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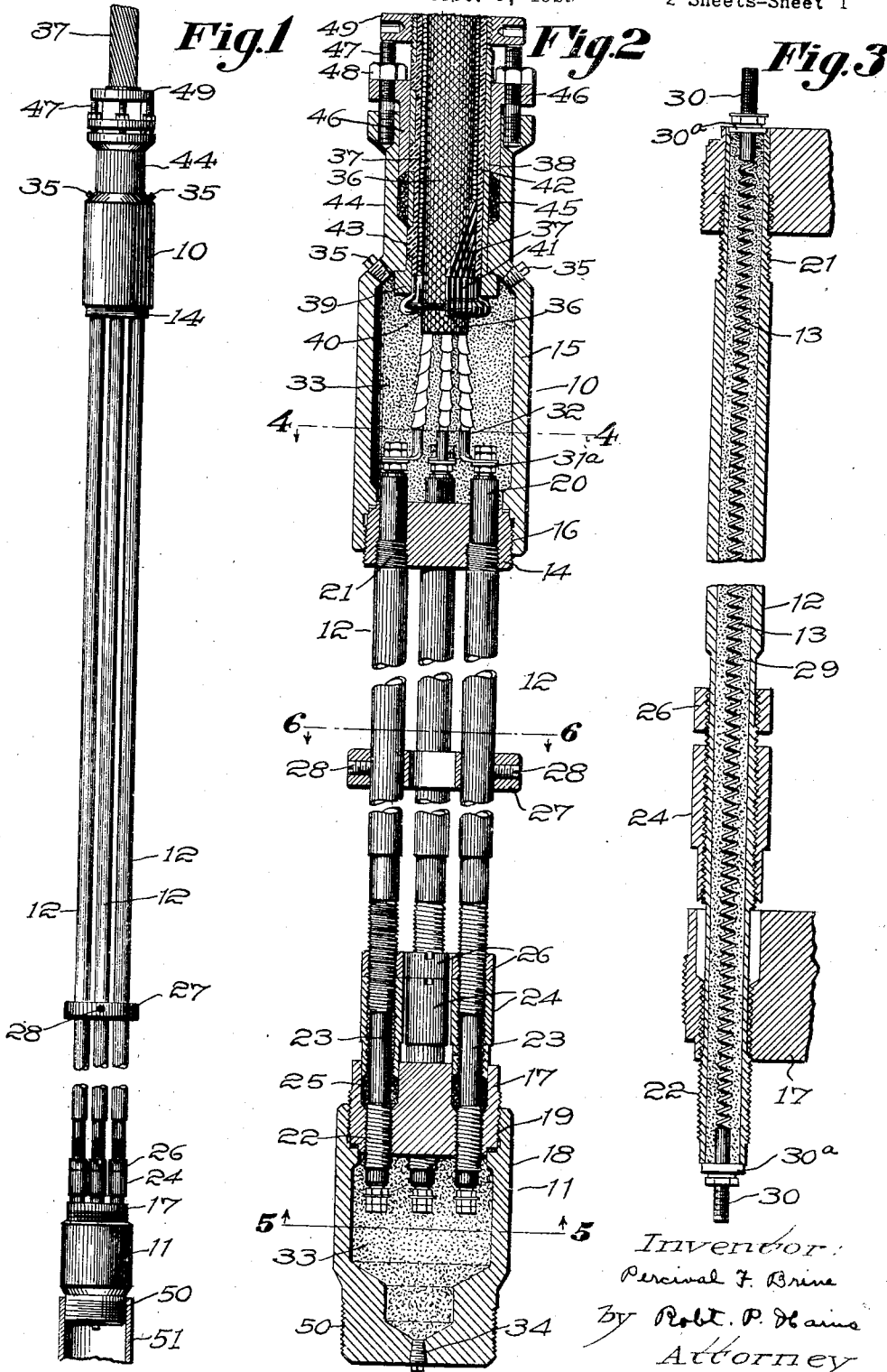
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1,504,208

