

C. C., R. C. & J. W. FINE.
 AUTOMATIC CUT-OFF FOR ELECTRIC WATER HEATERS.
 APPLICATION FILED MAR. 5, 1912.

1,051,991.

Patented Feb. 4, 1913.

2 SHEETS-SHEET 1.

Fig. 1.

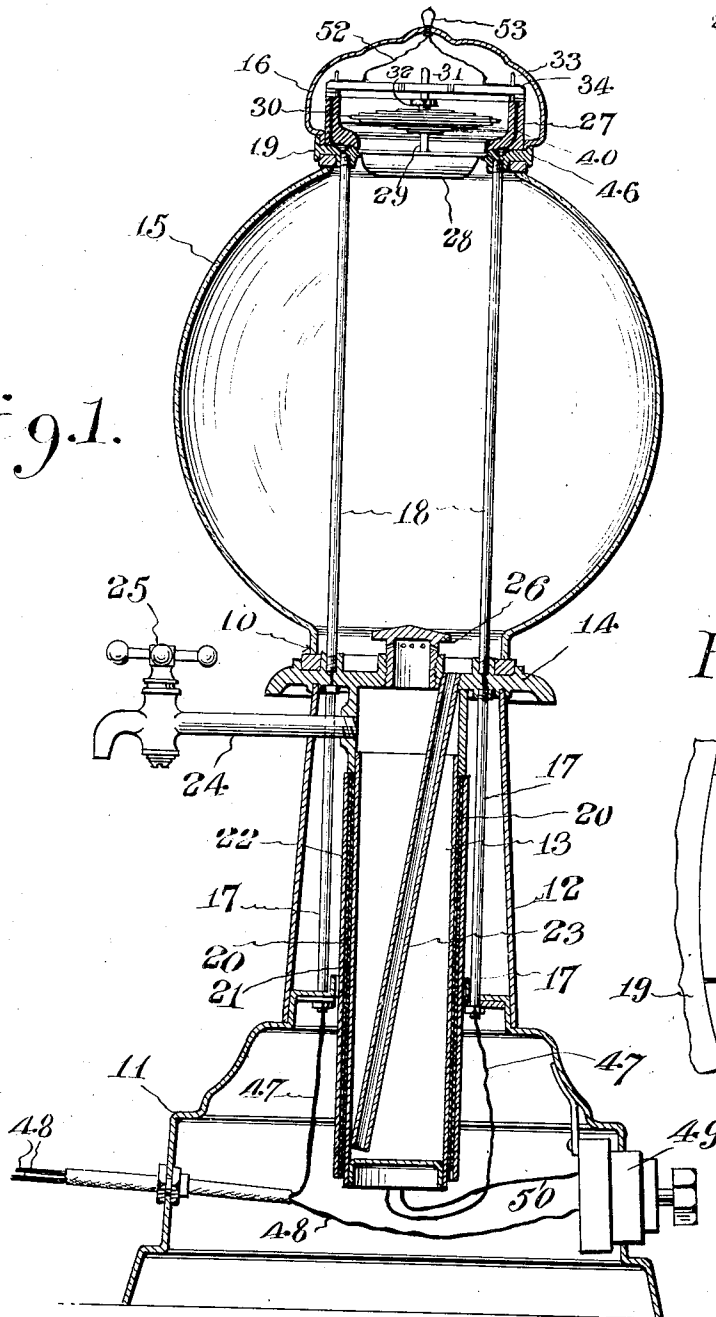
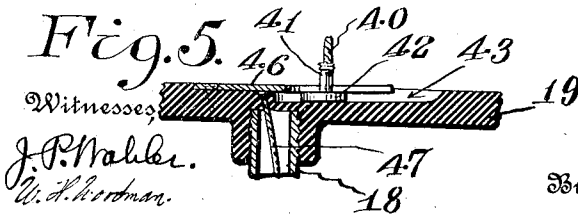


Fig. 4.

Fig. 5.



