E. J. OVINGTON.

ELECTRIC HEATING DEVICE.

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1,141,576.

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Fig. 1.

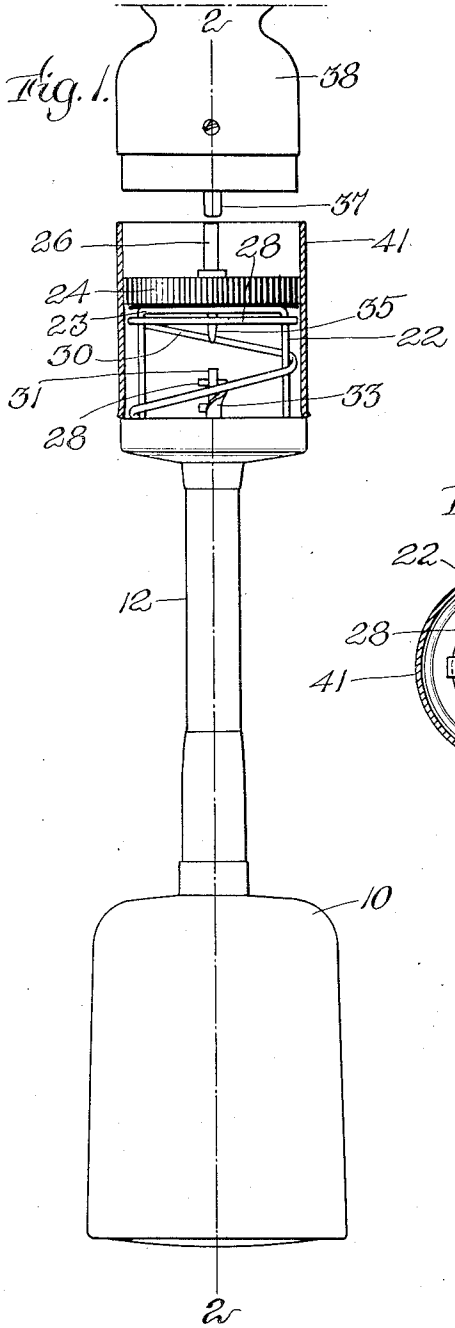


Fig. 2.

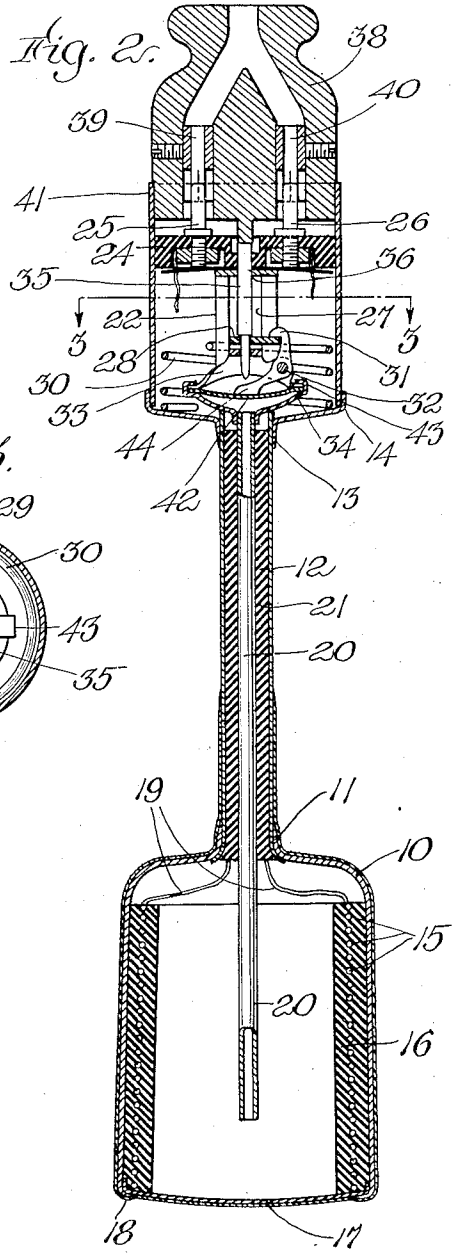
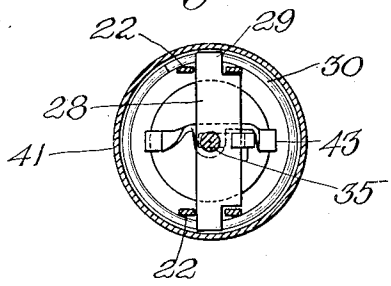


Fig. 3.



