Sept. 30, 1941. J. W. WELLS 2,257,209

SLUSH PUMP VALVE

Filed July 26, 1937

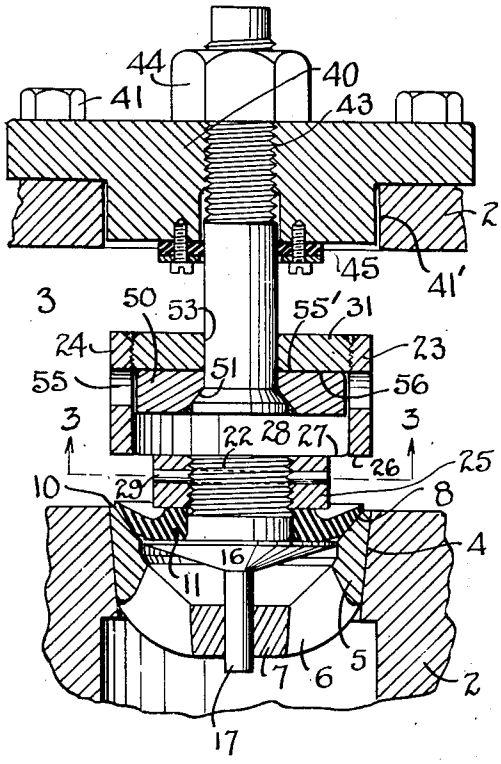

Fig. 1.

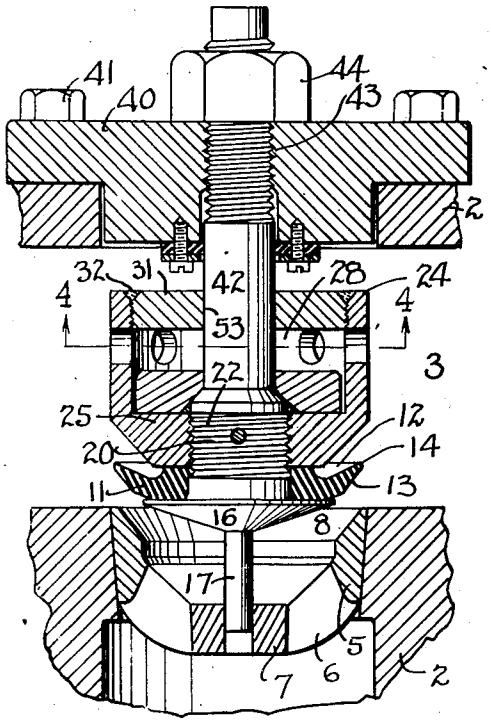

Fig. 2.

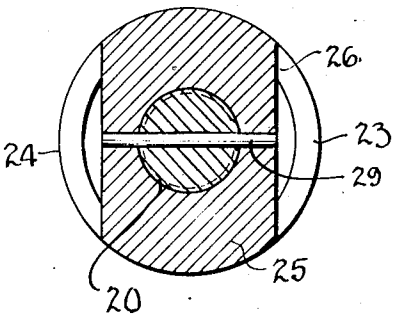

Fig. 3.

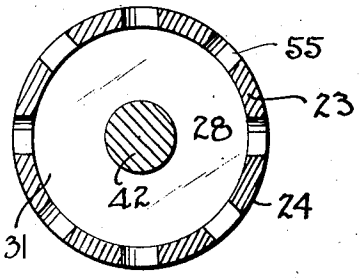

Fig. 4.

Inventor

J. W. WELLS.

Jesse R. Stone

Lester B. Clark

Attorneys

Patented Sept. 30, 1941 2,257,209

UNITED STATES PATENT OFFICE

2,257,209

SLUSH PUMP VALVE

John Wesley Wells, Houston, Tex., assignor to Mission Manufacturing Company, Houston, Tex., a corporation

Application July 26, 1937, Serial No. 155,605

4 Claims. (Cl. 103—228)

The invention relates to a slush pump valve assembly which can be readily inserted and removed from the slush pump body and which will provide a shock absorbing arrangement or mechanism whereby the load of closing of the valve is absorbed by the pump body.

In slush pumps, particularly of the type used in circulating drilling fluid into and out of the well bore in the rotary method of drilling wells the valves are subjected to enormous pressures and the fact that the liquid being pumped carries abrasives and is of high specific gravity increases the difficulties which are encountered in providing a satisfactory and serviceable valve.

