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PATENTED MAR. 7, 1905.

F. B. WARING.
ELECTRIC HEATER FOR OIL OR GAS WELLS.

APPLICATION FILED APR. 22, 1904.

Fig. 1.

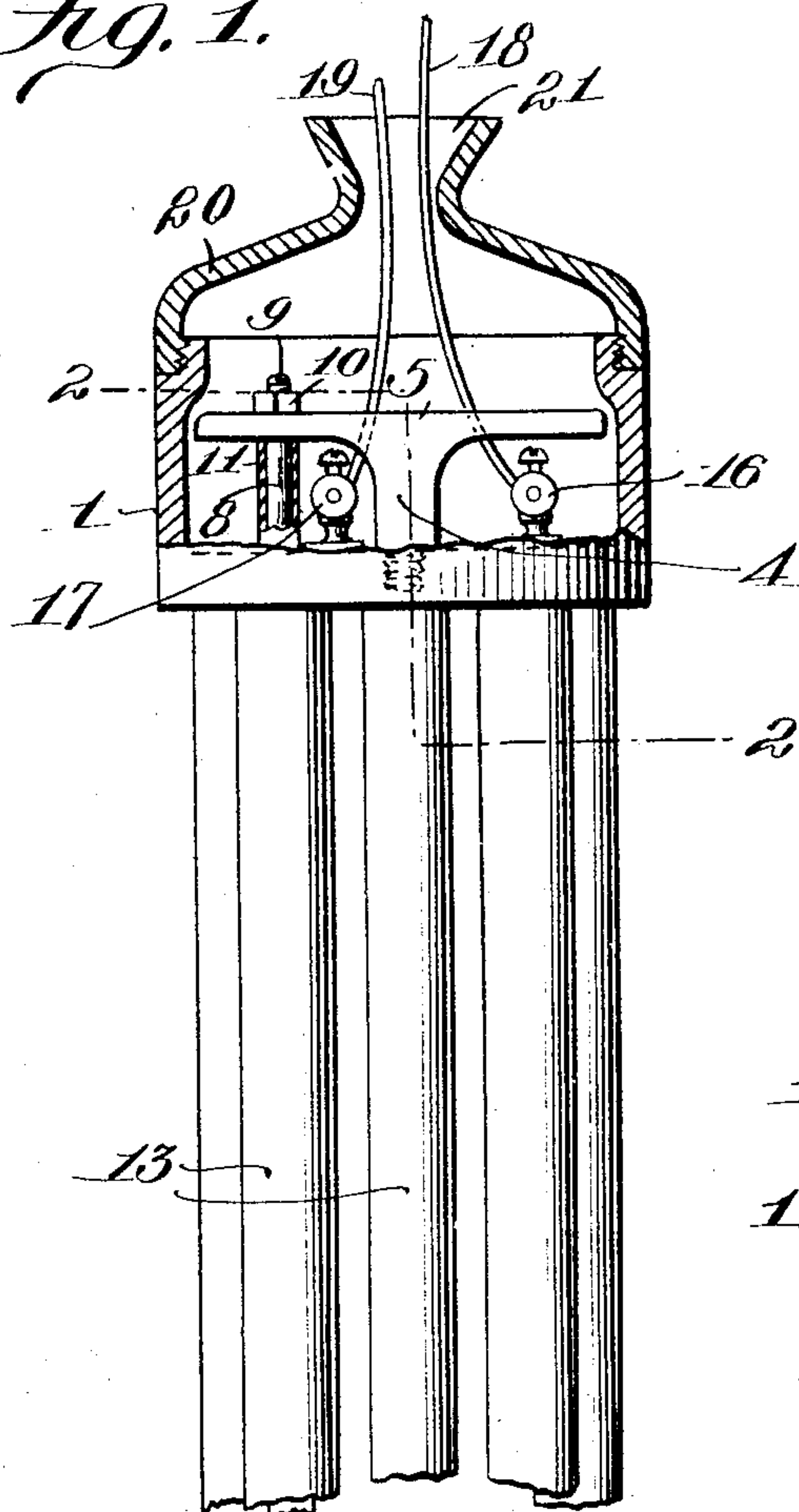
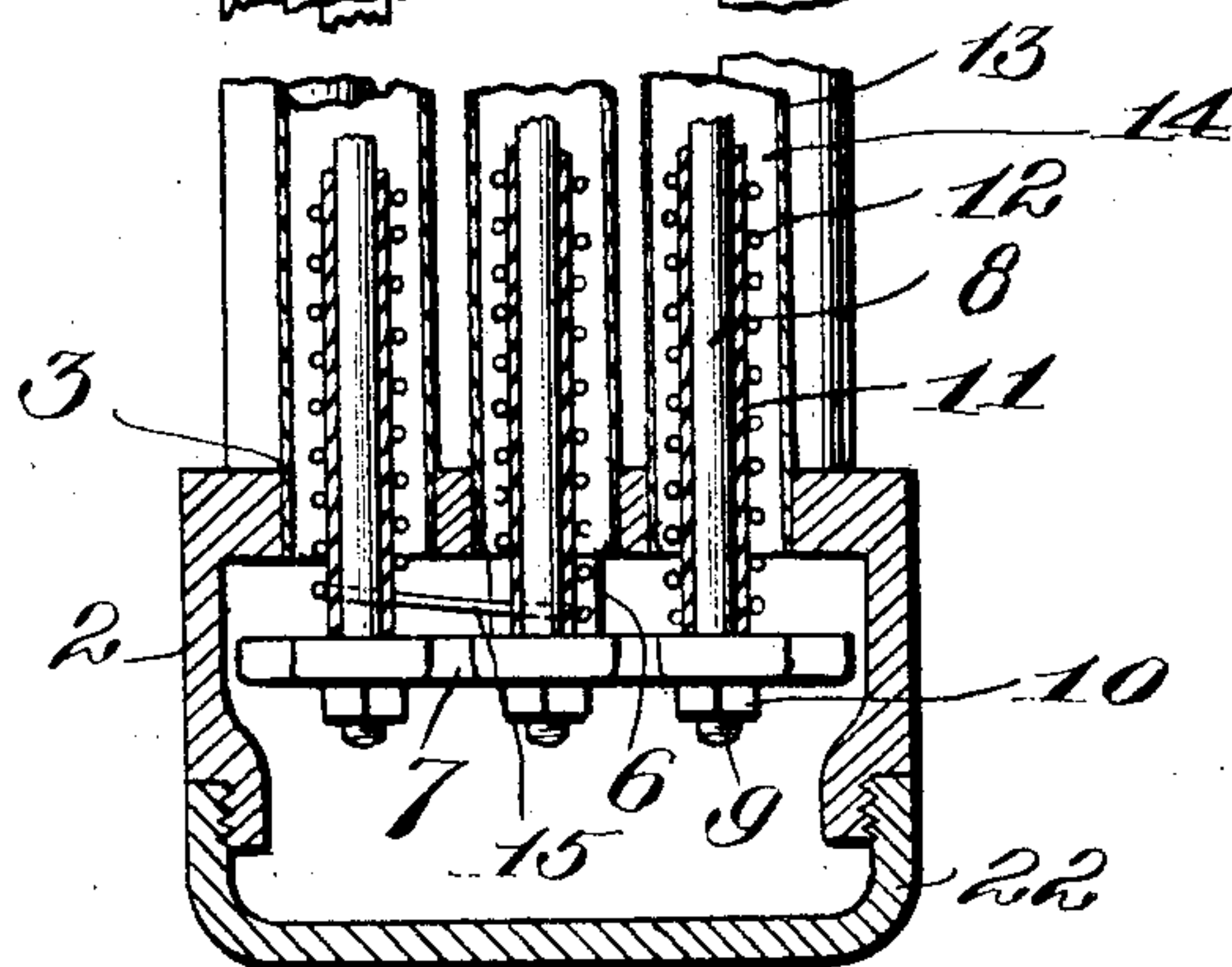
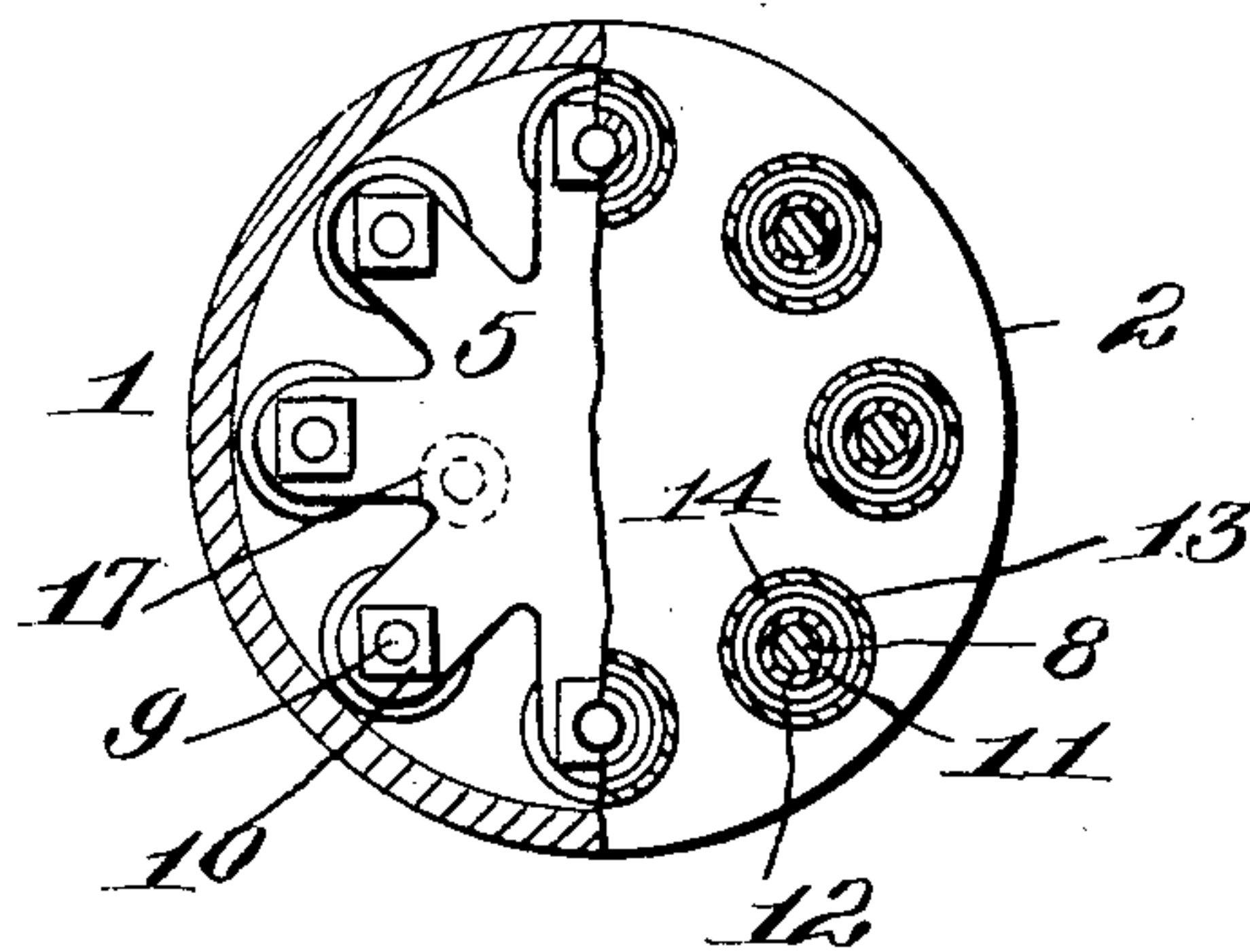


