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UNDERGROUND PUMP FOR DEEP WELLS

Filed April 27, 1925

Fig. 1.

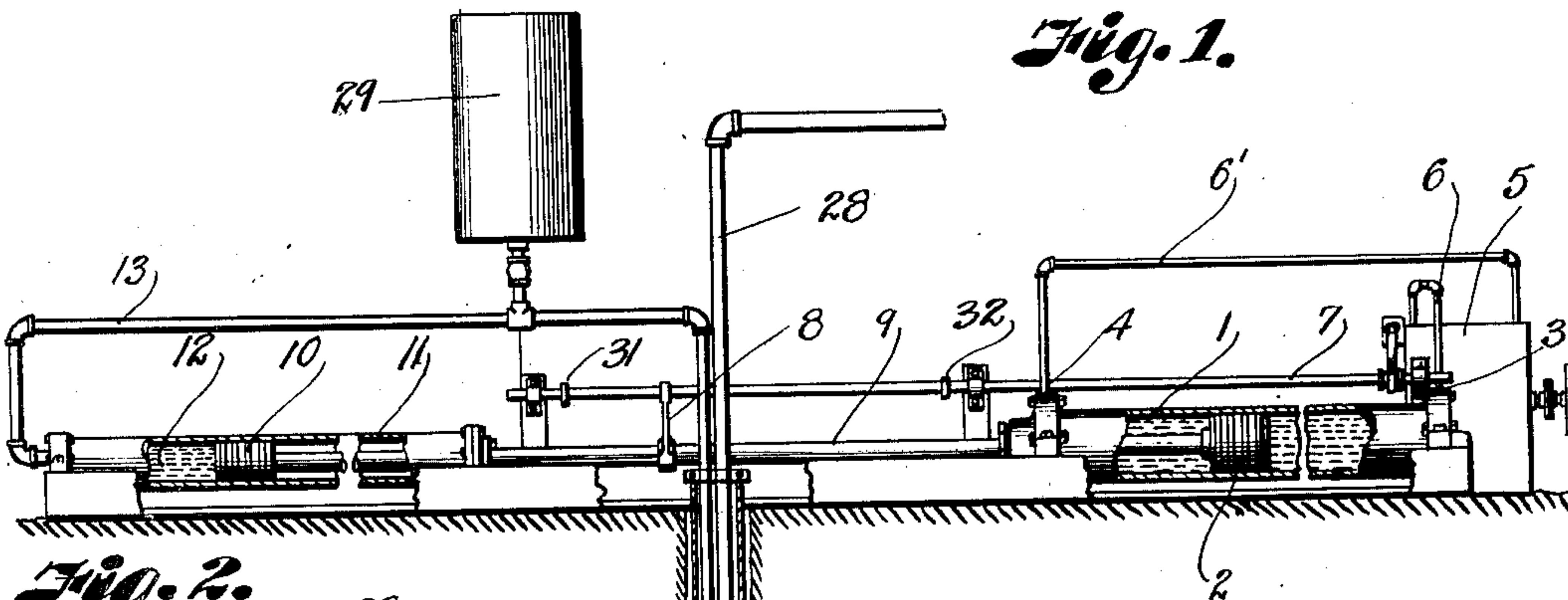


Fig. 2.

