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ELECTRIC HEATER.

APPLICATION FILED JAN. 3, 1906.

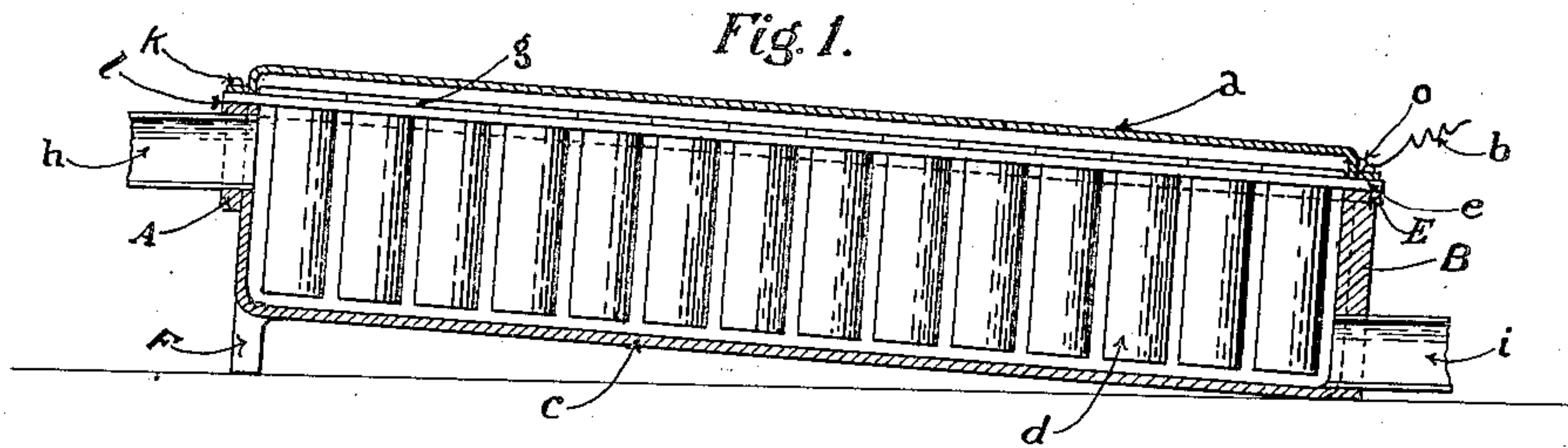


Fig. 2.

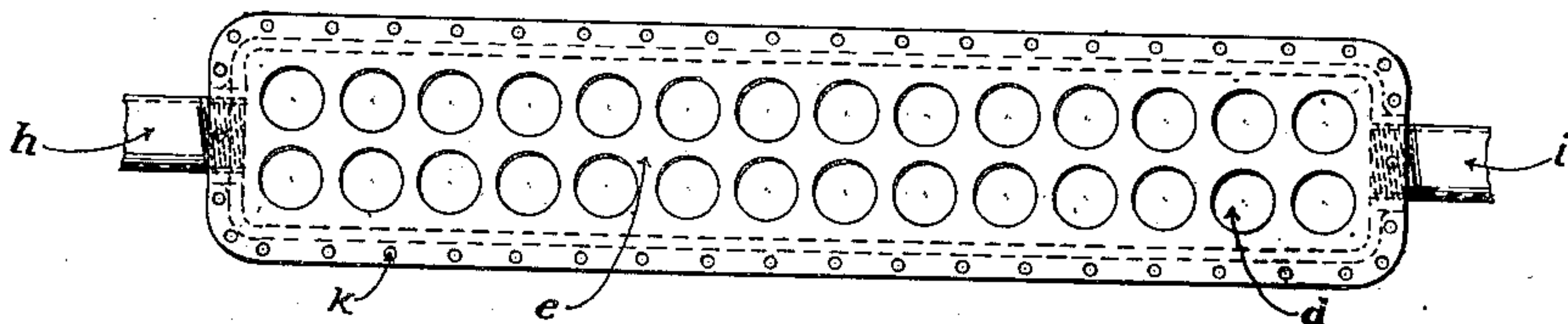


Fig. 3.

