Nov. 24, 1936. D. B. HOWE 2,062,058

OIL WELL CASING PUMP

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Fig. 1.

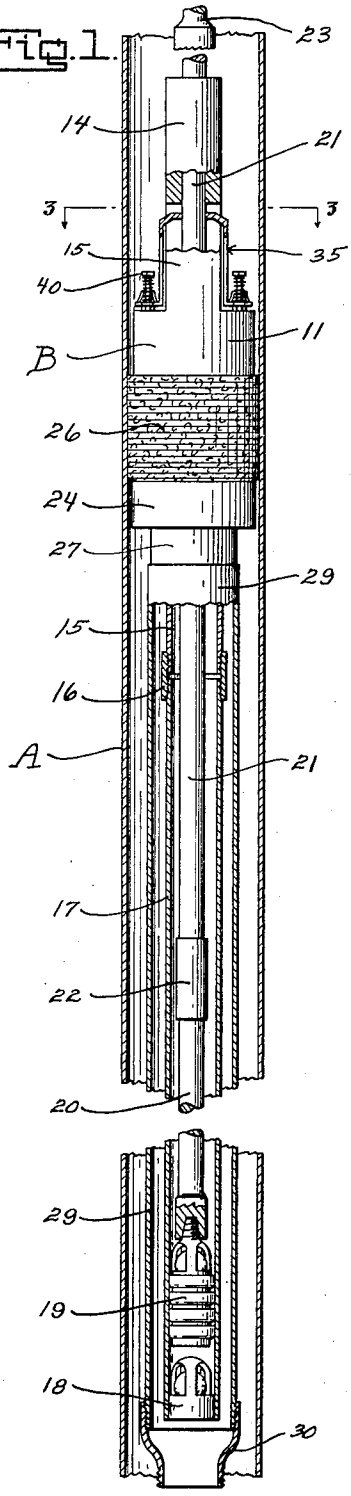
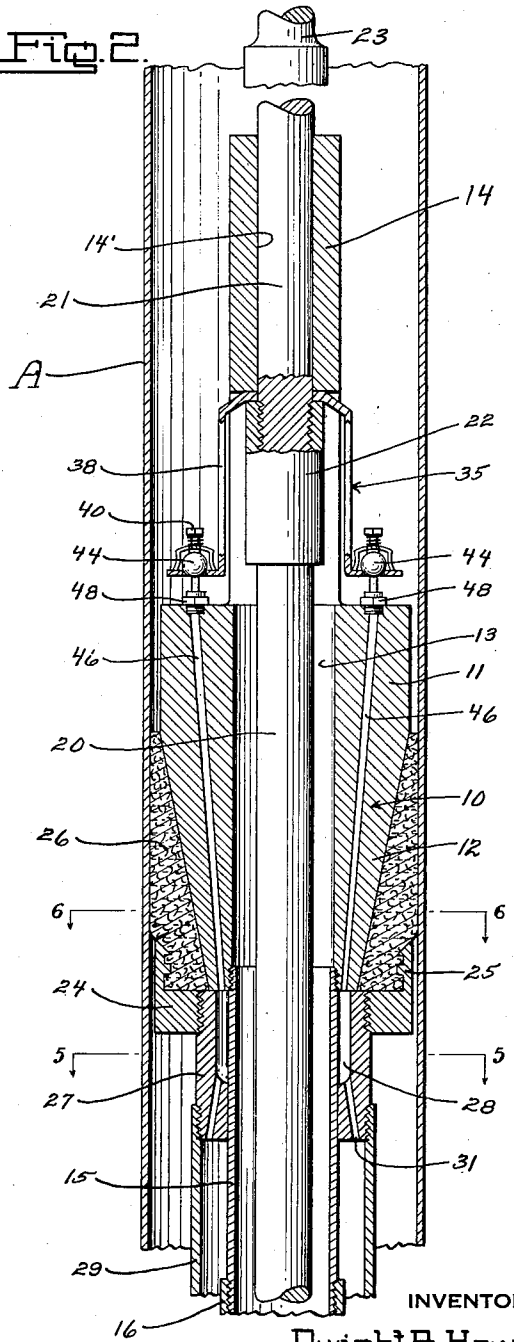


Fig. 2.