Witnesses:

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UNITED STATES PATENT OFFICE.

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ELECTRIC HEATING DEVICE.

1,141,576. Specification of Letters Patent. Patented June 1, 1915.

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To all whom it may concern:

Be it known that I, EDWARD J. OVINGTON, a citizen of the United States, and resident of Brookline, county of Norfolk, State of Massachusetts, have invented an Improvement in Electric Heating Devices, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

My present invention relates to electric heating devices, and particularly to automatic cut outs therefor, adapted to disconnect the current supply when the apparatus reaches a predetermined temperature or pressure.

While having other and more general fields of usefulness, the invention is well adapted for use as a feature of immersion heaters, or heating devices adapted to be inserted in a body of water, or other enveloping substance, to heat the same.

A prime feature of my invention consists in an improved arrangement of a projecting means in connection with a trigger adapted to forcibly disconnect the circuit connections upon the arrival of predetermined conditions, the trigger being arranged to normally hold such projecting means inactive.

A further feature of the invention consists in an improved construction of toggle device shown as in the form of a diaphragm, adapted to be controlled by thermal conditions and to act upon the trigger controller of the circuit disconnecting means.

A still further feature of the invention relates to an improved construction, wherein expansion of a gas, liquid or solid, caused by abnormal thermal conditions in the device, is adapted to bring about operation of the circuit disconnecting means.

A further feature of the invention relates to the use of water of crystallization to produce steam which acts to release the mechanism. Water of crystallization is not liberated into steam until a temperature is reached more or less above the boiling point of free water.

The above, and other features of the invention will be better understood from the following detailed description, taken in connection with the accompanying drawings, and will be thereafter pointed out in the appended claims.

Referring to the drawings, Figure 1 is a side elevation of my improved device, partly in section, with the parts shown in circuit disconnecting position; Fig. 2 is a central vertical section on line 2—2 of Fig. 1, showing the parts in circuit closed position; and Fig. 3 is a transverse section on line 3—3 of Fig. 2.

A heat radiating element is shown at 10 as an inverted cup or bell shaped member of metal plate stock, having a neck 11 at its top into which extends a tube 12 at the top of which is fitted a reduced neck 13 at the bottom of a shallow cup shaped member 14. The member 10 has fitted therein any suitable form of electric resistance device to transform electric current energy into heat. Such heating means is shown as a usual resistance wire or band 15 embedded in enamel or the like, 16. The member 10 is, however, well adapted to receive a heating resistance element of the types shown in my prior applications Serial Nos. 557,818, filed April 16, 1911, and 665,411 filed December 12, 1911. The bottom of the member 10 may be closed by a plate 17 over which the end of the member 10 may be spun as seen at 18, and a suitable coating or finish applied over the exterior of these members covering the same smoothly, tightly and firmly. Current energy is supplied to the resistance wire or ribbon 15 by conductors 19, which extend up through the tube 12. A small tube 20 also extends from the lower portion of the member 10 up through this tube 12 to a point within the shallow cup 14 as shown, and the annular space between the small tube 20 and the tube 12 is preferably packed in with any suitable insulating material 21. The shallow cup 14 has fixed thereto a U-shaped bracket or strap support 22 having side portions extending upward and united by a top portion 23, which carries an insulating disk block 24, which has fitted therein the terminal plugs or pins 25, 26, to which the respective conductors 19 lead, as shown. The support 22 is divided as shown to provide between its two sides guide slots 27 within which the ends of a cross bar 28 fit, the ends of this bar projecting some little distance beyond the guide support, as seen at 29 where they are engaged by a stout coil spring 30 which is seated at the bottom

