E. VERSTRAETE.

ELECTRIC HEATER.

APPLICATION FILED OCT. 30, 1919.

1,376,485.

Patented May 3, 1921.

3 SHEETS—SHEET 1.

Fig. 1.

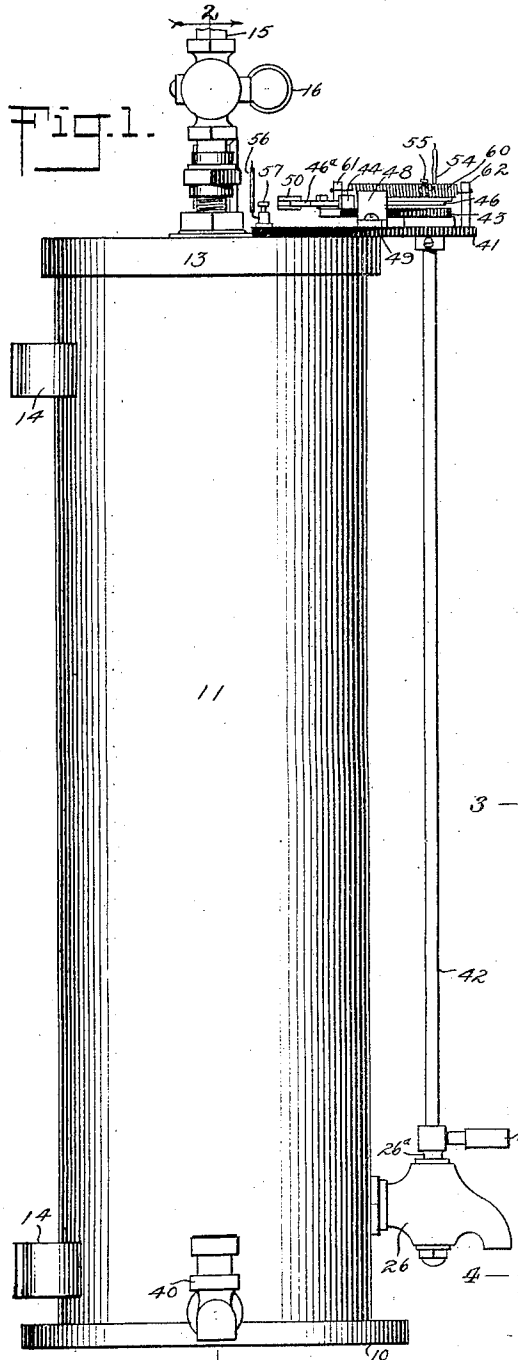
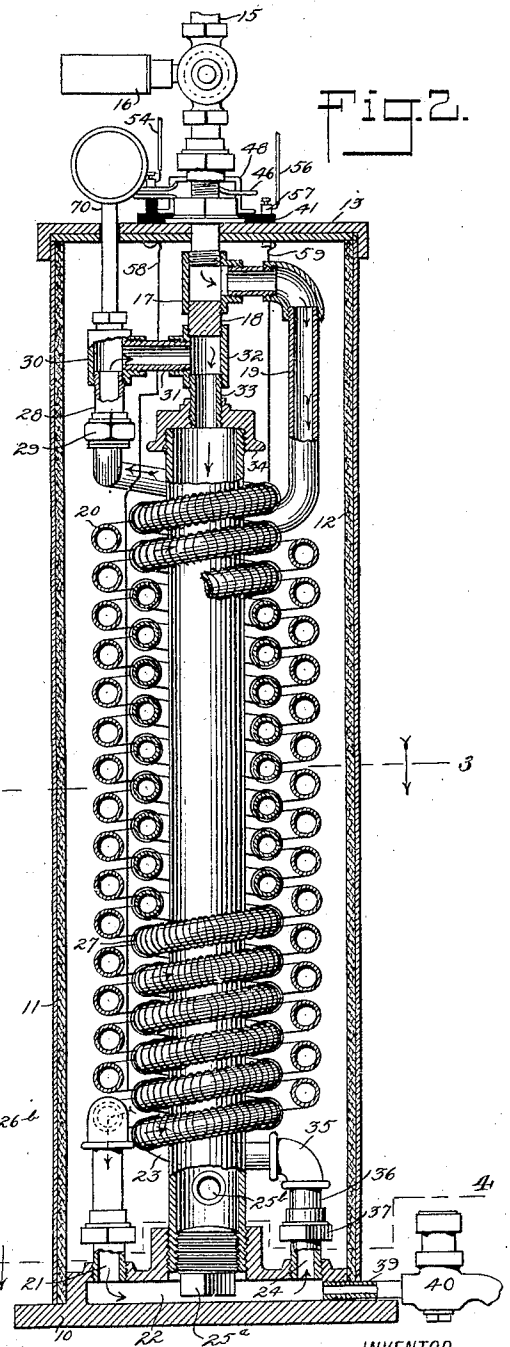


