July 7, 1936. C. M. MURPHY 2,046,834

OIL WELL PUMP

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Fig. 1

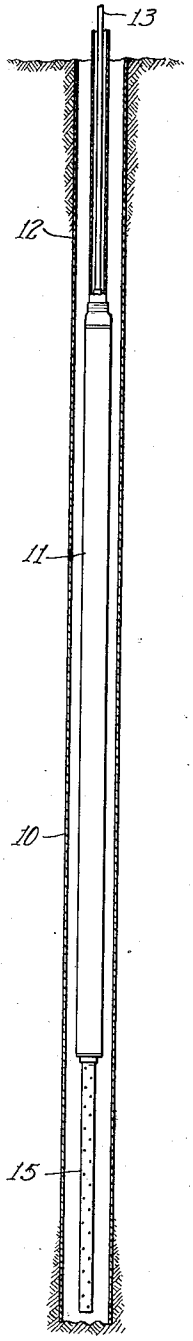

Fig. 2

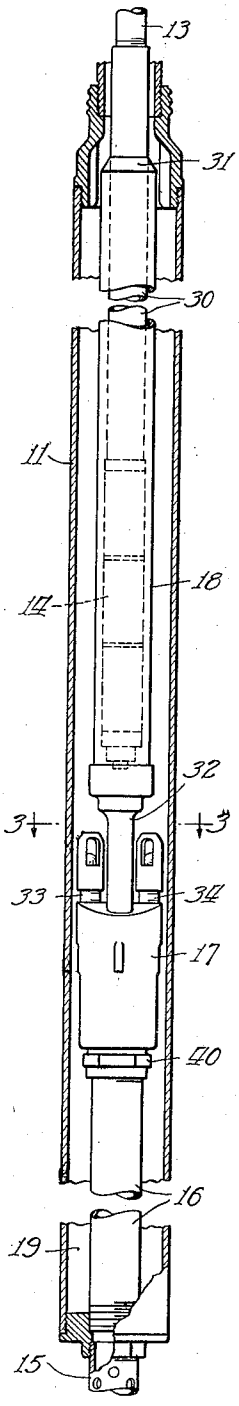

Fig. 3

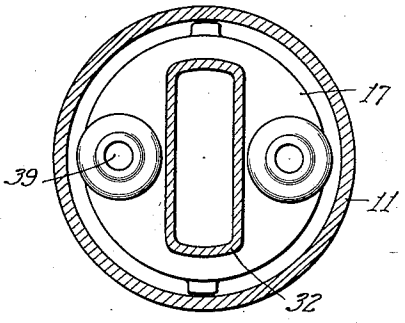

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Fig. 4

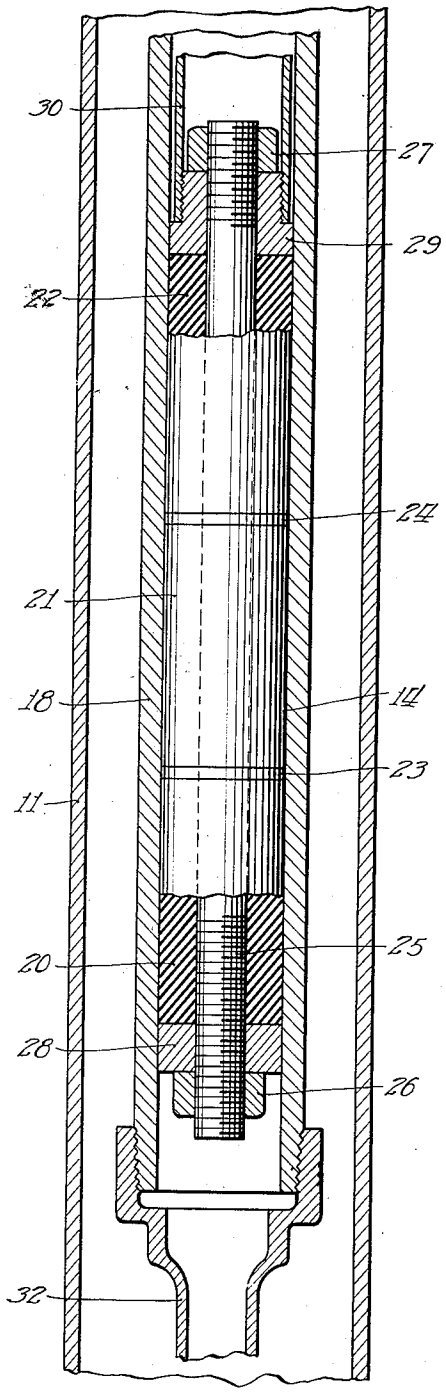
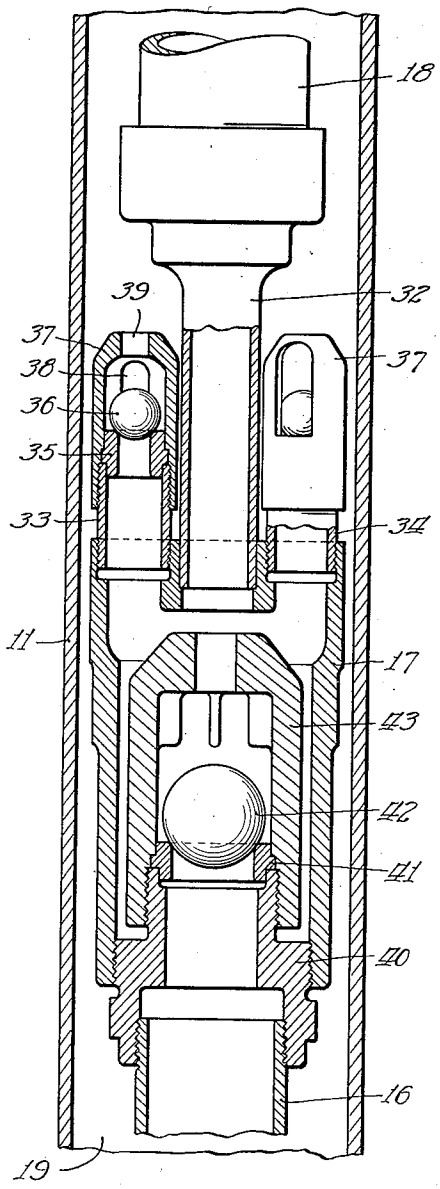


Fig. 5



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OIL WELL PUMP

Carey M. Murphy, Montpelier, Ind.

Application January 24, 1934, Serial No. 708,043

6 Claims. (Cl. 103—155)

My invention relates to pumps for pumping fluids such as oil from deep wells.

In wells of this character, particularly the oil wells, the liquid which is to be removed is usually found in a layer of sand, and the removal of the oil is accompanied by the difficulty that the sand gets into the working parts of the pump and causes them to wear out very rapidly. Perforated casings attached to the lower end of the pump assembly help to a certain extent to strain out the sand and to prevent this difficulty. Various other methods have been applied, but great difficulty is still encountered in avoiding the destructive action of the sand on the working parts of the pump.

My invention concerns itself primarily with the provision of a pump assembly which acts to keep the sand from getting into the parts of the piston working in the cylinder of the pump and thus avoid the excessive destruction of the piston cups and the cylinder barrel.

My invention contemplates also the provision of a novel type of piston or plunger which provides a much greater working surface than the valve cups that have heretofore been used.

My invention also contemplates the provision in a pump of this character of a novel inlet and outlet from the cylinder or working barrel of the pump.

My invention contemplates further the provision of a novel settling chamber for the delivery casing which provides a place for the sand to settle out before the liquid is forced high enough in the delivery casing to get in at the top of the cylinder or working barrel of the pump.

Other and more specific objects and advantages of my invention will appear as the description proceeds in connection with the accompanying drawings. It is to be understood, however, that the drawings and description are illustrative of the invention only and are not to be taken as limiting the invention except in so far as it is limited by the claims.

In the drawings—

Fig. 1 shows a portion of a casing at the bottom of a deep well with my pump assembly therein;

Fig. 2 is an enlarged view of a pump assembly showing the outer or delivery casing in section;

Fig. 3 is a section on the line 3—3 of Fig. 2;

Fig. 4 is an enlarged section showing the delivery casing and the working barrel or cylinder in section together with the piston partly in section;

Fig. 5 is an enlarged view of the inlet and outlet assembly which is attached to the bottom of the working barrel.

