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APPARATUS FOR PUMPING OIL WELLS.

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1,433,871.

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Fig. 1.

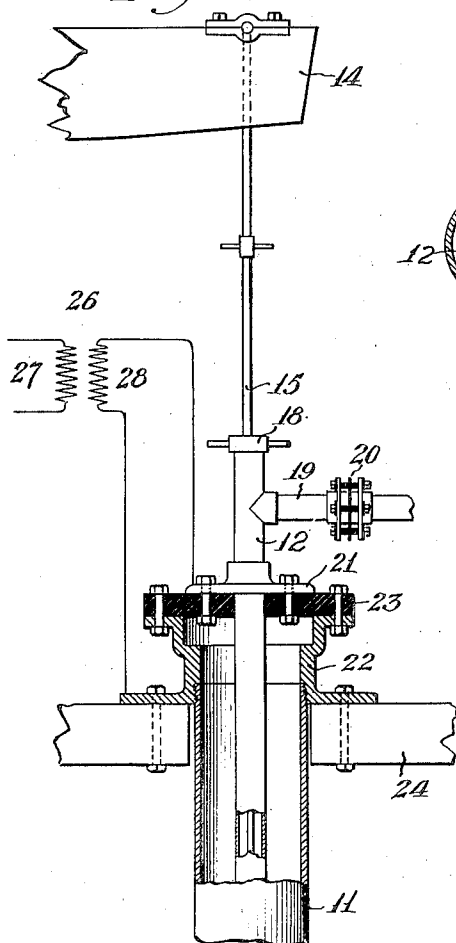


Fig. 2.

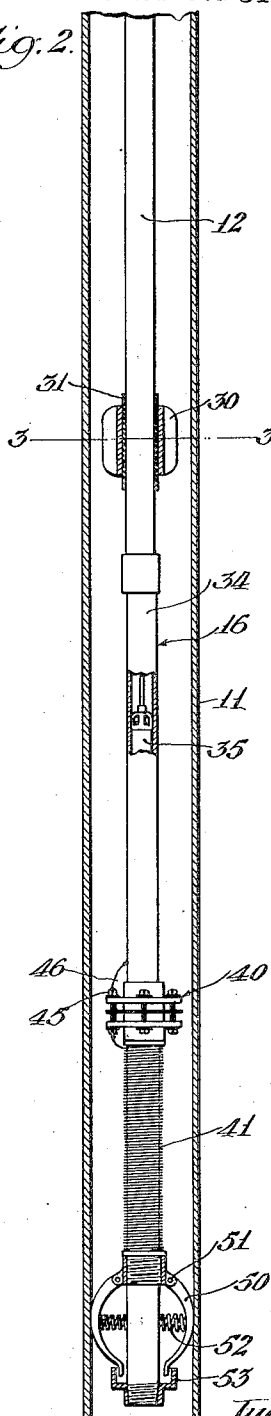


Fig. 3.

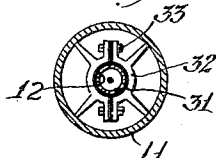
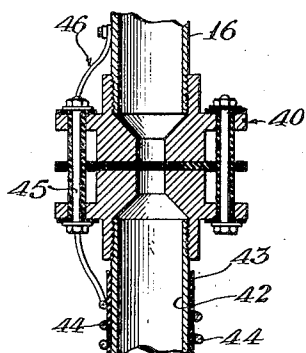


Fig. 4.



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DANA BURKS, OF VENICE, AND HUGH A. BARDEEN AND FORD W. HARRIS, OF LOS ANGELES, CALIFORNIA; SAID BARDEEN AND SAID HARRIS ASSIGNORS TO SAID BURKS.

APPARATUS FOR PUMPING OIL WELLS.

Application filed January 27, 1919. Serial No. 273,467.

To all whom it may concern:

Be it known that we, DANA BURKS, residing at Venice, in the county of Los Angeles, State of California, HUGH A. BARDEEN, residing at Los Angeles, in the county of Los Angeles, State of California, and FORD W. HARRIS, residing at Los Angeles, in the county of Los Angeles, State of California, all of us being citizens of the United States, have invented a new and useful Apparatus for Pumping Oil Wells, of which the following is a specification.

The invention relates to oil wells, and more particularly to the production of very heavy oils and asphalts. There are found in nature in many localities large deposits of asphalts, tars or asphaltic oils which are very thick and heavy and which are extremely difficult to pump by ordinary means.

The invention is designed to facilitate the removal of such oils from the ground.

Other objects and advantages will be made evident hereinafter.

Referring to the drawings which are for illustrative purposes only,

Fig. 1 is a somewhat diagrammatic cross-section of the upper portion of an oil well equipped with our invention.

Fig. 2 is a similar cross-section of the lower portion of the same well.

Fig. 3 is a section on a plane represented by the line 3—3, Fig. 2.

Fig. 4 is an enlarged section of the insulating coupling used near the bottom of the well.

The well consists of a well casing 11, tubing 12, a walking beam 14, a system of pump rods 15 which pass down through the tubing 12, and a pump 16, these parts being common to oil wells and the parts shown not being materially different from those used in common practice.

The casing 11 is ordinarily more or less permanently in place in the well and the tubing 12 is ordinarily so placed that it may be withdrawn from time to time for the purpose of making repairs in the pump 16.

