May 24, 1938. W. N. HUFF 2,118,307

RODLESS PUMP

Filed July 27, 1936 2 Sheets-Sheet 1

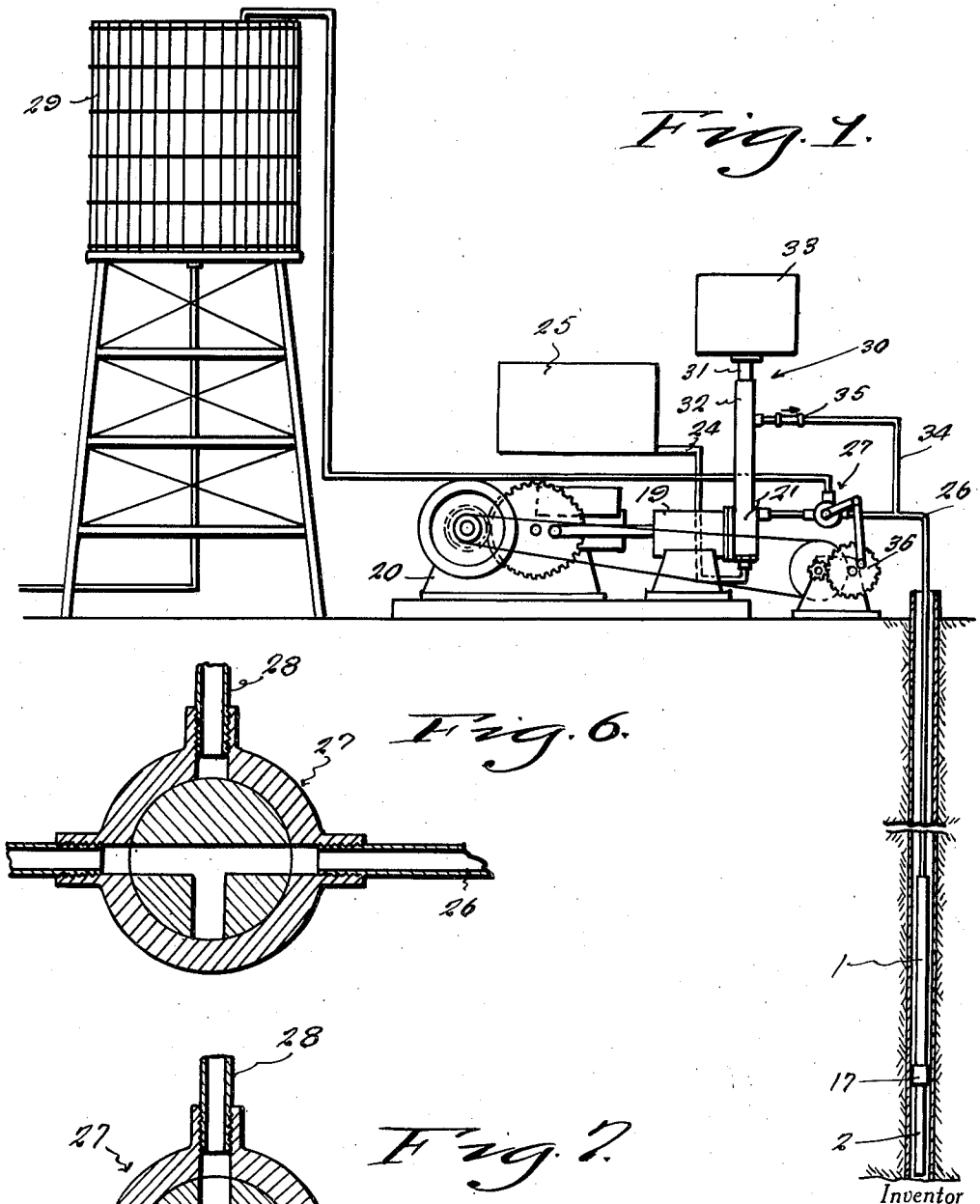


Fig. 1.

Fig. 6.

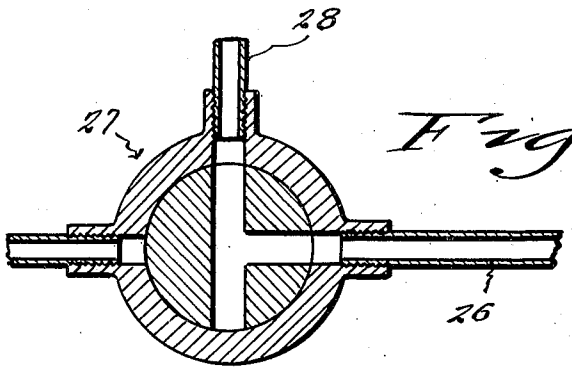


Fig. 7.