Referring now in detail to the drawings, the numeral 10 refers to the well casing, and within this casing I mount the pump assembly which consists primarily of an outer delivery casing 11 having the continuation 12 extended upwardly to the outlet from the well for carrying the liquid to the point of delivery. The driving member or sucker rod 13 extends down through the casing 12 and carries the piston or valve member 14 at its lower end. A perforated pipe or strainer member 15 is mounted on the lower end of the delivery casing 11 in communication with the inlet pipe 16 which leads into the inlet and outlet valve assembly 17 for the cylinder or working barrel 18. A substantial space, as shown at 19, is provided below the valve assembly 17 as a settling chamber to take care of the sand that may pass through the valve assembly and prevent it from getting up to the top of the cylinder 18 and cause difficulty by working in between the piston and the cylinder barrel.

The piston and cylinder in this device differ substantially from those commonly used by providing a piston and cylinder assemby in which the oil does not go through the piston, but instead is drawn into the cylinder and discharged out of the cylinder at one end thereof.

If we refer now particularly to Figs. 2, 4, and 5, it will be clear that the piston 14 working inside the cylinder 18 is a solid piston: that is to say, it has no opening therethrough to allow the fluid to pass upwardly through it as it is forced down in the cylinder.

The valve packing or washers which maintain the tight bearing connection between the piston and the cylinder consist of a series of rings such as 20, 21, and 22 spaced by means of metal washers such as 23 and 24 and secured together by means of the bolt 25 and the nuts 26 and 27. The end washers 28 and 29 complete this assembly. Washer 29, it will be noted, is screw-threaded to receive the metal extension 30 of the piston which passes upwardly through the upper end of the cylinder preferably making a close fit therewith, and the rod 13 is secured to the upper end of this member 30. The top of the cylinder or working barrel is bevelled as indicated at 31 (see Fig. 2) so as to further reduce the probability of any sand working into the cylinder from the top.

The long rubber sleeves or rings such as 20, 21, or 22 provide a much greater bearing surface for the piston than has been obtained by the usual

valve cups heretofore used for this type of work. This in itself prolongs the length of time of continual run of the pump, before it is necessary to pull the pump out of the well and make replacements. It will also be noted that, in as much as the piston merely draws the fluid up into the working barrel and then forces it out again, there is little opportunity for the sand that may be in the oil to work up so as to get between the piston and the barrel. The down stroke of the piston wipes off whatever sand may be drawn in on the up stroke, and thus the working parts are more or less kept clean so far as the lower end is concerned. The upper end of the piston and cylinder is protected as I have already brought out.

Now the valve assembly at the lower end of the cylinder **18** consists of a tubular member **32** which is flattened as indicated most clearly in Fig. 3 and extends down to join the assembly casing **17** between the two valve nipples **33** and **34**. These valve nipples each carry a valve seat such as **35** and a ball valve such as **36**. Over the ball valve is provided a housing such as **37** open at the sides with openings **38** and at the top by means of the opening **39**. The right and left hand valves, as shown in Fig. 5, are duplicates so no further description will be made of the right hand valve. The inlet valve consists of the plug **40** inserted in the bottom of the casing **17** and supporting the inlet pipe **16**. This plug in turn has mounted thereon the valve seat **41** for ball valve **42**, and the shield **43** is also provided over the ball valve **42**.

The liquid on the up stroke of the piston **21** is drawn up through the inlet pipe **16** and past the check valve **42** into the cylinder **18**. The length of this cylinder may, of course, be any length desired, and the length of the cross-sectional area of the cylinder will more or less govern the amount of liquid that will be drawn up for any one stroke. On the down stroke of the piston, check valve **42** closes, and the liquid is forced upwardly past the check valves such as **36** to discharge into the delivery casing **11**.

Of course, any sand that might have been drawn up by the suction of the pump may be carried over through the check valves **36** into the delivery casing. It will be noted, however, from an inspection of Fig. 5 and Fig. 2 that the valve assembly leaves a sufficient space between it and the delivery casing to allow the sand to settle down into this lower space which I have numbered **19** in Figs. 2 and 5. This sand which settles down is naturally taken out of circulation, and, by the time the liquid rises to the level of the top of the working barrel or cylinder **18** which is usually several feet long, there is practically no sand left to cause difficulty by working in between the piston **14** and the cylinder **18**.

