Sept. 5, 1939. R. J. HOWARD 2,172,101

OIL WELL PUMP

Original Filed Nov. 10, 1936

FIG. 1

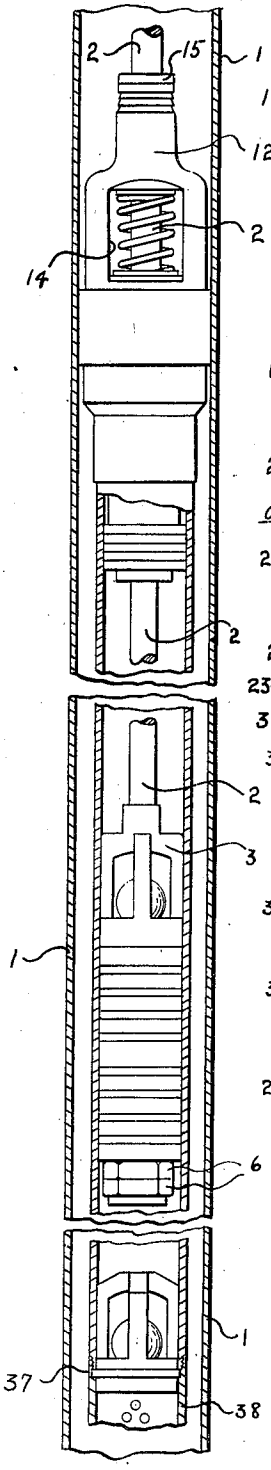


FIG. 2

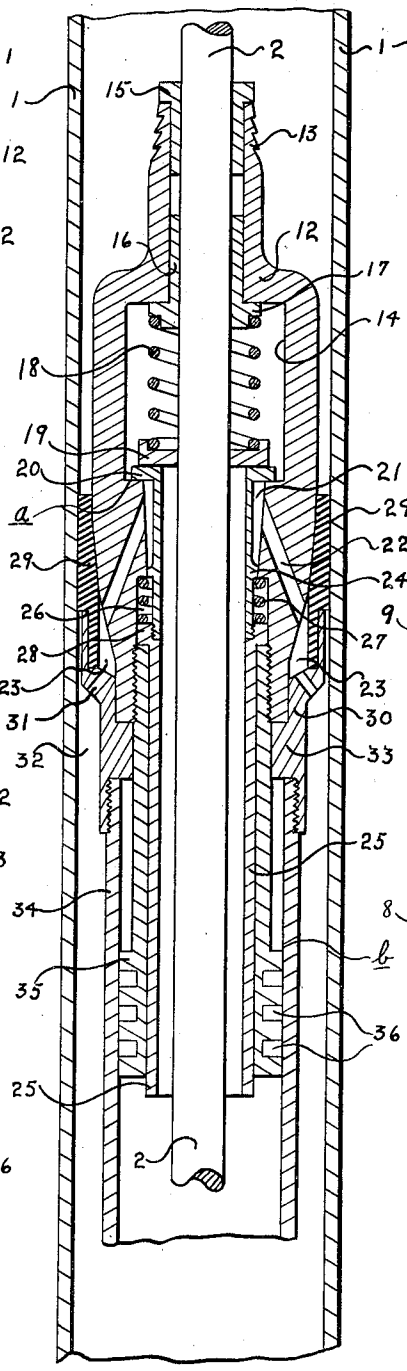
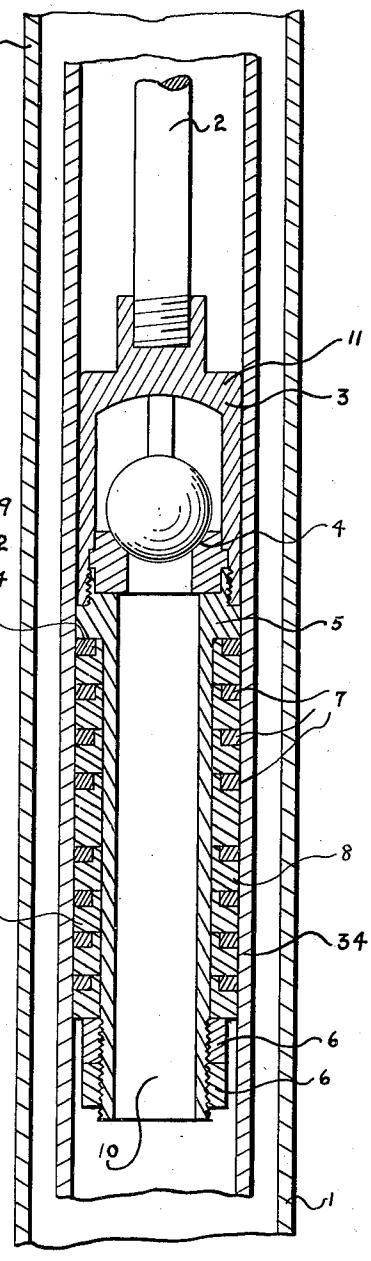


FIG. 3



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OIL WELL PUMP

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Substitute for abandoned application Serial No. 110,079, November 10, 1936. This application February 1, 1939, Serial No. 254,084

4 Claims. (Cl. 103—221)

This invention relates to oil well pumps of the type wherein the oil is lifted from the well by a plunger and check valve means and more particularly to pumps which do not require an inner conduit from the pump to the top of the well, and the principal object of the invention is to provide a device of this character wherein means are provided for readily lowering and raising the apparatus through columns of oil and thus saving time and expense by eliminating resistance due to the vacuum which is created when the assembly is withdrawn from the well.