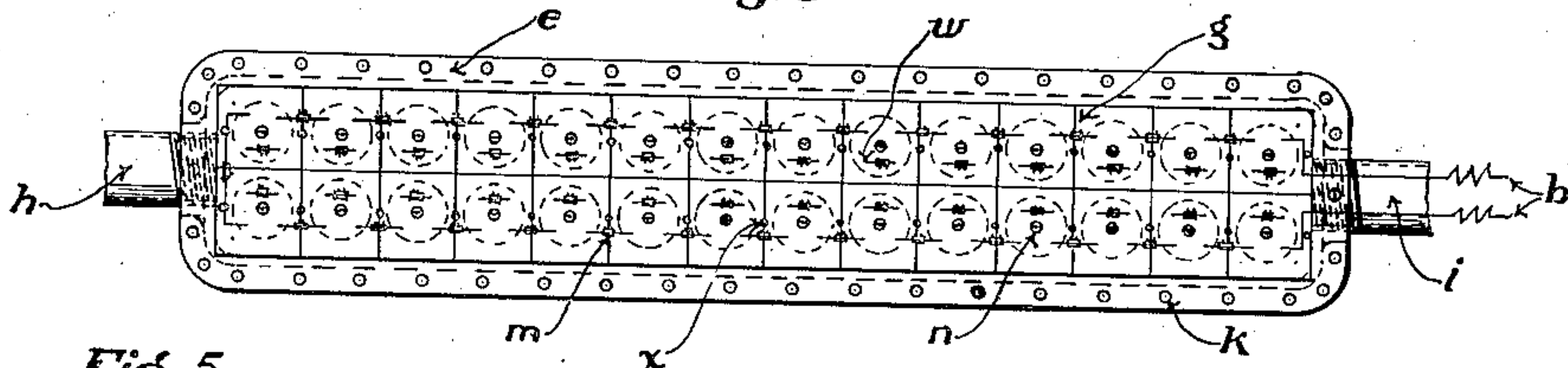


Fig. 4.

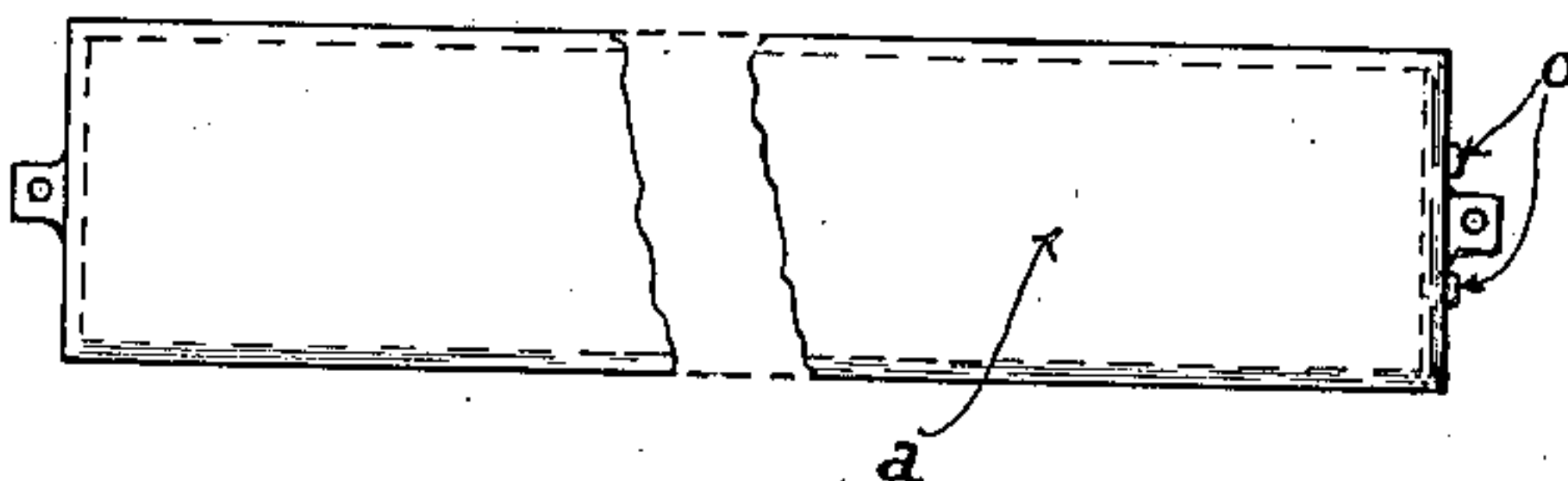


Fig. 5.