Fig. 2.



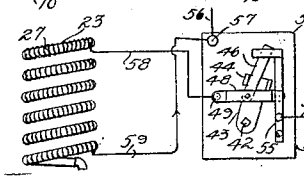


Fig. 3.

WITNESSES

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3 SHEETS—SHEET 2.

Fig. 3.

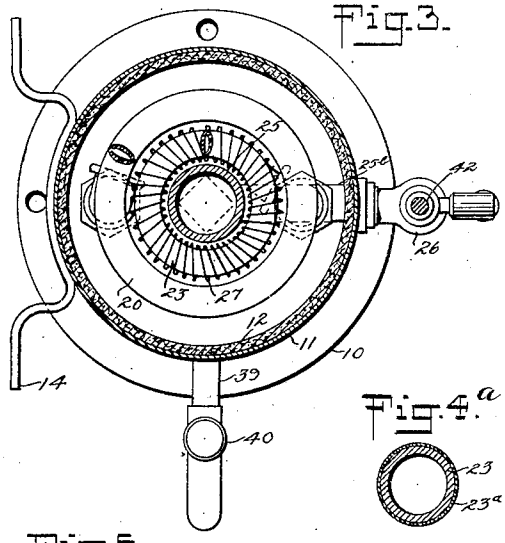


Fig. 4.

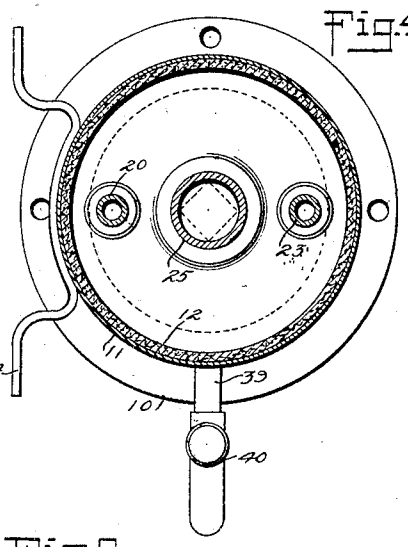


Fig. 4a.

Fig. 5.

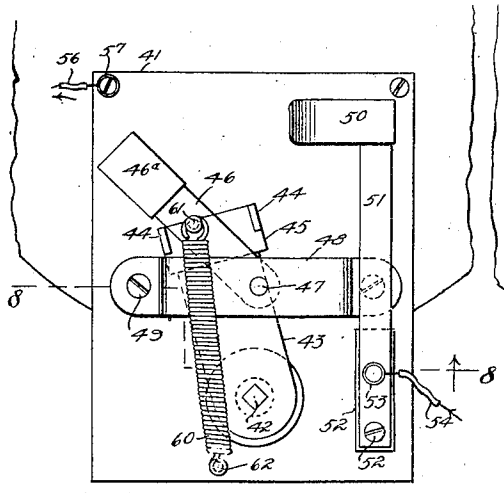


Fig. 6.

