June 27, 1933. F. M. LEWIS 1,915,895

OIL WELL HEATER

Filed May 25, 1932

Fig. 1A.

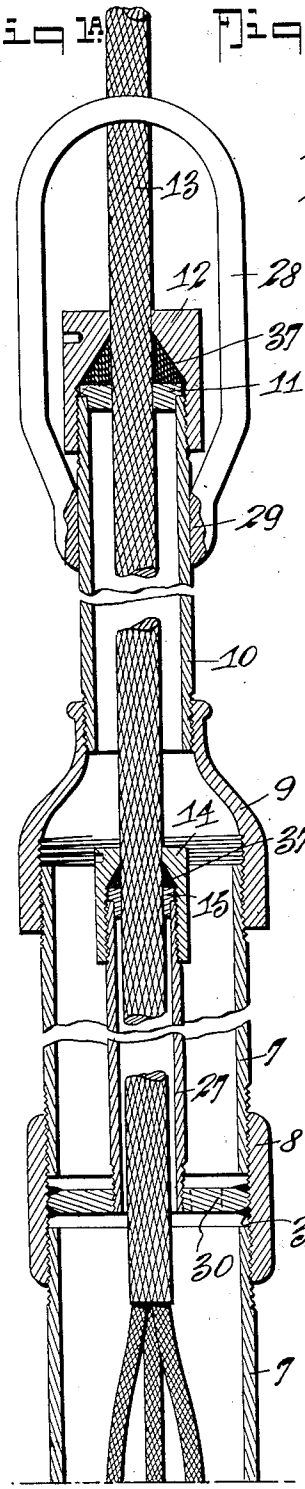


Fig. 1B.

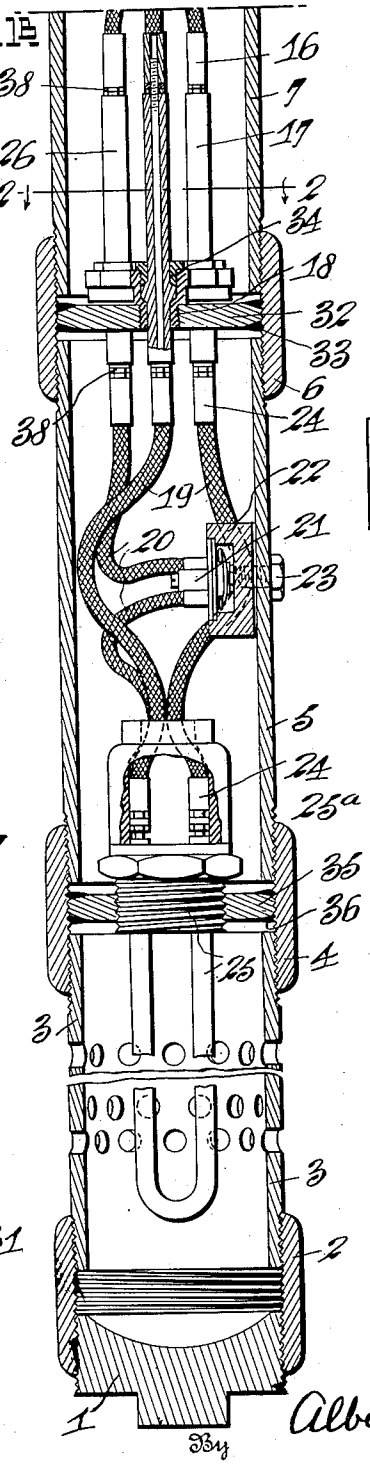
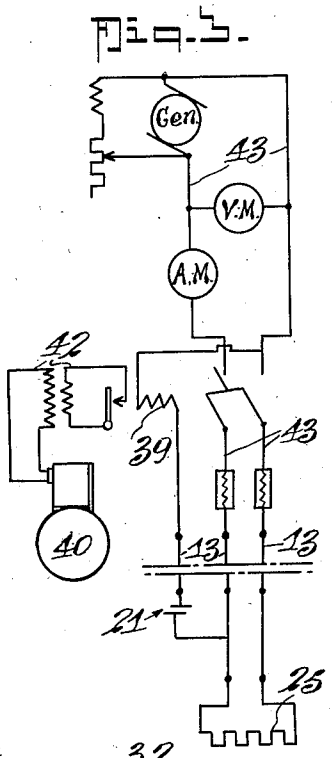


Fig. 3.



