C. C. SCHARPENBERG.

WELL PUMPING APPARATUS.

APPLICATION FILED APR. 1, 1922.

1,428,300. Patented Sept. 5, 1922.

Fig. 1.

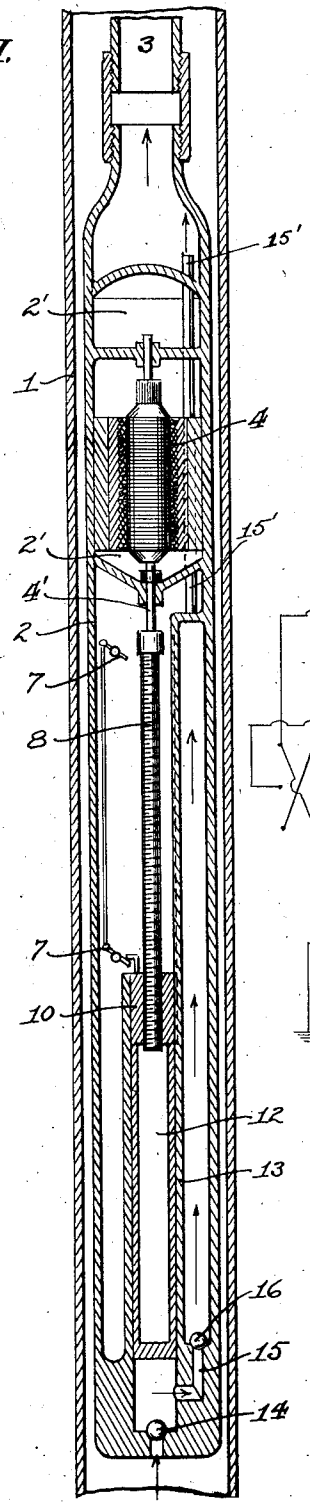


Fig. 2.

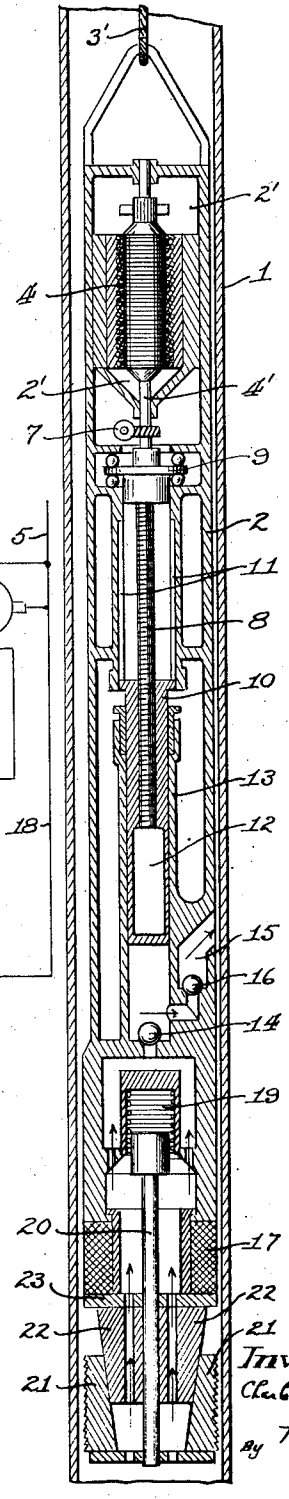
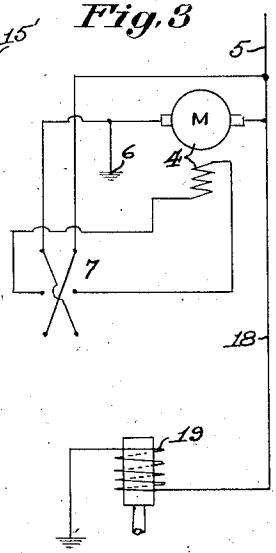


Fig. 3



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UNITED STATES PATENT OFFICE.

