No. 809,917. PATENTED JAN. 9, 1906.

B. F. GARDNER.

ELECTRIC HEATER FOR OIL WELLS AND METHOD OF MAKING SAME.

APPLICATION FILED APR. 5, 1905.

Fig. 3.

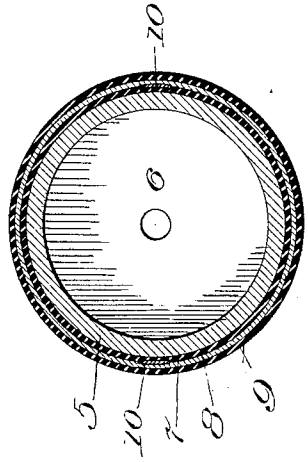
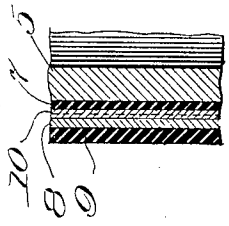


Fig. 4.



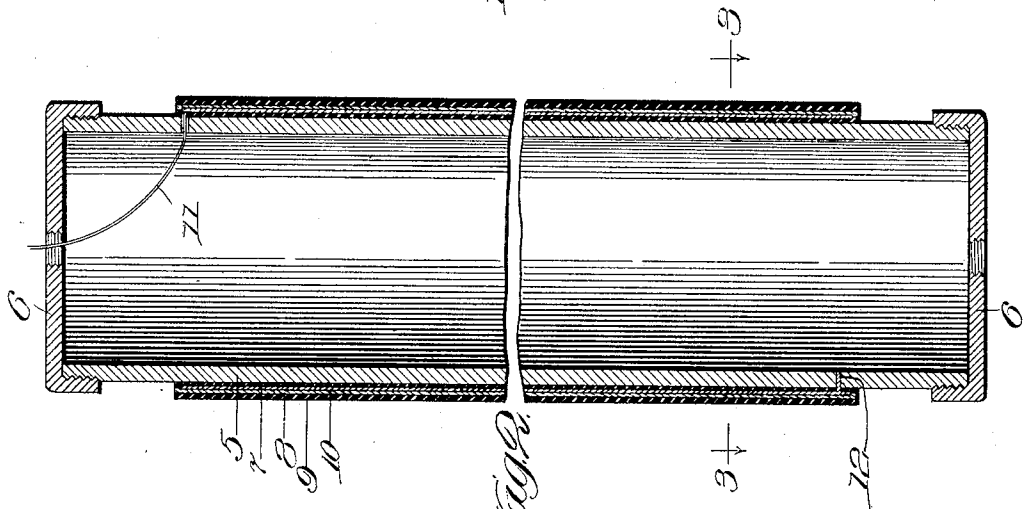


Fig. 2.

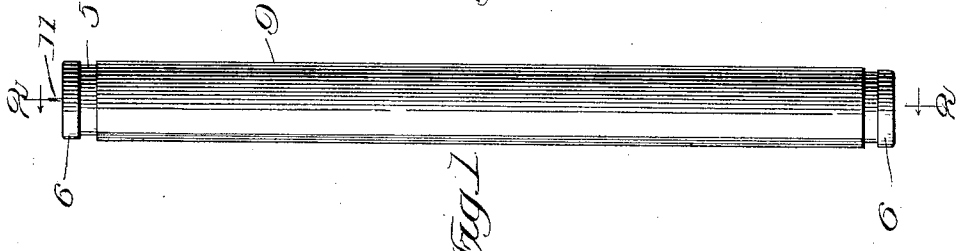


Fig. 1.

Witnesses:
H. S. Gaither
M. A. Middle

Inventor:
Benjamin Fulton Gardner
by Wm. H. Belt
Atty

UNITED STATES PATENT OFFICE.

BENJAMIN FULTON GARDNER, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE PETROLEUM ELECTRIC PRODUCING COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF DISTRICT OF COLUMBIA.

ELECTRIC HEATER FOR OIL-WELLS AND METHOD OF MAKING SAME.

No. 809,917. Specification of Letters Patent. Patented Jan. 9, 1906.

Application filed April 5, 1905. Serial No. 253,934.

To all whom it may concern:

Be it known that I, BENJAMIN FULTON GARDNER, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented new and useful Improvements in Electric Heaters for Oil-Wells, &c., and Methods of Making Same, of which the following is a specification.