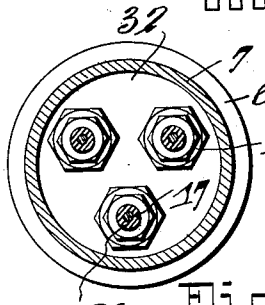


Fig. 2.

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UNITED STATES PATENT OFFICE

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OIL WELL HEATER

Application filed May 25, 1932. Serial No. 613,516.

My invention is an electric heater for use in oil wells to melt the paraffine in the bottom of the wells which restricts the flow of the oil. I am aware that electric oil well heaters have heretofore been devised but all such which have come to my attention have been deficient in one way or another; some are objectionable because the life of the electrical units and power cables is too short; some make no adequate provision to protect the electrical wires, terminals, and contacts against short circuits due to water and moisture leaking into the heater or being deposited by condensation; some make no adequate provision to prevent the insulation of the cables rotting due to the presence of oil seepage; others are too expensive; others are inefficient in operation, etc.

My invention has for its object to provide an oil heater which is free from the objections above noted and one which will readily and effectively serve its intended purpose.

Other objects will in part be obvious and in part be pointed out hereinafter.

To the attainment of the aforesaid objects and ends, the invention still further resides in the novel details of construction, combination and arrangement of parts, all of which will be first fully described in the following detailed description, then be particularly pointed out in the appended claims, reference being had to the accompanying drawing, in which:—

Figure 1*a*—1*b* is a vertical longitudinal section of my improved heater.

Figure 2 is a horizontal section on the line 2—2 of Figure 1*b*.

Figure 3 is a diagrammatic view hereinafter referred to.

In the drawing I have shown the preferred embodiment of my invention which I shall now describe in detail as the same has been made up for actual use, although I desire it understood that I do not wish to limit myself to the sizes and proportions of parts hereinafter specified except insofar as they may be specifically recited in the appended claims.

In the embodiment of my invention shown 1 represents a four-inch iron pipe plug screwed into the lower end of a four-inch iron pipe coupling 2 that in turn is screwed onto the lower end of a perforated four-inch iron pipe section 3 of about there feet in length. The upper end of the pipe section 3 is screwed into a four-inch iron pipe coupling 4. This coupling 4 has screwed into it a disk 35 which is permanently secured about midway the ends of the coupling by welding as at 36. The disk 35 has a central threaded aperture into which is tightly threaded the plug of a heating unit 25 of which more will be said later.

The coupling 4 has a four-inch pipe section 5 of about twelve inches in length screwed into it and this pipe section is in turn coupled, as at 6, to the lower one of two iron pipe sections 7, there being a partition disk 32 threaded into the coupling 6 and welded thereto as at 33. The disk 32 has three tapped holes for the spark-plug-type seal joints 18.

The two pipe sections 7 are coupled together by a coupling 8 which also carries a partition disk 30 that is threaded into the coupling and welded thereto as at 31. The disk 30 has a central threaded hole into which is screwed a one and one-quarter inch iron pipe 27 about twelve inches long. The upper pipe section 7 is coupled to a two-inch iron pipe 10 of any desired length by means of a reducing joint coupling 9. The upper end of the pipe 10 receives the stuffing box ring 11 and the stuffing box cable 12 which is screwed thereon.

The cable (three-strand) 13 passes through the stuffing box 12 and pipe 10, stuffing box 14 and pipe 27 into the lower pipe section 7. Suitable packing 37 is used in the stuffing boxes to effect a water-tight joint where the cable passes through. The cable 13 is a special cable with varnished cambric insulation, with a cotton braid impregnated with a tar compound over each conductor and surrounded by a suitable braid which will withstand both heat and oil, and to some degree, water.

The pipe 27 has its upper end provided with a stuffing box 15 and a stuffing box cable 14 through which the cable 13 passes and is secured water-tight by suitable packing 37.

