

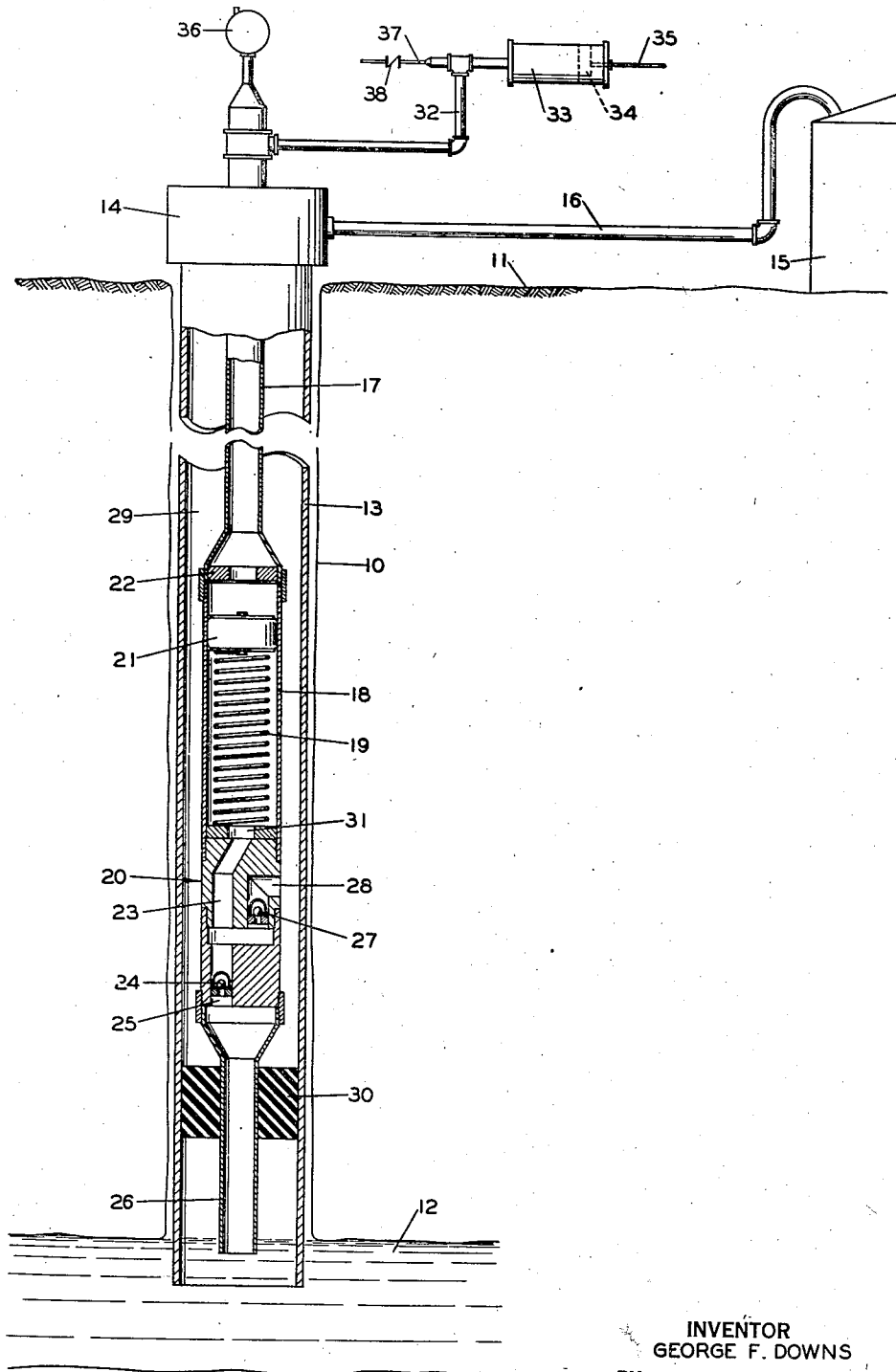
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OIL WELL PUMP

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OIL WELL PUMP

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1 Claim. (Cl. 103-46)

This invention relates to pumping and more particularly to fluid-operated pumping apparatus.

The present practice of pumping fluid from well bores commonly employs a reciprocating pump which is actuated by a string of sucker rods which are attached to and reciprocated by a pumping unit or rig front at the surface of the ground. During recent years, developments in rodless types of pumping apparatus have been developed in the industry and used with great success. Among the rodless types of pumping apparatus are fluid-operated or hydraulic pumps, which utilize a "pressure fluid" to actuate the down-hole pump.

It is quite common with hydraulic pumps to exhaust the "pressure fluid" into the flow tubing where it mixes with the hydrocarbon fluid which is being produced from a well bore. This procedure is undesirable, as the hydrocarbon fluid may not always be suitable for use as a pressure fluid. Further, a large supply of pressure fluid must be available to actuate the hydraulic pump. This usually results in the operation of the pumping apparatus in conjunction with the central storage tank battery which is commonly employed for the storage of hydrocarbon oils.

By the practice of my invention, I am able to pump hydrocarbon fluids using a "pressure fluid" without mixing the "pressure fluid" with the hydrocarbon fluid. Thus, only a relatively small supply of "pressure fluid" is necessary for the continuous operation of my device, and the storage of the hydrocarbon fluid produced may be located independently of my apparatus.

