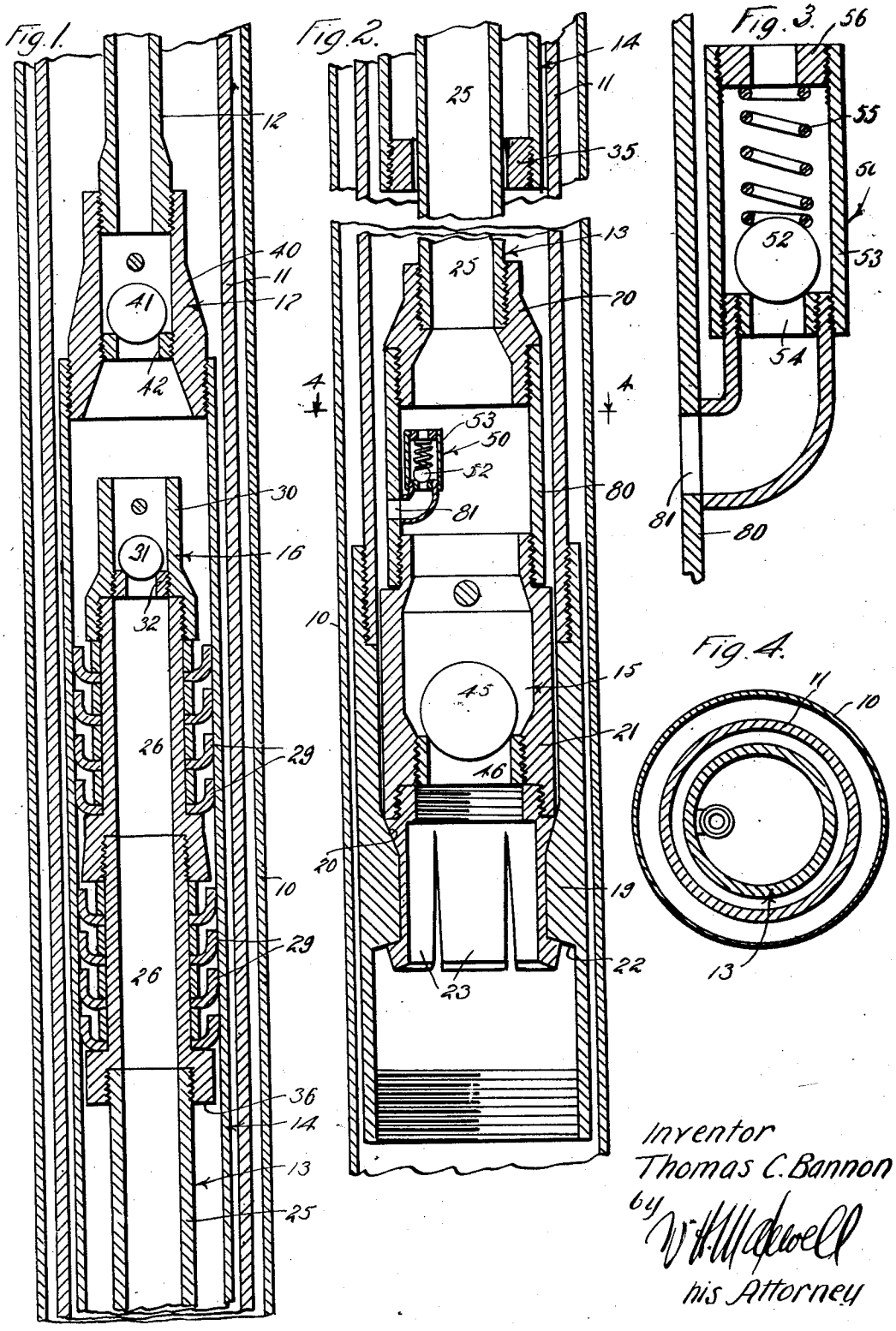
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PUMP

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Inventor
Thomas C. Bannon
by V. H. Mackwell
his Attorney

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THOMAS C. BANNON, OF LOS ANGELES, CALIFORNIA

## PUMP

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This invention has to do with a pump and has particular reference to a pump for use in oil wells. It is a general object of my invention to provide an improved pump of the type in which circulating fluid is introduced into the well and the pumped fluid is discharged through a hollow sucker rod.

