July 17, 1956 N. W. CURSON 2,754,912

HEATER FOR OIL WELLS

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Fig. 1.

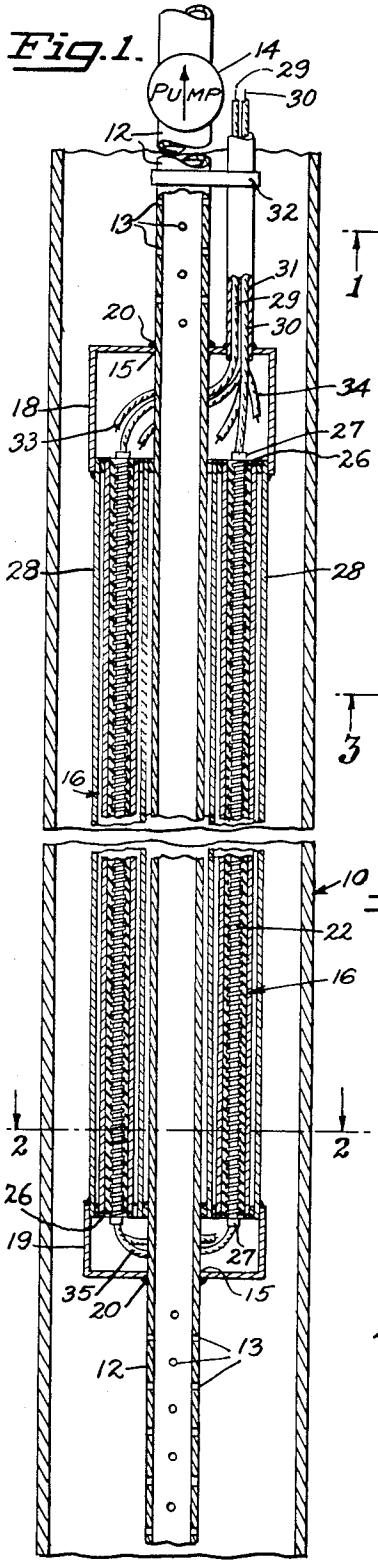


Fig. 2.

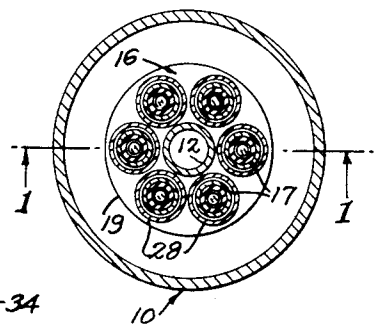


Fig. 4.

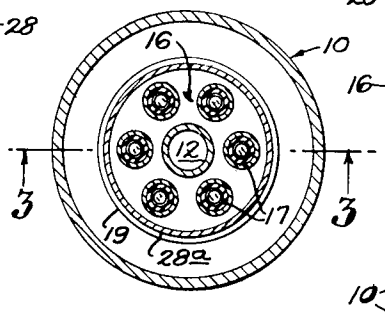


Fig. 5.

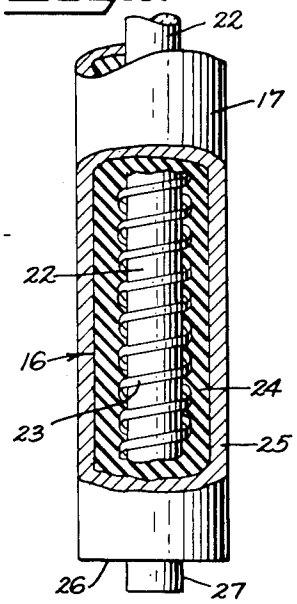
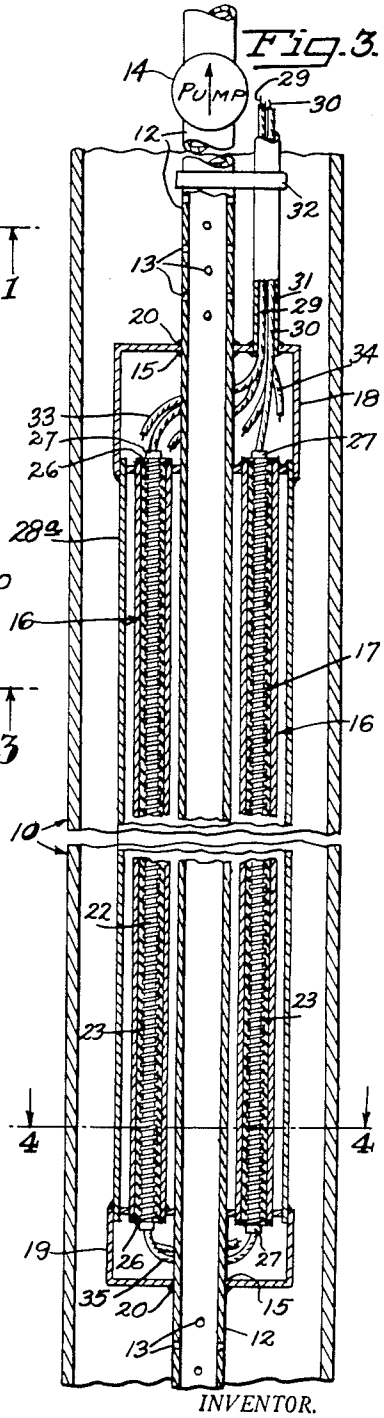


Fig. 3.