ELECTRICAL HEATER FOR OIL WELLS

Filed Sept. 5, 1922

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Fig. 4

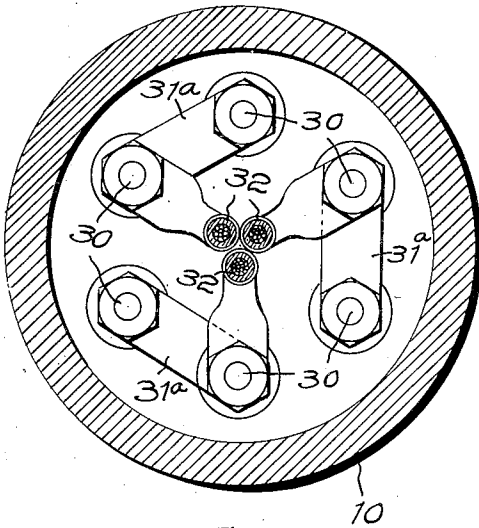


Fig. 6

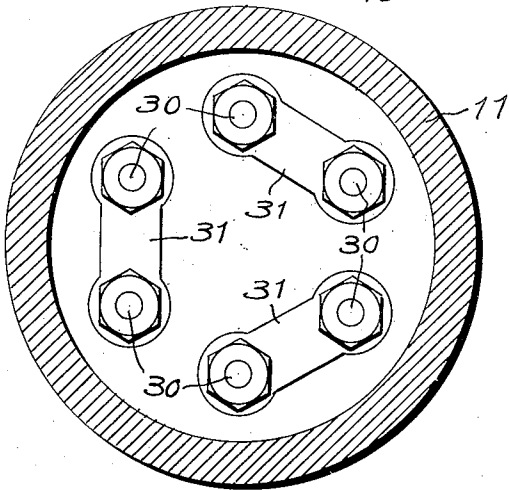
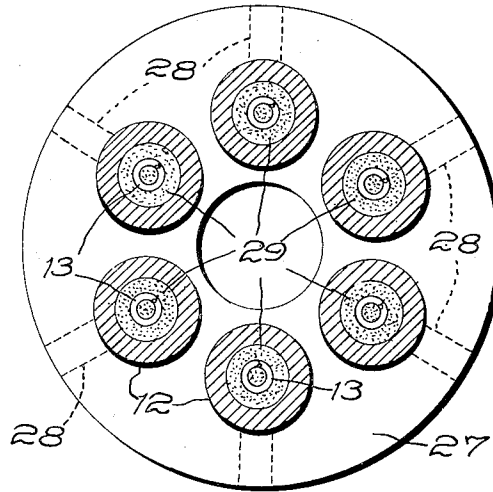


Fig. 5

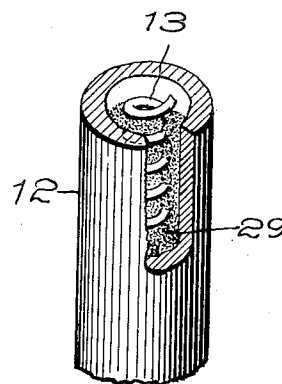


Fig. 7

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UNITED STATES PATENT OFFICE.

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ELECTRICAL HEATER FOR OIL WELLS.

Application filed September 5, 1922. Serial No. 588,192.

To all whom it may concern:

Be it known that I, PERCIVAL F. BRINE, a citizen of the United States, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented an Improvement in Electrical Heaters for Oil Wells, of which the following description, in connection with the accompanying drawings, is a specification, like characters on the drawings representing like parts.

This invention relates to electric heaters constructed to be introduced into oil wells to melt or fuse the petroleum deposits that often accumulate in these wells.

It frequently occurs that the flow of oil into a well from the surrounding terrane is materially reduced, and in cases is entirely stopped, by the accumulation of paraffin and other petroleum products in the well and surrounding terrane.

These petroleum products may be removed by heating them until they melt, whereupon they may be pumped from the well, but in practice the heating of these deposits sufficiently to melt them presents serious difficulties. One difficulty experienced is due to the great depth to which these wells are often sunk; and another is due to the fact that, in order to completely remove these deposits, a high temperature must be established in the lower portion of the well and maintained for a period sufficiently long to melt the deposits in the well and in the surrounding terrane. Furthermore, since water is often found in oil wells it is necessary to so construct the electric heater and conductor applying current thereto, that the water will not reach the electrical parts and short circuit them.

One important purpose of the present invention therefore is to provide an oil heater which is so constructed that it may be maintained at a high temperature for a long period of time without being burned out or injured by the heat.

Another important purpose of the invention is to so construct the oil heater that water surrounding the same will be prevented from reaching the electrical parts.

Another important purpose of the invention is to provide an armored cable that supports the heater and supplies current there-

to, and to provide novel means for securing the cable to the heater.