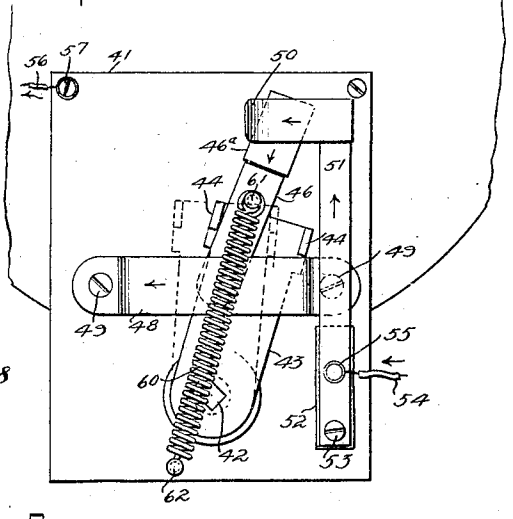


Fig. 7.

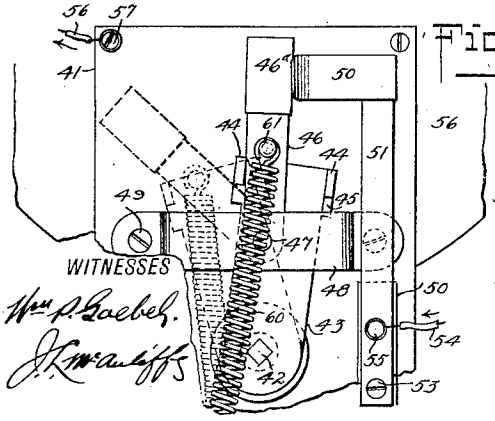
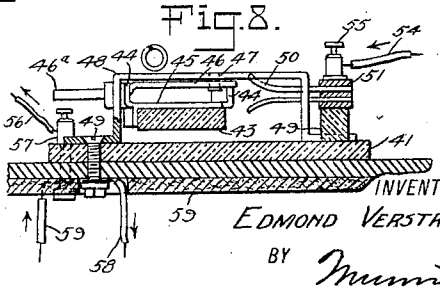


Fig. 8.



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3 SHEETS—SHEET 3.

Fig. 9.