The several strands of the cable 13 are tipped with brass terminals 16 which are threaded onto the projecting upper ends of

the conductor rods 26. The rods 26 are secured in suitable insulators 17 held in spark-plug-type joints 18 that are threaded into the disk 32 in a fluid-tight manner. The rods 26 are secured to the insulator by nuts 38—38.

Extra flexible asbestos covered copper wire connecting cables of suitable size have brass terminals 24 threaded to two of the rods 26 and to the two thread-rod terminals 25*a* of the heating unit 25. 20 are other flexible asbestos covered cables of suitable carrying capacity which have threaded terminals 24 for connecting the third thread-rod 26 with the thermostat 21. The thermostat is connected to the return terminal of the heater unit by a cable section 20 for a purpose presently explained.

The thermostat includes a housing 22 secured within the pipe 5 as at 23.

28 is a bale formed of steel bar welded at its ends to the upper extremity of the pipe 10. By means of this bale the heater may be secured to the lowering and raising tackle (not shown).

The plugs 18 may have gaskets 34 like those of the ordinary spark plugs in order to effect a fluid and gas-tight seal.

In the heater which I have built and successfully tested I have found that the presence of the pipe 27 and stuffing box 14—15, etc. prevents water entering the pipe 7 below the partition 30, thereby preventing short circuits in the chamber of the lower pipe section 7 and materially increasing the life and efficiency of the apparatus, the plug 25 being screwed gas and fluid-tight in the disk 35 and the members 18 being similarly screwed into the disk 32, the chamber of the pipe 5 is maintained gas-tight.

Any water of condensation in the pipe 10 and the upper section of the pipe 7 next below it is trapped in the chamber surrounding the pipe 27.

The parts 6, 32, 17 and 18 comprise a unit assembly having several important features, namely it provides a convenient and easy means to connect and disconnect the lead-in cable 13 with the thermostat and with the heating element, both in assembling and dismantling the heater; it provides additional insurance against water from leakage or condensation (elements 17 extend above element 18 so as to provide in pipe 7 a second well for the collection of condensation); it makes a gas-tight chamber for the thermostat where an explosive mixture could form from the spark when the thermostat operates, and it provides a rigid connection for the conductors.

The thermostat which I use is of standard make and serves to operate a relay 39 to break the ignition circuit of the gas engine 40 which drives the dynamo 41 that furnishes power for the heating circuit 43 (see Figure 3) and thus prevents overheating the oil.

The whole heater is an assembly of standard parts easily obtainable. All of these parts were chosen to accomplish certain results and for their suitability for the particular purpose. The features and requirements for a heater of this type are that the heating element must withstand water and oil and be installed so that there is enough circulation of oil to prevent too high a temperature which would carbonize the oil; the electrical insulation must withstand heat, oil, mechanical abrasion, and to some degree water or moisture; the thermostat must cut off the heater at a temperature which will not damage the heater or the oil; the thermostat chamber must be gas-tight to prevent a possible explosion due to spark of the thermostat; simplicity of construction and selection of parts which can be obtained easily and fabricated in a small machine shop; ease of assembly and repair; the prevention of condensation and water from causing short circuits; and the housing must be oil and gas-tight.

Recent tests under actual working conditions in the field have proved that my heater meets all of the above requirements.

From the foregoing description, taken in connection with the accompanying drawing, it is thought the complete construction, operation and advantages of my invention will be clear to those skilled in the art to which it relates.

What I claim is:

1. In an oil well heater, a tube composed of a series of pipe sections, couplings joining said sections end to end, partitions secured in said coupling between the ends of the pipe sections to divide the tube into a plurality of separate chambers, the lower one of which constitutes the heating chamber, the next above constitutes the control chamber and the second above constitutes the cable terminal chamber, a heater unit secured in the partition between the heating and control chambers with its heating element proper located in the heating chamber and its terminal elements located in the control chamber, a set of spark-plug-type rigid conductor units mounted in the partition between the control chamber and the cable terminal chamber, a thermostat in the control chamber, connector cables between said rigid conductor units and the thermostat and the heater unit terminals, a cable having a set of separate conductors enclosed in a common envelope passed downward into said tube and having its lower conductor ends located in said cable terminal chamber and provided with connectors coupling said ends to said rigid conductor units, and means for sealing said cable in said tube above the cable terminal chamber against passage of water and moisture, said tube having the walls of the heating chamber perforated.

