

Feb. 26, 1929.

J. H. HERMAN

1,703,423

PUMP

Original Filed Nov. 20, 1926

2 Sheets-Sheet 1

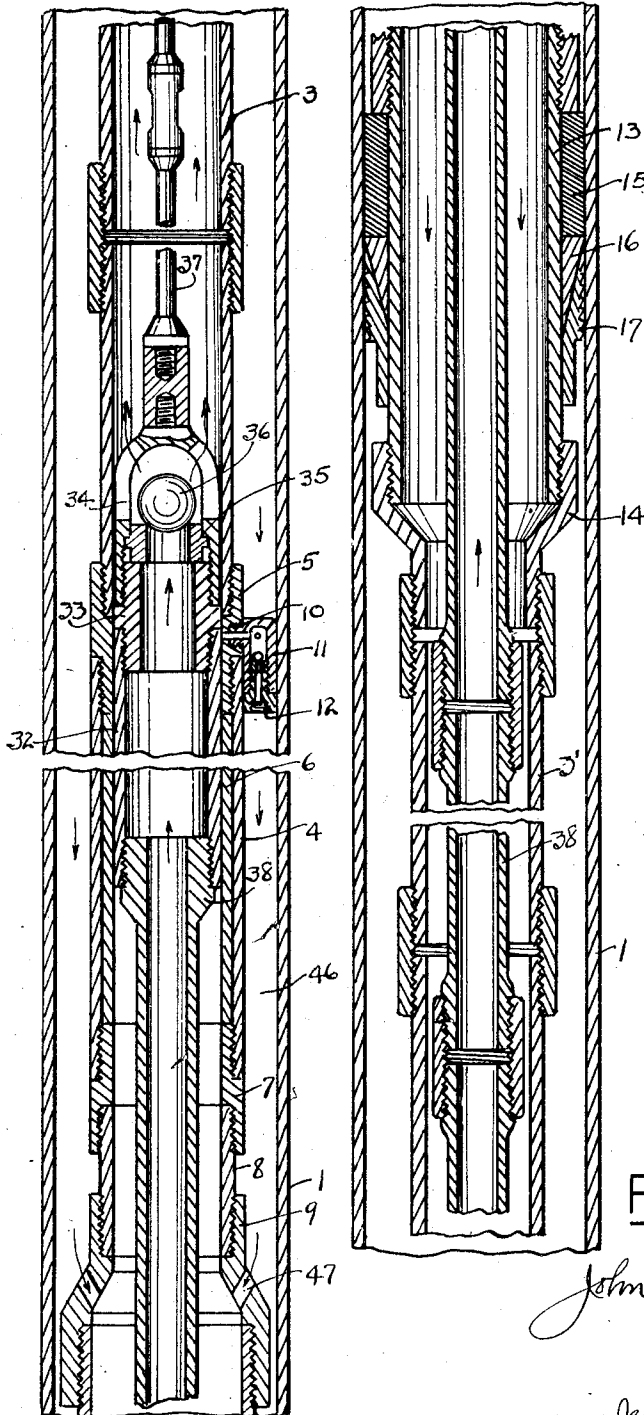


Fig. 2.

Fig. 1.