With the aforesaid and other purposes in view, the character of the invention will be best understood by reference to the following description of one good form thereof shown in the accompanying drawings, wherein:

Fig. 1 is a side elevation of an oil heater constructed in accordance with the present invention.

Fig. 2 is an enlarged vertical sectional view of the heater of Fig. 1.

Fig. 3 is an enlarged vertical sectional view of one of the tubes containing an electric resistance coil.

Fig. 4 is an enlarged sectional view taken on line 4—4 of Fig. 2.

Fig. 5 is an enlarged sectional view taken on line 5—5 of Fig. 2.

Fig. 6 is an enlarged sectional view taken on line 6—6 of Fig. 2; and

Fig. 7 is a perspective view of part of one of the tubes and its electric resistance coil.

In the embodiment of the invention illustrated the electric heater has an upper head 10 and a lower head 11 connected by a plurality of tubes 12. Each tube 12 contains an electric resistance coil 13, and the number of tubes may vary in accordance with the number of heating units desired, six being shown in the drawings. The tubes 12 may be given any desired length and may be formed of any metal possessing sufficient strength and other requirements, steel being well adapted for the purpose, and the walls of the tubes preferably are relatively thick as shown in Figs. 6 and 7 to furnish the requisite strength.

The tubes 12 may be variously secured to the heads 10 and 11, and one desirable means to this end consists in forming threads upon the ends of the tubes so that they may be screwed into sockets formed in the heads. The upper head 10 preferably consists of an end support 14 threaded upon its outer surface, and a hollow cap 15 internally threaded at 16 and screwed upon the end support 14, and the lower head 11 preferably consists of an end support 17 threaded upon its outer surface and a hollow cap 18 internally threaded at 19 and screwed upon the end

support 17. Each of the tubes 12 preferably has one end, in the instance shown the upper end, reduced as at 20 and a threaded portion 21 adapted to be screwed into a threaded socket within the end support 14. The other ends of the tubes 12 are threaded at 22 to be screwed into threaded sockets within the end support 17.

Since there are a number of tubes 12 having threaded engagement with the end supports 14 and 17, it is necessary to make provision for assembling the parts, for after one tube has been secured to both end supports the other tubes must be inserted while the end supports are maintained a fixed distance apart by the first tube. To facilitate assemblage the tubes 12 may have a portion 23 reduced in diameter sufficiently to permit the tube to be inserted into the end support 17 to an abnormal extent to thereby permit the upper end of the tube 12 to be brought into alignment with and moved upwardly into a socket of the end support 14 to the position shown in Fig. 3. The tube 12 may now be rotated to cause its upper threads 12 to enter the adjacent socket and as the tube is rotated the threads 22 at the lower end of the tube will travel upwardly within the end support 17 to the normal position shown in Fig. 2.

It is important to prevent water from leaking into the head 11 about the tubes 12, and to this end each tube is provided with a sleeve 24 threaded and having a portion that enters the stuffing box 25 to compress the packing therein. The sleeves 24 may be locked in place by the nuts 26. The threaded engagement of the upper end of the tubes 12 with the end support 14 may be sufficiently tightened to make the use of stuffing boxes at this end unnecessary. If the tubes 12 are of substantial length it may be desirable to provide a bracing collar 27 between the ends thereof and through which the tubes extend, set screws 28 being provided to rigidly secure the tubes 12 within the apertures of the bracing collar.

The heating coils 13 within the tubes 12 may be constructed of any suitable material and should be held in spaced relation to the inner walls of the tubes. To this end the tubes are filled with powdered magnesium oxide 29 or other powdered insulating material that will withstand a high temperature, and will also serve to conduct the heat of the coils to the walls of the tubes. At each end of the coils 13 are provided contact members 30 and caps 30^a for retaining the powdered material within the tubes.

The ends of the electric resistance coils 13 may be variously connected and various kinds of current may be supplied thereto. The wiring shown is adapted for three-phase alternating current, and at one end of the tubes 12 the alternate pairs of coils 13 are

connected by bridge members 31 while at the other end of these tubes different pairs of coils 13 are connected by bridge members 31^a, and each bridge member 31^a is connected to a conductor wire 32.

As stated it is important to exclude water from the electrical parts, and to this end the hollow caps 15 and 18 are screwed tightly onto the end supports 14 and 17, but to further exclude moisture, the heads preferably are filled with ground magnesium oxide 33 or other insulating material soaked in oil. This insulating and moisture excluding material may be introduced in the head 11 through an aperture closed by the plug 34 and may be introduced in the head 10 through apertures closed by the plugs 35.