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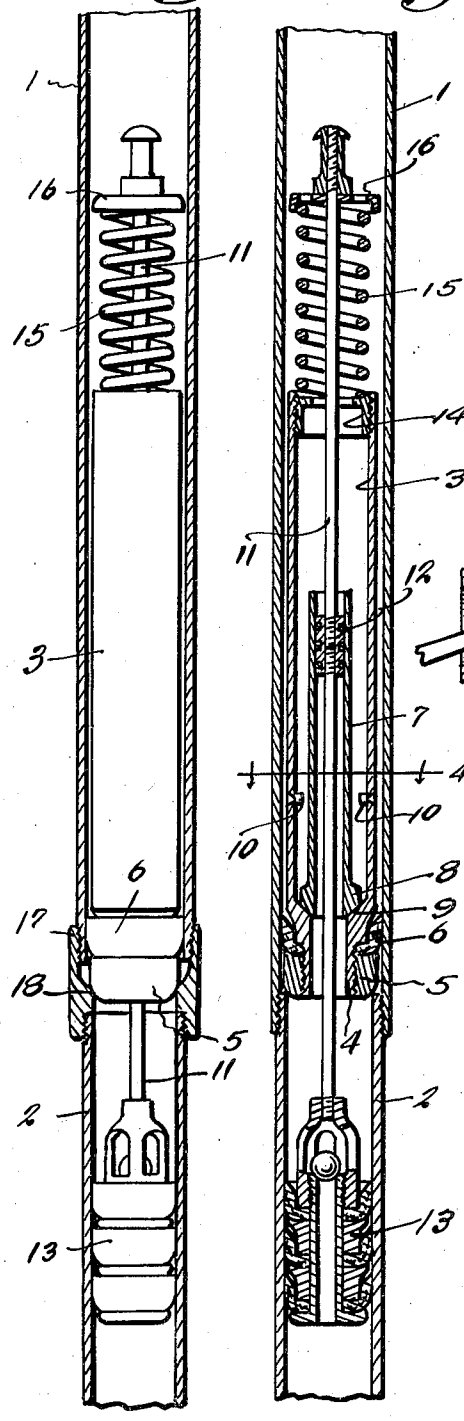
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Filed July 27, 1936 2 Sheets-Sheet 2

Fig. 2. Fig. 3. Fig. 5.



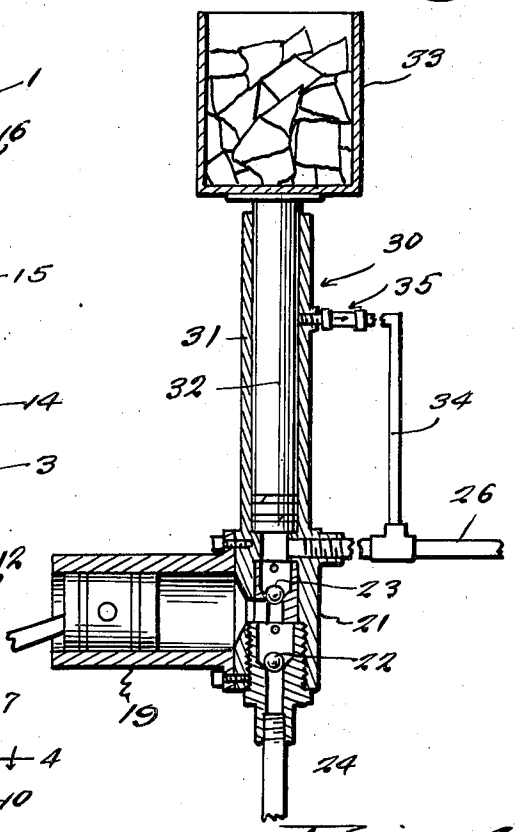
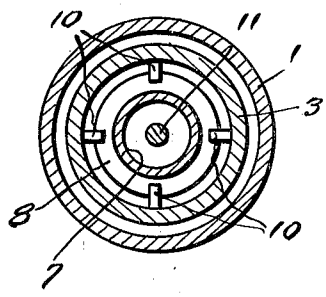


Fig. 4.



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UNITED STATES PATENT OFFICE

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RODLESS PUMP

Walter N. Huff, Harwood, Tex.