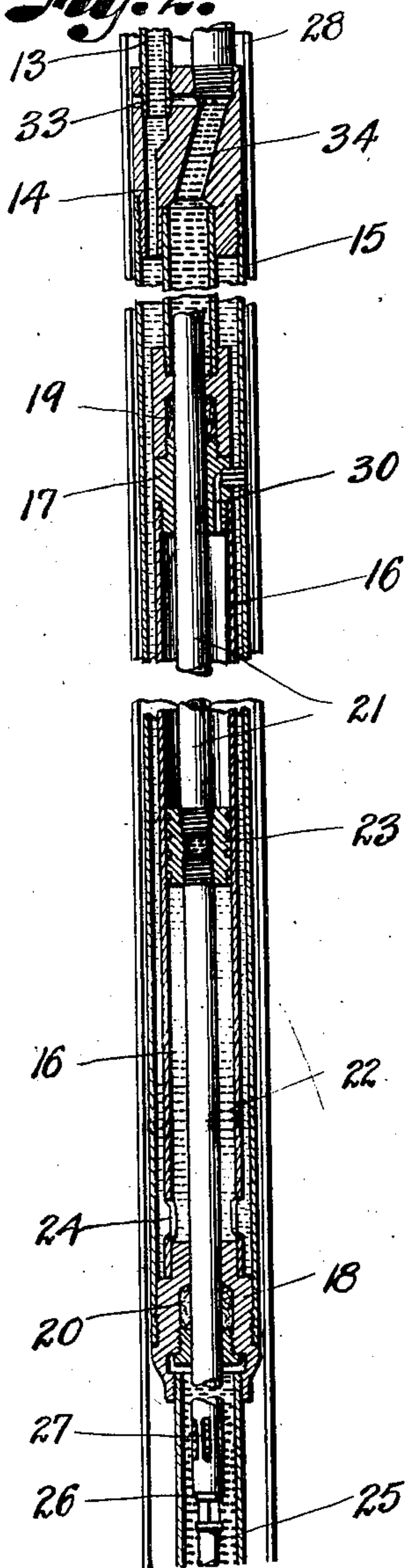
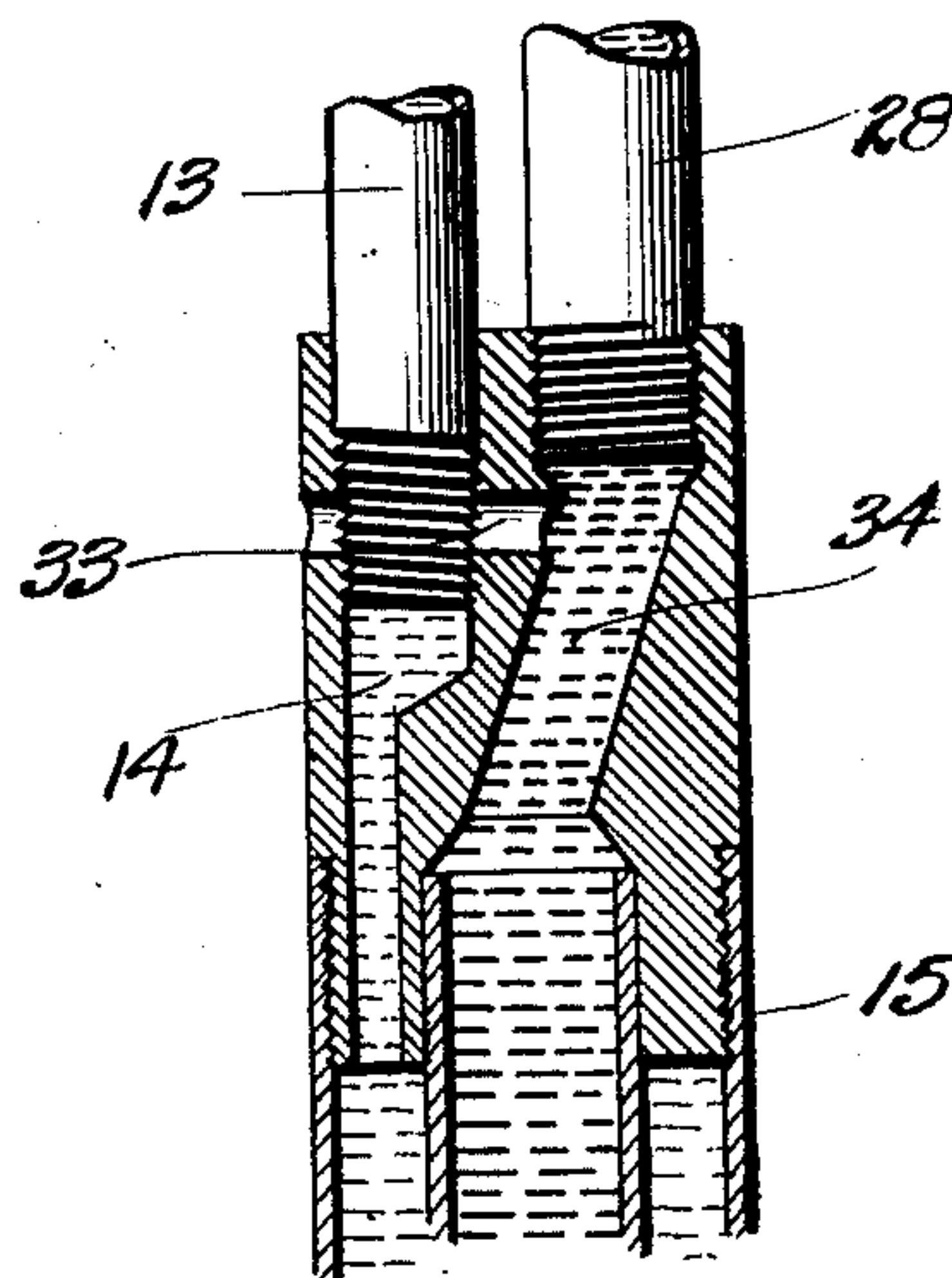


Fig. 3.