My invention has for its primary object the provision of a fluid-operated pumping apparatus.

Another object of my invention is to provide a fluid-operated pumping apparatus in which the fluid used to actuate the pump does not mix with the fluid lifted by my pumping apparatus.

These and additional objects and advantages will be apparent to persons skilled in the art by reference to the following description and annexed drawing, which is an elevation view of my invention partly in cross section.

Referring to the drawing, I have denoted a well bore by reference numeral 10, which extends downwardly from the surface of the ground 11 to a hydrocarbon oil-bearing formation 12. A string of oil well casing 13 which is contained within the well bore is provided at the top with a closure 14 which communicates with an oil disposal apparatus, such as a tank 15, through a conduit 16. The closure is also adapted to re-

ceive and support a string of "pressure fluid" tubing 17, which extends downwardly within casing 13. The lower end of the tubing is threadedly connected to a pump chamber 18, which contains a suitable spring 19 intermediate a valve member 20 and a movable partition, such as a piston 21. It will be noted that the upper limit of travel of the piston is determined by a stop ring 22. The piston and the interior wall of the pump chamber form an adequate fluid seal to prevent leakage of fluid past the piston as the piston reciprocates in the pump chamber. Valve member 20 is provided with a valve chamber 23 and with an inlet valve 24 which controls the flow of fluid through a port 25. Port 25 establishes communication between a lower inlet conduit 26 and valve chamber 23. The valve member is also provided with a discharge valve 27 which controls the flow of fluid through a second port 28. Port 28 establishes communication between the valve chamber and an annular space 29, which is formed in the casing above a packer 30. Packer 30 is preferably of a type which can be removably anchored in the casing and which can withstand any force exerted thereon during the operation of this invention. The valve chamber also communicates with the pump chamber by way of a passage 31.

The upper end of the tubing connects with a "pressure fluid" conduit 32, which in turn connects with the discharge end of a positive displacement pump cylinder 33. A piston 34 is reciprocated within the cylinder by a piston rod 35 which is connected in a conventional manner to a prime mover (not shown). A conventional vapor release valve 36 is preferably provided at the highest point of elevation of the "pressure fluid" conduits, such as at the top of tubing 17. This valve allows the automatic removal of entrained vapors from the "pressure fluid." It will be noted that a "pressure fluid" supply conduit 37 connects with conduit 32 and with a source of fluid (not shown). Conduit 37 is provided with an automatic check valve 38 which may be adjusted to maintain an adequate volume of "pressure fluid" in conduit 32.

In operation, my device is assembled, as illustrated in the drawing. Let us assume that piston 21 is held at the top of pump chamber 18 by spring 19; that the pump chamber is filled with fluid from formation 12; that piston 34 is in a position in cylinder 33 whereby the piston may commence its forward stroke; and that tubing 17, conduit 32, and the discharge end of cylinder 33 are filled with a "pressure fluid." As piston 34

moves forward in cylinder 33, "pressure fluid" is discharged from the cylinder, displacing "pressure fluid" in conduit 32 and tubing 17. This displacement causes piston 21 to move downwardly in pump chamber 18 against the action of spring 19. As piston 21 moves downwardly, formation fluid in the pump chamber is urged through passage 31, valve chamber 23, and port 25, and is discharged into annular space 29. The downward movement of piston 21 causes the fluid in the valve chamber to close valve 24 and to open valve 27. It is to be noted that piston 21 is at its lower limit of travel when piston 34 in cylinder 33 is at the end of its forward stroke. As piston 34 recedes during its return stroke, spring 19 urges piston 21 upwardly in chamber 18. The upward movement of piston 21 displaces "pressure fluid" from the chamber and causes the fluid to fill the discharge end of cylinder 33. At the same time, the pressure of the formation fluid causes the formation fluid to open valve 24 which allows the formation fluid to flow through port 25 into valve chamber 23 and into pump chamber 18. The pressure of the column of fluid in annular space 29 maintains valve 27 in a closed position during the upstroke of piston 21. When piston 34 reaches the end of its return stroke, the above cycle is repeated. During the pumping operation, the hydrocarbon fluid flows through annular space 29 to the surface of the ground, where the fluid is conveyed from the annular space to tank 15 by conduit 16.

From the foregoing, it is believed that the con-

struction, operation and advantages of my instant invention will be readily comprehended by persons skilled in the art. It is to be clearly understood, however, that various changes in the apparatus shown and described may be resorted to without departing from the spirit of the invention, as defined by the appended claim.

I claim:

In a fluid actuated pumping system for producing oil from an underground reservoir through a well bore communicating therewith, the combination comprising a casing in the well bore, a conduit in the casing and spaced therefrom to form an annular passage therewith, a packer removably anchored in the annular passage and sealing the spacing between the conduit and the casing, a pump housing in the conduit, a valve casing in the conduit between the pump housing and the packer, a plunger reciprocable in the housing, resilient means in the housing between the plunger and the valve casing, means for transmitting a fluid under pressure above the plunger to actuate the same downwardly against the action of the last mentioned means, a fluid actuated check valve in the valve casing for admitting well fluid from below the packer into the pump housing below the plunger on movement of said plunger in one direction and a second fluid actuated check valve in the valve casing for discharging well fluid into the annular passage above the packer on movement of the plunger in the opposite direction.

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