John H. Herman Inventor

By Jesse R. Stone

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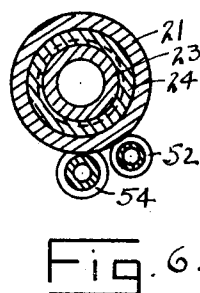
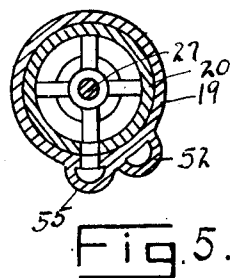
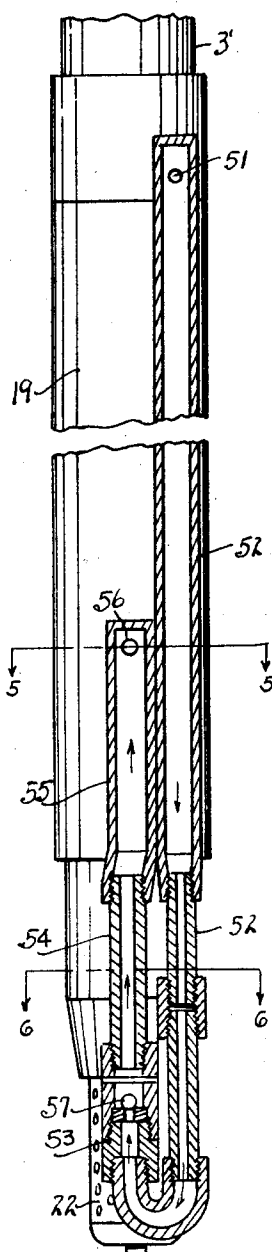
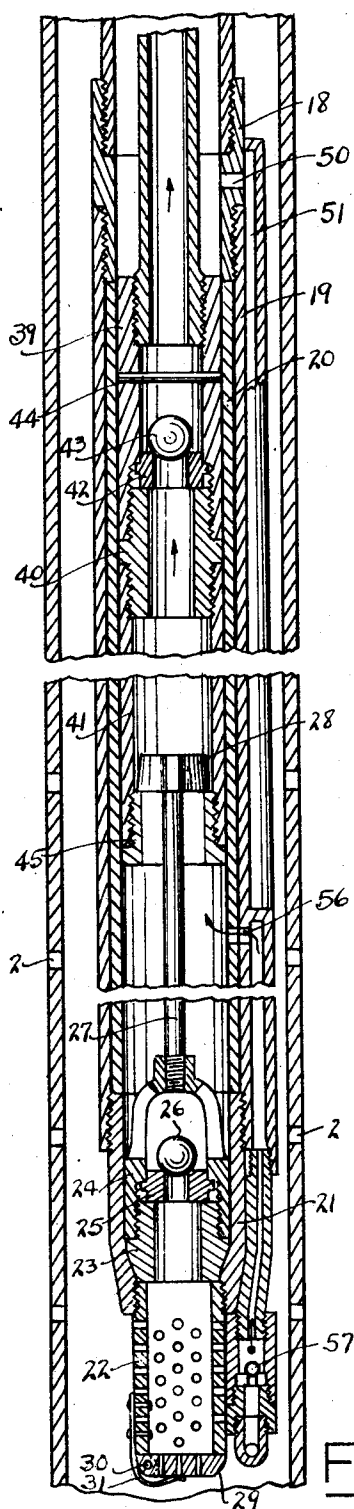


Fig. 4. John H. Herman Inventor

Fig. 3

By

Jesse R. Stone

Attorney

UNITED STATES PATENT OFFICE.

JOHN H. HERMAN, OF LONG BEACH, CALIFORNIA.

PUMP.

Refiled for abandoned application Serial No. 149,723, filed November 20, 1926. This application filed April 23, 1928. Serial No. 272,304.

This application is a substitute for my abandoned application #149,723, filed Nov. 20, 1926.

My invention relates to an improvement in deep well pumps of the reciprocating type employed in raising oil or water from great depths, and is particularly adapted for use in oil wells.

It is a frequent difficulty experienced in pumping of deep wells that sand and mud are included with the oil and must be carried by the pump to the surface. Breaking of the pump arises through the fact that the ordinary reciprocating pump will not operate successfully in mud or sand and will clog and cease to function within a short time.

It is an object of my invention to provide a pump which will handle oil or water laden with sand and mud in such manner as to prevent the clogging of the apparatus during its operation. It is my aim to provide a pump with means to flush the working parts of the pump with liquid to carry away with the flushing liquid and the liquid being pumped, the sand and other detritus coming into the well.

It is also an object to provide a pumping installation having means to clear the inlet openings to the pump whenever this becomes necessary and without removing the pump from the well.

My invention resides in the particular construction and arrangement of the parts making up the pump, and the details thereof will be set forth in the specification which follows.