The object of this invention is to provide an electric heater of high efficiency especially adapted for use in oil-wells and capable of being adapted for many other purposes.

Other objects of the invention are to provide a heater which can be used with a direct or an alternating current and made for any desired voltage or amperage, which is non-combustible and non-fusible and which will distribute the heat uniformly and not burn out its current-carrying parts, and also to provide a simple method of making the heater.

In the accompanying drawings I have shown the invention embodied in a heater for oil-wells.

Referring to the drawings, Figure 1 is an elevation. Fig. 2 is an enlarged longitudinal sectional view. Fig. 3 is a transverse sectional view on the line 3 3 of Fig. 2. Fig. 4 is a further enlarged detail sectional view.

Referring to the drawings, 5 is a metal pipe which is provided at each end with a reducing-cap 6, to which the oil-well pipe (not shown) is connected. On this pipe I first wrap a layer of non-vitreous insulating material 7, then a layer of non-metallic resistance material 8, and then a layer of non-vitreous insulating material 9, and in the resistance material I embed the positive and negative electrodes 10 on opposite sides of the pipe. The insulating material may be made of twenty parts rubber and eighty parts pulverized asbestos; but I do not limit myself to this particular composition. The resistance material is preferably made of the composition described in Letters Patent No. 782,232, issued to me and my assignees on February 14, 1905. The layers of material on the pipe may vary in thickness, and when the heater is completed and ready for use the superposed layers will be bound tightly together on the pipe in a homogeneous mass.

In practice the insulating and resistance material layers are applied on the pipe, and superposed upon each other while in a soft or pliable or gummy condition, somewhat like beeswax, and then vulcanized, the layers of material being held in place on the pipe by a wrapping of muslin or in some other suitable manner. When the vulcanizing step is completed, which will take five or six hours at a pressure of one hundred pounds, the muslin is removed, and the layers of material on the pipe will be found bound tightly together and to the pipe in a homogeneous mass. In practical use the heat generated by the current will carbonize the resistance material and drive out all gas which may be left after the vulcanizing step.

The electric current is carried to the positive electrode through an insulating-wire 11, and the negative electrode is grounded by suitably connecting it with the metal pipe, as by a pin 12. In applying the layers on the pipe the electrodes are placed upon the first layer of insulating material before the layer of resistance material is applied thereon, or the electrodes may be affixed to the resistance material before it is applied.

My invention can be embodied in various forms and adapted for many different purposes; but I have found it especially useful in the form shown herein and described for producing heat in oil-wells to remove the solidified paraffin, which prevents the flow of oil. The heat will be evenly and uniformly distributed throughout the heater and it can be adapted for alternating or direct currents and made in any shape and size for any voltage or amperage desired. The heater is non-combustible and non-fusible, which is of special advantage, as the danger of the heater burning out is thereby entirely avoided.

Without limiting myself to the exact construction and arrangement of parts herein shown and described, what I claim, and desire to secure by Letters Patent, is—

1. An electric heater comprising a metallic pipe, a non-vitreous insulating-covering on said pipe, a layer of non-metallic resistance material incased in said insulating material, and electrodes embedded in said resistance material, one of said electrodes being connected to the source of electric current and the other being grounded.

2. An electric heater comprising a metallic pipe, a layer of non-vitreous insulating material, a layer of non-metallic resistance material and a layer of non-vitreous insulating material, said layers being superposed one upon the other and upon said pipe, and electrodes embedded between the resistance material and one of the layers of insulating ma-

terial, one of said electrodes being connected to the source of electric current and the other being grounded to the pipe.

3. An electric heater comprising a metallic pipe, a layer of non-vitreous insulating material, a layer of non-metallic resistance material and a layer of non-vitreous insulating material, said layers being superposed one upon the other and upon said pipe, and electrodes embedded between the resistance material and one of the layers of insulating material, said materials being bound together and upon said pipe in a homogeneous mass, one of said electrodes being connected to the source of electric current and the other being grounded to the pipe.

4. The herein-described method of making an electric heater which consists in wrapping upon a metallic pipe a layer of non-vitreous insulating material, a layer of non-metallic resistance material, and a layer of non-vitreous insulating material, said layers being superposed one upon the other, applying electrodes between the layer of resistance material and one of the layers of insulating material at the time said layers are arranged in place, and finally vulcanizing the same.

BENJAMIN FULTON GARDNER.

Witnesses:
WM. O. BELT,
M. A. KIDDIE.