A further object of the invention is to produce in a device of this character a trip and by-pass which will operate automatically when the entire apparatus is lifted. Other objects of the invention are to provide a device which can be manufactured economically, one which is relatively simple to install and operate, as well as affording a pump which is durable and efficient.

These and other objects are made manifest in the following description of one form of my invention when taken in connection with the accompanying drawing, wherein:

Figure 1 is a vertical view of the entire assembly with the casing and working barrel in section and other parts in elevation and fragments.

Figure 2 is an enlarged sectional view of the upper portion of the invention, and

Figure 3 is an enlarged sectional view of the lower portion.

With reference to the drawing, the numeral 1 designates an oil well casing in which the device operates. On the lowermost end of the polish rod 2 there is threaded a cage 3 which supports and partially encloses a check valve 4. To the bottom of the cage 3 there is threaded a piston or plunger 5 whose lowermost end is threaded to receive lock nuts 6 which secure the seating rings 7 and the sleeve rings 8 between the annular shoulder 9 and the said lock nuts. There is a passage 10 through the plunger, the function of which will be presently described. The shoulders 11 also perform an important function which will be disclosed as the description progresses.

Near the top of the device is a head 12 which is substantially conical in its lower part and is comparatively small at its top, the said small portion being provided with slips 13 designed to accommodate fishing tools (not shown) and thus, should the device become disconnected from the sucker rod 2 for any reason, the device can be retrieved.

Through opposing sides of the head 12, and between the conical portion and the upper smaller portion, ports 14 are provided for the passage of oil, the said ports also serving as openings for assembling the device. Between the uppermost part of the head 12 and the polish rod 2 a bushing 15, which is rigid with the head 12 due to its having been inserted under pressure, slidably contacts the polish rod 2.

Below the bushing 15 there is another bushing 16 whose lowermost end is provided with an integral annular shoulder 17, the lower periphery of which is recessed to receive a spring 18. A disc valve 19, whose upper surface is recessed to receive the spring 18, is urged away from the bushing 16 by the tension of the said spring and aids in retaining the valve 19 against its seat.

A flanged sleeve valve 20 is located immediately below the disc valve 19, the lower periphery of the flange resting on the shoulder *a* of the head 12. Between the sleeve valve 20 and the head 12 there is a cavity 21 which extends downwardly to a series of ports 22, said ports opening into another cavity 23. Near the bottom of the cavity 21, a ring seat 24, which is integral with the sleeve valve 20, securely seals the bottom of the said cavity. To the bottom of the thimble valve 20 there is threaded a mandrel 25 which is slidably mounted in an annular recess 26, the said recess accommodating a spring 27 which urges the mandrel 25 downwardly by pressing against the mandrel shoulder 28.

Surrounding the conical portion of the head 12 is a cylindrical washer or packing cup 29 which contacts the head 12 and the casing 1 and is supported in the thimble 30, as illustrated in Figure 2. A series of ports 31 in the thimble 30 form conduits between the cavity 23 and the chamber 32 which is below the packing 29 and within the wall of the casing 1. An annular shoulder 33, which is integral with the thimble 30, supports the lower end of the head 12, and immediately below the said shoulder a working barrel 34 is threaded to the thimble 30.

Within and near the upper end of the working barrel 34 there is a piston 35 the lower end of which has piston rings 36 and slidably contacts the inner walls of the working barrel 34, whereas the upper portion of the said piston is smaller than its lower portion and thereby forming a shoulder at *b*. The uppermost end of the piston 34 is threaded to the lowermost end of the head 12, and the inner wall of the said piston slidably contacts the mandrel 25, the said mandrel extending a short distance below the said piston.

Threaded upon the working barrel 34, and below the lower end of the plunger 5, when said

plunger is in its lowest position, there is a check valve 37 whose function is to sustain oil in the working barrel until acted upon by the said plunger. Immediately below the check valve 37 a string of perforated tubing 38 is connected between the check valve and the floor of the well to support the assembly.

In operation the entire apparatus is lowered into the well until the perforated tubing 38 rests upon the well floor. Since the tubing 38 supports in turn the working barrel 34, the thimble 30 and the packing 29, the apparatus comes to rest at a level determined by the length of the tubing 38. By reason of the fact that the piston 35 is slidable within the working barrel 34, and because the piston 35 is connected to the head 12 and, since the latter is of a conical shape at its lower end, this member with the piston 35 recede within the packing cup 29 by their own weight and cause a seal between the said head and the casing 1.