Referring to the drawing, Fig. 1 illustrates the upper end of the pump barrel and tubing, shown in central vertical section, and embodying my invention. Fig. 2 is the central section of the said pump barrel, and Fig. 3 is the lower end of the pump, the pump being shown as set within a casing. Fig. 4 is a view of the lower end of the pumping installation shown in Fig. 3, with the outer walls of the by-passing shown as broken away. Figs. 5 and 6 are transverse sections on the lines 5—5 and 6—6 respectively of Fig. 4. Like numerals of reference are employed to designate like parts in all the views.

In the drawing, the pump is shown as installed with an outer casing 1 which may be understood as being the usual sectional well casing, which serves to support and line the interior of the well. Said casing is perfo-

rated at 2 toward the lower end to allow the inlet of oil or other liquid to the well.

Within the casing is the usual tubing 3 of the pump, the lower end of which is connected to a pump barrel 4 by means of a special coupling 5. Said pump barrel is of slightly larger diameter than the tubing and includes within it a liner 6, which is of the same inner diameter as the tubing and adapted to fit closely about the plunger. Said liner is set between the lower end of the coupling 5 and a similar coupling 7 at its lower end. The coupling 7 connects the pump barrel with a short nipple 8 connected at its lower end within a swedged coupling 9. The coupling 5, previously referred to, may have a central opening therethrough at one side, threaded at 10 for connection with a valve chamber 11, the lower end of which is directed downwardly and adapted to fit within the casing in the manner shown in Fig. 1. The lower end of the valve chamber is threaded at 12 to connect with a tube, not shown, which may be extended downwardly to any desired depth and adapted to convey away the gas which may accumulate in the well. The valve within the chamber serves to prevent the liquid from the pump barrel escaping downwardly below the pump barrel.

The swedged coupling 9 is connected with a packer made up of a pipe section 13, threaded at its upper and lower ends to connect with the swedged couplings 9 and 14 respectively. The packer formed upon this pipe section may be of any preferred form. I have shown a sleeve 15 on the pipe section, said sleeve being of compressible material, such as rubber or similar composition, and supported upon a tapered collar 16, which may be in turn supported by toothed jaws 17, adapted to engage with the inner face of the casing, as shown. The details of this packer need not be further described. It is contemplated that the passage of fluid outside the pump will be cut off at this point by a packer of any preferred construction.

Below the packer I have shown the tubing 3' as extending downwardly and connected at its lower end to a special coupling member 18, similar in its make up to the coupling 5, previously described. It connects at its lower end with a pump barrel 19 having a liner 20 inside the same, said liner being of the same interior diameter as the tubing and serving as a working barrel for the lower plunger.

The lower end of the pump barrel is connected with a housing 21 for a standing valve for the pump. The lower end of the housing is tapered downwardly and connected at its lower end with a strainer 22 perforated to allow the liquid to pass therethrough to the standing valve.

The standing valve comprises a lower tapered bushing 23, threaded at its upper end for connection with the valve cage 24, serving to retain a valve seat 25 on the upper end of the bushing. Within the valve cage is the usual ball valve 26. The upper end of the standing valve may be connected by means of a Garbot rod 27 to a head 28 within the lower end of the pump plunger, as will be more particularly set out.

The lower end of the strainer 22 is closed by means of a cap 29, which is hinged at one side, shown at 30, to open when desired. Said cap is held in place closing the lower end of the strainer by means of a spring 31. Said spring exerts a predetermined force upon the cap 29, allowing the cap to open under the pressure of fluid from the inside, when desired.

The pump plunger is, in fact, a double plunger, having a reciprocating head within each of the two working barrels, above described. The upper plunger fitting within the working barrel 6 is of ordinary construction and has a tubular head 32, shaped to fit closely within the liner 6 of the working barrel. Its upper end is threaded for connection with a valve housing 33 connected at its upper end with the valve cage 34, said cage serving to retain a valve seat 35 in position. A ball valve 36, within said seat, is limited in its movement by the valve cage 34, the upper end of said cage being connected to a sucker rod 37 of the usual construction, extending upwardly to the surface.