Witnesses,

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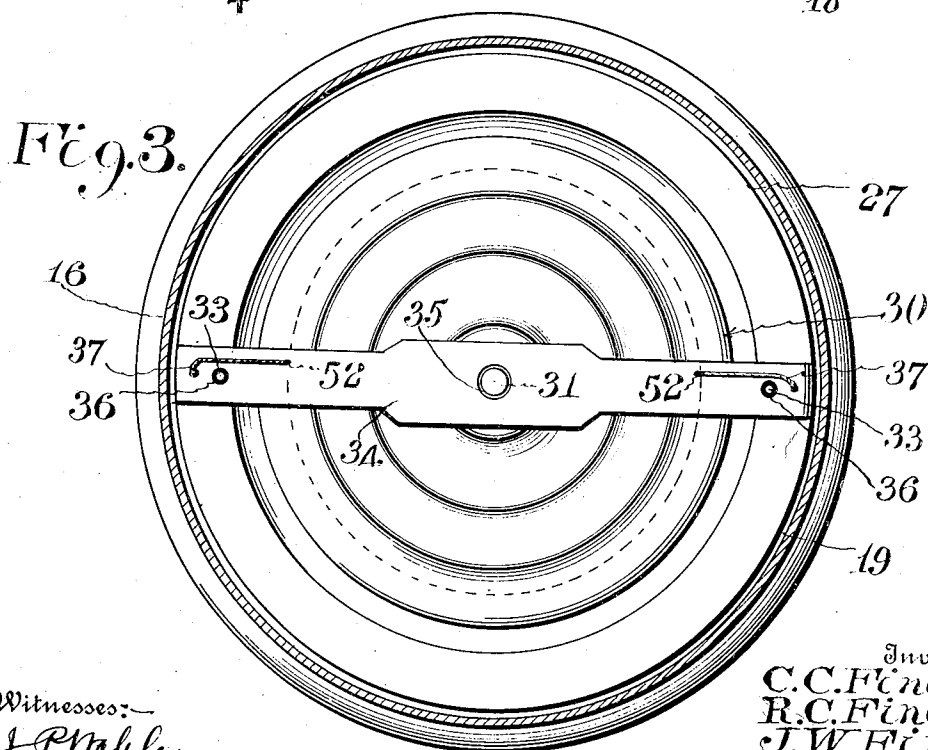
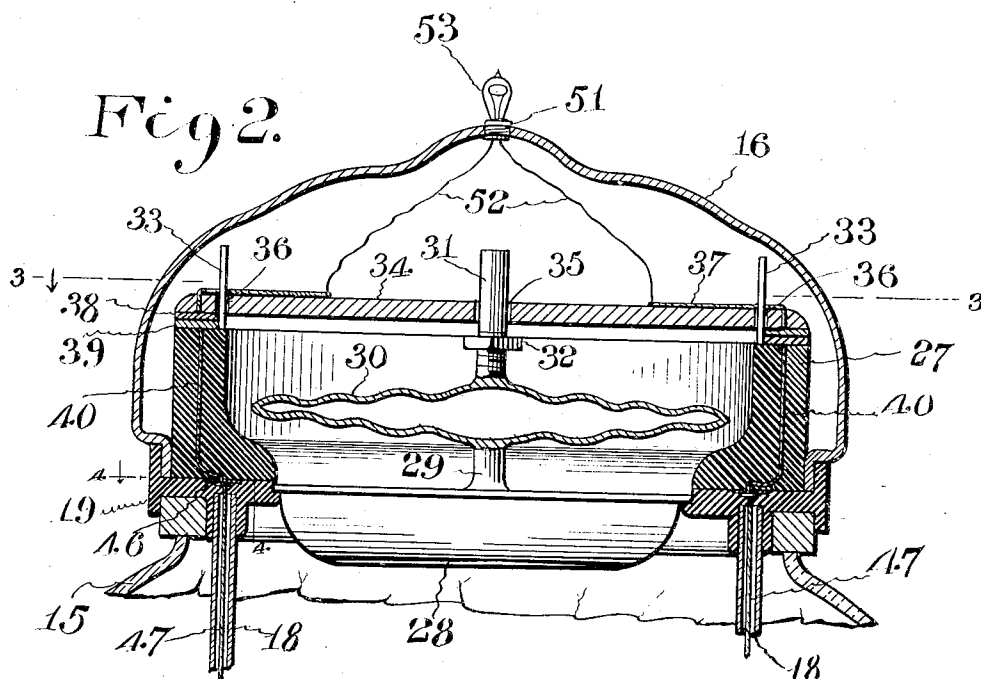
Attorneys

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2 SHEETS—SHEET 2.



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UNITED STATES PATENT OFFICE.

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AUTOMATIC CUT-OFF FOR ELECTRIC WATER-HEATERS.