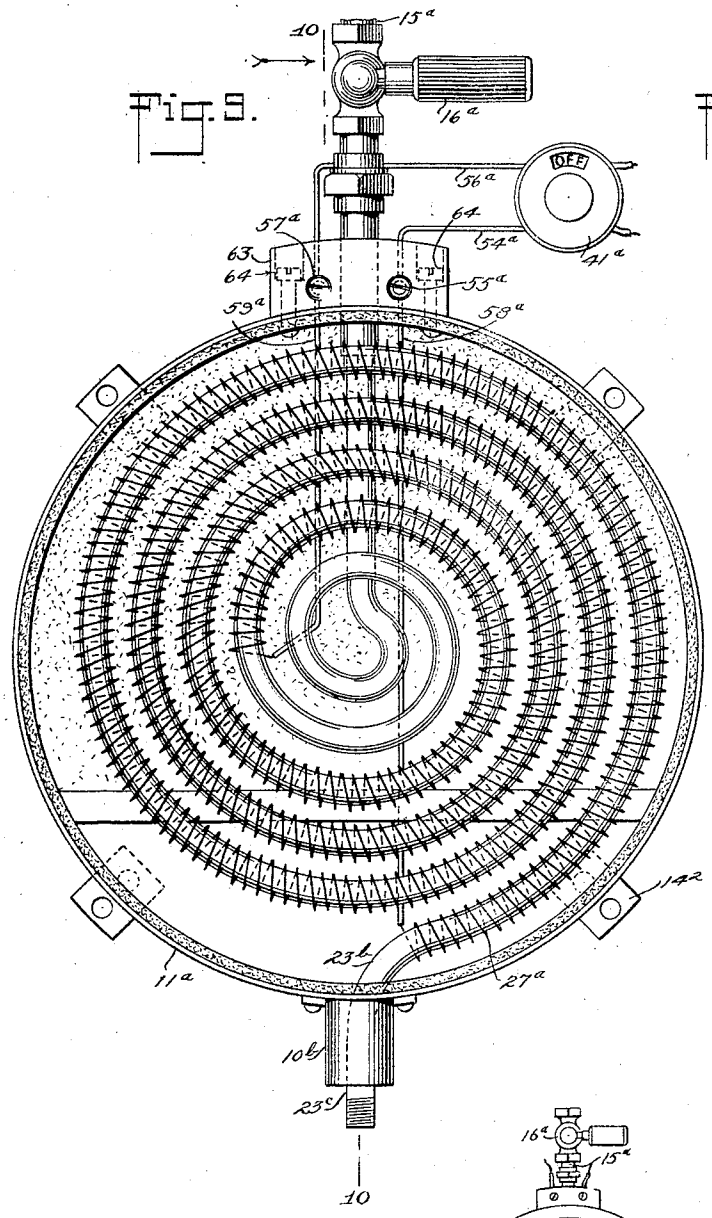


Fig. 10.

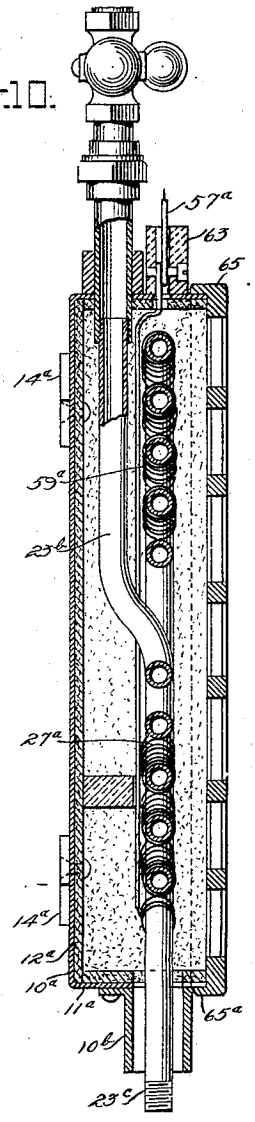
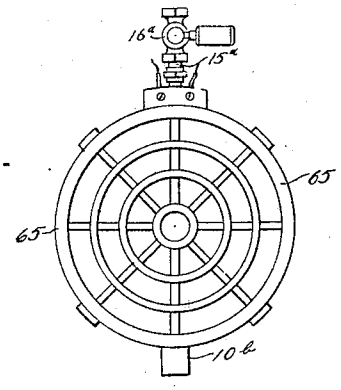


Fig. 11.



WITNESSES

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UNITED STATES PATENT OFFICE.

EDMOND VERSTRAETE, OF BELLEVILLE, NEW JERSEY.

ELECTRIC HEATER.

1,376,485. Specification of Letters Patent. Patented May 3, 1921.

Application filed October 30, 1919. Serial No. 334,504.

To all whom it may concern:

Be it known that I, EDMOND VERSTRAETE, a citizen of the United States, and a resident of Belleville, in the county of Essex and State of New Jersey, have invented a new and Improved Electric Heater, of which the following is a description.

My invention relates to a heater and more especially is designed for embodiment in a heater employing an external electrical resistance to generate the heat although not limited in all of its phases to that particular heat-generating means.

The general objects of the invention are to provide an improved arrangement of the electrical resistance and to provide a heater which, while capable of use for heating generally, such as the heating of a room, is especially adapted for bringing water or other liquid almost instantaneously to an exceedingly high degree of heat.

Other objects, as well as the distinguishing features of the invention and the advantages thereof will clearly appear as the description proceeds.

Reference is to be had to the accompanying drawings which are given to illustrate practical means for carrying out the invention.