Fig. 2.



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UNITED STATES PATENT OFFICE.

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ELECTRIC HEATER FOR OIL OR GAS WELLS.

SPECIFICATION forming part of Letters Patent No. 784,454, dated March 7, 1905.

Application filed April 22, 1904. Serial No. 204,461.

To all whom it may concern:

Be it known that I, FRED B. WARING, a citizen of the United States, residing at Lima, in the county of Allen and State of Ohio, have
5 invented new and useful Improvements in Electric Heaters for Oil or Gas Wells, of which the following is a specification.

This invention relates to certain new and useful improvements in electrical heaters for use
10 in oil or gas wells.

The object of the invention is to construct an electrical heater adapted to rid oil and gas wells of a formation of paraffin or other residuum of petroleum that forms on and in the
15 fissures, crevices, and interstices of the oil-bearing strata of rock or pay-sand by means of liquefaction.

The foregoing result is obtained by lowering the heater into the bore of a well to a depth
20 corresponding to that at which the productive strata is encountered. By heating through the medium of the heater which has been lowered the fluid contained within the walls of the well where the pay-sand lies to a degree
25 sufficient to fuse paraffin or other residuum of petroleum the oily matter becomes separated from the foreign and in its liberated state rises in the bore of the well to a point above that occupied by the salt water, thus
30 commingling with and forming a part of the oil then in the well. The foreign matter robbed of the holding qualities of the residuum of petroleum crumbles, scales, and falls from the walls of the well to the bottom, leaving the pay-sand in its natural pure condition,
35 thus permitting the oil to enter the well without restraint.