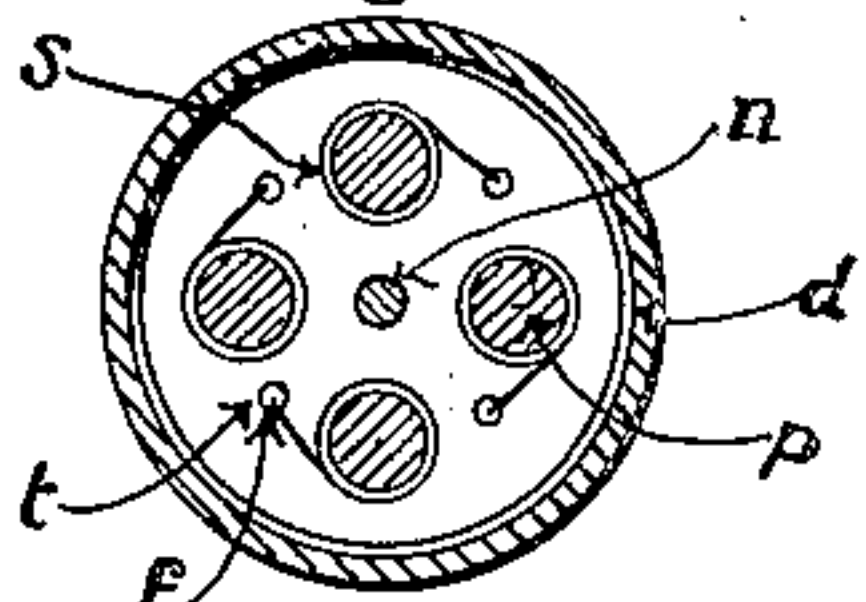


Fig. 6.

