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OIL WELL PUMP

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OIL-WELL PUMP.

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My invention relates to oil well pumps and more particularly to a pump of that type employing a standing barrel and working plunger, the principal object of the present invention being to so combine the valve members of the barrel and plunger as to eliminate the accumulation of surplus gas at the bottom of the barrel, thereby effecting an appropriately maximum pump capacity at each plunger stroke, and incidentally increasing the gravity of the oil by its absorption of the free naphtha in the gas.

It is a further object of the invention to increase the capacity of the pump by effecting a pumping action on both the up and downstrokes, and to direct the fluid into the plunger on the downstroke in a manner to avoid the backslip which induces churning and disintegration of the oil.

In accomplishing these and other objects of the invention hereinafter mentioned, I have provided the improved details of structure hereinafter described and illustrated in the accompanying drawings, wherein

Fig. 1 is a vertical, sectional view of part of an oil well, with its casing and tubing, and illustrating the assembly of the pump in the tubing, parts being broken away for better illustration.

Fig. 2 is an enlarged, central, longitudinal section of the upper portion of the pump and the standing barrel.

Fig. 3 is a similar view of the lower portion of the pump.

Fig. 4 is a transverse section of the lower plunger valve housing, illustrating the seating of the valve ball.

Fig. 5 is a detail perspective view of the standing valve, the parts being shown separated and partly broken away.

Referring more in detail to the drawings: 1 designates the well tubing, which extends through the ordinary casing 2 into the slot hole 3, and carries at its lower end a standing valve seat 4 having a tapered seat 5 for receiving and holding the tapered lower end 6 of the standing valve 7 which is incorporated in the lower end of the working barrel 8.

The standing valve is sectional, comprising the member 6 having a screw-threaded shank 9 with a bevelled seat 10 at the top for seating the valve ball 11. Threaded onto the member 6 is a sleeve 12 having an

interior diameter but slightly greater than the ball 11, so that the latter may work freely therein but without such side motion as might permit grinding of the ball or its housing, upward travel of the ball being limited by a cross pin 13 which extends across the interior of the sleeve.

The inner wall of the sleeve is provided with vertical grooves 14 through which oil may pass on the upstroke of the plunger in the ordinary manner.

The upper end of the sleeve 12 is also provided with a screw shank whereby the standing valve is attached to the lower end of the working barrel.

At the upper end of the working barrel is a bushing 15 having a hexagon head 16 through which the plunger rod 17 may work. The rod 17 is tubular and provided at its lower end with a tubular plug 18 having a flaring end to provide a mouth substantially coextensive with the cross section of the working barrel, in order to facilitate the flow of oil directly into the tubular plunger rod, and thereby avoid a forcing of the contents of the barrel between the plunger and the inner wall of the barrel.

The plug 18 is threaded into the lower end of the tubular plunger rod and carries a valve collar 19 having a seat 20 at its upper end for accommodating the valve ball 21.

I preferably employ a sleeve 22 for housing the valve members just described, and which is threaded onto the lower end of the body portion of the tubular plunger and provided with vertical grooves 24 similar to the grooves 14 in the standing valve sleeve, and with a pin 25 for limiting upward movement of the valve ball 21.

The body portion of the tubular plunger rod is provided with a shoulder 26 against which the upper end of the sleeve 22 abuts and which forms a support for the valve cup and spacer members 27 and 27', which may be of any ordinary construction.

The valve members, consisting of the plug 18, the sleeve 22 and the plunger rod shoulder 26, are all of such diameter as to fit snugly within the working barrel and form a fluid seal to prevent backslip.

Fixed on the plunger rod above the cups and spacers 27 and 27' are spaced bushings 28 and 29, of any desired number, and spaced sufficiently to form a plurality of fluid seals to insure against backslip during the opera-

tion of the pump, and to further insure a vacuum below the valve for drawing in oil upon the upstroke of the plunger.

At the upper end of the plunger rod is a valve cage 30 enclosing a valve seat 30' and valve ball 31, and having at its upper end a threaded shank 32 whereby the plunger is connected with the lower end of the sucker rod 33.

The relative diameters of the hollow plunger rod 17 and the working barrel tube 8 are such that an annular chamber is formed about the rod between the upper bushing 29 on the hollow plunger rod and the bushing 15 of the working barrel tube.