Figure 1 is a side elevation of one form of heater constructed in accordance with my invention;

Fig. 2 is a vertical section, parts broken away;

Fig. 3 is a horizontal section on the line 3—3, Fig. 2;

Fig. 4 is a horizontal section on the line 4—4, of Fig. 2;

Fig. 4ª is an enlarged cross section through the electrically heated tube;

Fig. 5 is a plan view of my improved electric switch employed in carrying out my invention in the form shown in the foregoing figures, showing the switch open;

Fig. 6 is a view similar to Fig. 5 but showing the switch closed;

Fig. 7 is a view similar to Figs. 5 and 6 but showing the switch with the movable contact element about to be swung away from the fixed contact;

Fig. 8 is a transverse vertical section on the line 8—8, Fig. 5;

Fig. 8ª is a diagrammatic view of the electric circuit;

Fig. 9 is a plan view of another form of heater embodying my improved arrangement of electric resistance, the cover of the heater being omitted;

Fig. 10 is a longitudinal section on the line 10—10, Fig. 9 and with the cover in position;

Fig. 11 is a plan view of said heater, the heating coil being omitted.

In carrying out the invention in accordance with the illustrated example shown in Figs. 1 to 8, a casing 11 is employed, mounted upon a suitable base 10, the casing being preferably cylindrical and having a lining 12 of asbestos or the like and provided with a cap 13. The casing may, as shown, have upper and lower brackets 14 at a side thereof to secure the heater to a wall, for example to the wall in a bathroom or adjacent to a sink.

An inlet tube 15 adapted to be connected in practice with a source of water supply and preferably provided with a cut-off cock 16, leads into a casing 11 through the top thereof and is caused to traverse a heating tube or tubes, the arrangement illustrated in Fig. 2 including a special arrangement of tubular heating elements presenting a large heating surface. In the illustrated construction the inlet pipe 15 within the casing 11 connects with a T-coupling 17, that end of said coupling opposite the inlet pipe being closed as by a plug 18. Said coupling communicates with the upper inlet end 19 of a tube 20 in the form of a spiral coil, the lower end of which communicates as at 21 with a chamber 22 in the base 10. A spiral coil 23 within the coil 20 has an inlet 24 at its lower end communicating with the chamber 22, the upper end of said coil 23 being in communication with the upper end of a stand pipe 25 supported on the base 10 within the inner tubular coil 23. The lower end of the stand pipe 25 is closed by a screw plug 25ª to cut off communication with the chamber 22 and adjacent to its lower end said stand pipe has a lateral discharge 25ᵇ provided with a faucet or draw-off cock 26 for drawing off the water as required.

An electric resistance 27 is in the form of a tubular coil and said resistance, when employed in connection with one of a plurality of tubular heating elements, disposed one within another, may be applied to either tubular heating element, the illustrated form being preferred with the resistance applied to the intermediate tubular element 23,

