

Aug. 18, 1936.

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2,051,243

DEEP WELL PUMP

Filed April 13, 1934

2 Sheets-Sheet 1

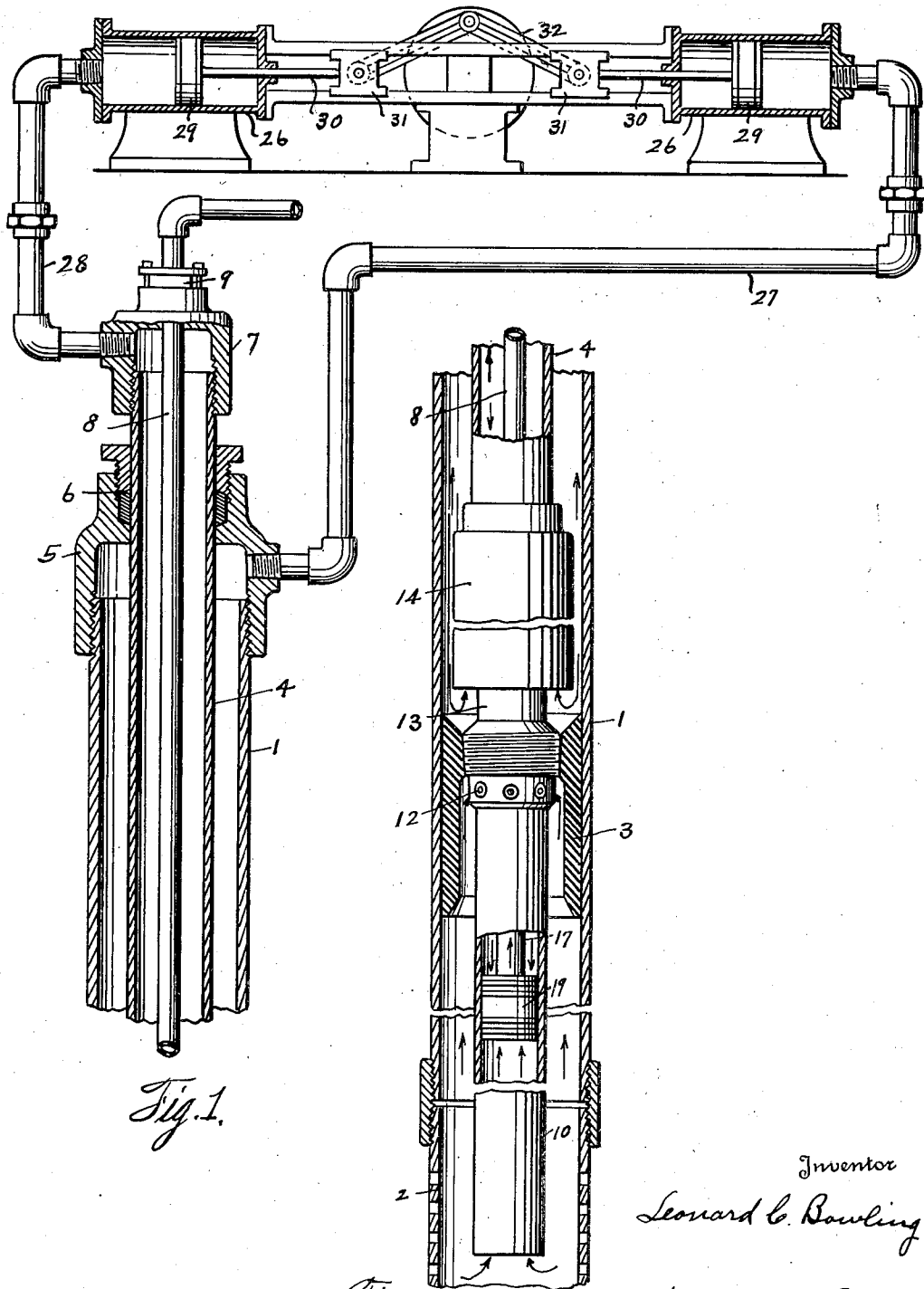


Fig. 1.