In applying the invention to an oil well we supply certain additional parts. The tubing 12 terminates at its upper end in a stuffing box 18 which surrounds and makes an oil tight joint with the rods 15 and is provided with an outlet pipe 19 in which we place an electric insulating coupling 20. We also support the tubing 12 on a flange 21

which is supported on and insulated from a casing head 22, insulation 23 being provided for that purpose. The casing head 22 is supported on the floor 24 of the derrick of the oil well. A transformer 26, having a primary 27 and a secondary 28, is provided, the secondary 28 being connected to the flange 21 and to the casing head 22. The casing 11 is threaded in the casing head 22 and forms a gas and oil tight joint therewith, the insulation 23 forming a gas and oil tight connection between the tubing 12 and the casing 11. The tubing 12 is insulated by the insulation 23 from the casing 11 at the top and hangs inside the well and free from the casing 11.

For the purpose of insuring the insulation of the tubing 12 from the casing 11 throughout its length, insulating members 30 are placed at intervals on the tubing 11. These members 30 may consist of a sheet of insulation 31 having clamps 32 secured thereon by means of bolts 33. The tubing 12 terminates in the pump barrel 34 of the pump 16 and the rods 15 are connected to the plunger 35 of the pump, which is provided with valves, not shown, in accordance with standard oil well practice.

Secured to the extreme bottom end of the pump barrel 34 by means of an insulating coupling 40 is an electric heater 41, this heater consisting of a metal tube 42 having insulation 43 wound thereon. Wire 44 is wound upon the insulation 42 and is connected through one of the bolts 45 of the coupling 40 and a wire 46 with the pump barrel 16. The lower end of the wire 44 is connected to the metal tube 42 which is provided with a pair of fingers 50 which are pivoted at 51 and which are forced outwardly against the casing 11 by compression springs 52, their movement being limited by a coupling 53. A free opening is left through the interior of the heater 41 into the bottom of the pump 16.

The method of operation of our invention is as follows:

The current supplied by the transformer 26 passes downwardly through the tubing 12 and pump 16 and through the bolt 45 into the wire 44 of the heater, passing through this wire to the fingers 50 which are maintained in mechanical and electrical contact with the casing 11. Current passes upwardly through the casing, and in some cases

partially through the ground, to the casing head 22 and thence to the transformer. The pump is operated in the usual manner through the pump rods 15, the oil being drawn through the interior of the heater where it is heated to such a degree that its viscosity is greatly reduced. This hot oil is comparatively easy to pump, being delivered through the pipe 19 to any suitable cooling or refining apparatus.

The heating of the oil in many cases tends to gasify some of the lighter constituents thereof which fill the tubing 16 and lighten the column of oil therein. On some oils and under certain conditions it is unnecessary to use the pump 16 or the rods 15 which may be omitted, the heater 41 heating the oil to such a degree that it flows upwardly, the natural pressure of the oil in the ground being sufficient to lift the lightened column in the tubing 12.

The heating of the oil around the outside of the heater 41 heats the casing 11 and the oil strata around it. The heat from the bottom of the well is transmitted slowly outwardly in all directions and tends to increase the flow of oil into the well through natural channels, melting any paraffine or asphaltic deposits which may exist and which impede the natural flow of the oil.

It is quite essential that the space between the tubing 12 and casing 11 are tightly sealed at the top so that oil or gas cannot escape from this space except through the tubing. In many wells the heater gradually heats up the oil in the bottom until enough gas pressure accumulates outside the tubing to force practically all the oil out of the well through the tubing 12. The gas pressure inside the well being thus relieved cooler oil flows in from the surrounding strata and a further reduction in pressure takes place in the well due to this cooling. This flow continues until the heater 41 can sufficiently heat the oil to build up some pressure. As the oil is further heated the gas pressure around the tubing 12 increases and some of the heated oil in the bottom of the well is forced back into the strata, helping to dissolve the paraffine and asphalt. As soon as the gas pressure due to this heating rises sufficiently the well again empties itself through the tubing. This procedure of intermittently flowing and then remaining quiescent while pressure builds up is generally called "flowing by heads" and is a commonly observed characteristic of many wells.

What we claim is:—

1. In an oil well, the combination of a casing; a tubing suspended inside said casing; means for impressing an electromotive force between said tubing and said casing; an electrically actuated device in said well connected between said tubing and said casing; insulating members carried on said tubing and spacing said tubing from said casing; and means for securing said insulating members rigidly on said tubing.

2. In an oil well, the combination of a casing; a tubing suspended inside said casing; means for impressing an electromotive force between said tubing and said casing; an electrically actuated device in said well connected between said tubing and said casing; sheets of insulating material wrapped about said tubing; and members clamped on said insulating material and spacing said tubing from said casing.

3. In an oil well, the combination of a casing; a tubing suspended inside said casing; means for impressing an electromotive force between said tubing and said casing; an electrically actuated device in said well connected between said tubing and said casing; means for insulating said tubing from said casing; and insulating means for supporting the upper end of said tubing.

4. In an oil well, the combination of a casing; a tubing suspended inside said casing; means for impressing an electromotive force between said tubing and said casing; an electrically actuated device in said well connected between said tubing and said casing; means for insulating said tubing from said casing; and insulating means for supporting the upper end of said tubing upon said casing.

5. In an oil well, the combination of: a casing; a member formed of metal suspended inside said casing; means for impressing an electromotive force between said member and said casing; an electric heater suspended in said well and electrically connected between said member and said casing; insulating members carried on said member spacing said member from said casing; and means for securing said insulating members on said metal member.

In testimony whereof, we have hereunto set our hands at Los Angeles, California, this 7th day of January, 1919.

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