which arrangement results in the maximum efficiency in the application of the heat generated by the resistance. The pipe forming the said coil 23 is insulated by any approved insulating medium, preferably by a coating 23^a of suitable varnish or the like as indicated in Fig. 4^a. The tubular resistance 27 has a slidable fit on the tube to which it is applied in carrying out my purpose in applying or removing said resistance by slipping it onto or from said tube. To provide for thus applying or removing the resistance I make provision in practice to uncouple either end of the tube 23, the arrangement being such that the resistance is adapted to be readily installed or removed by worming it onto or from the said coil 23, the ends of which are arranged to be uncoupled. In the illustrated form the upper end of coil 23 leads through a short pipe section 28 having a coupling 29 therein and communicating at its upper end with a T-coupling 30 connecting by a lateral branch pipe 31 with a T-coupling 32, one end of which is secured to the plug 18, the opposite end communicating with a short pipe section 31 extending into the top of the stand pipe 25 through cap 34 on the latter. The lower end of the tubular coil 23 has an elbow 35 connecting the coil with a short vertical pipe section 36 secured by a detachable coupling 37 to the inlet 24 of said coil. By the described arrangement water entering through the inlet pipe 15 may flow through coupling 17 and the end 19 into the top of the spiral coil 20 and through the latter downwardly to the base chamber 22. From chamber 22 the water will flow upwardly through the inner coil 23 to the top of the latter and into the stand pipe 25 at the top. When the resistance element 27 is heated by the closing of an electric circuit such as hereinafter described, the inner tubular coil 23 surrounded by said resistance will be directly heated in an effective manner and the heat from said resistance and said tubular coil will be imparted to the stand pipe 25 within and to the outer coil 20, so that the water in flowing through the coils and stand pipe will become incidentally heated to a very high degree. To cause the water to flow it is necessary only to open the draw-off cock 26 and the mere act of turning on the cold water by opening the cock 26 heats the water. The arrangement of the electrical resistance to be placed or removed merely by uncoupling either end of the spiral tube to which it is applied, simplifies the renewal or the repair of the resistance since the same can be accomplished without dismembering the heater generally. I provide means whereby to prevent the turning on of the electrical current except when the draw-off cock 26 is open in order thereby to prevent the generating of excessive pressure in the heater, for which purpose electric switch designated generally by the numeral 41 is arranged to be closed or opened with the closing or opening of the cock 26. In the illustrated form the switch is rigidly secured by any suitable means to the top 13 of the casing and a rod 42 rigid with the valve stem 26^a of cock 26 extends upwardly to said switch through the base thereof and carries a lateral arm 43 of insulating material. Said arm 43 has lugs 44 at opposite sides thereof, here shown as on a strip 45 secured to said arm, adapted to engage opposite sides of a swingable switch element 46 pivotally mounted at one end as at 47, said pivot securing said element in the present example to a bridge 48 rigidly fastened to the switch base by screws 49 or the like. The free contact end 46^a of element 46 is adapted to engage or disengage a fixed contact 50 here shown as formed of flaring plates as best seen in Fig. 8 spaced to receive the swingable contact element. The fixed contact 50 in the illustrated construction is secured to a conductor strip 51 formed of two members (see Fig. 8) spaced by an intermediate block 52 at one end, said conductor strip being secured as by screws 53 to the switch base at the end of the strip opposite the contact 50. One conductor wire 54 connects with strip 51 as by a binding post 55 and the other conductor wire 56 is secured to a binding 57 on the switch base. The terminals 58, 59 of the tubular resistance 27 have suitable connections with the switch to complete the circuit, the terminal 58 being shown as connected with one of the fastening screws 49 of bridge 48, thus electrically connecting said terminal with the swingable contact element 46, and the other terminal 59 being indicated as connected with the binding post 57.

A retractile spring 60 is arranged to insure the positive closing and opening of the switch and at the same time to have an advantageous relation to the cock 26. Said spring is secured at one end as by a post 61 to the swingable contact element 46 between the ends of the latter, the opposite end of the spring being secured to a fixed element, such as a post 62 on the switch base. The arrangement is such that with the turning of the handle 26^b of cock 26, to open said cock, the rod 42 will be turned and by engagement of the left-hand lug 44 (Fig. 6) will swing the contact element 46 toward the fixed contact 50. At the same time, the spring 60 will be stressed and when the center represented by the post 61 passes the center of movement of the element 46 represented by the pivot 47, the reaction of said spring will positively throw the contact 46 into full engagement with the contact 50. The arrangement, it will be observed, requires that the cock be opened in

order for the switch to close. With the closing of the cock 26 the reverse movement of the contact element 46 will be brought about as well as the stressing of the spring 60, said spring reacting after element 46 has moved through a given arc for completing the movement of said element, and positively opening the switch. It will be observed from Figs. 5 to 7 that the lugs 44 are spaced a greater distance than the width of the contact element 46, so that clearance is allowed for a limited swinging of the arm 43 in either direction when desired without throwing the switch element 46. With the lost motion thus provided for the switch actuating arm 43, the controlling element 42 which is the actuating element can be given a limited movement without affecting the switch, and in the present example of employing my improved switch, the lost motion referred to is utilized for permitting a limited regulation of the flow through the cock 26 after the switch is closed. At the same time the opening of the switch is made a necessary incident to the complete closing of the cock 26 and in that way it will be impossible for the cock to be closed, while the current is on, a condition which would be liable to result in undue steam pressure being developed in the heater. A steam gage may be employed in connection with one of the tubular elements appurtenant to the heating unit as indicated conventionally at 70.

