Aug. 21, 1934. W. A. McGREGOR 1,971,270

OIL WELL PUMP

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Fig. 1.

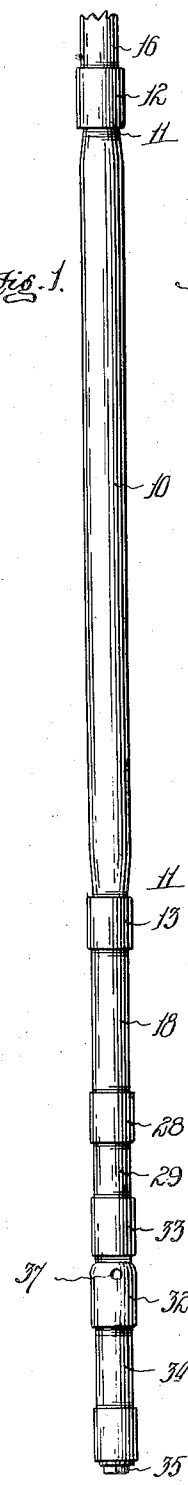


Fig. 2.

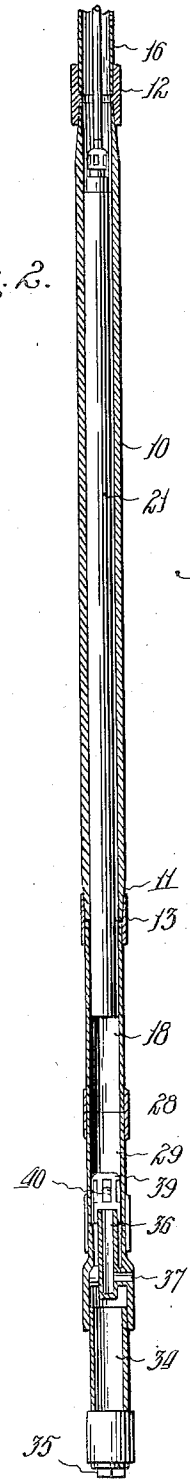
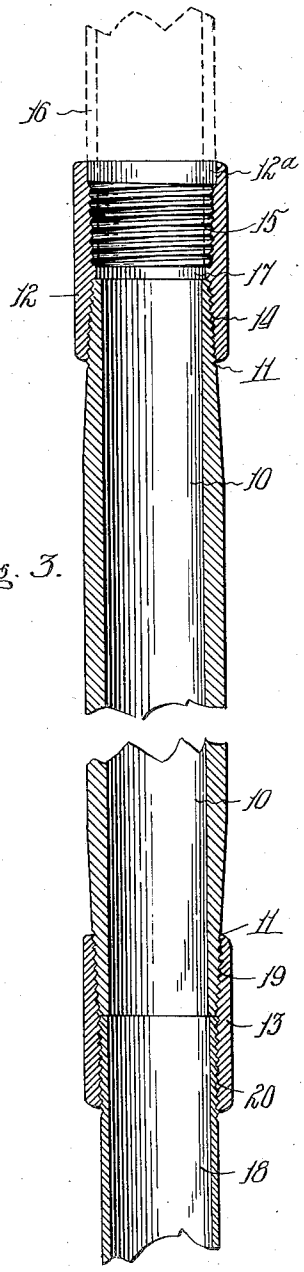


Fig. 3.



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Fig. 4.