It is desirable to provide a single cable that serves to support the heater and to supply current thereto, and since oil wells are often hundreds of feet deep the cable must have a corresponding length, and must have sufficient strength to support its own weight and the weight of the heater. In the present instance the cable consists of the inner conductor wires 32, the number of which may be varied as desired, and these wires are covered with suitable insulating material to form the inner cable 36 about which may be wound one or more layers of spirally disposed wire strands 37. The connection between the head 10 and the cable should be strong and durable, and should be such that moisture is prevented from entering the head about the cable. Satisfactory means to this end will now be described.

About the wire cable is provided a sleeve 38 having a shoulder 39 at its lower end, and the ends of the wire strands 37 are looped about a ring 40 to form an enlargement at the lower end of the cable too great in size to pass through the sleeve 38, and the ends of the wires may be extended upwardly into the sleeve 38 as at 41. To further secure the sleeve 38 to the cable, solder may be introduced between the sleeve and cable as at 42 and the solder may be introduced through one or more apertures 43 in the sides of the sleeve 38.

The sleeve 38 preferably fits in an outer sleeve 44 formed upon the head 10 and the shoulder 39 of the inner sleeve may abut against the inner end of the outer sleeve as shown. Leakage between the inner and outer sleeves may be prevented by a stuffing box having packing 45 compressed in its box by the gland nut 46. Adjustment of the gland nut may be secured by threaded studs 47 secured in the outer sleeve 44 and extending through apertures in the gland nut. Nuts 48 upon the studs serve to adjust the gland nut. It may be desirable firmly to secure the shoulder 39 of the inner sleeve against an end of the outer sleeve, and

to this end a nut 49 having threaded engagement with the upper end of the sleeve 38 is provided. The nut 49 rests upon the studs 47 and serves to exert an upward pull upon the inner sleeve.

In some cases it may be desirable to support the electric heater in spaced relation to the bottom of a well, and to this end the lower end of the head 11 is threaded as at 50 and is adapted to have a piece of pipe 51 of the desired length screwed thereon.

From the foregoing description and the drawings it will be apparent that an oil well heater constructed in accordance with the present invention is strong and durable, consists of relatively few parts, and that the parts may be readily taken apart and assembled without necessitating the use of special equipment.

What is claimed is:

1. An electric heater for oil wells, comprising, in combination, a pair of heads each having a plurality of threaded tube-receiving apertures, tubes connecting said heads and having threaded ends entering the threaded apertures, the threads upon one end of the tubes extending along the same a sufficient distance to permit the tubes to be screwed into one head an abnormal distance and then screwed into the other head by backing the tubes outwardly in the first head to the normal position, electrical resistance coils within said tubes, and a cable for supplying current to said coils.

2. An electric heater for oil wells, comprising, in combination, a pair of heads each having a plurality of threaded tube-receiving apertures, tubes connecting said heads and having threaded ends entering the threaded apertures, the threads upon one end of the tubes being adapted to permit the tubes to be inserted in one head to an abnormal position and then rotated to cause the tubes to screw outwardly in this head while they are screwed into the other head by said rotation, electrical resistance coils within said tubes, and a cable for supplying current to said coils.

3. An electric heater for oil wells, comprising, in combination, a pair of hollow liquid-tight heads having a plurality of threaded tube-receiving apertures, tubes connecting said heads and having threaded ends entering and screwed into the threaded apertures of each head, stuffing boxes about the tubes to prevent leakage between the tubes and head, electrical resistance coils within the tubes, electric contacts within the hollow heads, and a cable for supplying current to said coils.

4. An electric heater for oil wells, comprising, in combination, a pair of hollow closed heads having a plurality of threaded tube-receiving apertures, tubes connecting said heads and having threaded ends en-

gaging the threaded apertures, electrical resistance coils within the tubes and spaced from the walls thereof, ground insulating material filling the space between the coils and the surrounding tubes, electric contacts within the hollow heads, ground insulating material soaked in oil packed within said head, and a cable for supplying current to said coils.

5. An electric heater for oil wells, comprising, in combination, a pair of hollow closed heads, tubes connecting said heads and having the ends of the tubes secured thereto, electrical resistance coils within the tubes and spaced from the walls thereof, electric contacts within the hollow heads, a cable connected to one of said heads and to the contacts to supply current to said coils, a threaded projection upon the other head, and an extension removably secured to said projection and adapted to contact with the bottom of the oil well to support the heater in spaced relation to the bottom of the well.