CHARLES C. SCHARPENBERG, OF BAKERSFIELD, CALIFORNIA.

WELL PUMPING APPARATUS.

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To all whom it may concern:

Be it known that I, CHARLES C. SCHARPENBERG, a citizen of the United States, residing at Bakersfield, in the county of Kern and State of California, have invented certain new and useful Improvements in Well Pumping Apparatus, of which the following is a specification.

My invention relates to pumping apparatus especially adapted for wells.

My invention is especially applicable for pumping crude oil from wells, and it consists in the novel pumping apparatus which I shall hereinafter fully describe.

The several objects and advantages of my invention will be made clear in the course of the following specification.

Referring to the accompanying drawings:—

Fig. 1 is a vertical section of my apparatus, showing it in its simplest form.

Fig. 2 is a vertical section showing the apparatus in its more complete development, to reach further desirable results.

Fig. 3 is the wiring diagram, showing conventionally the simplest arrangement of the electric circuits which, for the sake of clearness, are omitted from Figs. 1 and 2.

1 is the well casing. 2 is a shell which forms a carrying member for the pump and motor, said shell being suspended in the well casing. In the simplest form of the apparatus, shown in Fig. 1, the suspension of the device is by means of a tubing string 3, which communicates with the shell. In the more developed form of Fig. 2, the tubing string is dispensed with, and the device is suspended by a cable 3′.

Within the upper portion of the shell 2 is a reversing motor 4, which receives its current as shown in the wiring diagram, Fig. 3, through a wire 5 and is grounded on the other terminal by a wire 6. The motor is fitted within a closed chamber 2′ of the shell, and is to run in a fluid, either gas or liquid, preferably oil, which by being under pressure tends to resist any exterior collapsing pressure on the shell and also serves to conduct away the motor heat.

The shaft 4′ of the motor extends through the floor of the motor chamber 2′, and has an associated motor-reversing switch of any suitable form. Reversing switches being well known, I have not deemed it necessary to illustrate any specific structure of switch, its presence and function being sufficiently shown conventionally in Fig. 3, but in Figs. 1 and 2 I have at 7 indicated means by which it may be automatically operated from a moving part of the apparatus.

To the lower end of the motor shaft is connected a screw-threaded shaft 8, the end thrust of which is taken care of by the bearing 9, shown in Fig. 2. The lower portion of the screw shaft 8, engages a nut 10, which is held against turning on its axis by suitable fixed guides 11, Fig. 2, which, however, permit the reciprocative linear movement of the nut, due to the rotary movement of the screw shaft.

The nut 10 is part of or is fastened to the plunger 12 of the pump barrel 13. The pump barrel has an inlet check valve 14, and above this valve is a discharge port 15 controlled by a check valve 16. In the form of Fig. 1, the exit port 15 communicates with the lower interior of the shell 2. A pipe 15′ leads through the shell chamber 2′ to the upper interior of the shell which, as before stated communicates with the tubing string 3. In the form of Fig. 2 the exit port 15 leads through the shell wall to its exterior, into the space within the well casing 1.

In operation, due to the frequent reversals of the motor shaft 4′ and the screw shaft 8, the nut 10 is alternately raised and lowered, thus reciprocating the pump plunger. On the up-stroke the oil, as shown by the arrows, is drawn in through the check valve 14 and expelled on the down stroke through the check valve 16. Thence in Fig. 2, it passes into the outside well casing 1 and is lifted therein to the mouth of the well. In Fig. 1, the discharged oil passes up within the shell 2, and through the pipe 15′ into the tubing string 3 and thence to the well mouth.

In the developed form of Fig. 2, in which the tubing string is dispensed with, and the well casing alone functions as the discharge conduit, there is carried on the foot of the shell 2 a packer 17, adapted for expansion against the well casing to prevent the oil above from flowing back to any point below the pump. While the pump is being lowered into position, the packer 17 is contracted and therefore inoperative.