Fig. 2. By

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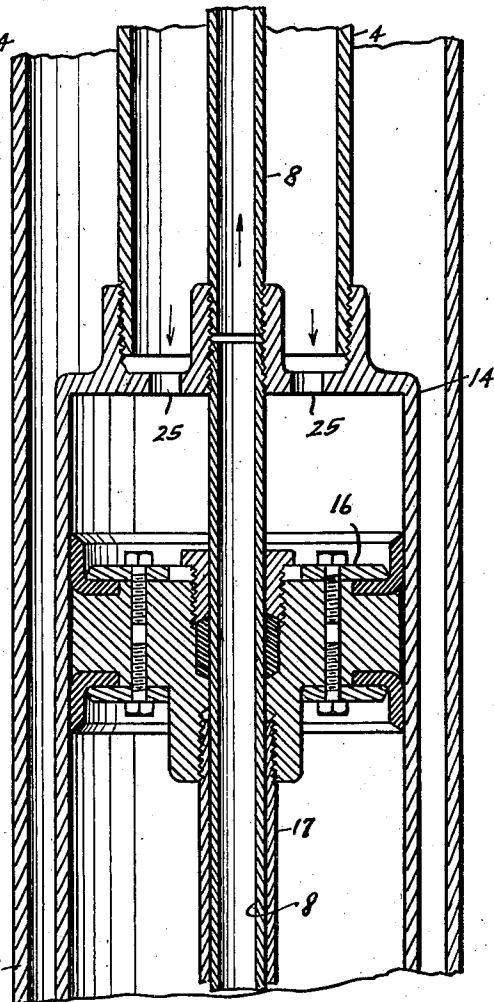
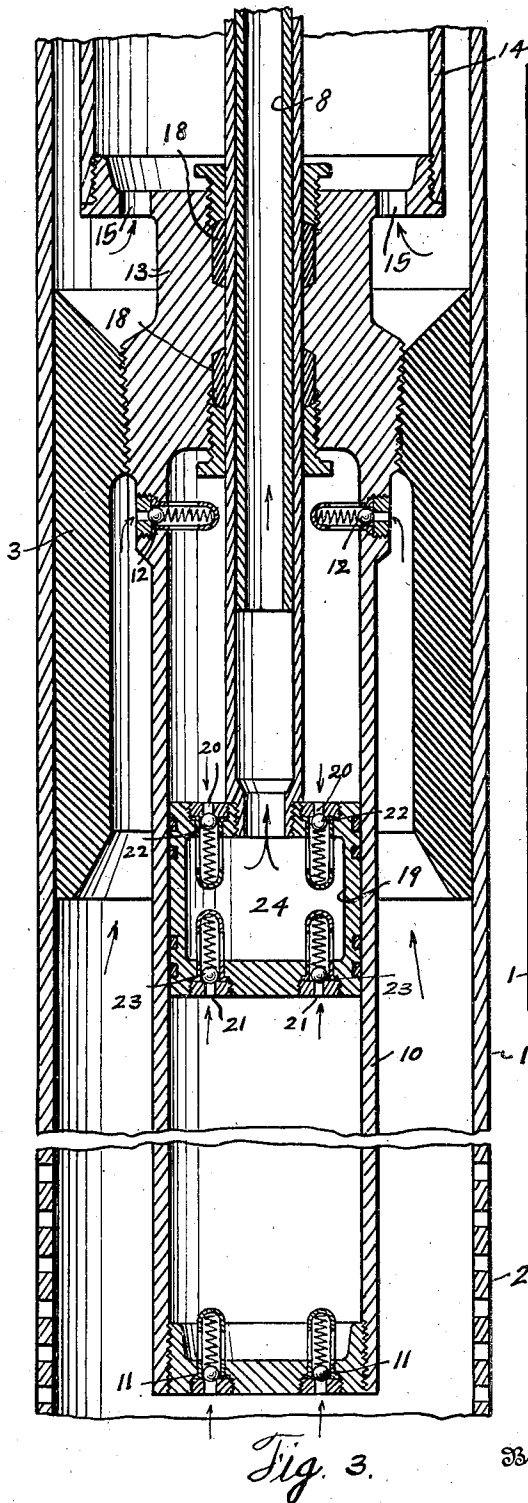
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UNITED STATES PATENT OFFICE

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DEEP WELL PUMP

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1 Claim. (Cl. 103—44)

This invention relates to a deep well pump.

An object of the invention is to provide a pump shaped to be located in a well and arranged to be operated by the pressure of balanced columns of an operating fluid with means for alternately applying pressure to said columns of operating fluid to effect the reciprocation of the traveling plunger of the pump.

Another object is to provide pump mechanism of this character of such construction that the pressure of the operating fluid will be excluded from the producing stratum in the well.

Another object is to provide pump mechanism of the character described having a traveling plunger and an operating piston connected to the plunger and means for confining balanced columns of operating fluid in combination with means at the ground surface for applying pressure to one column and simultaneously relieving pressure from the other column in alternating succession whereby the piston will be reciprocated to reciprocate the traveling plunger of the pump.

With the above and other objects in view, the invention has particular relation to certain novel features of construction, operation and arrangement of parts, an example of which is given in this specification and illustrated in the accompanying drawings, wherein:

Figure 1 shows a vertical sectional view of the upper end of the tubing showing also the means for applying pressure to and relieving pressure from the columns of separating fluid.

Figure 2 shows a side elevation partly in section of the pump mechanism.

Figure 3 shows an enlarged vertical sectional view of the lower end of said mechanism, and

Figure 4 shows an enlarged vertical sectional view of the upper end thereof.