The heater employed to obtain the foregoing object must be of such size as to operate
40 within the bore of the well, which is as small as four and a half to six and a half inches in diameter. The greatest possible amount of radiation in this space must be secured and at the same time the device must be constructed
45 in such a manner that the heat generated by the electric current will not be reduced in intensity by the insulating material occupying a space between the resistant material and the inclosing case therefor, thereby giving no heat

or but little heat outside of the device when 50 in use in the oil or gas bearing sand.

The invention further aims to construct an electrical heater of a plurality of inclosed heating devices connected by the necessary wiring and of such a number as the diameter of the
55 well will permit, and by such an arrangement the utilization of the greatest possible amount of radiating-space can be obtained, and thereby a material gain in radiating-surface is obtained over heating devices of equal diameter and
60 for the same purpose.

The invention further aims to construct an electrical heater so that the inclosing casings for the heating devices will have their joints
65 brazed or hermetically sealed, thereby insuring against any and all leakage of the electrical current or power.

The invention further aims to construct an electrical heater which shall be simple in its construction, strong, durable, efficient in its
70 use, and comparatively inexpensive to set up.

With the foregoing and other objects in view the invention consists of the novel combination and arrangement of parts hereinafter more specifically described, illustrated in the
75 accompanying drawings, and particularly pointed out in the claims hereunto appended.

In describing the invention in detail reference is had to the accompanying drawings, forming a part of this specification, wherein
80 like reference characters denote corresponding parts throughout both views, and in which—

Figure 1 is a side elevation of the heater, partly in section; and Fig. 2 is a sectional
85 plan on the line 2 2 of Fig. 1.

Referring to the drawings by reference characters, 1 denotes an upper support, and 2 a lower support. These supports are metal castings, preferably constructed of brass, and
90 the support 1 is formed with a plate having a pair of upwardly-extending arms which are screw-threaded at their upper ends. The support 2 consists of a plate having a pair of depending arms screw-threaded at their ends.
95 Each of the plates of the supports is provided with a plurality of openings 3, the function of which will be hereinafter referred to.

The plate of the support 1 is provided centrally with a screw-threaded recess in which engages a screw-threaded shank 4 of a spider 5. The plate of the support 2 is provided centrally with a screw-threaded recess, which receives a screw-threaded shank 6 of a spider 7. By such an arrangement the spider 5 is secured to and supported by the plate of the support 1, and the spider 7 is secured to and suspended by the plate of the support 2.

A plurality of heating devices are employed, and as each of the heating devices is of the same construction only one will be described, as the same reference characters will be applied to all of the heating devices. Each of the heating devices consists of a core 8 in the form of an elongated metallic bar screw-threaded at each end, as at 9, and extending through a corresponding arm of each of the spiders 5 7. The screw-threaded ends of the core 8 carry the binding-nuts 10. The core 8, from spider to spider, is enveloped in a covering of non-conducting material 11, preferably asbestos, and surrounding said covering of non-conducting material 11 is a resistance-coil 12. The core 8 and its covering, as well as the resistance-coil 12, is inclosed in a metallic tube 13, preferably of brass and of such a diameter as to form a space 14 between the inner face of the tube and the resistance-coil 12. The tube 13 at its upper end extends in one of the openings of the plate of the upper support 1 and is brazed or hermetically connected to said plate and at its lower end extends in the corresponding opening of the plate of the lower support 2 and is brazed or hermetically connected to said plate. The resistances 12 are alternately connected together at their top and bottom, the bottom connection being indicated by the reference character 15.

Mounted upon the plate of the upper support 1 is a pair of binding-posts 16 17, to which are attached, respectively, the leading-in wires 18 19, which communicate with a suitable electrical supply. The binding-post 16 is connected to one of the resistances 12, and the binding-post 17 is connected to another of the resistances 12—that is to say, the binding-post 16 is connected to what may be termed the “first” resistance 12 and the binding-post 17 is connected with what may be termed the “last” resistance 12 by a suitable wire connection.

The reference character 20 denotes a cap secured to the screw-threaded ends of the arms of the upper support 1 and is provided with an opening 21, through which passes the leading-in wires 18 and 19. The wires 18 19 are insulated and lead-incased and may be, if desired, soldered to the cap 20 in such a manner as to insure a firm and water-tight connection.