Another example of the use of the slip resistance slidably embracing a coiled heater tube and arranged to be readily removed or applied to the tube is shown in the heater illustrated in Figs. 9 to 11 in which a casing 10^a presents a cylindrical shell 11^a having an asbestos lining 12^a and provided with securing ears 14^a adapted to rest on any suitable support with the heater disposed horizontally or said ears may be screwed to a wall. A single tube 23^b is in the form of a flat coil having applied thereto the resistance 27^a corresponding essentially with the resistance 27. The inlet 15^a in communication with tube 23^a is provided with a shut-off cock 16^a to permit or cut off flow of fluid. The outlet 23^c, as shown, may be threaded to receive any suitable cock or fitting (not shown) when desired, said outlet advantageously being surrounded by a protective boss or sleeve 10^b on the casing flange 11^a. The terminals 58^a, 59^a of the resistance 27^a lead to any suitable switch 41^a, here conventionally indicated as a well-known form of snap switch. The numerals 54^a, 56^a indicate the conductor wires in which said switch is interposed, said conductors and terminals being brought into circuit in any suitable manner as for example by connecting the same respectively to binding screws 55^a, 57^a on an insulating block 63, secured, as by screws 64, to casing flange 11^a. The resistance 27^a when disconnected from the binding screws may be slipped from the heater coil 23^b or readily replaced thereon by worming said resistance through the boss 10^b, the resiliency of said resistance permitting it to readily conform to the convolutions of the heater coil. A removable cover 65 is provided for the casing 10^a to fit over the front edge of the flange 11^a, said cover having in the present case a flange 65^a to fit outside of said flange. The cover 65 may be of openwork or grid-form after the manner of a hot air register to permit free escape of heat.

The heater shown in Figs. 9 to 11 may be utilized for heating water when the pipe 15^a is connected with a source of water supply and water will be heated to a high degree merely in passing through the described heater coil. When the heater is placed with the coil in the vertical plane, the drip from the outer portion of the coil can escape from the outlet 23^c. The heater is highly useful for general heating purposes without permitting water to flow therethrough for which purpose, ordinarily, the outlet 23^c is without any fitting, thereby making it impossible to close said outlet with a resultant high pressure in the heater. Said heater is particularly useful when disposed horizontally on any suitable support for use in cooking and in both forms of the heater the coiled element within the resistance constitutes a strengthening core for the same and affords substantial support for the resistance, a feature of importance particularly in a cooker. Also, it is to be noted that the resistance is removable from the insulated core, that is to say, relatively to the core and insulation without disturbing the relation of the insulation and core.

The heater shown in Figs. 1 to 4 may be employed for general heating purposes without admitting liquid thereto by closing the cock 16.

I would state in conclusion that while the illustrated example constitutes a practical embodiment of my invention, I do not limit myself strictly to the mechanical details herein illustrated, since manifestly the same can be considerably varied without departure from the spirit of the invention as defined in the appended claims.

Having thus described my invention, I claim as new:

1. An electric heater including a tubular heater element in the form of a spiral coil, and an electric resistance winding about said element and having a slidable relation thereto, said resistance being flexible and adapted to be wormed from said element in removing the resistance, and adapted to conform to the convolutions of said element in being replaced in position.

2. For use in an electric heater, a resistance unit wound spirally to present a tubular form to fit over a heater element and flexible to conform to the configuration of the heater element when said resistance is applied to the heater.

3. An electric heater including a coiled tubular heater element; and a flexible electrical resistance winding spirally about successive convolutions of said element and having a sliding relation thereto, said resistance being adapted to conform itself to the convolutions of the coiled element in being moved along said element.

4. An electric heater including a tubular element formed into an outer coil constituting one heater element and having an inlet at its upper end, an element in the form of a second coil within the first coil and in communication therewith at the lower ends of both, a longitudinally ranging tubular heater element within the inner coil and in communication therewith at the upper ends of both, said longitudinal element having an outlet at the lower portion thereof, and an electric resistance applied externally to one of said elements.