The lower end of the plunger is threaded at its interior for engagement with a hollow sucker rod 38. Said rod extends downwardly through the packer and the tubing and is connected at its lower end to the upper end of a valve housing 39 of the lower plunger. Said valve housing is made up of the section 39, which forms a part of the plunger and fits closely within the liner 20 of the lower working barrel and a central section 40 connecting the upper valve housing with the head 41 of the plunger. Within the valve housing is a valve seat 42 and a ball valve 43 thereon. A transverse pin 44 through the valve housing limits the upward movement of the ball valve 43. The lower end of the plunger has a threaded plug 45 screwed therein, the upper end of said plug acting to engage the head 28 of the Garbot rod so as to withdraw the standing valve when the plunger is withdrawn. Thus, also the raising of the standing valve allows flushing fluid

to enter and clean the strainer 22 below in an obvious manner.

To flush the plunger and also to dilute the sand and mud-laden fluid, I provide means for directing flush water or similar liquid from the surface downwardly about the pump barrel. The tubing is spaced from the casing a material distance, forming a space 46 to allow passage for the flushing liquid. The swedged coupling 9 has perforations 47 therein to allow the liquid to pass inwardly between the hollow pump rod 38 and the packer. Said liquid finds a passage within the tubing 3' to a point above the lower plunger and finds an outlet from the tubing through an opening 50 within the coupling member 18. The opening 50 connects with a closed passage 51, which may be a separate pipe or may be made integral with the wall of the pump barrel 19, as shown in Fig. 5. Said passage leads downwardly to the lower end of the pump barrel and there connects with the pipe 52, which is recurved at its lower end and connected through a valve chamber 53 to a pipe 54 connected at its upper end with a passage 55, formed upon the wall of the pump barrel and acting to convey the fluid to an opening 56 in the pump barrel 19 and the liner 20. A ball valve 57 within the housing 53 prevents the passage of liquid backwardly in an obvious manner.

In the operation of my pump, the principal suction effect is obtained almost entirely from the lower plunger 41. It serves to suck in the liquid through the strainer 22 and past the standing valve so as to force it upwardly to the surface in the usual manner, the fluid passing from the plunger upwardly through the hollow sucker rod 38 and the upper plunger and from thence through the tubing to the surface. The action of the upper plunger is mainly to prevent liquid being pumped from passing downwardly into the tubing between the plungers where it might find exit through the opening 47 above the packer.

The flushing fluid in the casing may pass through the opening 47 and thus pass the packer to the opening 50 and the by-pass made up of the passages 51, 52, 54 and 55 to the opening 56 in the pump barrel between the lower plunger and the standing valve.

I form the opening 56 at such a point in the pump barrel that it will be covered by the pump plunger during the larger portion of its stroke. The pump plunger will hence close the opening so that no fluid can find entrance to the pump barrel until the lower end of the plunger has reached the point above the opening 56 and then the fluid will flow largely through the opening 56 alone. I wish it understood that the opening 56 is of fairly large diameter, so that the flow of liquid therethrough will be in comparatively

large volume when the piston has passed this opening. It will be obvious, of course, that I can place the opening 56 at any point desired in the pump barrel to provide sufficient
 5 flow of flushing water to accommodate the amount of mud and sand which is being pumped in the particular installation under consideration. If but little sand or mud is encountered, the opening 56 will be covered
 10 by the plunger through the larger part of its stroke, but if the mud and sand is pumped in large quantities, the opening 56 may be placed somewhat lower in the barrel so that it will be opened in time to allow an inlet
 15 of a large quantity of the flushing fluid. This fluid will serve to dilute the fluid being pumped and make it possible to lift it to the surface with little difficulty. The mud and sand will be carried away in such manner as to prevent clogging of the pump and
 20 will prevent the wear ordinarily caused by the sand collecting between the plunger and the working barrel and scoring the barrel and plunger.

25 The amount of flushing liquid taken in at the lower end of the pump barrel may be also regulated from the surface without change in the pump barrel by adjusting the stroke communicated to the sucker rod. If
 30 the sucker rod is raised slightly and given a shorter stroke, it will be possible to take in relatively large quantities of flushing fluid. On the other hand, if it is lowered slightly and given a long stroke, relatively small quantities
 35 of flushing fluid will be taken in. The further advantages of this construction will be apparent to those skilled in the art.