1,051,991.

Specification of Letters Patent.

Patented Feb. 4, 1913.

Application filed March 5, 1912. Serial No. 681,798.

To all whom it may concern:

Be it known that we, CHARLES C. FINE, ROSCOE C. FINE, and JACOB W. FINE, citizens of the United States, residing at Nanticoke, in the county of Luzerne, State of Pennsylvania, have invented certain new and useful Improvements in Automatic Cut-Offs for Electric Water-Heaters; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

Our invention relates to new and useful improvements in electric water heaters and more especially to automatic cutoffs constructed and arranged to break the heating circuit when the water in the heater has reached a predetermined temperature and the object of our invention is to improve the construction and increase the efficiency of devices of the above described character.

A further object of our invention is to provide a cutoff which may be inclosed in the removable closure for the filling opening of the heater and which will be automatically connected with the heater when said closure is put in place.

With these and other objects in view, our invention will be more fully described, illustrated in the accompanying drawings which show a preferred embodiment of our device and then specifically pointed out in the claims which are attached to and form a part of this application.

In the drawings, Figure 1 is a vertical central section on an electric heater with our cutoff applied thereto. Fig. 2 is a similar section showing the cutoff upon an enlarged scale. Fig. 3 is a transverse section on the line 3—3 of Fig. 2. Fig. 4 is a section on the line 4—4 of Fig. 2 showing the manner of connection employed between the heating circuit and our device. Fig. 5 is a fragmentary vertical sectional view, on an enlarged scale, of the clamping ring and its adjunct parts.

Referring more specifically to the drawings, in which similar reference numerals designate corresponding parts throughout, 10 designates in general a well known form of electric heater comprising a sheet metal base 11 and a tubular upright portion 12 which forms a casing within which is supported a vertical heating vessel 13 comprising a sheet metal tube closed at its lower end

and extending upwardly into the lower end of a tubular extension of the cast metal top piece 14, which constitutes in part a portion of the top wall of the casing and in part the top wall of the heating chamber vessel. The said top piece 14 also forms a support for the liquid reservoir 15 which is preferably made of glass and which is provided at its top with a removable cap piece or closure 16 which normally closes the filling opening of the reservoir.

The upper margin of the upright casing member 12 is seated within an annular groove formed in the bottom of the casing 14 and is clamped between the base and said top piece, and the base is attached to the latter by means of hollow rods or tubes 17 as shown in Fig. 1. The reservoir is held in place upon the casing by means of tubes 18 which extend between and are attached at their ends to the casing 14 and to a clamping ring 19 fitted to the upper open end of the reservoir, a seat for the cap 16 being formed in the upper face of said clamping ring.

The tubular heating vessel 13 is surrounded by an electrical heating coil 20 which is connected with a supply circuit and switch as will be hereinafter described, said coil being preferably wound about a thin insulating layer of mica 21 or the like, which immediately surrounds the heating vessel. The coil is also inclosed by a heat insulating sheet 22, of asbestos or the like, to protect the casing from the heat of the coil.

The liquid passes from the reservoir to the heating vessel through a pipe 23 which leads through an opening in the casing 14 and extends to the lower end of the vessel 13. Liquid is drawn off through a draw off pipe 24 having a faucet 25. The top wall or casting 14 is provided with an opening through which the steam and heated water may pass to the reservoir and this opening is preferably fitted with a hollow, perforated plug 26 by means of which the circulation of water between the vessel and the reservoir is limited.

The cap 16 is provided at its lower inner edge with an annular, inwardly directed flange or seat 27 formed of a non-conductive material such as vulcanized rubber, and seated upon this flange in position to extend downwardly a slight distance within the reservoir when the cap is in place, is a closed

vessel 28, preferably formed of light sheet metal and filled with some liquid having a high coefficient of expansion such as alcohol. A tubular extension 29 of this vessel, communicates with and supports a diaphragm 30 positioned within the cap and extending upwardly and centrally from this diaphragm is a threaded stud 31 provided intermediate its length with an adjusting nut 32.

10 Guide rods 33 extend upwardly from diametrically opposite sides of the seat 27 and a cross bar 34 is provided centrally with a bore 35 and at each end with a bore 36 by means of which it is slidably mounted over the stud 31 and the guides 33, said bore normally resting upon the upper face of the seat 27 with the nut 32 spaced a slight distance below it. A conductor wire 37 extends longitudinally along the upper face of the bar and has its ends directed downwardly through perforations formed in the bar and connected to contact plates 38 which normally bear upon similar contact plates 39 carried by the upper face of the seat 27.