It is an object of my present invention to provide a pump of the type mentioned which can be lowered into and removed from a well as a complete or assembled unit.

It is another object of this invention to provide a pump of the type mentioned in which the reciprocating parts and also the working and standing valves are kept clean and in proper operating condition by the circulating fluid.

A further object of my invention is to provide a pump of the type mentioned in which the pressure or head of fluid in the rod is more or less equalized.

It is another object of the invention to provide a pump of the type mentioned which can be operated to admit any desired amount of circulating fluid into the pump parts.

Another object of my invention is to provide a pump of the type mentioned in which the circulating fluid enters between the reciprocating parts to keep them lubricated and clean.

A further important object of my invention is to provide a pump of the type mentioned in which both the standing valve and the working valve can be flushed or cleaned out by the circulating fluid.

The various objects and features of my invention will be best and more fully understood from the following detailed description of a typical form and application of the invention, throughout which description reference is had to the accompanying drawings, in which:

Fig. 1 is a longitudinal sectional view of the upper portion of a pump embodying my invention, showing it arranged in a typical well casing;

Fig. 2 is a view similar to Fig. 1, showing the lower portion of the pump;

Fig. 3 is an enlarged view of the circulation valve, shown in Fig. 2; and

Fig. 4 is a transverse sectional view taken as indicated by line 4—4 on Fig. 2.

The pump provided by my invention is intended to be operated in an ordinary oil well, for instance, it may be operated in an ordinary well casing 10. In accordance with my invention, a pump tubing 11 extends downwardly into the well casing 10 to the desired point while the pump parts proper are lowered into position in the tubing 11 by means of a hollow sucker rod 12.

The pump proper includes, generally, a stationary tubular part 13, a reciprocating tubular part 14, a foot valve 15 at the lower end of the stationary part 13, a standing valve 16 at the upper end of the stationary part 13, and a working valve 17 in connection with the reciprocating part 14. The stationary part 13 is releasably held by a carrier 19, connected with the pump tubing 11. Part 13 extends upwardly from the carrier 19 to co-operate with the reciprocating part 14. The reciprocating part 14 is connected with the lower end of the sucker rod 12 and fits over or around the part 13.

The carrier 19 is preferably screwthreaded to the lower end of the pump tubing 11 and is provided with an internal tapered seat 20 to receive the cage 21 of the foot valve 15. The carrier is provided with an internal downwardly facing shoulder 22 below the seat 20 to co-operate with spring latches 23 in releasably retaining the cage 21 in the seat. The spring latches 23 extend downwardly from the lower end of the cage 21 and are provided with heads to engage under the shoulder 22. As the valve cage 21 is lowered into the carrier, the latches 23 engage the seat 20 and are sprung inwardly until they engage under the shoulder 22. With the latches engaged under the shoulder 22, as shown in Fig. 2 of the drawings, the cage 21 is releasably held in the carrier 19. To remove the cage, it is pulled upwardly with sufficient force to cause the latches to spring in, thus releasing the cage from the carrier. It is to be understood that I disclose this particular form of releasable mounting for the stationary part 13 merely as typical of that which may be used in carrying out my invention.

In the form of construction illustrated in the drawings, the stationary part 13 includes a tubular body 25 which extends upwardly from the cage 21 of the foot valve 15. In practice, it is desirable to provide a fluid tight connection between the parts 13 and 14 and, therefore, I provide packing carriers 26 at the upper end of the body 25. In practice, I prefer to use rings 29 for packing and I face the rings upwardly. The rings 29 pack between the part 13 and the part 14 to prevent leakage of fluid downwardly between these parts. The standing valve 16 may be mounted on the upper end of the uppermost packing carrier 26 and may include a cage 30 and a ball valve 31 carried in the cage to co-operate with a suitable seat 32 in the cage.

The outer reciprocating part 14 may be a plain cylindrical member provided at its lower end with a head 35 to co-operate with a shoulder 36 presented by the lowermost packing carrier to pull the stationary part of the pump from the carrier 19 when it is desired to remove the pump from the well. The head may also engage coupling 70 at the lower end of the body 25 to seat the cage 21 in the carrier. The head 35 fits freely over the body 25 and is normally spaced below the shoulder and above the coupling 70 so that it does not in any way interfere with the normal action of the pump. In the construction shown in the drawings, the reciprocating part 14 is connected with the sucker rod 12 through the cage 40 of the working valve 17. I have shown the cage 40 screwthreaded on to the lower end of the sucker rod and into the upper end of the part 14. The cage 40 is a blind cage and may carry an ordinary ball valve 41 which co-operates with a suitable seat 42 in the cage.

