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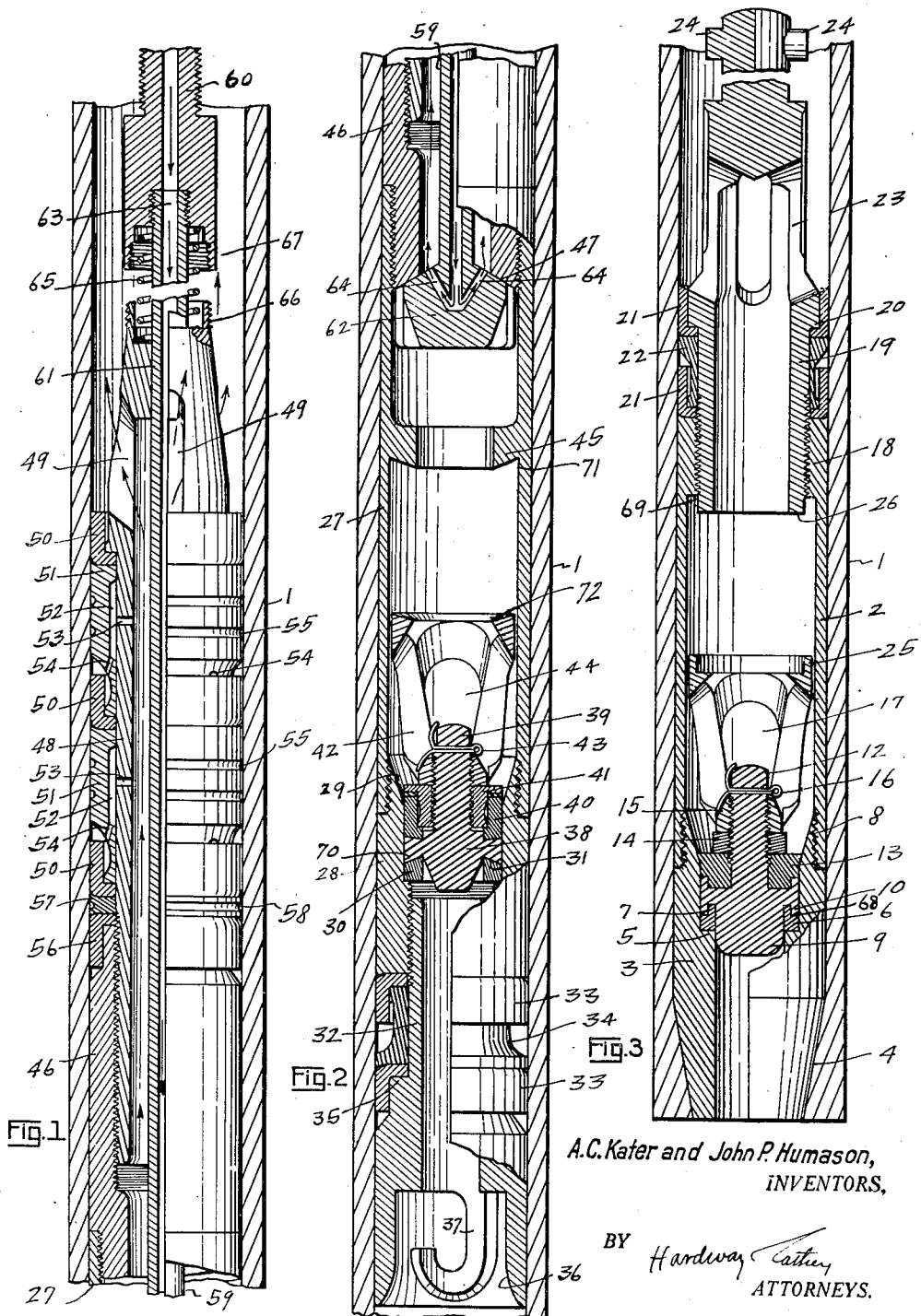
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1,930,839