When ready for setting, an electric current, as shown in Fig. 3, is sent through the circuit wire 18 leading from the motor circuit above, and put through the solenoid

coils 19 to lift the solenoid core rod 20, which carries at its lower end the toothed slips 21, Fig. 2. These slips acting upon the taper surfaces of a member 22 having a collar 23 which bears up against the packer 17, are thereby expanded tightly against the well casing 1. The taper member 22 then settling down under the weight of the pump, expands the slips with increased pressure against the casing, and this results in expanding the packer 17 against the casing. The pump is then ready for operation which is accomplished by turning on the electricity, or, in the case here shown, as the circuit to the solenoid proceeds from the motor circuit, the packer may be set simultaneously with the start of pumping operation.

In the pumping of crude oil from deep wells much trouble is experienced, due to friction losses and to sand which collects in the pump, causing excessive wear upon pipe and valves. It is also usual to have a special conduit pipe or tubing string, such as is shown by 3 in Fig. 1, within the well casing.

By the use of my apparatus, these friction losses are avoided; no sand collects in the pump; and no special conduit pipe or tubing string need be used with the form of Fig. 2.

In present practise, so much sand frequently collects in the pump that the plunger sticks and cannot be moved. It is then necessary to pull the pump out of the well for cleaning. These pumps are placed, usually, at least 2000 feet below the surface, being suspended on a tubing string, serving as a conduit for the pumped oil, and through which the string of pump rods pass. This string of rods must also be pulled when the pump sticks. This "pulling" of the well is expensive. It is also slow and keeps the well from producing. By eliminating the pumping rods, as in Figs. 1 and 2, or both rods and tubing, as shown in Fig. 2, these losses are reduced, and a pump may be provided relatively small in diameter.

It is to be understood that changes in arrangement and details of construction of the interrelated working parts and their connections may be made without affecting the essential principles of my invention as defined in my claims hereunto appended.

I claim:—

1. A pumping apparatus comprising a shell adapted for suspension within the fluid to be pumped; a reciprocative pump member within said shell; a conduit member into which the pump member discharges; a reversing electric motor within the shell; and connections for driving the reciprocative pump member from the motor, consisting of a threaded shaft connected with the motor shaft, and a traveling nut connected with the pump plunger.

2. A pumping apparatus for wells comprising a shell adapted for suspension within a well-casing; a pump member within the shell, and adapted to discharge into the well casing; a motor within the shell adapted for driving the pump; and a packer carried by the shell, adapted to shut off the space within the well casing below the pump.

3. A pumping apparatus comprising a shell adapted for suspension within a well-casing; a pump member within the shell and adapted to discharge into the well casing; an electric motor within the shell adapted for driving the pump; and an electrically actuated packer device carried by the shell adapted to shut off the space within the well casing below the pump.

4. A pumping apparatus comprising a shell adapted for suspension within a well-casing; a pump member within the shell and adapted to discharge into the well casing; an electric motor within the shell adapted for driving the pump; and an electrically actuated packer device carried by the shell adapted to shut off the space within the well casing below the pump, said packer device consisting of slips adapted to engage the casing wall; a solenoid to actuate the slips and a wedge member coacting with the slips to expand the packer.

5. A pumping apparatus for wells comprising a motor; a pump connected with and operated by the motor; means for suspending the motor and pump within the well; and means for packing the well below the pump.

6. A pumping apparatus for wells comprising an electric motor; a pump connected with and operated by the motor; means for suspending the motor and pump within the well; and an electrically actuated packer for closing the well below the pump.

7. A pumping apparatus for wells comprising an electric motor; a pump connected with and operated by the motor; a member carrying the motor and pump; means for suspending the carrying member within the well; and an electrically actuated packer mounted on the carrying member for closing the well below the pump.

8. A pumping apparatus for wells comprising an electric motor; a pump connected with and operated by the motor; means for suspending the motor and pump within the well; an electrically actuated packer for closing the well below the pump; an electric circuit to the motor; and an electric circuit from the motor circuit to the packer.

In testimony whereof I have signed my name to this specification.

CHARLES C. SCHARPENBERG.