The foot valve 15 may include the cage 21, above described, and a ball valve 45 in the cage to co-operate with a suitable seat 46 in the cage. It is to be understood that I have disclosed ball valves in my pump as typical of the construction that may be employed but that I do not wish to limit the invention to valves of any particular form or construction. Further, the cage 21 and carrier 19 may be threaded to receive a gas anchor or other device that may be desired below the pump. The foot valve has the same general function with reference to the working valve as the standing valve and therefore may be considered a second standing valve.

In accordance with my invention, I provide what I will term a circulation valve 50 for admitting circulating fluid from the pump tubing into the working parts of the pump. In the preferred arrangement, the circulation valve 50 is arranged to admit fluid from the tubing into the stationary part 13. In the drawings, I show the circulating valve 50 arranged at the lower end of the stationary part 13 to discharge circulating fluid from the tubing upwardly in the part 13. The circulating valve may be of any suitable type; for instance, it may be a ball valve 52 mounted in a cage 53 so that it is normally held on a seat 54 by a spring 55. The cage is arranged in a tubular part 80 which is applied to the upper end of valve cage 21 and is connected with the body 25 by coupling 70. The circulating fluid enters the cage through an opening 81 in the part 80. The valve 52 allows fluid to enter the part 13 from the tubing but prevents reverse flow. In accordance with my invention, the valve is made adjustable, that is, I provide means for adjusting the action of the spring 55 so that I may regulate the pressure at which the valve opens. In the construction shown in the drawings, the spring is held between the valve 52 and an annular stop 56 which screwthreads into the cage 53. With this construction, the pressure on the spring 55 may be regulated by varying the position of the stop 56 in the cage.

In using the equipment provided by my invention, the pump parts, that is, the parts 13 and 14, together with the various valves, are assembled and applied to the lower end of the hollow sucker rod 12. The pump assembly is then lowered downwardly through the pump tubing 11 until the spring latches 23 have engaged the shoulder 22 in the carrier 19 to seat the stationary pump 13 in operating position at the bottom of the tubing. The sucker rod 12 is then raised to properly space member 14 between shoulder 36 and coupling 70 and is then reciprocated to give the reciprocating part 14 the desired movement with reference to the stationary part 13, thus putting the pump in operation. It will be obvious how the reciprocation of the part 14, which carries the working valve 17, causes fluid from the well to enter the foot valve 15, pass upwardly through the stationary part 13, and pass the standing valve and be pumped from above the standing valve past the working valve 17 into the sucker rod to flow from the well. During this pumping operation, I may introduce circulating fluid, for instance, clean oil, or any other suitable fluid into the pump tubing 11 around the sucker rod so that it flows downwardly to fill the lower part of the pump tubing around the pump parts. The circulating fluid may be heated. When sufficient circulating fluid has thus been introduced into the tubing, the circulating valve 50 will open during each up stroke of the reciprocating part to admit circulating fluid into the part 13 to mix with the fluid being pumped from the well. It will be obvious that the setting of the spring 55 will determine the head of circulating fluid necessary in the tubing 11 to cause the introduction of circulating fluid into the part 13 of the pump. When the necessary head of fluid has been established in the tubing to

cause operation of the circulation valve, the rate at which the circulating fluid is introduced into the pump will depend upon the rate at which the circulating fluid is fed into the tubing, which amount, of course, is under control of the operator. Further, it is to be noted that during each up stroke the head of circulating fluid in the tubing causes a small amount of circulating fluid to leak or work its way up between the parts 13 and 14 and thus keep the packing leathers clean. During the down stroke, the head of circulating fluid tends to balance the head of fluid in the sucker rod and thus minimize the tendency of the fluid in the pump from leaking down between the parts 13 and 14. At any time the standing and working valves may be flushed clean by pumping circulating fluid into the tubing in a manner to open the circulation valve and force the circulating fluid upwardly through the valves 16 and 17 and out through the sucker rod. Under this flushing condition, the foot valve 15 acts to prevent the flushing fluid from discharging from the lower end of the pump part 13.