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HEATER FOR OIL WELLS

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7 Claims. (Cl. 166—60)

This invention relates to heaters for oil wells and more particularly to heaters which may be mounted on the oil stem or suction pipe and lowered into an oil well casing with the suction pipe and thereby positioned in the oil bearing stratum. Such a heater is particularly desirable when employed in oil wells which require pump pressure to bring the oil to the ground surface, the depth in the ground of the oil stratum being normally several thousand feet below ground surface. Since the temperature at that depth is relatively low, and the oil, especially if it has a low specific gravity, has a viscosity which makes it difficult to pump, it is desirable to reduce the viscosity by heat which not only reduces the viscosity of oil to facilitate pumping, but also effects a vacuum in the suction pipe which causes the oil to flow more freely from the oil strata into the suction pipe. The device of the present invention is an improvement upon existing structures in its simplicity, efficiency, economy and ease of operation.

Briefly described, the invention comprises a heater device which may be suitably secured circumferentially of the lower end of the suction pipe which is lowered into the casing of an oil well in the usual manner, the heater being lesser diameter than the casing and spaced therefrom. The heater comprises a plurality of pairs of parallel relatively spaced elongated electrical heating rods preferably circularly arranged, each heating rod having longitudinally thereof an electrical resistance element enclosed in electric insulating body which is also a heat conductor and in turn enclosed in a protective metal jacket. The heating elements are preferably arranged in pairs in series parallel whereby an electric circuit may be connected at relatively adjacent ends of each pair of heating elements, the current passing therethrough and heating the resistance element. For protective purposes, the heating elements are encased in an outer casing, either separately as shown in one exemplified form of the invention, or collectively within a single outer casing as shown in a modified form of the invention.

A box or chamber is provided at the upper end of the heating elements, for making necessary electrical connection in an electric circuit, and a second box is provided at the opposite or lower end for electrical connection of relatively adjacent ends of the heating elements in each pair, whereby the heating elements of each pair are in series.

Any suitable pump may be employed in the suction pipe, and suitable metal clamps are employed to connect an electric conduit parallel with the suction pipe for lowering the suction pipe, heater and electrical conduit in unison.

Preferred forms in which the invention may be embodied are more particularly as described in the specifications herein and illustrated in the accompanying drawing in which:

Fig. 1 is a vertical longitudinal central elevational section of one form of the invention on line 1—1 of Fig. 2.

Fig. 2 is a horizontal transverse section on line 2—2 of Fig. 1.

Fig. 3 is a vertical longitudinal central elevational section of another form of the invention on line 3—3 of Fig. 4.

Fig. 4 is a horizontal transverse section on line 4—4 of Fig. 3, and

Fig. 5 is a fragmentary elevational view of a heating rod element shown in all other figures, the view being partly broken away to show internal structure.

Referring to the drawing in which like reference characters indicate corresponding parts in the several views, and referring firstly to Figs. 1, 2 and 5, any suitable type of oil well casing is indicated 10, the illustrated portion of which being the portion which is in the oil well at the oil bearing strata. Extending longitudinally and preferably substantially centrally of the casing 10 of the oil well is a conventional oil stem or suction pipe 12 having orifices 13 therein above and below the heater member and within the oil bearing strata, through which oil may flow into the suction pipe. Spaced above the heater member at an elevation which would be at approximately the upper level of the oil bearing strata, there is a suitable pump 14 provided in the suction pipe, preferably being of the well-known check valve type.

The heater member generally indicated 16 is mounted circumferentially of the oil stem or suction pipe below the pump 14 and between the openings or orifices 13. The heater member is of lesser diameter than the casing, thus providing a flow space for oil around the heater, as well as through the suction tube. The heater comprises a unitary structure of a plurality of elongated electrical heating rods 17, preferably arranged in pairs, three pairs comprising six heating rods being exemplified herein. The heating rods are preferably circularly arranged in relatively evenly spaced relation and are fixedly connected at their upper ends to a conduit distributor box 18, and at their lower ends by a conduit transfer box 19, both of said boxes being sealed against entry of oil, each of said boxes having an axially central opening 15 through which the suction pipe extends. At its opposite ends the heater may be secured in any suitable manner to the suction pipe 12, such as by welds 20. The suction pipe is imperforate between the opposite ends of the heater and extends axially through the conduit distributor and conduit transfer boxes and centrally of the circular grouping of the heater rod elements, which are radially spaced therearound.

