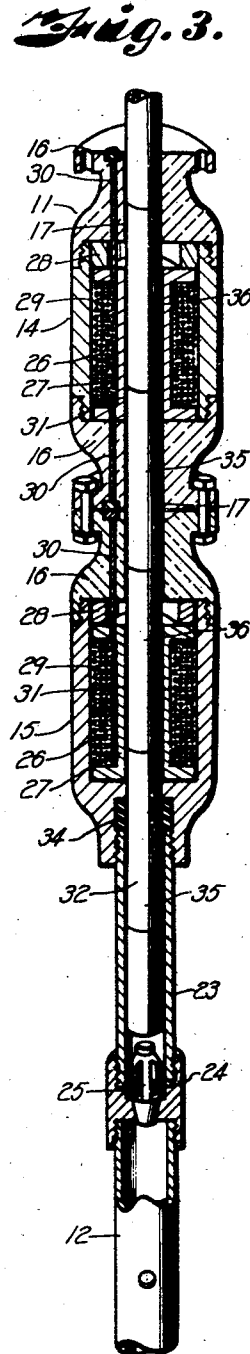
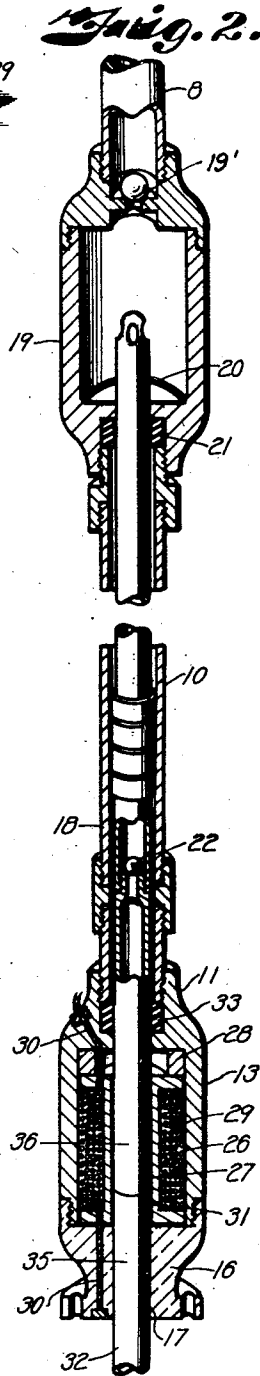
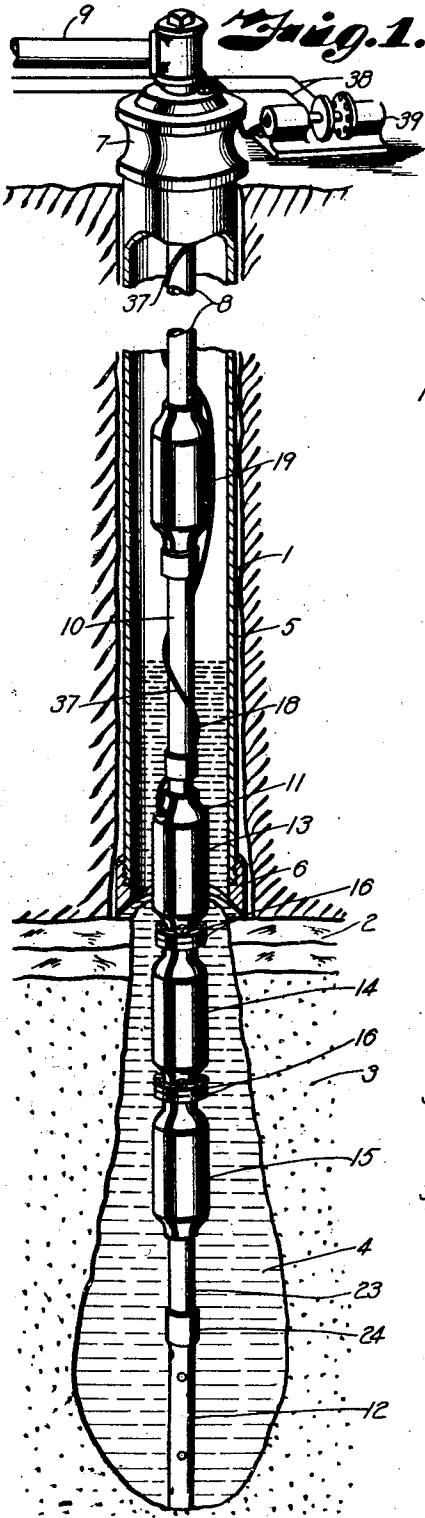


Jan. 12, 1932.

I. B. WINSOR
ELECTROMAGNETIC PUMP

Filed Jan. 20, 1930

1,840,994



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ELECTROMAGNETIC PUMP

Application filed January 20, 1930. Serial No. 421,986.

My invention relates to apparatus for pumping wells and more particularly to apparatus of that character including a solenoid type motor for direct operation of a well pump and adapted for heating the liquid petroleum accumulated at the bottom of the well; the principal object of the invention being to accelerate flow from the oil sand to the well through tubing leading from the well, by dissolving the paraffine and other congealable contents which at normal well temperatures tend to retard flow of the oil.

In accomplishing this and other objects of the invention, I have provided improved details of structure, the preferred forms of which are illustrated in the accompanying drawings, wherein:

Fig. 1 is a vertical section of an oil well equipped with pumping apparatus in accordance with my invention.

Fig. 2 is an enlarged, central, longitudinal section of the pump and motor, showing the pump plunger and core member at the lower limit of their stroke.

Fig. 3 is a similar view of the lower portion of the motor.