In the drawings the numeral 1 designates an outer tubing adapted to be lowered into a well and whose lower end may be formed into a screen 2. Within this tubing there is secured a suitable packer 3 preferably located above the liquid level in the well. The numeral 4 designates the inner tubing which extends down into the outer tubing. A suitable tubing head 5 is secured to the upper end of the outer tubing and is equipped with a suitable stuffing box 6 through which the inner tubing descends.

Attached to the top of the inner tubing there is a tubing head 7 and an eduction tube 8 is fitted through a stuffing box 9 and through the head 7 and extends down into the well.

Anchored within and extending beneath the packer 3 there is the cylinder 10 having the in-

wardly opening valves 11 at its lower end and similar inwardly opening valves 12, 12 at its upper end. This cylinder has a head 13 at its upper end to which the lower end of the operating cylinder 14 is connected and the space within the outer tubing and around the inner tubing communicates with the space within said operating cylinder through the joints 15, 15.

Within the cylinder 14 there is an operating piston 16 and a tubular piston rod 17 has its upper end connected to the piston 16 and extends down through suitable stuffing boxes 18, 18 in the cylinder head 13 and its lower end is attached to the traveling plunger 19 of the pump. This plunger reciprocates in the cylinder 15 and is formed with the upper and lower collars 20, 21, the former of which is controlled by the downwardly opening valves 22 and the latter of which is controlled by the upwardly opening valves 23, said valves controlling the inlet of the pumped fluid into the chamber 24 by the pump plunger. The eduction tube 8 is let down into and is closely surrounded by the tubular piston rod 17 said eduction tube being anchored to the upper end of the cylinder 14. The upper end of the cylinder 14 has the port 25 for the admission of operating fluid from the inner tube 4 into the cylinder 14 above the piston 16.

At the ground surface, means have been provided for applying pressure to the columns of operating fluid. As shown this means for applying pressure to said operating fluid comprises the cylinders 26, 26 and leading from the outer end of these respective cylinders are the pressure lines 27, 28, the former entering the outer tubing and the latter entering the inner tubing. In the cylinders 26 are the reciprocable pistons 29, 29 which are welded to the outer end of the piston rods 30, 30. The inner ends of these rods are attached to the reciprocable cross heads 31, 31 which are reciprocated by a suitable central tower. The outer tubing and the pressure line 27 connected thereto and the corresponding cylinder 26 are filled with the operating fluid such as water or oil and likewise the inner tubing and the pressure line 28 connected therewith and the corresponding cylinder 26 are filled with said fluid, said operating fluid also filling the cylinder 14 above and beneath the piston 16. Consequently there will be two columns of operating fluid, one in the outer tubing 1 and one in the inner tubing 4. As the pistons 29 reciprocate pressure will be applied to one of said columns and simultaneously relieved from the other in

alternate succession and the piston 16 will be correspondingly reciprocated thus reciprocating the pump plunger 19. The cylinder 10 will be submerged in the liquid to be pumped and upon upward movement of the pump plunger 19 the liquid will enter through the valves 11 into the cylinder 10 beneath said plunger and the liquid in said cylinder 10 above said plunger will enter the chamber 24 through the ports 20 and pass on into the eduction tube 8. Upon downward movement of the plunger 19 the liquid from the well will flow into the cylinder 10 above the plunger through the valves 12 and the liquid in the cylinder 10 beneath said plunger will pass in through the ports 20 to the chamber 24 and thence up through the eduction tube 8 and with each downward and upward stroke of the pump plunger 19 the pumped liquid will be discharged through the eduction tube 8.

20 The drawings and specification now disclose what is considered to be a preferred form of the invention by way of illustration only, while the broad principle of the invention will be defined by the appended claim.

25 What I claim is:

30 A deep well pump comprising an outer tubing, a tubular packer within and forming a fluid-tight seal with the wall of said outer tubing, an inner tubing extending down into the outer tubing, said outer tubing having a seal through which the inner tubing extends, a tubing head attached to the top of the inner tubing, an eduction tube ex-

tending through and forming a fluid-tight joint with the tubing head and extended down through the inner tubing, a lower cylinder anchored to and extended beneath said packer, said cylinder having inwardly opening valves at its lower and upper ends and having an enlarged head upon the upper end of said cylinder, an upper operating cylinder whose lower end is connected to said cylinder head, said operating cylinder having inlet ports at its respective ends, one communicating said upper cylinder with the outer tubing and the other communicating the upper cylinder with the inner tubing, an operating piston within said operating cylinder between said ports, said eduction tube extending through said piston and through the operating cylinder and terminating in the lower cylinder, a tubular piston rod around the eduction tube and attached, at its upper end, to said piston, said piston rod being extended through and forming a fluid-tight joint with said cylinder head, a hollow pump plunger in the lower cylinder to which said piston rod is connected, whereby the piston and plunger are rigidly connected together, inwardly opening upper and lower valves controlling the flow of liquid through said pump plunger into the eduction tube, means for anchoring the eduction tube to the upper end of the operating cylinder, and means for alternately applying fluid under pressure through said upper and lower ports to opposite sides of said piston.

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