insert for mud pump valves comprising a resilient ring, the sides of which are other than parallel or at right-angles to the axis through the ring, there being a groove formed on the back of said ring.
18. An insert for mud pump valves comprising a resilient ring, the sides of which are approximately parallel to each other and are other than parallel or at right-angles to the axis through the ring, there being a groove formed on the back of said ring.
19. A mud pump poppet valve having a closure in which is formed an annular groove the sides of which are approximately parallel to each other and inclined other than at a right angle to the axis of the closure, a resilient insert fitting between the walls of the groove, there being passages formed in the closure for conveying fluid pressure to the back of the insert in the groove.
20. A mud pump poppet valve having a closure in which is formed an annular groove the sides of which are approximately parallel to each other and inclined other than at a right angle to the axis of the closure, a resilient insert fitting between the walls of the groove, there being passages formed in the closure for conveying fluid pressure to the back of the insert in the groove, the back of the insert having an annular groove formed therein.
- In testimony whereof I have signed my name to this specification.

ERWIN E. MILLER.