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UNDERGROUND PUMP FOR DEEP WELLS

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This invention relates to pumps and pump operating mechanisms such as are used in deep wells, and the invention illustrated is particularly applicable for use in connection with oil wells.

The primary object of the invention is to provide a simple, efficient form of hydraulically operated pump and to this end the invention consists in certain parts and combinations of parts, all of which will be specifically described hereinafter, reference being had to the accompanying drawings, in which

Fig. 1 is an elevational view of a pumping mechanism constructed in accordance with my invention, parts being shown in section.

Fig. 2 is a vertical, longitudinal, sectional view through the pump motor located below the ground, and

Fig. 3 is an enlarged, sectional view through the upper part of the pump motor shown in Fig. 2.

In carrying out the invention I provide a hydraulic motor having a cylinder 1 with a reciprocary piston 2 therein. The cylinder 1 has two inlets 3 and 4, which are supplied with oil from an oil pump 5 through the medium of the pipes 6 and 6'. The oil pump 5 has a reversing mechanism controlled by a reciprocary rod 7, which will be actuated by the arm 8 on the piston rod 9 so that oil will be fed first to one end of the cylinder and then to the other.

I prefer to use a high grade oil as the motive fluid for the motor just described.

On the end of the piston rod 9 is a pump piston 10 in a cylinder 11. The pump piston 10 and the cylinder 11 are of diameters less than the piston 2 and the cylinder 1 of the motor; therefore, the cylinder 11 will be a high pressure cylinder as compared with the cylinder 1. I am thereby enabled to intensify the power delivered through the fluid 12 in the cylinder 11.

The cylinder 11 is connected to a pipe 13 which discharges into the top port 14 of a pump motor barrel 15. The port 14 runs longitudinally of the barrel 15 and it constitutes a concentric, annular passageway formed by a motor cylinder 16 carried by the heads 17 and 18 of the motor barrel. The ends of the

motor cylinder 16 have stuffing boxes 19 and 20 in which hollow rods 21 and 22 slide, the rods being connected by a hollow piston 23 adapted to be raised when fluid from the port 14 enters the cylinder 16 through the openings 24. The lower end of the rod 22 is connected to a sucker rod 25 of the pump 26 so that fluid will be raised when the fluid from cylinder 12 passing through pipe 13, annular port 14 and into the cylinder 16, raises the piston 23. When such fluid is raised, it will pass through the openings 27 in the rod 22, passing through the hollow rod, through the piston 23, through the rod 21 into the upper part of the motor barrel and out through pipe 28 to a suitable receptacle or to the pipe line.

The motor in the ground is usually sunk about 37%, (counting from the top) of the distance between the top of the ground and the bottom of the well, this being recommended as the best mean average for fluids of different specific gravities. This is only illustrative, however, as I do not wish to be limited to placing the pump motor at any particular location under ground.

Attention is called to the fact that there will be leakage from the pipe 13 so I have provided a reservoir 29 to hold oil which will communicate with the pipe 13 and supply any deficiencies in the line. Any oil which seeps past the piston 23, that is, above it, will flow out through the side port 30.

The motor consisting of the cylinder 1 and piston 2 will be reversed by the arm 8 as the rod 9 reciprocates to and fro because the arm will strike the projections 31 and 32 on the rod 7; that is, when the rod 9 moves in one direction, the arm 8 will strike the projection 31 and when it moves in the opposite direction, it will strike the projection 32.

When it is desired to remove the mechanism from the well, it will be necessary to drain the oil from the pipes 13 and 28. In order to accomplish this I have provided a cross port 33 in the head 5 which passes through the port 14 and through the outlet port 34 at the top of the piston cylinder 16. Therefore, by unscrewing the pipe 13 until

the lower end thereof registers with the cross port 33, the oil in pipe 13 will drain out back into the well and since the port 33 will also communicate port 34 with the well, the oil in pipe 28 will drain back into the well. Then the mechanism can be conveniently raised or pulled from the well.

The threaded connection between the lower end of the pipe 13 and the head 15 is a left hand screw thread connection.

It will be apparent from the foregoing that the device is simple in construction, that the power stroke of the piston 2 will be effective in moving the piston 10 to cause the fluid 12 to flow through pipe 13 into the motor cylinder 16 to raise the piston 23 and thereby lift the oil, and that when the power stroke of the piston 2 moves in a reverse direction, the hydraulic pressure against the piston 23 will be relieved so that fluid, working barrel of the pump, sucker rods, etc., will be effective in lowering the piston 23 to a position so that it can be raised on the next power stroke of the piston 2.