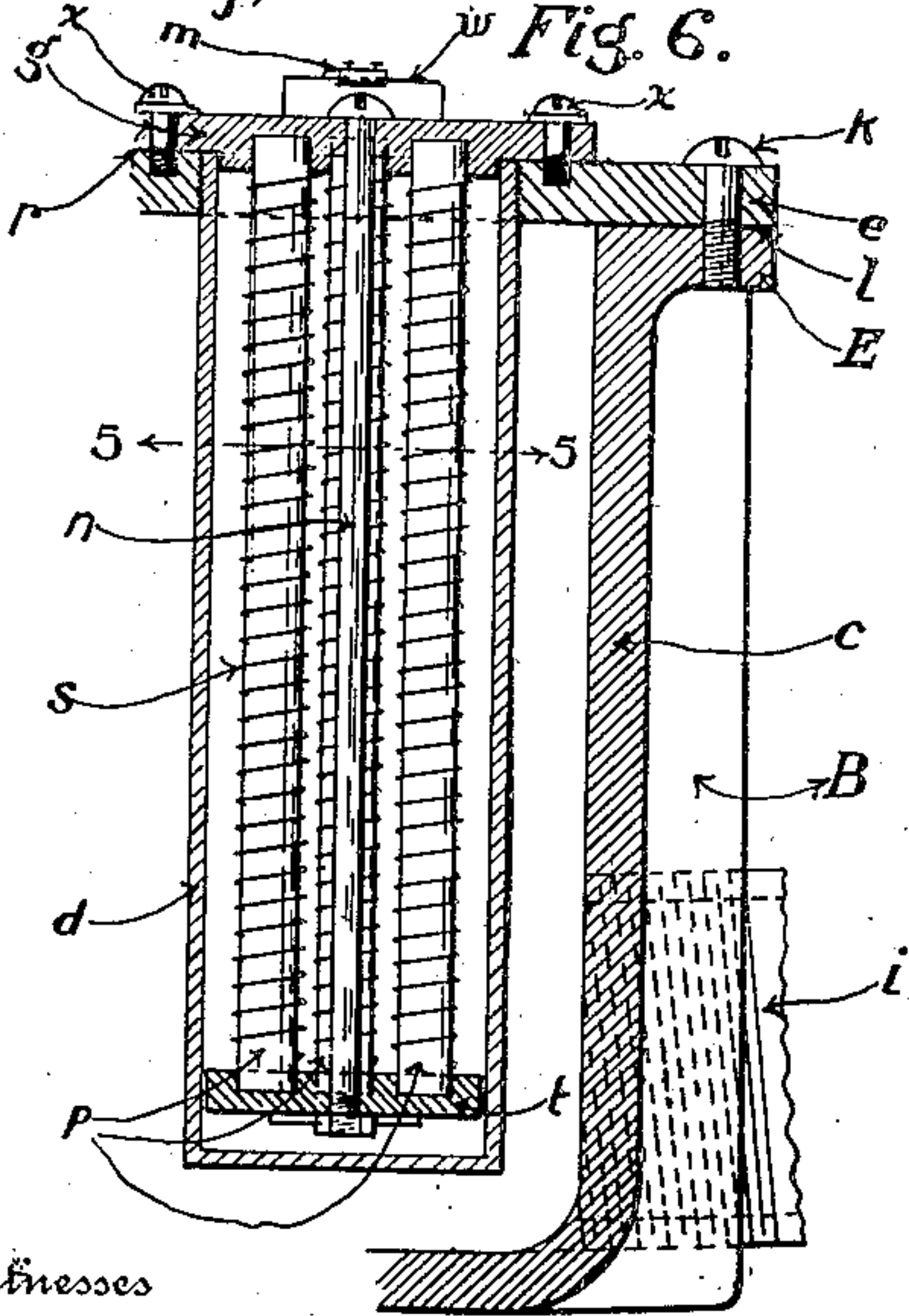


Fig. 7.

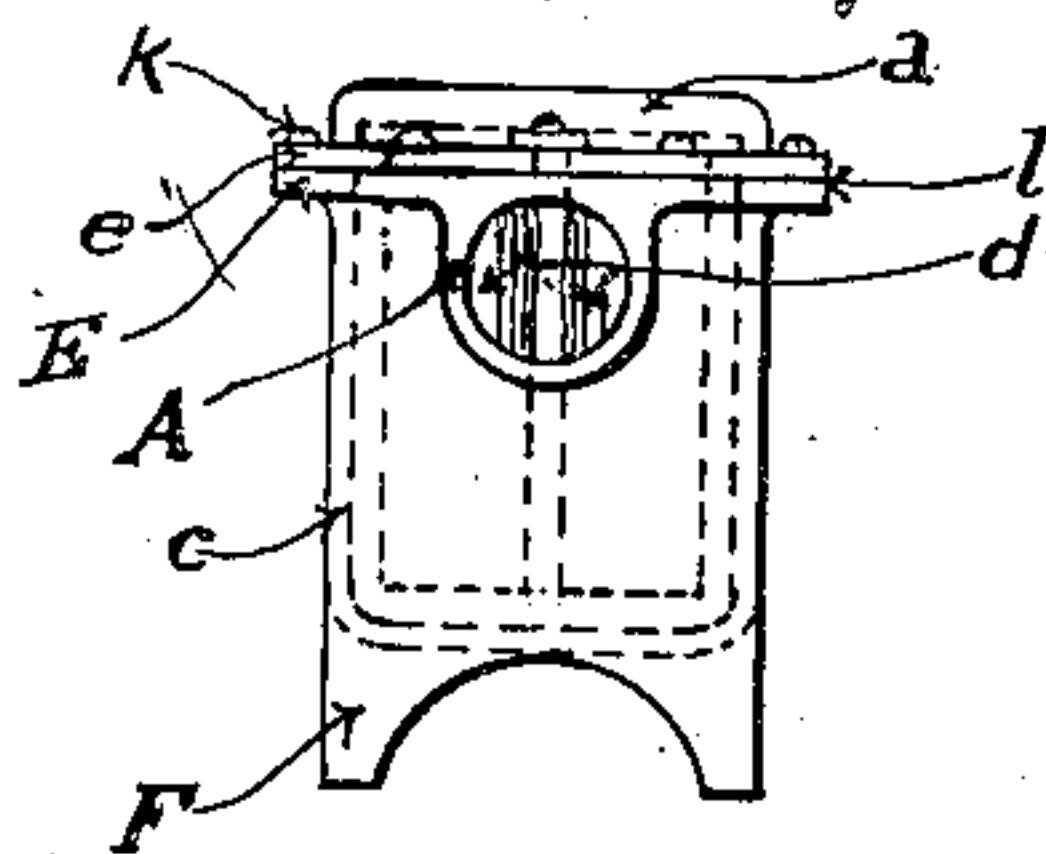
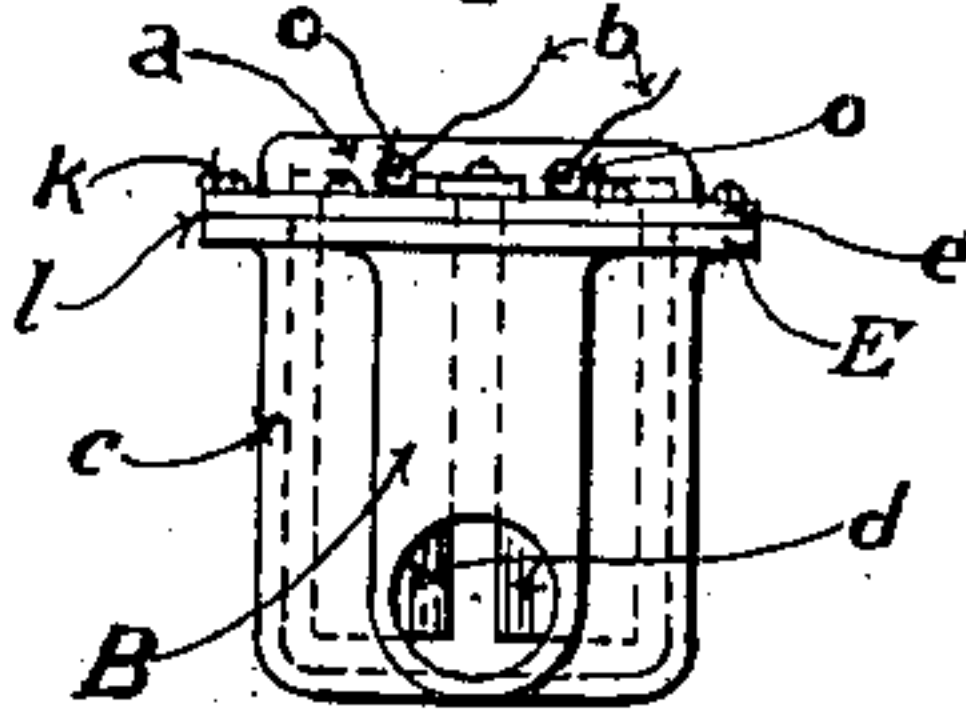