2. In an oil well heater, a tube composed

of a series of pipe sections, couplings joining said sections end to end, partitions secured in said couplings between the ends of the pipe sections to divide the tube into a plurality of separate chambers, the lower one of which constitutes the heating chamber, the next above constitutes the control chamber and the second above constitutes the cable terminal chamber, a heater unit secured in the partition between the heating and control chambers with its heating element proper located in the heating chamber and its terminal elements located in the control chamber, a set of spark-plug-type rigid conductor units mounted in the partition between the control chamber and the cable terminal chamber, a thermostat in the control chamber, connector cables between said rigid conductor units and the thermostat and the heater unit terminals, a cable having a set of separate conductors enclosed in a common envelope passed downward into said tube and having its lower conductor ends located in said cable terminal chamber and provided with connectors coupling said ends to said rigid conductor units, there being a partition in the tube at the top of said cable terminal chamber which has an aperture for the passage of said cable, a standpipe secured at its lower end in said aperture, through which pipe the cable passes, and a stuffing box at the top of said standpipe for sealing the cable thereto.

3. In an oil well heater, a tube composed of a series of pipe sections, couplings joining said sections end to end, partitions secured in said couplings between the ends of the pipe sections to divide the tube into a plurality of separate chambers, the lower one of which constitutes the heating chamber, the next above constitutes the control chamber and the second above constitutes the cable terminal chamber, a heater unit secured in the partition between the heating and control chambers with its heating element proper located in the heating chamber and its terminal elements located in the control chamber, a set of spark-plug-type rigid conductor units mounted in the partition between the control chamber and the cable terminal chamber, a thermostat in the control chamber, connector cables between said rigid conductor units and the thermostat and the heater unit terminals, a cable having a set of separate conductors enclosed in a common envelope passed downward into said tube and having its lower conductor ends located in said cable terminal chamber and provided with connectors coupling said ends to said rigid conductor units, there being a partition in the tube at the top of said cable terminal chamber which has an aperture for the passage of said cable, a standpipe secured at its lower end in said aperture, through which pipe the cable passes, a stuffing box at the top of said standpipe for sealing the cable thereto, and another stuffing box at the upper end of said tube for sealing the cable thereto where it enters the tube.

4. In an oil well heater, a tube composed of a series of pipe sections and couplings for connecting them together end to end, transverse partitions threaded into and secured to said couplings to divide the tube into a series of four compartments, the lower one of which constitutes the oil heating compartment, the next above that constitutes the control compartment and the next above that constitutes the cable terminal comparment, while the uppermost compartment constitutes the cable entrance and sealing compartment, means by which lowering and raising tackle may be secured to said tube, the lowermost partition having a threaded hole, a heating unit including a heater proper and a mounting and terminal carrying plug, carried by said lowermost partition with the heater proper located in the heating chamber and the terminals located in the control chamber, the wall of the heating chamber being perforated, a thermostat in the control chamber, the second partition from the bottom having a plurality of threaded apertures, a set of spark-plug-type insulated conductor rod units screwed into the plurality of said threaded apertures, and having the ends of said rods located respectively in the control chamber and in the cable terminal chamber, a cable passed down into said tube and having its strands separately exposed in said cable terminal chamber and provided with connections secured to the adjacent ends of the respective conductor rods, means to seal the cable where it passes into the tube, and also adjacent the upper partition of the cable terminal chamber against passage of water and oil, a set of connector wire cables in said control chamber for effecting connections between said conductor rods and said thermostat and said heating unit terminals.