What I claim as new and desire to protect by Letters Patent is:

40 1. In a pump, upper and lower pump barrels, a standing valve in said lower barrel, a pump plunger in each of said barrels, a hollow sucker rod connecting the two plungers, said lower barrel having an opening in the
 45 side thereof above said standing valve, and means to permit flushing fluid to be forced into said opening, said plunger controlling the said opening to allow entrance of liquid only at the upper end of its stroke.

50 2. In a pump, a pump tubing, upper and lower pump barrels therein, a standing valve in said lower barrel, a pump plunger in each of said barrels, a hollow sucker rod connecting the two plungers, a packer on said tubing
 55 between said pump barrels acting to close the passage of fluid outside said tubing, said lower barrel having an opening in the side thereof above said standing valve, and means to permit flushing fluid to be forced into
 60 said opening, said plunger controlling the said opening to allow entrance of liquid only at the upper end of its stroke.

65 3. In a pump, a pump tubing, upper and lower pump barrels connected in said tubing and spaced apart, plungers in said pump bar-

rels, said plungers being connected, a packer on said tubing between said barrels, there being openings into said tubing above and below said packer, a standing valve, and means
 70 to permit flushing liquid to be forced into said lower pump barrel only at a point adjacent the upper end of the stroke of said lower plunger, said openings allowing passage of said liquid.

75 4. In a pump, a pump barrel, a standing valve connected in the lower end thereof, a strainer below said standing valve, a cap on said strainer, means to hold said cap resiliently in closed position, a pump plunger, means
 80 connecting said plunger and said standing valve whereby said standing valve may be raised with said plunger, and means to conduct flushing liquid past said standing valve when it has been raised, to clean said strainer.

85 5. In a pump, a pump barrel, a standing valve connected in the lower end thereof, a strainer below said standing valve, a cap on said strainer, means to hold said cap resiliently in closed position, a pump plunger,
 90 means connecting said plunger and said standing valve whereby said standing valve may be raised with said plunger, there being an opening in said pump barrel whereby flushing liquid may be forced past said standing
 95 valve when it has been raised, to clean said strainer.

100 6. A pump including a tubing, upper and lower pump barrels connected in said tubing, a standing valve below said lower barrel, pump plungers in said barrels, a hollow rod connecting said plungers, a casing outside
 105 said pump barrels and tubing means closing the space between said tubing and casing between said pump barrels, there being a passage for liquid between said plungers inside said tubing, and means to conduct said liquid
 110 into said lower pump barrel at a point spaced above said standing valve.

115 7. In a device of the character described including a well casing, a well tubing therein, a pump barrel on said tubing, a standing
 120 valve in said barrel, a packer closing the space between said tubing and casing above said standing valve, a plunger in said pump barrel, said pump barrel having an opening
 125 therein above said standing valve, a solid sucker rod on said plunger and means to allow the flow of flushing fluid from within said casing past said packer and into said
 130 opening to clear said pump barrel.

135 8. In a device of the character described including a well casing, a well tubing therein, a pump barrel on said tubing, a standing valve in said barrel, a packer closing the space between said tubing and casing above
 140 said standing valve, a plunger in said pump barrel, said pump barrel having an opening therein above said standing valve, a solid sucker rod on said plunger, said barrel having
 145 openings therein above and below said

packer and a tube connecting the lower of said last named openings with the said opening above said standing valve.

5 9. In a device of the character described including a well casing, a well tubing therein, a pump barrel on said tubing, a standing valve in said barrel, a packer closing the space between said tubing and casing above said standing valve, a sucker rod, plungers there-

on above and below said packer, said pump 10 barrel having an opening therein above said standing valve and means to conduct flushing fluid from within said casing to said opening in the manner described.

In testimony whereof I hereunto affix my 15 signature this 12 day of April, A. D. 1928.

JOHN H. HERMAN.