Fig. 8.



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ELECTRIC HEATER.

No. 846,544.

Specification of Letters Patent.

Patented March 12, 1907.

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To all whom it may concern:

Be it known that we, ALBERT H. BREMER, WILLIAM J. CHATTIN, and AUGUST H. HOENISCH, citizens of the United States, residing in Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented an Electric Heater, of which the following is a specification.

This invention is an improvement in electric heaters, and relates more especially to that class which are adapted for heating water and circulating the same for the purpose of heating cars and other compartments.

The primary object of the invention is to provide a simple and efficient electric heater for use in connection with a water tank or boiler, whereby the water in such tank or boiler may be quickly heated and caused to circulate through the usual water-pipes employed for increasing the amount of heat-radiating surface.

A further object of the invention is to so construct the electric heater and tank or boiler as to produce a complete water-heating apparatus for hot-water heating systems, which is compact in construction, economical in use, and in which the parts are so arranged and connected that they may be conveniently examined and readily repaired or renewed, if necessary.

With these general objects in view the invention consists in the combination, with a water tank or boiler having inlet and outlet openings to which the circulating-pipes are connected, of an electric heating device comprising a plurality of closed metal tubes suspended in the boiler and containing the resistance-wires properly insulated therefrom.

The invention further consists in the particular construction of the parts constituting the apparatus, all as hereinafter fully described, and more specifically set forth in the appended claims.

In the accompanying drawing, which forms a part of this specification, Figure 1 is a vertical longitudinal sectional view of an electric heater or water-heating apparatus constructed in accordance with our invention. Fig. 2 is a top plan view with the covering-plate and electric heating devices removed. Fig. 3 is a similar view, the electric heating devices being shown in position in the water tank or boiler. Fig. 4 is a detail view of the covering-plate. Fig. 5 is a

transverse sectional view through one of the electric heating devices. Fig. 6 is a vertical sectional view, enlarged, through one end of the tank or boiler and including one of the heating devices. Fig. 7 is an elevation of the rear or discharge end of the apparatus. Fig. 8 is a similar view of the front or intake end of the boiler or apparatus.