While I prefer to use high grade oil for the cylinder 1 and piston 2, a very low grade of oil may be used in cylinder 11, pipe 13 and cylinder 16; in fact, I recommend ordinary raw crude oil from which the sand and similar impurities are removed as a proper medium for transmitting the power stroke of the piston 10 to the piston 23.

What I claim and desire to secure by Letters-Patent is:

1. Apparatus of the character described including an underground pump, tubing leading from the pump, a housing barrel having a lower head mounted on the tubing and an upper head provided with separate outlet and motive fluid supply channels, a cylinder within said barrel having an intake port at its lower end in communication with said motive fluid channel, a piston in said cylinder, a lower hollow rod section operatively connecting the piston with the underground pump and communicating with said tubing, an upper hollow rod section providing communication through the piston from the lower rod section to the said outlet channel, and means for intermittently charging said cylinder through said supply channel.

2. In combination with an underground pump and its tubing and rod, said pump delivering into the tubing, a vertical barrel having end closures, a cylinder in the barrel having end closures, a piston in the cylinder having a hollow rod connected with the pump rod and communicating with the tubing, a fluid outlet conduit communicating with the hollow piston rod, a power fluid supply conduit communicating with the lower portion of said cylinder, and means for intermittently supplying fluid under pressure through the supply conduit.

3. In combination with a cylinder, a tubing suspended from the cylinder, a pump including a piston suspended from the tubing, said pump delivering into the tubing, a piston in the cylinder having a hollow rod communicating with the tubing, a pump rod connected with the pump piston and suspended from and operable by the hollow rod, a fluid outlet conduit in communication with the hollow rod, a power fluid supply conduit in communication with the lower portion of the cylinder, and means for intermittently supplying fluid through the supply conduit whereby the piston is lifted hydraulically and returned by weight of the pump and its rods.

4. In combination with an underground pump, its tubing and a fluid pulsator, said pump delivering into the tubing, a motor between the pump and pulsator including a cylinder, a piston and a hollow piston rod communicating with the pump tubing at its lower end, the piston rod connected with the pump rod to operate and be operated thereby, a fluid outlet conduit in communication with the upper end of the hollow piston rod, and a supply conduit connecting the pulsator with the lower end of the motor cylinder.

5. In combination with an underground pump and a fluid pulsator, a motor between the pump and pulsator including a barrel having end heads, tubing suspended from the lower barrel head and suspending the pump, a cylinder within the barrel, closed at its ends and having connection with the barrel at its lower end, a piston in said cylinder, a hollow rod connected with the piston and extended into and communicating with said tubing to provide outlet from the tubing through the cylinder, and connected with the pump rod to operate and be operated thereby, an outlet conduit communicating with said hollow rod, and a power fluid conduit connecting the pulsator with said barrel.

6. In combination with an underground pump and a fluid pulsator, tubing for the pump and a pump rod in the tubing, a head on the tubing, concentric, spaced barrel and cylinder members rising from said head, the cylinder member communicating at its lower end with the barrel member, an upper head for the cylinder, a channelled head closing the upper end of the barrel, a piston in said cylinder, a hollow rod connected with the piston and extended through the cylinder heads, the lower portion of said rod communicating with the tubing and connected with the pump rod, an outlet conduit communicating with the upper portion of the hollow rod through one of the barrel head closures, and a power fluid conduit connecting the barrel chamber with the pulsator through another barrel head channel.

7. In combination with an underground pump, tubing for the pump and a pump rod in the tubing, a head on the tubing, concentric,

tric spaced barrel and cylinder members rising from said head, the cylinder member communicating at its lower end with the barrel member, an upper head for the cylinder, a head closing the upper end of the barrel having connecting well fluid outlet and motive fluid inlet channels, a piston in said cylinder, a hollow rod connected with said piston and extending through said cylinder heads to communication with said tubing and with said outlet channel, the lower portion of said hollow rod being operatively connected with the pump rod, an outlet conduit in communication with the outlet channel in the barrel head, and a supply conduit communicating with the inlet channel in said barrel head and normally closing communication between the inlet and outlet channels.

8. In combination with a cylinder, tubing suspended from the cylinder, a pump suspended from the tubing and delivering into said tubing, a piston in the cylinder having a hollow rod communicating with the tubing, a pump rod suspended from and operable by the hollow rod, a fluid outlet conduit in communication with the hollow rod, a power fluid supply conduit in communication with the lower portion of the cylinder, means venting the upper portion of the cylinder to atmosphere, and means for intermittently supplying fluid through the supply conduit whereby the piston is lifted hydraulically and returned by weight of the pump rod and the static head acting on the pump.

In testimony whereof I affix my signature.
RICHARD C. MASON.

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