5. A heater including an outer tubular element in the form of a vertically disposed helical coil having an inlet at the upper end thereof, a second tubular element in the form of a spiral coil within the outer coil, means establishing communication between said coils at their lower ends, a stand pipe within the inner coil and in communication with its upper end with the upper end of said inner coil, said stand pipe having an outlet from the same at the lower portion, and an electric resistance coiled about the second coil and slidable thereon, said resistance being removable and flexible to conform itself to the convolutions of the coil in being removed, the space between the second coil and the outer coil and between the second coil and the stand pipe permitting movement of said resistance along the second coil.

6. A heater including a base having a chamber, a tubular element in the form of a helical coil having an inlet at its upper end and communicating at its lower end with said chamber, a second coil within the first coil and communicating at its lower end with said chamber, and an electrical resistance applied externally to the inner of said coils and winding about the same; together with means to uncouple said inner coil, said resistance being slidable on said inner coil and removable therefrom endwise by a worming movement of said resistance.

7. A heater including a base having a chamber, a tubular element in the form of an approximately vertical helical coil having an inlet at its upper end and communicating at its lower end with said chamber, a second coil within the first coil and communicating at its lower end with said chamber, a stand pipe rising from said base within said second coil and communicating at its upper end with said second coil, the lower end of said stand pipe being out of communication with said chamber and there being an outlet from said stand pipe at its lower portion, and an electrical resistance coiled about said second element following the convolutions thereof.

8. A heater including a base having a chamber, a tubular element in the form of an approximately vertical helical coil having an inlet at its upper end and communicating at its lower end with said chamber, a second coil within the first coil and communicating at its lower end with said chamber, a stand pipe rising from said base within said second coil and communicating at its upper end with said second coil, the lower end of said stand pipe being out of communication with said chamber and there being an outlet from said stand pipe at its lower portion, and an electrical resistance coiled about said second element following the convolutions thereof; together with means to uncouple said second coil, said resistance being slidable as a unit on said coil to permit removal of the resistance when said second coil is uncoupled.

9. A heater including means affording a passage for the flow therethrough of a fluid to be heated, means optionally operable to control the flow of fluid therethrough, and heat-generating means for heating the first means, said heat-generating means being subject to the movements of said controlling means to bring the heat-generating means into action by movement of said controlling means to permit a flow of fluid and throw the heat-generating means out of action by a movement of the controlling means to arrest the flow of fluid, said controlling means being capable of a limited movement independent of the heat-generating means, when the latter is in action, to permit a limited regulation of the flow of fluid without throwing the heat-generating means out of action.

10. An electric heater including a heater element affording a passage for the flow of fluid therethrough, valve means controlling the flow of fluid through said element, an electric resistance for heating said element, said valve means including a valve stem, and an electric switch controlling said resistance, said switch including a movable switch element and an operating arm therefor connected with said valve stem to partake of the movements thereof to open the switch when the valve is turned to stop the flow of fluid and close the switch when the valve is turned to permit the flow of fluid, said valve stem and operating arm being

capable of a limited movement independently of said switch element when the latter is in the position closing the switch, to permit a limited regulation of the flow of fluid without operating said switch element.

11. An electric heater including a heater element affording a passage for the flow of fluid therethrough, valve means controlling the flow of fluid through said element, an electric resistance for heating said element, said valve means including a valve stem, and an electric switch controlling said resistance, said switch including a movable switch element and an operating arm therefor connected with said valve stem to partake of the movements thereof to open the switch when the valve is turned to stop the flow of fluid, and close the switch when the valve is turned to permit the flow of fluid; together with spring means acting on said movable switch element and adapted to be stressed by the movement of said element by the valve means, said spring means after an opening or closing movement of the valve being adapted to cause further closing or opening movement of said switch element and valve to insure the complete closing and opening.

12. An electric heating unit including an insulated heating element, and an electric resistance helically wound about the exterior of said element so that the latter constitutes a core therefor, said resistance having a slidable relation to the insulated core to permit of being slipped from or onto the same.

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