Like letters and numerals of reference indicate like parts in all the views of the drawing.

In carrying out our invention we employ in the first instance a water tank or boiler *c*, which is substantially rectangular in cross-section and is provided at one end with an inlet-pipe *i* and at its other end with an outlet-pipe *h*, the former entering the tank or boiler at the bottom thereof, while the outlet is located at the top, and where said pipes connect with the boiler the openings therefor are formed in bosses *B* and *A*, respectively. This tank or boiler is disposed at an inclination longitudinally, as shown in Fig. 1, for which purpose there is formed at one end, the outlet end, legs or feet *F*. By thus inclining the tank or boiler upwardly from the intake to the outlet it greatly accelerates the circulation by inducing a flow of the heated water or fluid to the outlet. This tank or boiler may be constructed in any suitable manner; but in the present instance the top *e* is attached to lateral flanges *E* of the body by means of screws *k*, with an ordinary packing *l* interposed to provide a water-tight joint.

Located in the tank or boiler *c* are a series of tubes *d*, which are adapted to contain the electric heating devices hereinafter described, said tubes being preferably suspended from the top *e* of the tank, for which purpose the latter is provided with holes into which the open ends of the tubes *d* are threaded, the connection between the tubes and top of the tank being such as to prevent leakage. By this arrangement the tubes are let into the water or other fluid contained in the tank or boiler, so that the water or fluid may circulate around the same, and as they open out through the top of the boiler the heating medium may be conveniently placed therein.

In each of the suspended tubes *d* there is located an electric heating device or rheostat, comprising in the present instance the resist-

ance wires or coils *s*, which are wound upon rods *p*, of porcelain or other non-conducting material, said rods being held between opposite plates *g* and *t*, of slate or other non-conducting material, one of said plates, as *t*, being adapted to fit within the tube *d*, while the other plate, as *g*, is adapted to cover said tube and is preferably rectangular in shape, (see Fig. 3,) being secured in place by screws *x*. The under side of the plate or cover *g* is provided with a boss which fits snugly within the open end of the tube *d*, and on said under side of the plate is placed a lining of asbestos, as *r*, for the purpose of cushioning the heating device and also for retaining the heat within the tube, so that it may be utilized in heating the water. The porcelain rods *p* are let into recesses in the plates *t* and *g*, and the parts are held firmly together by means of a bolt *n*, as shown. In each heating device or rheostat there are preferably four resistance-coils, which are connected to form a continuous circuit, the wire extending from the first to the second coil through the plate *t*, from the second to the third coil through the plate *g*, and from the third to the fourth through the plate *t*, the several heating devices or rheostats being connected in series, as shown in Fig. 3, for which purpose the usual blocks or connectors *m* are provided. The electricity from a suitable source of supply is conducted by the wires *b b*.

In order to protect the electric heating devices or electrical connections at the upper end thereof, a covering-plate *a* is removably secured to the tank or boiler and at one end is provided with bushings *o*, of porcelain or other non-conducting material, through which pass the conducting wires *b* to and from the series of electric heating devices or rheostats.

The operation of the apparatus will be readily understood. As the current of electricity being turned into the rheostats or heating devices the resistance wires or coils *s* thereof will be heated, which will result in heating the tubes *d*, and the latter being suspended in the water of the boiler or tank will heat such water and cause it to circulate through the pipes *h* and *i* and intermediate connections, such circulation being accelerated by the inclination of the boiler, as hereinbefore pointed out.

By making up the electric heating device of a series of independent devices and locating the latter in separate tubes depending into the water tank or boiler a maximum amount of heating-surface is presented for quickly heating the water and causing a rapid circulation of the same. Also by this arrangement the entire heating device can be readily and conveniently examined and repaired.

In case any one of the individual electric heating devices contained in the tubes *d* is found to be injured or out of order such indi-

vidual heating device can be readily removed and repaired or replaced by a new one. The particular construction of the individual electric heating devices permits them to be rewound very quickly, in which operation it is only necessary to loosen the bolt *n* sufficiently to allow the rods *p* to be removed, rewound, and replaced one at a time.