From the above description, it is believed that the construction and operation of this device will be clear to those skilled in this art.

It is also believed to be clear that the structure hereinbefore described provides many advantages in prolonging the life of the working parts of the pump. This is highly desirable in this type of structure because of the great loss of time necessary to make any repairs of worn out parts. When for example the well is many hundreds of feet deep as they often are, the removal of the pump involves a tremendous amount of work, and the delay of many hours for the replacement work.

In a well which was particularly bad for sand a device embodying my invention was inserted and compared in operation with the pump such as shown in the catalogue number 40 of the National Supply Company on page 490. The sand had such a bad effect upon the prior pump that the cup leathers were substantially ruined in a few hours time, in fact it operated for about eight hours. When my assembly replaced this worn out assembly, we were able to operate continuously for several weeks without any difficulty.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A well pump for operation in a well casing comprising a delivery casing sealed at the bottom, an inlet conduit projecting upwardly into the delivery casing from the bottom thereof, a supply chamber within said delivery casing and on the top of said conduit having a check valve to prevent back flow through said conduit, a pump cylinder in said delivery casing above the supply chamber and having its lower end open directly to the supply chamber, outlet conduits projecting upwardly into the delivery casing from the supply chamber and having check valves therein, a piston in said cylinder and a driving member for said piston projecting upwardly through the delivery casing.

2. A well pump comprising a supply chamber provided with a bottom and top opening, a check valve in the chamber for said bottom opening, a pump cylinder having its lower end open directly to said top opening, said supply chamber having an outlet opening in the top thereof and a check valve for said outlet opening, an inlet conduit extending downward from said bottom opening, a delivery casing enclosing and spaced from said supply chamber and cylinder and sealed to said inlet conduit at a substantial distance below the supply chamber to provide a settling chamber below the supply chamber of substantially greater length and volume than the supply chamber, a piston in said cylinder, and means to operate said piston.

3. A well pump for operation in a well casing comprising a delivery casing sealed at the bottom, an inlet conduit projecting upwardly into the delivery casing from the bottom thereof, a supply chamber within said delivery casing and on the top of said conduit having a check valve to prevent back flow through said conduit, a pump cylinder in said delivery casing above the supply chamber and having a tubular member leading from its lower end directly to the supply chamber, outlet conduits projecting upwardly into the delivery casing from the supply chamber and having check valves therein, a piston in said cylinder, and a driving member for said piston projecting upwardly through the delivery casing.

4. A well pump comprising a supply chamber provided with a bottom and top opening, a check valve in the chamber for said bottom opening, a pump cylinder having a flattened tubular member leading from its lower end directly to said top opening, said supply chamber having an outlet opening in the top thereof and a check valve for said outlet opening, an inlet conduit extending downward from said bottom opening, a delivery casing enclosing and spaced from said supply chamber and cylinder and sealed to said inlet conduit at a substantial distance below the supply chamber to provide a settling

chamber below the supply chamber, a piston in said cylinder, and means to operate said piston.

5. In a well pump, a supply chamber having a large inlet opening and a plurality of smaller outlet openings, a check valve within the chamber for said inlet opening, check valves outside the chamber for said outlet openings, an inlet conduit extending from said inlet opening downwardly from the chamber, a delivery casing surrounding said chamber and conduit and sealed to said conduit at a substantial distance below the chamber to provide a settling chamber around the inlet conduit.

6. In a well pump, a supply chamber having a large inlet opening and a plurality of smaller outlet openings, a check valve within the chamber for said inlet opening, check valves outside the chamber for said outlet openings, an inlet conduit extending from said inlet opening downwardly from the chamber, a delivery casing surrounding said chamber and conduit and sealed to said conduit at a substantial distance below the chamber to provide a settling chamber around the inlet conduit, and a pump unit above said supply chamber and in communication therewith for drawing fluid into said chamber through said inlet opening and forcing the fluid out into the delivery casing through said outlet openings.

CAREY M. MURPHY.