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Fig. 3.

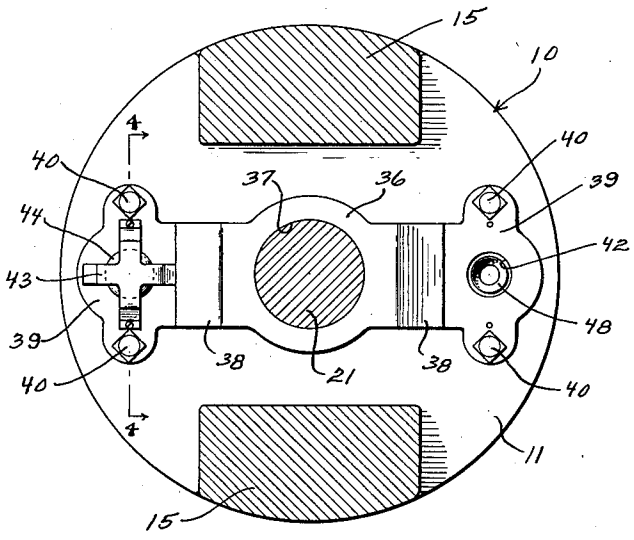


Fig. 4.

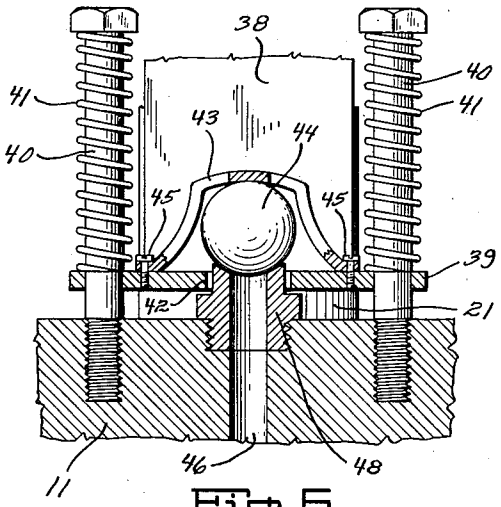


Fig. 6.

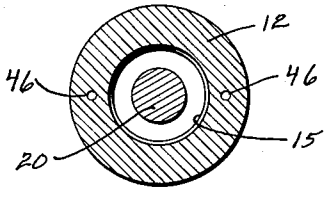


Fig. 7.

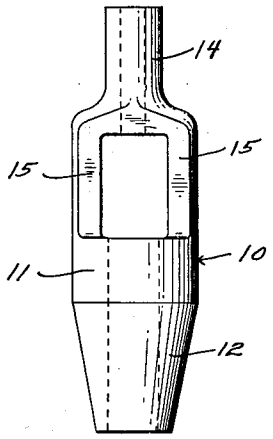
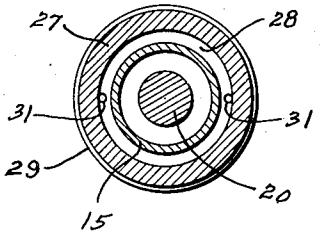


Fig. 5.



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OIL WELL CASING PUMP

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Application October 30, 1934, Serial No. 750,687

4 Claims. (Cl. 103—221)

The present invention relates to pumping equipment and more particularly to improvements in pumping units for oil well casing pumps.

The primary object of the invention is to provide a pumping unit embodying means for automatically releasing the hydrostatic pressure upon the unit before moving the unit from its operating position so that the pumping unit may be easily pulled with the regular pulling equipment and without likelihood of breaks occurring while pulling the pump for inspection or repairs.

A further object is to provide a pumping unit embodying means whereby when pulling the unit, the column of fluid above the pump head is released before the pump head is lifted from its packer and thereby relieving excessive strain on the pulling equipment.

A further object is to provide a pumping unit having drain valve means associated therewith adapted to be opened upon initial raising of the sucker rod when pulling the unit from the well, and which drain valve means is automatically closed upon lowering the unit to its operating position in the well.

A still further object of the invention is to provide a strong and sturdy device of this character and one wherein all wearing parts are standard equipment.