Though we have described the apparatus as used for the purpose of heating water for hot-water heating systems, it is obvious that the same could be used for heating other liquids and, in fact, for any purpose where it is desired that a maximum amount of heating-surface be provided.

Having thus described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. In combination with a tank or boiler, of a plurality of tubes located therein and opening out through said tank or boiler, and electric heating devices located in said tubes.

2. In combination with a tank or boiler disposed at an inclination from the inlet to the outlet, of a plurality of tubes located in said tank or boiler and opening out through the same, and electric heating devices located in said tubes.

3. In an electric heating apparatus, the combination, of a tank or boiler having an inlet at the bottom of one end and an outlet at the top of the other end, said tank being inclined upward from the inlet to the outlet; a plurality of tubes located in the tank or boiler, and electric heating devices in said tubes.

4. In an electric heating apparatus, the combination, of a tank or boiler having an inlet at the bottom of one end and an outlet at the top of the other end, said tank being inclined upward from the inlet to the outlet; a plurality of tubes suspended within the tank or boiler and opening out at their upper ends through the top of said tank or boiler, and electric heating devices removably located in said tubes.

5. In an electric heating apparatus for the purposes set forth, the combination with the tank or boiler, of a series of tubes depending through the top thereof and closed at their lower ends, and electric heating devices supported removably in said tubes.

6. In an electric heating apparatus for the purpose set forth, the combination with a tank or boiler, of tubes suspended in said tank or boiler and arranged in parallel rows, said tubes being closed at their lower ends and opening out through the tank at their upper ends, and electric heating devices suspended within the tubes.

7. In an electric heating apparatus for the purpose set forth, the combination with a tank or boiler, of tubes suspended in said tank or boiler, said tubes being closed at their lower ends and opening out through the tank

at their upper ends, electric heating devices suspended in the tubes so as to be removable therefrom, and a covering-plate covering the upper end of the electric heating apparatus, substantially as shown and described.

8. In an electric heating apparatus for the purpose set forth, the combination with a tank or boiler, of tubes suspended in said tank or boiler and closed at their lower ends, and electric heating devices for said tubes comprising end plates, rods interposed between the end plates and upon which the resistance-wires are wound, and a bolt connecting the end plates and aforesaid rods.

9. In an electric heating apparatus for the purpose set forth, the combination with a tank or boiler, of tubes suspended in said tank or boiler and closed at their lower ends, and electric heating devices for said tubes comprising end plates, rods interposed between the end plates and a bolt for connecting the end plates and rods, one of said end plates fitting within the tube and the other projecting beyond the edges of the tube to support such electric heating device within the tube, substantially as shown and described.

10. In an electric heating apparatus for the purpose set forth, the combination with a water tank or boiler, of tubes suspended in said tank or boiler from the top thereof, said tubes being closed at their lower ends; together with electric heating devices for said tubes comprising end plates, rods interposed between said end plates and having the resistance-wires wound thereon, and a bolt connecting the end plates and rods, one of the end plates fitting within the tube and the other projecting beyond the same for supporting the electric heating device in said tube, and a covering-plate adapted to cover the electric heating devices and secured to the tank or boiler.

11. In an electric heating apparatus for the purpose set forth, the combination with a water tank or boiler comprising a body portion having outwardly-projecting flanges at its upper edge, a top secured to said flanges with an interposed packing, said top having holes therein arranged in series, tubes threaded in said holes so as to depend in the tank or boiler, the lower ends of said tubes being closed, electric heating devices mounted in said tubes through the open ends thereof, and a plate covering the electric heating devices and forming the top of the apparatus.

12. In an electric heating apparatus for the purpose set forth, the combination, of a tank or boiler comprising the body having lateral flanges at its upper end, a top secured to said flanges with a packing interposed, said top having holes therein, a boss at one end of the tank or boiler having an opening at its lower end for the inlet-pipe and a boss at the upper part of the other end of the tank or boiler having an opening for the outlet-pipe, such latter end of the boiler also provided with feet to dispose the boiler at an upward inclination; together with tubes depending from the openings in the top of the boiler and closed at their lower ends, electric heating devices located in the tubes and connected in series, and a covering-plate, the latter having bushings for the passage of the electric conducting-wires, substantially as herein shown and described.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

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Witnesses:

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