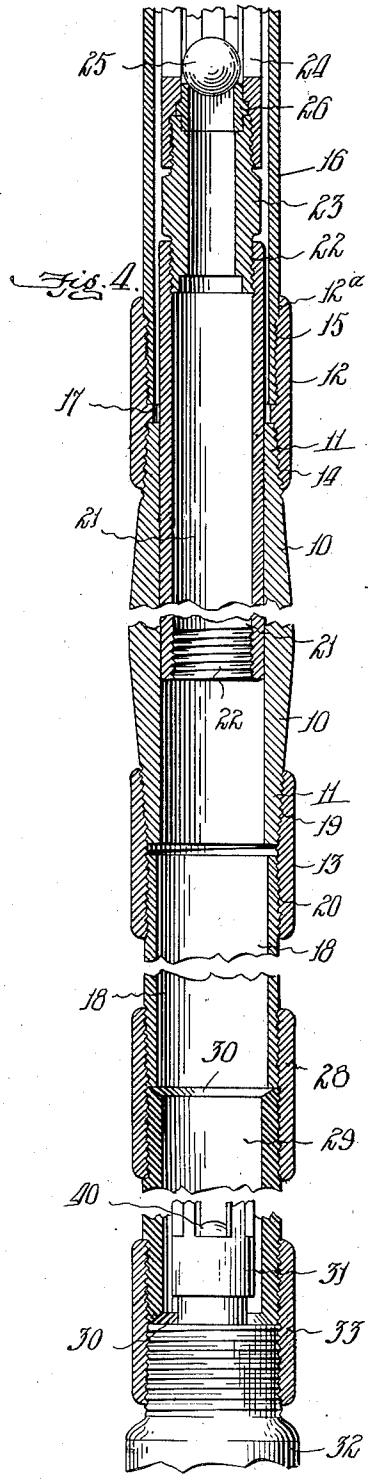


Fig. 5.

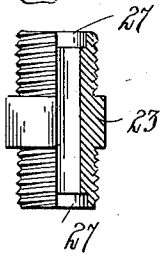


Fig. 6.

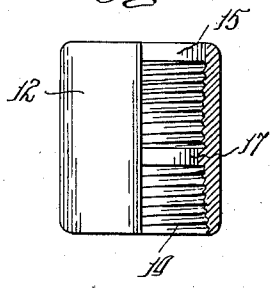


Fig. 7.

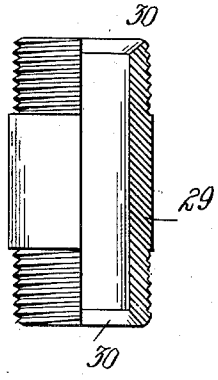


Fig. 8.

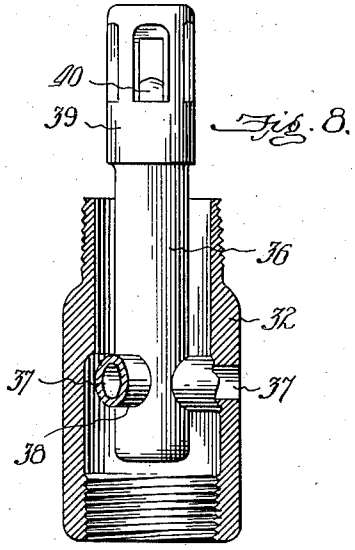
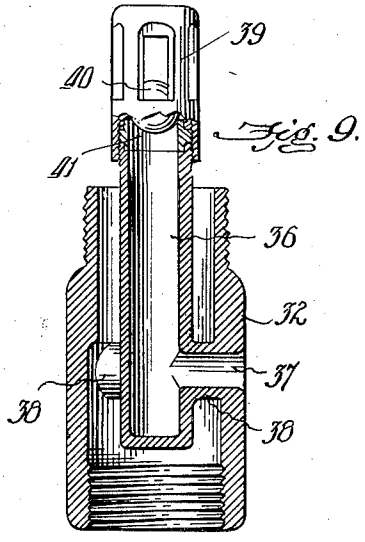


Fig. 9.



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UNITED STATES PATENT OFFICE

1,971,270

OIL WELL PUMP

William A. McGregor, Bradford, Pa.

Application December 15, 1932, Serial No. 647,446

3 Claims. (Cl. 103—179)

My invention is an improvement in oil well pumps of that general construction in which a valved plunger works in a barrel forming a section of the tubing extending to the bottom of the well and provided near its lower end with a standing-valve through which the oil passes into the tubing and barrel on the upstroke of the plunger and is forced through the valved upper end of the plunger on the down stroke of the latter, whereby the operation of the reciprocating plunger serves to pump the oil from the well.

My invention contemplates certain improvements in the construction of the pump, with particular reference to the formation of the barrel and valved plunger working therein and cooperating with a section of the tubing below the barrel to form a seat above the standing-valve to receive a drop valve to operate instead of the standing valve when the latter becomes worn and affects the operation of the pump.

My invention also contemplates a particular form of construction of standing valve which permits sand that may enter the tubing with the oil to pass below said standing valve into a sand trap at the lower end of the well tubing.

With these principal objects in view my invention consists in the improved construction of oil well pump hereinafter fully described, and what I claim as new and desire to protect by Letters Patent is more specifically set forth in the appended claims.