PUMP

Filed June 29, 1931

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

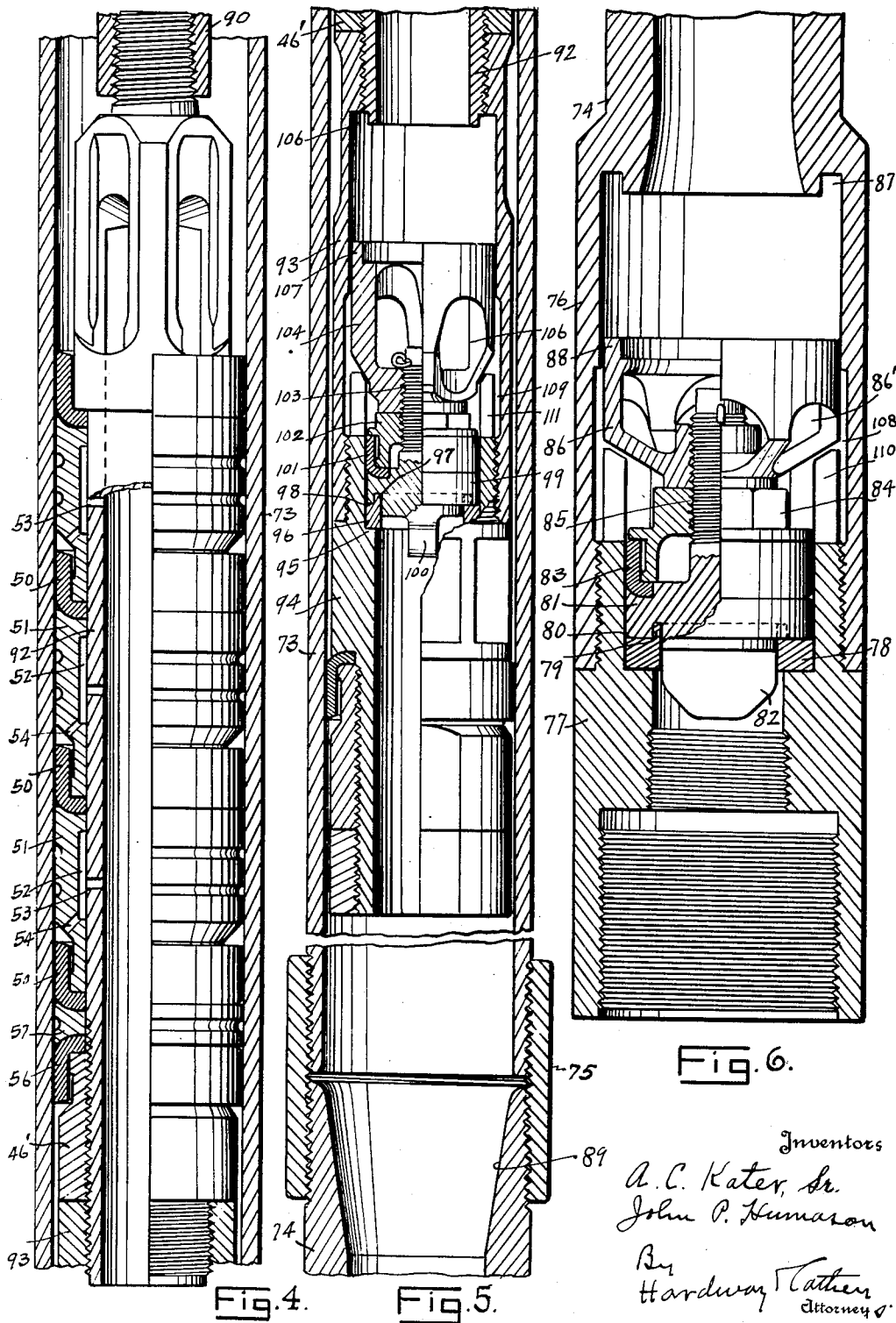


Fig. 6.

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PUMP

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2 Claims. (Cl. 103—228)

This invention relates to a pump.

One object of the invention is to provide a pump of the character described specially designed for use in pumping fluid from wells, particularly deep oil wells.

Another object of the invention resides in the provision of a pump having novel means for lubricating the traveling valve thereof.

Another object is to provide a pump whereby the fluid may be pumped from the well either by the reciprocation of the traveling valve, or by the introduction of pressure fluid into the well, or by the combined action of the traveling valve and said pressure fluid.

Another object is to provide novel means for cushioning the movable parts.

Another object is to provide a pump whose operating parts are so shaped as to prevent the pump from becoming "sanded up" or cut out by sand or gritty substances in the pumped fluid.

A further feature is to provide, in a pump, a novel type of valve mechanism.