Referring in detail to the drawings:

1 designates an oil well extending through cap rock 2 above the oil sand 3 to a shot hole 4, and lined with casing 5 supported on the cap rock by a shoe 6, the upper end of the casing being provided with the usual casing head 7 supporting well tubing 8, in accordance with common practice.

The upper end of the well tubing is connected with an outlet pipe 9 leading to a storage tank or flow line (not shown), and the lower end of the tubing is connected, through the pump 10 with the motor 11 which may be supported from the bottom of the well by a strainer 12.

The motor 11, which I employ is of solenoid type similar to that disclosed in my co-pending application, Serial No. 371,980 and includes a plurality of individual housing sections 13, 14 and 15, connected by insulating couplings 16 having central openings 17 in axial alignment with the housing sections.

The upper section 13 of the motor housing

is connected with a pump barrel 18 provided at its upper end with a container 19 with a check valve 19' at its top communicating with the tubing 8, and a hollow plunger 20 sealingly engaging a packing gland 21 in the container, and having a valved inlet 22.

Depending from the lower housing section 15 is a nipple 23 provided with a coupling 24 for connection with the strainer 12, and fitted with a standing valve 25 for checking return flow of fluid to the strainer.

Inclosed in each housing section is a solenoid 26 including a spool 27 secured in the respective sections by a clamping ring 28, and carrying an induction coil 29 preferably constructed of asbestos insulated copper wire for heating purposes, and having connector branches 30 connecting the coils to the respective housing sections in circuit.

The openings 31 of the spools 27 register with the openings 17 of the couplings 16 for receiving a reciprocable core member 32 sealingly engaged in packing glands 33 and 34 in the upper and lower housing sections.

The core member 32 comprises tubular magnetic sections 35 cooperative with the solenoids and connected by non-magnetic sections 36, and the upper end of the member is connected with the pump plunger 20 for effecting reciprocation of the plunger when the motor is in operation.

Leading from the induction coil of the upper housing section is a conduit cable 37 extending through the casing head 7 and connected in circuit with electric current supply lines 38 through an automatic solenoid switch 39, whereby the circuit is intermittently opened and closed for supplying electric current to the solenoids.

In practicing with the apparatus as herein illustrated and described, the operation is as follows:

When the solenoids 26 are connected in circuit with the supply lines 38 by the switch 39, the induction coils 29 are energized for heating the core member 32 and the housing sections 13, 14 and 15, and magnetizing the solenoids. The fluid at the bottom of the well is heated by its contact with the heated housing sections, causing the paraffine or

other congealable content of the fluid to be dissolved, and the magnetic sections 35 of the core member 32 are attracted by the magnetized solenoids, thereby lifting the core member and pump plunger 20 for an upward stroke and causing a charge of fluid to be drawn through the standing valve 25 into the heated core member.

When the upward stroke is completed, the circuit to the solenoids is automatically opened by the solenoid switch and the core member and pump plunger are returned to their normal downward limit by gravity, preparatory for the succeeding upward stroke, the heated fluid passing upwardly through the pump plunger to be discharged through the tubing 8 and flow line 9 by continued reciprocation of the plunger.

It will be obvious that the lowered viscosity of the fluid and the direct operation of the pump will accelerate displacement of the fluid from a well and with a minimum of power.

What I claim and desire to secure by Letters Patent is:

1. In combination with well casing and tubing, a pump in the casing below the tubing having a hollow reciprocable plunger, a solenoid motor in the casing below the pump including heat dispensing units, and a hollow core member operably connected with said plunger, and an automatic switch controlling intermittent delivery of electric energy to said motor to actuate the pump for pumping liquid from the well through said hollow core and plunger.

2. In combination with well casing and tubing, a pump barrel below the tubing having a receiving chamber communicating with the tubing, a hollow, valved plunger in said barrel, a solenoid motor below said barrel including individual solenoids adapted for generating heat when energized, and a core member responsive to said solenoids and operably connected with said plunger, the core member having a through channel for delivery of fluid through the solenoids to said plunger.

3. In combination with well casing and tubing, a pump barrel below the tubing having a receiving chamber communicating with the tubing, a hollow valved plunger in said barrel, a solenoid motor below said barrel including individual solenoids adapted for generating heat when energized, a hollow core member including magnetic sections responsive to respective solenoids and operably connected with said plunger, and a magnetic switch controlling intermittent delivery of electric energy to said motor to actuate the pump for pumping liquid from the well through said hollow core and plunger.

4. In combination with well casing and tubing, a pump barrel below the tubing having a receiving chamber communicating with the tubing, a hollow plunger reciprocable in the barrel, having a valved inlet, and hav-

ing an outlet in said receiving chamber, a solenoid motor below said barrel including a plurality of solenoids connected in circuit, a hollow core member operably connected with said plunger and including insulated magnetic sections responsive to respective solenoids, and a solenoid switch for automatically opening and closing the circuit to said motor to actuate the pump for pumping liquid from the well through said hollow core and plunger.

5. In combination with well casing and tubing, a pump barrel below the tubing having a receiving chamber communicating with the tubing, a hollow plunger reciprocable in the barrel having a valved inlet and having an outlet in said receiving chamber, a packing gland on said barrel sealingly engaging said plunger, a solenoid motor below said barrel including a plurality of insulated solenoids connected in parallel circuit, a hollow core member operably connected with said plunger and including insulated magnetic sections cooperating with respective solenoids, a packing gland on said motor sealingly engaging said core member, and an automatic solenoid switch for intermittently opening and closing the circuit to said solenoids to actuate the pump for pumping liquid from the well through said hollow core and plunger.

In testimony whereof I affix my signature.

IRWIN B. WINSOR.

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