Application July 27, 1936, Serial No. 92,862

3 Claims. (Cl. 103—44)

This invention pertains to rodless pumps of the general type constituting the subject matter of my co-pending United States applications Serial Numbers 44,114, filed Oct. 8, 1935, now Patent No. 2,058,445 dated October 27th, 1936, 64,920 filed February 20, 1936 and now abandoned and 80,211, filed May 16, 1936.

The primary object of the present invention is to provide, in a rodless pump of the type including a spring elevated fluid lifting piston, novel means for lowering said piston against the tension of the spring through the medium of a fluid, together with means for controlling the operating fluid as well as the fluid being pumped.

Another very important object of the invention is to provide a fluid operating mechanism for a rodless pump of the aforementioned character embodying novel means for maintaining a constant and uniform pressure on the operating fluid.

Other objects of the invention are to provide a rodless pump of the character described which will be comparatively simple in construction, strong, durable, and reliable in use.

All of the foregoing and still further objects and advantages of the invention will become apparent from a study of the following specification, taken in connection with the accompanying drawings wherein like characters of reference designate corresponding parts throughout the several views, and wherein:—

Figure 1 is a view in side elevation of an embodiment of the apparatus constituting the present invention, the well casing being shown in section.

Figure 2 is a vertical sectional view, showing the pump installed in a tubing which is made therefor.

Figure 3 is a vertical sectional view through the invention, showing the same installed in a conventional tubing.

Figure 4 is a view in horizontal section, taken substantially on the line 4—4 of Figure 3.

Figure 5 is a view in vertical section through the pressure pump and accumulator.

Figure 6 is a detail view in vertical section through the multiway valve, showing the same connecting the pressure pump to the well.

Figure 7 is a detail view in vertical section through the multiway valve, showing the same connecting the well to the storage tank.

Referring now to the drawings in detail and to Figure 3 thereof in particular, it will be seen that the reference numeral 1 designates a conventional tubing in the lower end of which is threaded a barrel 2. Mounted in the lower end portion of the tubing 1 is a sleeve 3 having a reduced, threaded lower end portion 4 on which a seat 5 is mounted, said seat being adapted to rest on the shoulder provided by the upper end of the barrel 2. Cup washers 6 are clamped between the seat 5 and the shoulder provided by the reduced end portion 4.

Mounted for vertical movement in the sleeve 3 is a floating cylinder 7 which terminates, at its lower end, in a valve 8 which is engageable on a seat 9 which is provided therefor in the lower end portion of said sleeve. Stops 10 are provided in the sleeve 3 at an intermediate point for engagement by the valve 8 for limiting the upward movement of the floating cylinder 7.

Extending upwardly from the barrel 2 through the floating cylinder 7 and the sleeve 3 into the tubing 1 is a sectional rod 11 having mounted thereon at an intermediate point for reciprocation in the floating cylinder 7 a comparatively small piston 12. On the lower end of the rod 11 is a valve piston 13 which travels in the barrel 2. A plug 14 is threaded in the upper end portion of the sleeve 3 and engaged thereon is a coil spring 15. The upper end of the coil spring 15 is engaged in a cup member 16 which is mounted on the upper end portion of the rod 11.

In the operation of the invention as thus far described, fluid under pressure is forced downwardly in the tubing 1 and acts on the piston 12 to force the piston 13 downwardly in the barrel 2 against the tension of the coil spring 15. When this occurs the valve 8 engages the seat 9 to prevent the downward flow of fluid into the barrel 2. The fluid pressure in the tubing 1 is then released and the coil spring 15 immediately expands, elevating the piston 13 and lifting the fluid which has passed through said piston into the upper portion of the barrel 2 upwardly into the tubing 1, the valve 8 lifting off the seat 9 to permit the passage of this fluid. This operation is then repeated.

In the arrangement shown in Figure 2 of the drawings, the barrel 2 is connected to the tubing 1 by a coupling 17. The coupling 17 has formed therein, at an intermediate point, a seat 18 on which the valve 5 rests. It will thus be seen that in this arrangement the tubing is prepared for the reception of the pump while in that shown in Figure 3 the tubing already in the well is used.

The apparatus which has been illustrated for forcing the operating fluid into the well comprises a pump 19 of the reciprocating piston type which is driven from a suitable power plant 20. The cylinder head 21 of the pump 19 has mount-

ed therein intake and exhaust check valves 22 and 23, respectively. A conduit 24 extends from the intake of the pump 19 to a fluid supply tank 25. A conduit 26 connects the outlet of the pump 19 to the upper end of the tubing 1.