With the above and other objects in view this invention has particular relation to certain novel features of construction, operation and arrangement of parts, an example of which is given in this specification and illustrated in the accompanying drawings, wherein:

Figure 1 shows a vertical sectional view of the upper end of the pump.

Figure 2 shows a vertical sectional view of an intermediate section thereof.

Figure 3 shows a vertical sectional view, of the lower end thereof, and

Figures 4, 5, and 6, show vertical sectional views of the upper, intermediate and lower sections, respectively, of a slightly modified form of the pump.

Referring now more particularly to the drawings the numeral 1 designates the working barrel of the pump which is attached to the lower end of the pump tubing (not shown) in the usual way, said tubing extending to the ground surface. In the lower end of said barrel there is a standing valve, as shown in Figure 3. This standing valve has a tubular body 2 whose lower end 3 is detachable and tapered to seat in a downwardly converging seat 4 at the lower end of the barrel. Within the lower end of said body there is an annular shoulder 5 which supports the ring like valve seat 6 whose inner margin has the annular upstanding lip 7. The inside of the body 2 has the upwardly flared portion, above the shoulder 5, forming a guide 8.

There is a valve 9 whose lower end is shaped

to fit through the seat 6 and which has an external annular depending lip 10 shaped to fit around the lip 7 when the valve 9 is seated to form a fluid tight joint therewith. The valve 9 has the upstanding stem 12 and fitted over said stem there is the seal ring 13 which is locked on the stem by the lock nut 14 and screwed onto the upper end of the stem against the lock nut 14 there is a guide 15 which is retained in place also by the cotter key 16 and which has suitable fluid openings 17 therethrough.

The upper end of the body 2 is inwardly thickened and provided with the internal threads 18 and a tubular nipple 19 is threaded through said inwardly thickened portion and its upper end is provided with the downwardly facing shoulder 20. On the nipple 19 and located between the shoulder 20 and the upper end of the body 2 are the upwardly opening cup rings 21, 21 spaced apart by the spacer ring 22. Above the upper cup ring 21 the nipple has the outlet openings 23 and the upper end of said nipple is reduced and formed with the oppositely disposed studs 24, 24 for a purpose to be hereinafter described. The valve 9 and its guide move upwardly upon intake stroke of the pump. The upper end of said guide has an annular upstanding rib 25 which fits around and forms a close fit with the lower end of the nipple 26 when said guide is in its upper position.

Reciprocable in the barrel above the standing valve assembly there is a traveling valve assembly which will now be described:

The traveling valve assembly has a tubular body 27 whose lower end 28 is inwardly thickened and formed with a tapering portion forming a guide 29 beneath which there is a removable annular seat 30 having the inwardly and upwardly converging face 31. Screwed into the lower end 28 of the traveling valve body there is a tubular nipple 32 having the downwardly opening cup rings 33, 33 thereon spaced apart by the spacer ring 34 and confined between the lower end 28 of said body and the annular external shoulder 35 of the nipple 32. The lower end of said nipple 32 is flared and fits closely within the working barrel forming a guide 36 and has the oppositely arranged hooks as 37 to the end that when it is desired to pull the standing valve assembly the traveling valve assembly may be lowered until the guide 36 passes over the reduced upper end of the nipple 19 and then turned to carry the hooks 37 into engagement with the studs 24 and the standing valve structure may

then be pulled out for repairs or replacements or for any other purpose desired.