Other objects and advantages of the invention will be apparent during the course of the following detailed description, taken in connection with the accompanying drawings, forming a part of this specification and in which drawings:—

Figure 1 is a view part in elevation and part in section showing the pumping unit in position in a casing and in an operating position.

Figure 2 is an enlarged vertical sectional view thru the upper portion of the pumping unit with the parts in a position for draining fluid from above the unit.

Figure 3 is an enlarged transverse section on the line 3—3 of Figure 1.

Figure 4 is an enlarged fragmentary section on the line 4—4 of Figure 3.

Figures 5 and 6 are fragmentary transverse sections on the respective lines in Figure 2.

Figure 7 is a view of the pump head.

Referring to the drawings in detail and wherein like characters designate corresponding parts throughout the several views, the letter A designates a well casing of usual construction within which is adapted to be sealed as by lowering into the casing, the pumping unit designated as a whole by the letter B.

The pumping unit B comprises a pump head 10 formed with a body portion or mandrel 11 which is externally tapered at its lower portion as at 12. The body portion 11 is of a diameter slightly less than the internal diameter of the casing A and is provided with an axial opening 13. Formed integral with the upper end of the body portion 11 is a yoke embodying a guide sleeve 14 spaced above the upper end of the body portion 11 by a pair of arms 15 disposed diametrically of the body portion. The opening 14' thru the guide sleeve 14 is arranged in axial alignment above the opening 13 and is of less diameter than the opening 13 as clearly shown in Figure 2.

Threaded into the lower end of the opening 13 thru the pump head 10 is a nipple 15 and to the lower end of which is connected as by a coupling 16, a working barrel or pump cylinder 17. Arranged in the lower end of the working barrel 17 is a standing valve 18 of ordinary construction which co-acts with a traveling valve 19 reciprocally movable in the working barrel 17.

The traveling valve 19 may be connected to the lower end of a pony rod 20 having its upper end connected to the lower end of a polish rod 21 as by a polish rod coupling 22. The polish rod 21 has a sliding working fit in the guide sleeve 14 and above the guide sleeve may be connected by a suitable coupling the lower end of a sucker rod as indicated at 23. Reciprocation of the traveling valve 19 raises the fluid thru the opening 13 in the pump head 10.

Associated with the pump head 10 is a packer gland 24 having an upstanding ring flange 25 forming a support for a cylindrical packer sleeve 26 formed of a suitable compressible material. The packer gland 24 is provided with an axial threaded opening into which is threaded the upper end of a drain sleeve 27. This drain sleeve 27 encircles the nipple 15 and at its lower portion has a sliding fit on the nipple as shown in Figure 2. The bore of the drain sleeve 27 is enlarged at the upper portion of the sleeve and this enlarged bore portion coacts with the sleeve to provide an annular pocket 28 opening at the upper end of the drain sleeve. As will be observed in Figure 2, the drain sleeve 27 is of a length less than that of the nipple 15 and that the drain sleeve has limited sliding movement on the nipple between the lower end of the pump head 10 and the coupling 16.

Threaded upon the lower end of the drain sleeve 27 is a drain sleeve supporting tube 29 which extends to a point below the lower end of the working barrel 17. The lower end of the supporting tube 29 may be provided with a suitable coupling nipple 30 to which may be connected a

suitable strainer or anchor adapted to rest on the bottom of the well and support the pumping unit in its operating position in the casing. Various other means may be employed for setting the pumping unit for operation, such for instance, by dispensing with the supporting tube 29 and allowing the packer gland 24 to rest on a liner in the casing A, or by attaching a suitable tubing anchor to the lower end of the supporting tube 29.

The supporting tube 29 is of greater internal diameter than the external diameter of the nipple 15 and the working barrel 17 and forms a chamber about the nipple 15 and barrel 17 which extends to the lower end of the drain sleeve 27. The drain sleeve 27 is provided in its lower portion with two or more drain openings 31 providing communication between the lower end of the annular pocket 28 and the interior of the supporting tube 29.