In the drawings:—

Figure 1 is an elevation of my improved construction of pump.

Fig. 2 is a vertical longitudinal section through the same.

Fig. 3 is an enlarged detail sectional view of the barrel and couplings connecting the same with the adjoining well tubing.

Fig. 4 is a similar sectional view including the cooperating parts of the pump.

Fig. 5 is a detail sectional view of a reversible valved body used in connection with the plunger.

Fig. 6 is a detail view of one of the couplings between the pump barrel and tubing.

Fig. 7 is a detail view of a pipe section of the well tubing adapted to form a seat for a drop valve, and

Figs. 8 and 9 are detail sectional views of my improved form of standing valve.

In carrying out my invention a section of the well tubing is in the form of a cast iron barrel 10, the cylindrical wall of which is comparatively thick and tapered externally at both ends where they are threaded, at 11, to engage correspondingly threaded openings in couplings 12 and 13 for connecting said barrel to the well tubing of which it forms a section, the coupling 12 in addition to the tapered threaded opening 14 having a straight threaded opening 15 at the opposite end thereof to receive the well tubing 16 above the barrel with an internal shallow flange 17 forming opposite shoulders against which the ends of the barrel 10 and tubing 16 abut when these parts are coupled together. A similar coupling may be employed for connecting the lower end of the barrel to the well tubing, 18, instead of the coupling 13 wherein the tapered threaded opening 19 in the upper end thereof joins the straight threaded opening 20 in the lower end. In addition to the flange 17 the coupling 12 is reamed, as at 12a, immediately above the thread 15 for convenience in connecting the tubing to this coupling.

A hollow plunger 21 works in the barrel 10 and is of such length with respect to the length of said barrel that it projects into the tubing 16 on the upstroke and into the tubing 18 on the down stroke, and in order that there will be a clearance around the plunger when it moves in either direction beyond the barrel said tubings 16 and 18 are of slightly greater internal diameter than the internal diameter of the barrel (see Figs. 3 and 4) so that the oil which is forced up the well tubing in the operation of the pump will wash off the outside of the plunger keeping it clean and well oiled and preventing it from sticking as well as reducing the wear to a minimum. The plunger is internally threaded at both ends, at 22, to receive a check valve, such as shown in Fig. 4, and although I have illustrated the plunger as being provided with a check valve at the upper end only it will be understood that an additional check valve may be used at the lower end; in either instance however the said plunger is reversible in the barrel so as to distribute the wear by reversing it.

The check valve threaded in the upper end of the plunger is in the form of a ball-valve, the body portion 23 being externally threaded at its opposite ends for connection with the internally threaded end of the plunger 21 and to receive the cage 24 which confines the ball 25, with a reversible valve seat 26 interposed between the inner end of the cage and outer end of the valve body. As will be noted by reference to Figs. 4 and 5 the valve body is reversible, for which purpose an annular recess 27 is provided at each end of said body portion to receive the ordinary form of reversible valve seat shown. The ball of this check valve closes downwardly so that the oil will be lifted in the well tubing above the plunger on the upstroke of the latter and opens automatically by pressure of the oil on the down stroke of the plunger.

The pipe section 18 of the well tubing into which the plunger projects from the barrel on the downstroke may be of any desired length to accommodate the length of stroke of the plunger, and to the lower end of this pipe section there is

connected by coupling 28 a comparatively short pipe section 29 serving in the present instance as a seat for a drop valve (not shown) which is to be used as an auxiliary to the regular standing valve. In order that the drop valve may pack closely in this pipe section or seat 29 the cylindrical wall thereof is thicker than the wall of the pipe section 18 above the same to decrease the internal diameter, and the upper end of said seat is beveled inwardly, as at 30. Into the lower portion of this pipe section or seat projects the upper portion of a standing valve 31, hereinafter particularly described, which supports the drop valve when it is lowered into the well tubing, said standing valve being supported by a pipe section 32 connected by coupling 33 to said pipe section 29, and into the lower end of this last mentioned pipe section is threaded an anchor consisting of a pipe 34 closed at its lower end by a plug 35, said anchor forming a sand trap in association with the standing valve.