Cooperating with the seat 30 there is a valve 38 which opens upwardly and which has an up-
 5 standing stem 39. Around the stem there is a sealing ring 40 retained in place by the gland 41 which is screwed on to the stem 39 and which is also held in place by means of the guide 42 which is screwed onto said stem against said gland and
 10 is held against said unscrewing by the cotter key 43. This guide has the inlet opening 44 through which the pumped fluid may pass into and up through said guide and the guide is limited in its upward movement by means of an inside annular
 15 stop 45 above it in the valve body 27. Screwed into the upper end of the valve body 27 there is a coupling 46 whose lower end is downwardly flared forming a seat 47 and threaded into the upper end of this coupling there is an elongated nipple
 20 48 whose upper end has the upwardly diverging side passageway 49 for the fluid being pumped. Around this nipple 48 are the upwardly opening cup rings 50 between which are the spacer rings 51. These rings have the inside annular channels
 25 52 therearound and ports 53 lead from the interior of the nipple 48 into said channels and leading from said channels are the ducts 54 located above the lower cup rings 50. The pumped fluid may thus find its way onto the internal surface
 30 of the working barrel so as to lubricate the traveling valve structure. The spacer rings 51 have external annular grooves 55 in which the lubricating oil collects and from which it is fed on to the surrounding wall of the barrel. This
 35 lubricating fluid will be fed under considerable pressure and will be discharged within the lower cup rings 50, 50 and the pressure will operate to hold said cup rings closely against the surrounding walls of the barrel, as shown in Figure 1.
 40 Beneath the lower cup ring 50 there is a downwardly opening cup ring 56 which is spaced from said lower cup ring 50 by the spacer ring 57, said cup ring 56 being clamped between said last mentioned spacer ring and the upper end of the coupling 46. This last mentioned spacer ring also
 45 has an annular lubricant containing channel 56 therearound.

There is a tubular valve stem 59 whose upper end is connected to the lower end of the sucker
 50 rod 60. This stem works closely through a bearing 61 in the upper end of the nipple 48 and its lower end is enlarged forming a valve 62 located beneath and arranged to cooperate with and close the seat 47. The sucker rod 60 and stem 59 have
 55 the channel 63 leading downwardly therethrough into the valve 62 and terminates in the upwardly directed nozzles 64, 64 arranged to discharge pressure fluid into the fluid passageway above the seat 47. During the operation of the pump pressure
 60 fluid such as compressed air, steam or other similar fluid, may be forced down through the channel 63 and out through the nozzles 64 into the fluid being pumped and the pump thereby assisted in discharging the pumped fluid from the
 65 well.

Upon upstroke of the traveling valve assembly the valve 9 will be lifted and fluid beneath will
 70 pass up into the working barrel, the valves 38 and 62 remaining closed and upon down stroke of the traveling valve structure the valve 9 will be seated, the valve 62 opened and the valve 38 lifted to permit the fluid to pass on up through the traveling
 75 valve structure up above the traveling valve 62 and the pumped fluid will pass on up through the nipple 48 and out through the passageways 49

and on up through the pump tubing. The downward tapering guides 8, 29 assist in causing the
 valves 9, 38 to seat closely on their respective seats beneath. During this operation fluid under
 80 pressure may be forced down through the channel 63 and out through the nozzles 64 in the manner and for the purposes above stated if desired. Upon downstroke of the sucker rod 60 the shock
 85 absorber 65, as shown in the form of a coil spring interposed between the lower end of the sucker rod and the upper end of the nipple 48, will absorb the shock of the downstroke of the sucker rod.

The upper end of the nipple 48 is shown as provided with a reduced outwardly threaded pin
 90 66 adapted to be screwed into the internally threaded box 67 at the lower end of the sucker rod so as to connect said sucker rod to the nipple 48 if desired. If this connection is made the valve 62
 95 will thereby be held permanently opened as indicated in dotted lines in Figure 2 and the pump may be operated as above explained to pump the fluid from the well or fluid under pressure may be forced down through the sucker rod as above explained to force the fluid from the well without
 100 pumping the well in the ordinary manner that is, without reciprocating the traveling valve assembly. This latter method will be used ordinarily only in wells where the normal level of the oil is above the valve 62.

It is to be noted that around the lip 7 there is the annular channel 68 and around the lower end
 105 of the nipple 19 there is the annular channel 69. It is also to be noted that the upwardly converging face 31 of the seat 30 forms an annular channel 70 around said face and the opposing portion of the valve 38 is shaped to conform to the taper of the face 30. The under side of the stop 45
 110 converges downwardly forming an annular channel 71 and the upper end of the guide 42 is upwardly flared at 72 to correspond to the shape of the underside of said stop. As the valves 9, 38 reciprocate a portion of the fluid being pumped
 115 will be trapped in these respective channels and will form cushions so as to cushion the valves at the ends of their stroke in either direction thus reducing the wear on the valves and reducing the vibration during the operation of the pump.

In the form shown in Figures 4 to 6 the working barrel is designated by the numeral 73 having
 125 the lower section 74 connected into the barrel by the coupling 75. The lower end of this section 74 is enlarged forming a standing valve casing 76, threaded into the lower end of which there is a tubular valve body 77 having the internal
 130 annular shoulder whereon is located the annular seat 78 having the inside, upstanding annular lip 79. This lip forms an annular channel 80 between it and the opposing inside wall of the valve body.