It is therefore one of the objects of the invention to provide a stop mechanism for slush pump valves which are carried by the port cover through which the valve is inserted through the pump.

Another object of the invention is to provide a combination valve and stop cage for slush pump valves.

Another object of the invention is to provide a stop mechanism for slush pump valves wherein the shock of closing of the valve is absorbed by the valve cage which is movable about a stop member carried by the slush pump body.

Another object is to provide a stop cage for slush pump valves which will hold the sealing member of the valve in operative position.

Other and further objects of the invention will be readily apparent when the following description is considered in connection with the accompanying drawing, wherein:

Fig. 1 is a vertical sectional view of the valve and stop portions of the device shown with the valve in closed position.

Fig. 2 is a vertical section taken at right angles to the section of Fig. 1 and illustrating the general arrangement of parts with the valve open.

Fig. 3 is a section taken on the line 3—3 of Fig. 1.

Fig. 4 is a section taken on the line 4—4 of Fig. 2.

The slush pump body is indicated generally at 2 and while the main portions of the body are broken away it seems obvious that the fluid passage 3 between the upper and lower portions of the body 2 can be observed from Fig. 1.

The main portion of the body is provided with a tapered face 4, which is arranged to receive the slush pump valve seat 5. The seat is usually of annular configuration and carries a cross spider 6 which carries the guide hub 7. A tapered valve seat 8 is provided on the upper face of the seat member 5 in order to receive the beveled face 10 of the sealing member or packing ring 11. This ring 11 is of peculiar configuration, as is best seen in Fig. 2, in that it has a dished upper surface 12 and a beveled face 13 on its periphery. In this manner a thin flexible lip 14 has been provided which will move down against the seat 8 when the valve moves to closed position. Fig. 1 shows the valve closed. Fig. 2 shows the valve open. In order to support the resilient member 11 a flange 16 has been formed upon the valve stem 17 at the desired elevation such that this flange will move downwardly into the opening through the valve seat below the beveled face 8. In this manner the resilient packing portion 11 will move into sealing engagement with the sealing face 8 in order to form a tight seal and prevent leakage.

It should be borne in mind that valves of this type are subjected to pressures running as high as one thousand and fifteen hundred pounds per square inch and in some instances these valves have an exposed area of fifty square inches so that a rap of considerable magnitude is imparted to the pump body 2 every time the valve closes.

It will be noted that the stem 17 passes through the hub 7 as a guide for the valve generally, which is best seen in Figs. 1 and 2 at 20.

In order that the packing member 11 will be retained firmly in position the stem 17 is materially enlarged and is threaded at 22 above the packing member in order to receive the stop cage or housing 23. This housing is in the form of an annular ring 24, which has a base portion 25. This base has been cut away along each side as indicated at 26 in Fig. 3 so that an opening 27 will be provided at the base of the chamber or recess 28, which is inside of the cage ring 24. This entire cage 25 is positioned on the enlarged portion of the valve stem by being threaded thereon. A lock pin 29 can be passed through both the stem and the housing in order to secure it firmly in position and prevent unscrewing of the threads.

The chamber 28 may be of any desired size or diameter and is closed at the top by the cap 31 of the housing. This cap is preferably threaded inside of the housing ring and then securely locked into position by a bead of welding material 32. In this manner the cap 31 is firmly fixed in position.

The entire assembly so far is subjected to reciprocation upon operation of the pump because a surge of liquid passes upwardly thru the the center of the valve seat so that it engages

against the lower face of the flange 16. This causes the valve to move upwardly to the position shown in Fig. 2 so that there may be a flow of liquid through the valve.

Pumps of this type are generally of a reciprocating construction and of course when the piston initiates its return stroke there will be a suction downwardly through the valve seat because of the reversing of the direction of the movement of the piston. When this occurs of course the valve 20 closes instantly, and where the flow of fluid is being maintained at a high pressure it seems needless to state that where the valve is closed under enormous force, which may approximate fifty thousand pounds, this tremendous force of closing must be absorbed. Various types of arrangements for stopping the valve and absorbing this thrust have been devised, but a majority of such have not provided any enlarged contact area to absorb this load, and the present invention directs itself to the provision of enlarged contact areas to absorb the shock of closing so that the unit area pressure will be very small. This is conducive to longer life and more satisfactory operation because the elastic limit of the metals will in this manner not be exceeded.