The reference character 22 denotes a cap se-

cured to the screw-threads of the arms of the lower support 2.

The tubes 13, that form the inclosures for the various resistance-coils 12, are adapted to protect the same from moisture and on becoming heated by the coils 12 gradually heat the fluid coming in contact with their exterior, and as a result the obstruction to the flow of oil or gas is removed. The spiders 5 and 7 are adapted to center the cores 8 in the tubes 13, and said cores 8 are drawn taut by the nuts 9. The purpose of such construction is to center the resistance-coils 12 within the tubes 13, thus separating the latter by a space. By such an arrangement the heat generated within the tubes 13 is permitted to reach the walls of its confine without loss, which would not be occasioned if asbestos or other insulating material intervened between the heat-giving medium and the objective point or outside surface of the tubes 13. As before stated, the coils 12 surround the asbestos covering 11, and said coils are formed in pairs by tightly binding the same over the asbestos at a point near the top and bottom end of the core, as shown, thus connecting the coils in series.

The operation is such that the current passes in over the wire 19 to the binding-post 17, from which point it is supplied to alternate coils placed as described by connecting such coil in a suitable manner to the binding-post 17, then flows down the coil to the point where the wire is straightened, following which it ascends the coil thus connected in series and reaching the binding-post 16, from which point the current passes out over conducting-wire 18, which is connected with the binding-post 16.

By constructing an electric heater in the manner as set forth it permits of the greatest amount of radiating-surface obtainable within the limited diameter of the well through its tubular construction, and by brazing or hermetically connecting the tubes 13 with their supports to form one compact body it eliminates the great element of danger from leakage of salt water into the tubes, which would occur in the case of screw-threads and leaded joints through the hydraulic pressure and expanded connections met with in the case of electrically-heated wells. By centering in the manner as hereinbefore set forth the resistance-coils in their tubes practically all the heat generated reaches the walls of the tubes in force and is not dissipated or its force and effect lost in its effort to reach the exterior of the confining-body.

It is thought that the many advantages of an electric heater for oil-wells constructed in accordance with the foregoing description, taken in connection with the accompanying drawings, can be readily understood, and it will furthermore be evident that changes,

variations, and modifications can be resorted to without departing from the spirit of the invention or sacrificing any of its advantages, and I therefore do not wish to restrict myself to the details of construction hereinbefore described and as set forth in the annexed drawings; but reserve the right to make such changes, variations, and modifications as come properly within the scope of the protection prayed.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A heater for oil-wells comprising an upper and a lower support, a plurality of tubes connected to said supports, heating devices extending through each of the tubes and connected with an electrical source, and spiders connected with said supports for centering the heating devices within the tubes.

2. A heater for oil-wells comprising a pair of supports having a plurality of openings, a plurality of tubes having their ends extending in said openings and hermetically connected to said supports, heating devices extending through said tubes and out of contact therewith, means carried by the supports for centering said heating devices within said tubes, binding-posts carried by one of the supports and connected with said heating devices, and leading-in wires connected to said binding-posts.

3. An oil-well heater comprising a pair of supports provided with openings, tubes extending in said openings and hermetically connected to said supports, heating devices extending through said tubes and of such a diameter as to form an intervening space between them and the inner faces of the tubes, spiders carried by the supports and adapted

to engage with the said heating devices for centering them within the tubes, and means for establishing communication between said heating devices and a source of electrical supply.

4. An oil-well heater comprising a pair of supports provided with openings, tubes extending in said openings and hermetically connected to said supports, heating devices extending through said tubes and of such a diameter as to form an intervening space between them and the inner faces of the tubes, spiders carried by the supports and adapted to engage with the said heating devices for centering them within the tubes, a pair of binding-posts carried by one of said supports and connected with said heating devices, and leading-in wires communicating with an electrical source and connected to said binding-posts.

5. An oil-well heater comprising a pair of supports, a plurality of tubes hermetically connected thereto, an insulated elongated bar extending through each of the tubes, a resistance-coil surrounding each of said bars, said coils alternately connected at their tops and bottoms, a spider carried by each of said supports for centering said bars within said tubes, said bars extending through the arms of the spiders, means mounted upon the bars for drawing them taut, and means connected with the coils for establishing communication between them and a source of electrical supply.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

FRED B. WARING.

Witnesses:

CHAS. P. OLIVER,
ANNA SCHULTZ.