Interposed in the conduit 26 is a multiway valve 27 connected by a conduit 28 to a storage tank 29. Mounted on the cylinder head 21 and communicating with the conduit 26 as well as with the outlet from the pump 19 is an accumulator which is designated generally by the reference numeral 30. The accumulator 30 comprises a vertical cylinder 31 in which a piston 32 is slidably mounted. Suitable weighting means, as at 33, is mounted on the upper end of the piston 32. A safety by-pass 34 extends between an upper portion of the cylinder 31 and the conduit 26, said by-pass connecting to said conduit at a point between the multiway valve 27 and the well. A check valve 35 is interposed in the by-pass 34. The multiway valve 27 may be driven by any suitable mechanism, as at 36, from the power plant 20 or from any other suitable source of power.

With the valve 27 in the position shown in Figure 6 of the drawings the tubing 1 is in communication with the pump 19 and the fluid which has been drawn into said pump from the supply tank 25 is forced through the conduit 26 into the well for lowering the valved piston 13 against the tension of the coil spring 15 in the manner hereinbefore described. The valve 27 then shifts to the position shown in Figure 7 of the drawings for establishing communication between the well and the storage tank 29 through the conduit 28 for the passage of the fluid which is pumped from the well to said storage tank. While the valve 27 is in this last-mentioned position the operating fluid from the constantly running pressure pump 19 enters the cylinder 31 and raises the piston 32, thus storing or accumulating the power as well as permitting said pressure pump 19 to operate continuously. The fluid thus stored in the cylinder 31 under pressure from the weight 33 and the piston 32 is always ready to flow into the conduit 26 for maintaining a constant and uniform fluid pressure. If, for any reason, too much fluid should be forced into the cylinder 31 the piston 32, when it has been raised high enough, will uncover the by-pass 34 and permit the excess fluid to flow through the by-pass 34 into the conduit 26 and then through the multiway valve 27 and the conduit 28 into the storage tank 29. Return flow of the fluid through the by-pass 34 is prevented by the check valve 35. It will thus be seen that in this manner ejection of the piston 32 from the cylinder 31 will be prevented.

It is believed that the many advantages of a rodless pump constructed in accordance with the present invention will be readily understood, and although a preferred embodiment of the apparatus is as illustrated and described, it is to be understood that changes in the details of construction and in the combination and arrangement of parts may be resorted to which will fall within the scope of the invention as claimed.

What is claimed is:—

1. In a pump comprising a well tubing and a fluid operated pump mounted in said tubing, a pressure pump, a conduit connecting said pressure pump to the tubing for forcing an operating fluid under pressure into said tubing, a multiway valve interposed in the conduit, a cylinder communicating with said conduit at a point between the pressure pump and the multiway valve, a gravity actuated fluid elevated piston slidably mounted in the cylinder, a conduit connecting said cylinder with the first-named conduit at a point between the multiway valve and the tubing, a check valve interposed in the second-named conduit for preventing return flow of fluid to the cylinder, a storage tank, and a conduit connecting said storage tank to the multiway valve, said multiway valve constituting means for alternately connecting the pressure pump and the storage tank with the tubing.

2. A pump comprising a tubing, a barrel mounted on the lower end of said tubing, a sleeve mounted in the tubing, a seat in the lower end portion of said sleeve, a floating cylinder mounted in the sleeve, a valve on the lower end of said cylinder engageable with the seat, a rod extending from the barrel through the floating cylinder, the sleeve and into the tubing, a valved piston on the lower end of said rod operable in the barrel, a spring mounted on the upper end of the sleeve and connected to the upper end of the rod for elevating the valved piston, and a fluid actuated piston fixed on the rod and operable in the floating cylinder for lowering the first-named piston against the tension of the spring.

3. In a structure of the class described, an upper tubing, a lower tubular barrel threaded at its upper end into the lower end of the upper tubing, a sleeve member in the upper tubing having a reduced lower end and an internal valve seat therein adjacent said end, a collar on the reduced end of the sleeve member adapted to seat on the upper end of the lower barrel, a cup washer interposed between the collar and the larger adjacent part of the said sleeve member, a floating cylinder in said sleeve member having an enlarged valve-like lower end for coaction with said seat to close the lower end of said sleeve member, coacting stops on said sleeve member and cylinder for limiting upward movement of the latter relative to the former and comprising studs in said sleeve member, a piston rod extending from the barrel through the sleeve member and cylinder, a valved piston on the lower end of said rod within said barrel, a tension spring interposed between the upper end of the sleeve member and rod and urging said rod upwardly, a fluid operated piston on said rod within said cylinder for lowering said rod and valved piston against the tension of said spring, and means for introducing fluid under pressure into the tubing.

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