Figs. 1 and 2 show the large area which is available on the lower side of the cap 31 of the housing 23 and it is the intention to utilize this large area for distributing the shock of closing. To transfer this load from the cage 23 to the pump body advantage has been taken of the fact that the port cover 40 is readily removable so as to provide ready access through the port 41 to the inside of the pump and particularly to the passage 3 as well as the valve parts.

This port cover 40 is held in position by the bolts 41.

Adjustably positioned in this port cover 40 is the stop rod 42, which is threaded at 43 into engagement with the port cover 40. This rod 42 is held in proper position by a nut 44. A suitable packing element 45 is positioned about the rod on the underside of the port cover 40 so as to normally form a seal about the rod. This rod, as seen in Figs. 1 and 2, is depending below the port cover 40 and has an enlarged stop head or plate 50 thereon. This plate may abut against the baffle 51 on the lower end of the rod or it may be otherwise affixed so long as it is in rigid position and capable of transmitting the shock of closing the valve to the rod 42. This disc or plate 50 is substantially the same size as the inside of the cage 23. The cap portion 31 has an opening 53 therein by which it is slidable about this rod 42.

If desired a set of breather openings 55 may be provided in the periphery of the ring 23. As seen in Fig. 1 the valve is in closed position with the face 55' of the cap 31 and the face 56 of the stop plate 50 in engagement with each other. This engagement limits the downward movement of the valve and transmits the shock of closing of the valve to the plate 50 and thence to the stem 42 where it is transmitted in turn to the cover plate 40 and the pump body 2.

Figs. 3 and 4 show sectional view illustrating details of construction of the device.

In practice the parts will be assembled as seen in Fig. 1 and the nut 44 will be adjusted so that the stem 40 will be held in proper elevation. When the pump begins to operate the valve will raise due to the force of fluid being ejected by the piston of the pump and will move to the position shown in Fig. 2. When the piston, however, reverses its path of movement and returns to draw in another charge of liquid into the pump cylinder then of course the valve 20 will quickly move to closed position as seen in Fig. 1. Where large areas and high pressure are encountered as in the drilling of wells this valve will close with a tremendous force and the shock of absorbing this force must be distributed over a large area, so that the contact faces 55' and 56 have been arranged to come into contact with each other at that period of operation such that the load will be taken entirely from the valve and the seat portion therefor.

Attention is directed to the fact that the port cover 40 is readily removable and that the valve assembly will be removed with it as a unit, only the valve seat remaining in position. In this manner adjustment and inspection can be made of the valves by merely removing the bolts 41 in order to remove the port cover.

What is claimed is:

1. A slush pump a valve assembly therefor comprising a valve seat, a valve, a resilient sealing member thereon to engage said seat, said valve having a stem, a cage fixed on said stem above said valve, a cap on said cage, a port through the pump body, a port cover therefor, a hanger rod projecting below said cover, a stop plate fixed on said rod and disposed within said cage to receive said cap in abutting position, and means to adjust said rod so that the abutment of said cap and plate serves as a stop the closing movement of the valve and to absorb the rap of closing of said valve.

2. A pump having a port cover and a stem thereon projecting into the pump in combination with a valve having an overhead cage, stop members on said cage and said stem to limit the downward movement of said valve.

3. A pump having a port cover and a stem thereon projecting into the pump in combination with a valve having an overhead cage, stop members on said cage and said stem to limit the downward movement of said valve, said members being in the form of plates of substantially the size of the valve so as to provide a large area to distribute the pressure.

4. A slush pump and slush pump valve assembly comprising a slush pump body, a fluid passage through said body, a valve for closing said passage, a port from the outside of said body into said passage, a cover normally closing said port, a stem adjustably carried by said cover, a packing to seal about said stem, a stop plate carried by the lower end of said stem and disposed in said passage, a valve seat in said pump body, a reciprocable valve, a valve stem to be guided by said seat, a sealing member about said valve stem, a stop cage on said valve stem retaining said sealing member in position and enclosing said stop plate, said housing including a cap portion to seat upon said stop plate so that such contact will absorb the shock of closing of said valve.

JOHN WESLEY WELLS.