The pumping unit is lowered into position in the well casing by means of the sucker rod 23. When lowering the pumping unit into the casing, the drain sleeve 27 is in a lowered position on the nipple 15 and resting upon the annular shoulder formed by the upper end of the coupling 16. The packer 26 is supported upon the packer gland 24. The polish rod coupling 22 acts upon the lower end of the guide sleeve 14 and retains the pump head 10 so elevated with respect to the drain sleeve 27 as to hold the tapered portion 12 of the pump head raised in the packer 26. When downward travel of the pumping unit is stopped, such as by engagement of the supporting tube 29 with the bottom of the well, the pump head 10, nipple 15 and working barrel 17 will continue downward movement until the lower end of the pump head comes to rest upon the upper end of the drain sleeve 27 as shown in Figure 2 and force the packer 26 into sealing contact with the well casing A.

Referring particularly now to the arrangement of the drain valve means for releasing the column of fluid above the pump head 10, this drain valve means operates to release the fluid before the pump head is lifted out of the packer 26. The drain valve means is associated with the upper end of the pump head body portion 11 and embodies a valve opener 35 formed with a head portion 36 provided with an opening 37 to slidably receive the polish rod 21. Depending from the opener head portion 36 at diametrically opposite sides thereof are arms 38 each of which is provided at its lower end with an outturned plate portion 39 and these plate portions extend parallel to the flat upper end of the pump head body portion 11. These plate portions 39 are vertically movable on guide bolts 40 threaded into the pump head body portion 11. Two of these guide bolts are preferably provided for each plate portion 39, and a coil spring 41 encircles each guide bolt 40 between the heads of the bolts and the plate portion 39 so that the springs act to normally urge the valve opener downwardly.

Each of the plate portions 39 of the valve opener member 35 is provided with a preferably circular opening 42, and retained in position above each opening 42 as by a ball cage 43, is a ball valve 44 having a diameter slightly greater than the diameter of its opening 42 so that the ball valve will be raised by the plate portions 39. The ball cages 43 may be secured to the ball lifter plate portions 39 by suitable cap screws 45 or in any other preferred manner.

Provided in the pump head body portion 11 to extend from the upper to the lower end thereof, is a pair of drain holes 46, the upper ends of which align beneath the openings 42 in the ball lifter plate portions 39. Provided at the upper end of each of the drain holes 46 is a suitable valve seat 48 upon which the ball valve 44 seats for closing the upper ends of the drain holes when the pumping unit is in operation. The lower ends of these drain holes 46 as will be observed in Figure 2 open into the annular pocket or chamber 28 formed in the drain sleeve 27. As will be noted in Figure 4, the opening 42 receives the upper end of the valve seat 48 and allows the ball valve to properly engage upon the valve seat.

Referring now to the operation of the pumping unit permitting releasing of the hydrostatic pressure upon the unit before raising the unit from its operating position in the casing, Figure 1 shows the unit in operating position in the casing with the drain valve means closed and the pump head sealed by the packer 26. When the pumping unit is in operation, the zone of travel of the polish rod coupling 22 is such that upon the upward limit of movement during the pumping stroke, the polish rod coupling will not contact the head portion 36 of the valve opener member 35. During the pumping operation, the springs 41 retain the ball valves 44 seated for closing the drain holes 46 and the polish rod 21 has sliding movement thru the openings 37 in the head portion 36.

When desiring to pull the unit either for inspection or making repairs, the sucker rod 23 first raises polish rod coupling 22 into engagement with the head portion 36 of the valve opener member 35 and moves this head portion into engagement with the lower end of the guide sleeve 14. This slight raising of the valve opener member 35 unseats the ball valves 44 as shown in Figure 2 without imparting any movement to the pump head 10. This opening of the ball valves 44 allows the fluid above the pumping unit to drain thru the drain holes 46, annular chamber 28 and drain openings 31 into the supporting tube 29 and thus releases hydrostatic pressure on the pump head. Further raising of the sucker rod causes the pump head to be lifted by the rod coupling 22 so that the body portion 11 of the pump head is lifted out of expanding relation to the packer sleeve 26. Since the nipple 15 is connected to the lower end of the pump head, further raising of the sucker rod causes the coupling 16 to engage the lower end of the drain sleeve 27 whereby the supporting tube 29 will be raised along with the pump head. Thus it will be seen that upon pulling the pumping unit from the casing, that the drain valve means is first opened for relieving hydrostatic pressure on the unit and then the pump head is raised out of the packer and acts as a suspending means for the portions of the pumping unit below the pump head. With the hydrostatic pressure released above the pumping unit, the pumping unit is easily pulled with the regular pulling equipment and without exerting such strain upon the sucker rod as would be apt to cause the rod to break or separate.