6. An electric heater for oil wells, comprising, in combination, a pair of hollow closed heads, tubes connecting said heads and having the ends of the tubes secured thereto, electrical resistance coils within the tubes and spaced from the walls thereof, electric contacts for the coils within the hollow heads, a cable for supplying current to said coils, one of the heads having an aperture through which ground insulating material may be introduced to fill the head, and a plug for closing said aperture.

7. An electric heater for oil wells, comprising, in combination, a pair of hollow heads each having a plurality of threaded apertures, tubes connecting the heads and having their opposite ends threaded and screwed into said apertures, electric resistance coils within said tubes, contacts at the ends of said coils, each head comprising an end support to which the tubes are secured and a hollow cap threaded to be screwed upon the end support to house the contacts, and an armored cable for supplying current to the coils and having an end entering one head and anchored therein to support the electric heater.

8. An electric heater for oil wells, comprising, in combination, a hollow head, an end support, tubes extending between the head and end support and secured thereto, electric resistance coils within said tubes, a cable for supporting the heater and conducting current thereto, comprising an inner conductor surrounded by wire strands, and means for securing the wire strands within said head, including a sleeve secured to the head and surrounding the wire cable, and a ring having the ends of the wire strands looped about it to form an enlargement at the end of the strands too great in size to pass through said sleeve.

9. An electric heater for oil wells, comprising, in combination, a hollow head, tubes extending from the head and provided with electric resistance coils, an armored
 5 cable for supporting the heater and conducting current thereto, comprising an inner conductor surrounded by wire strands, a sleeve extending from said head and surrounding the wire cable, and means for
 10 strongly securing the wire strands within said sleeve including solder interposed between the sleeve and wire strands.

10. An electric heater for oil wells, comprising, in combination, a hollow head, tubes
 15 secured to the head and extending therefrom, electric resistance coils for said tubes, a cable for supporting the heater and conducting current thereto, comprising an inner conductor surrounded by wire strands, a
 20 sleeve extending from said head and surrounding the wire cable, means for strongly securing the wire strands within said sleeve, and a stuffing box surrounding the wire cable and adapted to prevent entrance of liquid
 25 between the cable and sleeve.

11. An electric heater for oil wells, comprising, in combination, a hollow head having a cable receiving opening therein, tubes secured to the head and provided with electric resistance coils, a cable for supporting
 30 the heater and conducting current thereto, comprising an inner conductor surrounded by wire strands, said cable including the surrounding wire strands extending through the opening into said head, and means for
 35 securing the cable to the head, including a ring within the head and having the ends of the wire strands looped about the ring to form an enlargement too great in size to
 40 pass through said opening.

12. An electric heater for oil wells, comprising, in combination, a hollow head having a sleeve extending therefrom, tubes se-

cured to the head and having electric resistance coils, a cable for supporting the
 45 heater and conducting current thereto, comprising an inner conductor enclosed in an armored casing, and means for securing the cable to the head including a sleeve insertable in the first mentioned sleeve and rigidly
 50 secured about the armored casing, and a shoulder upon the inner sleeve for limiting its movement within the outer sleeve.

13. An electric heater for oil wells, comprising, in combination, a hollow head having
 55 a sleeve extending therefrom, tubes secured to the head and provided with electric resistance coils, a cable for supporting the heater and conducting current thereto, comprising an inner conductor surrounded by
 60 spirally wound wire strands, means for securing the cable to the head including a sleeve insertable in the first mentioned sleeve and firmly secured about the spirally wound wire strands, a shoulder upon the inner
 65 sleeve to limit its movement within the outer sleeve, and a stuffing box for preventing leakage between said sleeves.

14. An electric heater for oil wells, comprising, in combination, a hollow head having
 70 a sleeve extending therefrom, tubes secured to the head and provided with electric resistance coils, a cable for supporting the heater and conducting current thereto, comprising an inner conductor surrounded by
 75 spirally wound wire strands, means for securing the cable to the head including a sleeve insertable in the first mentioned sleeve and firmly secured about the spirally wound wire strands, a shoulder upon the inner
 80 sleeve to limit its movement in the outer sleeve, and threaded means for securing said shoulder against the cooperating surface.

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

PERCIVAL F. BRINE.