25 These latter contact plates 39 are each connected to conductor wires 40 which wires are passed downwardly through bores formed in the seat and are secured by their free ends to metal pins 41 which extend downwardly from the lower face of the seat 27 and terminate in heads 42 which are movable in grooves 43 formed in the upper face of the clamping ring 19 and which ring is also formed of non-conductive material. Each of these grooves terminates at one end over one of the tie tubes 18 and said ends are provided with bifurcated spring clips 46 which engage over the heads of the pins 41, forming electrical connection therewith and at the same time serving to lock the pin in place. Conductor wires 47 are connected by one end to these clips and are extended downwardly through the tubes 17 and 18 to the base 11 of the heater. Suitably insulated conductor wires 48 lead from the source of power and one of these wires 48 runs directly to a suitable form of switch 49 while the other is connected to one of the wires 47. The other wire 47 is connected to one terminal of the heating coil 20 while a wire 50 is connected by one end to the other terminal of the heating coil and by its other end to the switch 49. It will thus be seen that the heating circuit is extended through the wires 47 and the wire 37 of the movable bar 34 which in effect forms a second switch for cutting off the heating current as will be more fully explained hereafter. The top of the cap 16 is preferably provided with a lamp socket 51 electrically connected to the wire 37 by wires 52 and a small incandescent light 53 is carried by this socket and acts as an indicator to show when the heater is in operation, said light also acting as a handle for the cap.

In operation, the cap is turned to disengage the pins 41 from their clips, the reservoir 15 and heater chamber 13 are filled with water, the cap is replaced and counter-turned to again lock it in place and to close the circuit through the wires 47 and the wire 37 and the current is then turned on by means of the switch 49. As the water in the reservoir is heated the heat is transmitted to the alcohol in the vessel 28 forcing the same into the diaphragm and causing the diaphragm to expand and so raise the stud 31 together with the nut 32. When the temperature of the water has reached a certain point, determined by the position of the nut 32, the nut bears against the lower face of the bar 34 and raises the same from place, thereby breaking the circuit between the wires 47 and the wire 37 and as this circuit is part of the heating circuit all further heating of the water is stopped. The light 53 which is also energized by this circuit is cut out thereby showing that the water has been sufficiently heated. As soon as the water has cooled below the required point the diaphragm contracts and the bar 34 is seated to again close the circuit to reheat the water.

From the foregoing description it will be apparent that we have provided a simple and effective cut off for electric water heaters which is automatic in its action and which not only opens the heating circuit when the water has been sufficiently heated but which also closes the circuit when the water becomes cool. Because of this the heater is rendered absolutely automatic and will maintain water at a uniform temperature with the lowest possible expenditure of electrical energy and without any attention from the user.

It will of course be understood that minor changes in details of construction, such as may be necessary to adapt our device for use upon electrical water heaters of forms other than the one illustrated, may be made if desired, without in the slightest degree departing from the spirit of our invention.

What is claimed is:

1. The combination with an electric heater having a heating circuit, a heating vessel, and a reservoir, of a removable cap for closing said reservoir, a thermostatically movable contact member carried by said cap, and means for electrically connecting said contact member in the heating circuit, said means also locking the cap in place.
2. The combination with an electric heater having a heating circuit, a heating vessel, and a reservoir, said heating vessel and reservoir being connected by tie tubes extending through the reservoir, of a removable cap for said reservoir, a seat formed in the cap of non-conductive material, a thermostatically expansible diaphragm carried by

5 said seat and having an upwardly extending stud, a nut adjustable on said stud, guides and contact members carried by the upper face of this seat at diametrically opposite points thereof, a contact member slidably fitted on said guides and contacting with said contact members when in lowered position, said contact member being adapted to be raised by the expansion of the diaphragm, 10 wires extending from the contact members to the lower face of the seat, pins carried by the seat and connected to said wires and movable in grooves formed in the top of the reservoir, spring clips carried by the reser-

voir and adapted to engage said pins to lock 15 the cap in place, and contact wires forming part of the heating circuit extending upwardly through the tie tubes and connected to said spring clips.

In testimony whereof, we affix our signatures, in presence of two witnesses. 20

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Witnesses:

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