Changes in details may be made to the form of invention herein shown and described, without departing from the spirit of the invention or the scope of the claims.

I claim:

1. In an oil well casing pump, a pumping unit for lowering into the casing, comprising a pump head having an axial opening for the fluid being pumped, and drain openings providing fluid

communication above and below the head separately of said axial opening, a working barrel suspended from the pump head co-axial with said axial opening and provided with a shoulder, a traveling valve in said barrel, an operating rod for the traveling valve extending upwardly thru the axial opening in the pump head, a sleeve slidable on the working barrel between the pump head and said shoulder, a supporting tube carried by the sleeve for supporting the unit in the casing, a packer carried by the sleeve to be expanded by the pump head into sealing engagement with the casing when the unit is lowered into operating position in the casing by said operating rod, valve means normally closing the upper ends of said drain openings, opening means for said valve means, and means on said operating rod operable upon lifting the operating rod for pulling the pumping unit to first engage said opening means and actuate the valve means for releasing fluid pressure above the pump head and then moving the opening means into engagement with the pump head for raising the same out of expanding relation to said packer.

2. In an oil well casing pump, a pumping unit for lowering into the casing, comprising a pump head having an axial opening for the fluid being pumped and drain openings providing fluid communication above and below the head separately of said axial opening, a nipple secured in the lower end of said axial opening, a working barrel, a coupling connecting the working barrel to the lower end of the nipple, a traveling valve in the working barrel, an operating rod for the traveling valve projecting upwardly thru said axial opening, a drain sleeve slidable on said nipple between the lower end of the pump head and said coupling and having drain openings for communicating with the drain openings in the pump head, a packer supported by the drain sleeve to be expanded into sealing engagement with the casing when the pump head engages the drain sleeve, means for supporting the drain sleeve in the casing, valve means above the pump head for closing said drain openings, a valve opener member carried by the pump head, and a coupling member on said operating rod for engaging the valve opener member to open said valve means when the operating rod is raised above its normal zone of travel and in advance of raising the pump head out of expanding relation to the packer when pulling the unit from the casing.

3. In a pumping unit, a pump head having an axial opening, and drain openings providing fluid communication above and below the head, a nipple threaded into the lower end of said axial opening, a pump cylinder, a pump cylinder coupling at the lower end of the nipple, a drain sleeve slidable on the nipple between the pump head and said coupling and having drain openings for communicating with the drain openings in the pump head, a packer encircling the lower portion of the pump head and supported by said nipple, a traveling valve in the pump cylinder, a valve rod extending thru the axial opening in the pump head and coupled to said traveling valve, a sucker rod coupling on the valve rod, a valve for closing the upper end of each drain opening in the pump head, means normally seating said valves, a valve opener member for the valves, said valve opener member to be engaged by said sucker rod coupling for unseating the valves, and a guide sleeve on the pump head limiting opening movement of the valve opener member by the sucker rod coupling.

4. A pumping unit of the class described comprising a pump head having drain openings forming communication above and below the head, a guide sleeve connected to and spaced above the upper end of the pump head, a nipple threaded into the lower end of an axial opening thru the pump head, a pump cylinder, a pump cylinder coupling on the lower end of the nipple, a packer support slidable on the nipple between the coupling and pump head, a packer carried by said support, a traveling valve in the pump cylinder, a valve rod extending thru said axial opening in said pump head and coupled to said traveling valve, a polish rod coupling at the upper end of said valve rod, a polish rod connected to said coupling and slidable in said guide sleeve, and drain valve means embodying drain valves for closing said drain openings and an opener member carried by the pump head and engageable by said polish rod coupling for opening the drain valves.

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