The heating rods 17 per se comprise a central elongated core 22 around which is helically coiled an electrical resistance element 23 of well known Nichrome (nickel-chromium) wire, enclosed within a layer 24 of electrically-insulating and thermally-conducting material, such as magnesium oxide, which in turn is tightly encased within an outer protective metal shell or jacket 25 which is a thermal conductor, the opposite ends of the shell or jacket being closed as at 26, and each end having mounted therethrough a terminal electrical conducting post 27 extending therebeyond, the inner end of the terminal posts being thermally and securely connected for circuit purposes to the respective opposite ends of the resistance element 23.

Because the heating rods develop a relatively high temperature, and since it is desirable that the oil shall not come in direct contact therewith, but that the heat be diffused at relatively lower temperatures, as well as for the purpose of protecting the heating rods from injury, it is desirable to enclose the heating rods 17 in an imperforate outer casing. In Figs. 1 and 2 there is a separate imperforate tubular outer casing 28 spaced from and enclosing each of the heater rods, the outer casing being securely mounted between relatively opposing faces of the respective distribution and transfer boxes, 18 and 19.

A pair of electrical main conduits enters the distributor box 18, the conduit 29 being for feed and the conduit 30 being for return in an electric circuit. The conduits are

preferably enclosed in a protective oil-impervious tube or coating **31**, being suitably supported parallel with the suction pipe to the ground surface, such as by metal clamps **32**, so that the suction pipe, heater and conduit may be lowered and raised in unison. Within the distribution box **18** the feed conduit **29** has branch feed conduits **33** each of which is connected to the terminal post **27** of one heater rod in each pair of the heater rods, and the return conduit **30** has branch conduits **34** connected to the terminals **27** of the other heater rod in each pair, the heater rods in said respective pairs being connected at their opposite ends in the transfer box **19** in corresponding pairs by electrical conduits **35**, so that the heater rods in each pair are in series parallel, whereby a circuit for energizing the coiled heating elements **23** may be completed by a switch (not shown) at the ground surface of the oil well, to which only main conduits **29** and **30** lead.

In the form of the invention exemplified in Figs. 3 and 4, the structure is the same as in Figs. 1 and 2, except that the separate outer enclosing casings **28** of Figs. 1 and 2 are eliminated around each separate heater rod **17**, and in lieu thereof an outer enclosing casing **28***a* encloses all of the heater rods collectively, said outer casing being imperforate between opposite ends of the heater and spaced from the heater rods and being mounted between opposed faces of the respective distribution and transfer boxes, **18**, **19**.

Having thus described the invention, what is claimed as new and patentable is:

1. A heater device for oil wells comprising a plurality of relatively parallel and spaced elongated electrical resistance heater rods, imperforate casing means enclosing the heater rods and relatively spaced therefrom, said heater rods being arranged to provide an open space between said rods longitudinally of the casing means, a closed box at each of the opposite ends of said heater rods for connection of electrical conduits to opposite ends of said rods, said rods and said casing means being mounted between and supported by the opposed faces of said boxes, said boxes having an axial opening therethrough, and a tubular suction pipe mounted through said box openings and axially through said axial open space between the heater rods.

2. A device of the character described, as set forth in claim 1, the heater rods being in pairs and the electrical circuit in each pair being in series-parallel.

3. A heater for oil wells, as set forth in claim 1, and in which there is a casing around each of the heater rods and spaced therefrom.

4. A device of the character described, as set forth in claim 1, and in which the plurality of heater rods are arranged about an axis and spaced therefrom, and a single casing encloses all of said heater rods.

5. In an oil well apparatus having an oil well outer casing and a suction pipe axially within said oil well casing and spaced therefrom, the combination therewith of an elongated heater device mounted circumferentially of and coaxial with the suction pipe, said suction pipe being imperforate between the opposite ends of said heater device, said heater being of lesser diameter than the oil well casing and providing a space therebetween, the said heater device comprising a plurality of heater rods relatively spaced circumferentially of the pipe each having an electrical resistance element therein, imperforate casing means enclosing the heater rods and relatively spaced therefrom, a closed box at each of the opposite ends of said heater rods for connection of electrical conduits to opposite ends of said rods, said heater rods and said casing means being mounted between and supported by the opposed faces of said boxes, and each of said boxes having an axial opening therethrough through which the suction pipe extends.

6. In an oil well, the combination as set forth in claim 5 and in which there is a casing around each of the heater rods and spaced therefrom.

7. In an oil well, the combination as set forth in claim 5, and in which there is a single casing enclosing all of the heater rods.

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