Having described only a typical preferred form of my invention, I do not wish to limit myself to the specific details set forth, but wish to reserve to myself any changes or variations that may appear to those skilled in the art or fall within the scope of the following claims.

Having described my invention, I claim:

1. A well pump for use in combination with a tubing and a hollow sucker rod both extending to the top of the well including a reciprocating part carried by the rod, a working valve carried by said part, a stationary part connected with the reciprocating part to be lowered into the tubing therewith, a standing valve in the stationary part, means for releasably connecting the stationary part in the tubing upon its being lowered into place therein and means whereby fluid introduced into the tubing at the top of the well is discharged into the pump parts above the standing valve to pass up through the sucker rod with the fluid pumped.

2. A well pump for use in combination with a tubing and a hollow sucker rod both extending to the top of the well including a reciprocating part carried by the rod, a working valve carried by said part, a stationary part connected with the reciprocating part to be lowered into the tubing therewith, a standing valve carried by the stationary part, means for releasably mounting the stationary part in the tubing including a seat in the tubing and releasable catch members operable to hold the stationary part to the seat upon its being lowered thereto and to release upon an up strain being put on the stationary part by pull on the sucker rod, and means whereby fluid introduced into the tubing at the top of the well is admitted into the pump parts between the valves to pass up through the sucker rod with the fluid pumped.

3. A pump for use in combination with a tubing and a hollow sucker rod both extending to the top of the well including a reciprocating part carried by the rod, a working valve carried by said part, a stationary part connected with the reciprocating part to be lowered into the tubing therewith, a standing valve carried by the stationary part, means for releasably holding the stationary part against upward movement in the tubing upon its being lowered into place therein, and means whereby fluid introduced into the tubing at the top of the wall is admitted into the pump parts between the valves to pass up through the sucker rod with the fluid pumped, said last mentioned means including a valve operating to prevent fluid from entering the tubing from the pump parts.

4. A pump for use in combination with a tubing and a hollow sucker rod including a stationary part carried within the tubing, a standing valve in said part, a foot valve in said part below the standing valve, a reciprocating part carried by the rod, a working valve in connection with the reciprocating part, and means whereby fluid from the tubing is admitted into the stationary part below the standing valve and above the foot valve.

5. A pump for use in combination with a tubing and a hollow sucker rod including a stationary part carried within the tubing, a standing valve in said part, a foot valve in said part spaced below the standing valve, a reciprocating part carried by the rod, a working valve in connection with the reciprocating part, and means whereby fluid from the tubing is discharged into the stationary part below the standing valve and above the foot valve, said means including an opening through the stationary part below the standing valve and a spring pressed valve normally closing the opening.

6. A pump for use in combination with a tubing and a hollow sucker rod including a stationary part carried within the tubing, a standing valve in said part, a foot valve in said part below the standing valve, a reciprocating part carried by the rod, a working valve in connection with the reciprocating part, and means whereby fluid from the tubing is admitted into the stationary part below the standing valve and above the foot valve, said means including an opening through the stationary part, a check valve to close the opening, and a spring normally holding the valve closed.

7. A pump for use in combination with a tubing and a hollow sucker rod including a stationary part carried within the tubing, a standing valve in said part, a foot valve in

said part below the standing valve, a reciprocating part carried by the rod, a working valve in connection with the reciprocating part, and means whereby fluid from the tubing is admitted into the stationary part below the standing valve and above the foot valve, said means including an opening through the stationary part, a check valve to close the opening, and adjustable means normally yieldingly holding the valve closed.

8. A pump for use in combination with a tubing and a hollow sucker rod including a stationary part carried within the tubing, a pair of standing valves in said part, a reciprocating part carried by the rod, a working valve in connection with the reciprocating part, and means whereby fluid from the tubing is discharged into the stationary part between the standing valves.

9. A pump for use in combination with a tubing and a hollow sucker rod including a stationary part, means mounting the said part within the tubing releasable through the sucker rod, a pair of standing valves in said part, a reciprocating part carried by the rod, a working valve in connection with the reciprocating part, and means whereby fluid from the tubing is discharged into the stationary part between the standing valves to pass upwardly through the working valve.

In witness that I claim the foregoing I have hereunto subscribed my name this 8th day of March, 1927.

THOMAS C. BANNON.