There is a cylindrical valve 81 having a depending guide 82 which works through the seat
 140 78 and the underside of the valve is shaped to conform to the shape of, and to cooperate with, the upper side of the seat 78. There is an upwardly opening cup ring 83 which works closely in the valve body 77 and which is clamped around the valve 81 by means of the clamp nut 84. This
 145 nut is threaded onto the stem 85 which upstands from the valve 81. There is a valve guide 86 threaded onto the upper end of said stem 85 and abutting said nut 84 and this guide is open above and has the lateral openings 86' providing for the passage of fluid upwardly therethrough.
 150 Above the valve guide there is an annular down-

wardly facing channel 87 arranged to receive the correspondingly shaped upper end 88 of said guide. Above the channel 87 the passageway through the barrel is restricted and flared at its upper end forming a seat 89. In case the standing valve 81 should develop a leak the traveling valve, hereinafter described, may be removed and any selected type of standing valve may be dropped through the barrel and will land on the seat 89 and pumping operations may then be resumed.

In this type of pump the traveling valve is connected to and reciprocated by the sucker rod 90. This rod is attached to the cage 91 which in turn is connected to the upper end of the traveling valve nipple 92, which has the cup rings and spacer rings thereon as shown in Figure 1, with the lower spacer ring 56 clamped in place by the clamp sleeve 46' which is threaded onto the lower end of said nipple 92.

There is a tubular valve casing 93 threaded onto the lower end of the nipple 92 and into the lower end of this casing there is screwed the tubular valve body 94 having the inside annular shoulder 95 on which is seated the annular valve seat 96. This seat has the annular, inside, upstanding lip 97 forming the annular, upwardly facing channel 98 between said lip 97 and the inside wall of the body 94. There is a cylindrical valve 99 having the depending guide 100 which works through the seat 96. The under side of the valve 99 is shaped to conform to the contour of, and cooperate with, the upper face of said seat 96. The valve 99 has a surrounding, upwardly opening cup ring 101 there around which is clamped in place by the ring nut 102 threaded onto the valve stem 103 upstanding from the valve 99. Threaded onto the upper end of the valve stem 103 there is a valve guide 104 which abuts said nut 102 and whose upper end is open. This guide also has the side openings 105 to permit the passage of fluid upwardly therethrough. The upper end of this valve casing has the inside, downwardly facing annular channel 106 provided to receive the annular upper margin 107 of the cage 104.

The inside of the valve casings 76, 93 above the upper ends of the corresponding valve bodies 77, 94 are counterbored, as at 108, 109, upwardly a sufficient distance to give the required amount of space for the passage of fluid about the corre-

sponding valves, as said valves are lifted, and upstanding from the upper ends of said valve bodies 77, 94 are the spaced prongs, or guides, 110, 111 which closely surround the corresponding valves, when the said valves are lifted, to prevent the lateral movement, or side slapping, of said valves.

Fluid will be trapped in the channels 80, 98 as the corresponding valves 81, 99 approach their seats and likewise fluid will be trapped in the channels 87, 106 as the corresponding cages 86, 104 approach the limit of their upward movement and the trapped fluid will form cushions to minimize the wear on the contacting parts and the vibration of the pump.

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

What we claim is:—

1. In a pump a working barrel; a valve structure for controlling the flow of fluid through said barrel; said valve structure including a cylindrical body having a seat therein, a valve casing on said body which is internally counter-bored above said seat, a valve fitting in the body and cooperating with said seat; said barrel and valve being provided with spaced annular channels and corresponding annular projections forming coacting means for forming a fluid cushion to check the valve as it approaches the limit of its movement in either direction, and a cage-like guide on the valve having an annular upper end which fits closely in said casing above said counter-bore.

2. In a pump, a valve structure comprising a tubular member whose lower end is provided with a valve seat, a valve arranged to cooperate with said seat, a guide upstanding from the valve and having lateral openings and whose upper end fits closely with the walls of the tubular member, said seat having an annular upwardly facing groove, said tubular member having an inside, downwardly facing groove above the guide, said valve and the upper end of said guide having annular lips adapted to seat in the corresponding grooves at the limit of the valve movement in each direction.

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