In the regular pumping operation the plunger 5 works with a vertically reciprocating motion in a column of oil within the working barrel 34. On a down stroke of the plunger 5 oil passes through the passage 10, past the check valve 4 and to the upper side of the plunger 5, the check valve 37 sustaining the oil within the working barrel. On the up stroke of the plunger 5, the oil is urged toward the head 12 and a vacuum is created below the check valve 4 within the working barrel 34, causing the oil to pass the check valve 37 and enter the working barrel 34, the oil therein being sustained in readiness for the next downward stroke.

The oil that has been urged upwardly by the plunger passes within the mandrel 25 and reaches the disc valve 19, raises the same and enters the well casing 1 above the packing cup 29 after passing through the ports 14 of the head 12. The oil cannot flow back into the mandrel because the disc valve 19 is urged to its seat on the sleeve valve 20 by the tension of the spring 18. Consequently the oil is urged upwardly within the casing 1, above the packing cup 29 to the top of the well.

To withdraw the assembly from the well the sucker rod 2, which extends from the top of the well, is drawn upwardly and the shoulders 11 of the cage 3 raise the mandrel 25, which extends below the piston 35 and lifts the said mandrel until the outer portion of the shoulder 11 is in contact with the lower end of the piston 35. When the mandrel 25 is raised it unseats the sleeve valve 20 and raises the said sleeve valve from the shoulder *a* allowing oil above the packing cup 29 to flow within the cavity 21 and thence downwardly through the ports 22 into the cavity 23, thence through the ports 31 and into the well casing below the packing cup 29, thus eliminating the vacuum created when lifting the assembly.

As the shoulders 11 of the cage 3 contact the lower part of the piston 35, the piston rises until the shoulder *b* engages the lower end of the shoulder 33. In this operation, since the head 12 is rigidly connected with the piston 35, the former is lifted from the packing cup 29. As the sucker rod 2 continues to move upwardly, by reason of the engagement of the shoulder *b* with the shoulder 33, the entire assembly is lifted from the well, and oil is allowed to by-pass into the lower part of the well casing 1.

Since the form of the construction hereinabove described is capable of changes and modification without departing from the intent of the invention, the device is not limited to such specific structure except as hereinafter claimed.

I claim:

1. In an oil well pump for raising fluid through the casing and having a conventional working barrel, a piston therein, and a polish rod for operating the same, and also having a packing supported from the bottom of the well and an inverted conical head cooperating with the said packing for supporting the pump assembly, the combination of a disc valve mounted within the said head and over the polish rod of the said assembly, a sleeve valve positioned below the said disc valve and providing passage around the said polish rod, drain ports through the said head and beneath the said packing providing communication between the said passage and the interior of the casing, a mandrel secured to the said sleeve valve and extending within the working barrel of the said pump assembly, a piston for cooperation with the said working barrel rigidly fixed to the said head and means positioned near the lower end of the said polish rod for cooperation with the said mandrel.

2. In a casing pump having a supported packing and head member within the casing and a pumping assembly having a conventional working barrel, a piston therein, and a polish rod supported by the said packing, the combination of a disc valve mounted within the said head member and connecting the working barrel of the said assembly with the upper casing, a sleeve valve positioned below the said disc valve and cooperating with drain ports through the said head and beneath the said packing, for communication with the lower chamber of the said casing, a piston rigidly fixed to the lower portion of the said head for cooperation with the working barrel of the said assembly, a mandrel rigidly attached to the said sleeve valve and extending below the said piston, means positioned near the lower end of the said polish rod for engaging the said mandrel and opening the said sleeve and disc valves.

3. In a well pump for raising oil through the casing and having a packing and a head supported within the said casing and having a pumping assembly including a conventional working barrel, a piston therein, and a polish rod for operating the same, a valve system within the said pumping assembly comprising a spring actuated disc within the head of the said pumping assembly and positioned around a polish rod, a sleeve valve positioned within the said head for communication through ports in the said head and beneath the said packing to the lower portion of the said casing, a mandrel attached to the lower end of the said sleeve valve, a piston for cooperation with the working barrel of the said pumping assembly attached to the said head, a passage within the said mandrel and the said sleeve valve for communicating the chamber of the said working barrel and the said disc valve, shoulders mounted on the lower end of the said polish rod for cooperation with the said sleeve valve through the medium of the said mandrel.

4. In a casing pump having a pumping assembly comprising a conical head for cooperation with a casing packing, a conventional working barrel, a piston therein, and a polish rod for operating the same, a valve system comprising a spring actuated disc positioned within the said head and around the said polish rod, a sleeve valve having shoulders positioned within the said head for communication with ports through the said head and beneath the said packing for communication be-

tween the lower and upper portions of the said casing, a mandrel fixed to the lower portion of the said sleeve valve and extending into the working barrel of the said pumping assembly, a piston for cooperation with the walls of the said working barrel rigidly fixed to the lower portion of the said head, shoulders positioned near the lower end of the said piston for cooperation with a packing support for withdrawing the assembly from the well, valve tripping means comprising shoulders positioned near the lower end of the said sucker rod, extension of the said mandrel below the said piston, connection between the said mandrel and the said sleeve valve for raising the said sleeve valve, and valve closing means comprising a spring positioned above the said mandrel and cooperating with the said head.

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