For maximum efficiency in the operation of the pump I employ a standing-valve of a particular construction comprising a tube 36 located centrally within the pipe section or casing 32, leaving a space surrounding said tube which communicates with the oil well by inlet ports 37, 37 in the form of short tubes or integral nipples 38 extending between the body portion and wall of the pipe section or casing carrying the same, it being noted by reference to Figs. 8 and 9 that the parts 32, 36, and 38 are integral, that is, this part of the standing-valve is a casting and the surrounding wall of the pipe section or casing is comparatively thick. The tube 36 extends a short distance below the short tubes or nipples 38 and is closed at its lower end forming a shallow trap, and the upper end of said tube is externally threaded for the connection thereto of a cage 39 confining the ball 40, with an ordinary form of reversible valve-seat 41 interposed between the cage and end of the tube. By this construction of standing-valve the tube carrying the valve at its upper end is rigidly supported in the pipe section 32 with a space surrounding the same so that sand which may enter the well tubing above the valve will gravitate into the lower pipe section or anchor pipe and be trapped therein.

The pump mechanism hereinbefore described operates after the manner of a plunger pump, that is to say, oil is drawn through the standing-valve at the lower end of the well tubing on the upstroke of the plunger at which time the ball valve at the upper end of the latter is closed, and when the well tubing below the raised plunger, as well as the plunger itself, is filled with oil the down stroke will cause the oil to close the standing-valve and the liquid confined below the plunger will be forced upward through the same out of the valve at the upper end thereof into the well tubing to be lifted on the upstroke of the plunger. The plunger fits closely within the bore of the barrel and in the operation of the same the end portions thereof moving into the pipe sections 16 and 18 having larger bores will be washed of sand and grit by the oil surrounding said end portions thus reducing wear, and as the plunger is removable from the well tubing it can be reversed when desired, in which instance the ball valve 23 is transferred from one end to the other. During the operation of the pump the sand will gravitate past the standing valve at the sides thereof into the sand trap below the tubular casing 32, and it will be understood of course that the pipe section forming the sand trap or anchor is tightly plugged at its lower end for the required suction created by the plunger in drawing the oil into the well tubing and barrel, and should the standing-valve leak to such an extent as to affect the proper working of the pump it can be augmented in the customary manner by withdrawing the plunger and inserting a drop-valve which will rest on the beveled upper end of the pipe section or seat 29.

From the foregoing it will be obvious therefore that the arrangement of pump mechanism forming the subject matter of this application provides a very substantial arrangement, and the life of the pump is materially lengthened by the provision of reversible parts.

I claim:—

1. A pump for oil wells comprising tubing sections coupled together, a plunger barrel forming one of said sections above a standing-valve, said plunger barrel being of slightly less internal diameter than the tubing sections above and below the same, a plunger working closely in the barrel and into the tubing sections above and below the same to be cleaned by the oil in said tubing sections, and a tubing section of the well tubing intermediate the standing-valve and plunger barrel and below the tubing section into which the plunger works on its down stroke, said last mentioned tubing section having a thick cylindrical wall with inwardly beveled ends to provide a seat member of approximately the same internal diameter as the working barrel to receive a drop valve fitting closely therein; together with a standing-valve at the lower end of the tubing on which the drop valve rests, said standing valve consisting of a cast metal tubing section comprising a cylindrical casing forming a part of the well tubing, a vertical tube at the center of the casing leaving a space surrounding said central tube, and short tubes extending from the central tube to the cylindrical wall of the casing to support said central tube and provide inlet ports thereto, the upper end of the central tube being threaded to receive a ball-valve cage, seat, and ball.

2. In combination with well tubing, barrel, and plunger, of a standing-valve consisting of a cast metal section comprising a cylindrical casing forming a part of the well tubing, a vertical tube located centrally within the casing to leave a space surrounding the tube, and short tubes or nipples extending from said central tube to the cylindrical wall of the casing to support said central tube and provide inlet ports thereto, the lower end of the aforesaid tube being closed and the upper end thereof threaded to receive a ball-valve cage, seat, and ball.

3. In combination with well tubing, barrel, and plunger, of a standing-valve consisting of a cast metal section comprising a cylindrical casing forming a part of the well tubing, a vertical tube at the center of the casing leaving a space surrounding said central tube, and short tubes extending from said tubular body portion to the cylindrical wall of the casing to support the central tube and provide inlet ports thereto, the upper end of the central tube being threaded to receive a ball-valve cage, seat, and ball; together with a pipe connected to the lower end of the casing to form a sand trap below the standing valve, said pipe being closed at its lower end.

WILLIAM A. McGREGOR.