The plunger rod is provided with a port or ports 35 through which communication is established between the interior of the plunger rod and the annular chamber, so that fluid is delivered from the plunger rod to the chamber upon the downstroke of the plunger and caused to flow back from the chamber into the rod upon the upstroke, as presently more fully described.

Assuming that the parts are constructed as described and the well tubing in place, the pump is attached to the lower end of the sucker rod by threading the upper pump valve cage onto the rod and let down into the well, weight of the rod forcing the tapered lower end of the standing valve into the seat 4 to firmly anchor the valve and barrel at the bottom of the tubing. This positioning of the pump carries the plunger to the bottom of the working barrel tubing, so that it is ready for spacing on upstroke of the plunger. Lifting of the sucker rod pulls the plunger up in the working barrel tubing, closing both plunger valves and opening the standing valve, thereby pulling fluid from the well into the working barrel. When the plunger has reached its upper limit and starts down, the valves are reversed, the standing valve closing and the plunger valves opening, so that the contents of the working barrel is forced into the hollow rod and up therethrough, the major portion being delivered through the cage 30 into the well tubing above the pump, and a minor portion of the fluid being delivered through the port or ports 35 into the annular chamber 34, thereby forming an effective seal to insure a perfect vacuum on a succeeding upstroke of the plunger, and preventing backslipping.

In pumps of ordinary construction employing but a single plunger valve, it is not unusual for gas to accumulate in the working barrel until the barrel is completely filled with gas, to the exclusion of oil. Upon an upstroke of the plunger the gas expands, and on the downstroke is compressed, the quantity of gas being sufficient to prevent intake of oil, so that the pump reciprocates without performing any useful function.

With my construction, however, wherein the plunger carries a valve at its lower end, the plunger valve operation takes place in such close proximity to the standing valve that it is impossible for gas to accumulate in sufficient volume to interfere with positive pumping operation. Some gas is, of course, admitted with the oil, but this gas passes through the lower plunger valve, and rising through the column of oil in the plunger, passes on into the tubing and is removed with the oil, a certain quantity of the naphtha contents, however, being absorbed in the oil, and in this way increasing the gravity of the oil.

Another material advantage afforded by the annular chamber 34 in the upper part of the working barrel is that upon the downstroke of the plunger, a volume of oil is accumulated in this chamber which, upon the upstroke and consequent diminution of the chamber, forces this oil back into the hollow plunger and out through the valve cage into the well tubing, thereby affording a pumping effect on the upstroke of the plunger, as well as upon the downstroke thereof. This forcing of confined oil from the chamber 34 through the valve cage on the top of the plunger overcomes the weight of oil in the tubing, which tends to hold the valve closed, and serves to balance the valve.

By providing my pump with the multiple fluid seals, positively maintained through the intermittent flow into the chamber 34, I avoid the churning encountered with the ordinary type of pump and eliminate the formation of what is commonly known as "B S," or bottom settlements, which ordinarily results in what is further commonly known as "paraffining of the well" in which the pump is used.

Should the pump become sanded or stuck, the upstroke of the pump can be extended to contact the upper bushing 29 on the plunger rod with the bushing 15 on the working barrel, and thereby jar the barrel loose from its seat and enable the pump to be lifted out of the well.

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

1. A pump of the character described comprising a working barrel, a standing valve at the bottom of the barrel, a tubular plunger rod operable in the barrel, having an upwardly opening plunger valve at its lower end and an upwardly opening outlet valve at its upper end, and spaced bushings on the rod between the valves, forming fluid seals within the working barrel.

2. A pump of the character described comprising a working barrel, a standing valve at the bottom of the barrel, a tubular plunger rod operable in the barrel, having an upwardly opening plunger valve at its lower end and an upwardly opening outlet valve

at its upper end and spaced bushings on the rod between the valves forming fluid seals within the working barrel, the rod having an opening therein above the bushings affording communication between the rod and barrel chambers.

3. A pump of the character described, comprising a working barrel, a standing valve at the bottom of said barrel, a bushing at the top of the barrel, a tubular plunger rod operable in said bushing, an upwardly opening valve on the lower end of the rod, an upwardly opening valve on said rod above

said bushing, and means on said rod sealing the chamber of the working barrel, the rod having an opening above the sealing means providing communication between the chamber of the working barrel and the interior of said rod, said sealing means comprising bushings spaced to form a liquid seal within the chamber of the working barrel.

In testimony whereof I affix my signature.

IRWIN B. WINSOR.