5. In an oil well heater, a tube composed of a series of pipe sections and couplings for connecting them together end to end, transverse partitions threaded into and secured to said couplings to divide the tube into a series of four compartments, the lower one of which constitutes the oil heating compartment, the next above that constitutes the control compartment and the next above that constitutes the cable terminal compartment, while the uppermost compartment constitutes the cable entrance and sealing compartment, means by which lowering and raising tackle may be secured to said tube, the lowermost partition having a threaded hole, a heating unit including a heater proper and a mounting and terminal carrying plug, carried by said lowermost partition with the heater proper located in the heating chamber and the terminal located in the control chamber, the wall of the heating chamber being per-

forated, a thermostat in the control chamber, the second partition from the bottom having a plurality of threaded apertures, a set of spark-plug-type insulated conductor rod units screwed into the plurality of said threaded apertures, and having the ends of said rods located respectively in the control chamber and in the cable terminal chamber, a cable passed down into said tube and having its strands separately exposed in said cable terminal chamber and provided with connections secured to the adjacent ends of the respective conductor rods, means to seal the cable where it passes into the tube, and also adjacent the upper partition of the cable terminal chamber against passage of water and oil, a set of connector wire cables in said control chamber for effecting connections between said conductor rods and said thermostat and said heating unit terminals, said sealing means comprising a stuffing box at the upper end of said tube, a standpipe within the tube surrounding the cable and mounted fluid-tight on the upper partition of the cable terminal chamber, and a stuffing box on the upper end of said standpipe to seal the cable therein.

6. In an oil well heater, a tube composed of a series of pipe sections and couplings for connecting them together end to end, transverse partitions threaded into and secured to said couplings to divide the tube into a series of four compartments, the lower one of which constitutes the oil heating compartment, the next above that constitutes the control compartment and the next above that constitutes the cable terminal compartment, while the uppermost compartment constitutes the cable entrance and sealing compartment, means by which lowering and raising tackle may be secured to said tube, the lowermost partition having a threaded hole, a heating unit including a heater proper and a mounting and terminal carrying plug, carried by said lowermost partition with the heater proper located in the heating chamber and the terminal located in the control chamber, the wall of the heating chamber being perforated, a thermostat in the control chamber, the second partition from the bottom having a plurality of threaded apertures, a set of spark-plug-type insulated conductor rod units screwed into the plurality of said threaded apertures and having the ends of said rods located respectively in the control chamber and in the cable terminal chamber, a cable passed down into said tube and having its strands separately exposed in said cable terminal chamber and provided with connections secured to the adjacent ends of the respective conductor rods, means to seal the cable where it passes into the tube, and also adjacent the upper partition of the cable terminal chamber against passage of water and oil, a set of connector wire cables in said control chamber for effecting connections between said conductor rods and said thermostat and said heating unit terminals, said spark-plug-type insulated rod units each including insulators which are elongated to extend a substantial distance above the partition which carries them for the purposes specified.

7. In an oil well heater, a tube composed of a series of pipe sections and couplings for connecting them together end to end, transverse partitions threaded into and secured to said couplings to divide the tube into a series of four compartments, the lower one of which constitutes the oil heating compartment, the next above that constitutes the control compartment and the next above that constitutes the cable terminal compartment, while the uppermost compartment constitutes the cable entrance and sealing compartment, means by which lowering and raising tackle may be secured to said tube, the lowermost partition having a threaded hole, a heating unit including a heater proper and a mounting and terminal carrying plug, carried by said lowermost partition with the heater proper located in the heating chamber and the terminal located in the control chamber, the wall of the heating chamber being perforated, a thermostat in the control chamber, the second partition from the bottom having a plurality of threaded apertures, a set of spark-plug-type insulated conductor rod units screwed into the plurality of said threaded apertures, and having the ends of said rods located respectively in the control chamber and in the cable terminal chamber, a cable passed down into said tube and having its strands separately exposed in said cable terminal chamber and provided with connections secured to the adjacent ends of the respective conductor rods, means to seal the cable where it passes into the tube, and also adjacent the upper partition of the cable terminal chamber against passage of water and oil, a set of connector wire cables in said control chamber for effecting connections between said conductor rods and said thermostat and said heating unit terminals, said sealing means comprising a stuffing box at the upper end of said tube, a standpipe within the tube surrounding the cable and mounted fluid-tight on the upper partition of the cable terminal chamber, and a stuffing box on the upper end of said standpipe to seal the cable therein, said spark-plug-type insulated rod units each including insulators which are elongated to extend a substantial distance above the partition which carries them for the purposes specified.

FRANKLIN M. LEWIS.