of cup 14 and normally presses upward with considerable force against the bar 28. This bar is, however, normally held at its lower limit of movement with said spring strongly compressed by a trigger or latch dog 31, pivoted at 32 to a supporting bracket 33 carried by and secured to the flanged and enlarged upper end 34 of the tube 12, as illustrated in Fig. 2. The bracket 33 also is provided with a guiding hole for the reduced lower end of an ejector pin 35, which is guided at its upper end in a guiding aperture 36 in the top portion 23 of support 22 and is acted upon by the bar 28 when the spring 30 is released to forcibly move upward and engage a projection 37 on the lower end of a contact plug 38, to forcibly press the same outward and disconnect the socket contacts 39, 40 thereof from the contact pins 25, 26. The contact plug 38 is shown as fitted in a sleeve cover 41 which fits downward over the block 24 and against the cup 14 to inclose and protect the operative parts.

As a means for operating the trigger 31 to cause the same to be tripped and release the contact plug ejecting spring 30, I provide, as shown, a diaphragm 42, preferably of thin flexible metal, normally dished downward and held at its edges by spun over portions 43 at the periphery of the enlarged upper end 34 of tube 12. The trigger 31 has a downwardly extending arm 44 normally resting upon or adjacent to the top of this diaphragm when the trigger is in locking position, and adapted to be engaged by the diaphragm to trip the trigger from its locking position over the bar 28 upon the occurrence of abnormal thermal conditions, such as to cause the diaphragm 42 to be flexed upward. It is to be understood that this member, shown as a diaphragm 42, is really in the nature of a toggle device, and while specifically shown as a diaphragm is intended to typify any suitable device having a similar mechanical operation. I provide means whereby the diaphragm 42 is acted upon from beneath, upon the occurrence of an abnormal thermal condition to flex the same upward, *i. e.*, so that its "dish" is upward instead of downward. This result may be effected by the generation of a steam pressure in the interior of the member 10, which, passing up through the tube 20, will act on the lower side of the diaphragm 42. It is also within the scope of my invention that the tube 20 may typify a metallic element adapted to itself expand differentially enough to press the diaphragm past its neutral position by acting directly or indirectly thereagainst, but such a construction is not my preferred form and is not, therefore, herein illustrated.

It is to be understood that in practice the radiating member 10, along with part of the tube 12, is immersed in a body of water or the like, which by conducting the heat away as fast as it is generated, keeps the temperature of the member 10 relatively low, or not far above the boiling point of the liquid. However, when the device is removed from the water or other surrounding body and laid aside, if the user neglects to disconnect the connector plug 38, the device will heat up very rapidly, since the heat transference into the air is relatively slow, and the device would become abnormally and dangerously hot to an extent apt to injure it or set fire to adjacent bodies, were it not for the automatic cut out device which my invention provides. As soon as the temperature rises materially above a predetermined desired maximum, the trigger 31 will be operated to release the compressed spring 30, so that the ejector pin 35 will forcibly project the connector plug 38 outward and clear the terminal conductor pins 25, 26. In the use of gas pressure passing up through the tube 20 and acting on the lower side of the diaphragm, it is not necessary that any outside water be admitted to the interior of the member 10, since the water of crystallization in the refractory core of insulating material will furnish enough steam, and this has the advantage of not being set free in the operation of the device, up to or slightly above the boiling point of free water.

I am aware that various of the details of construction as described may be modified without departing from the spirit of the invention, and I therefore do not desire to be limited in these or in any other respects, except as set forth in the appended claims.

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

1. Apparatus of the kind described, comprising means for transforming electric current energy into heat, circuit connections thereto having a disconnectible portion, means for positively disconnecting such portion with provision for holding the same normally inactive, and means operable by abnormal pressure conditions in the apparatus for releasing said disconnecting means for action.

2. Apparatus of the kind described, comprising means for transforming current energy into heat, circuit connections thereto having a disconnectible element, means for effecting the disconnection of such element, a trigger for holding said means normally inactive, and means operated by expansion within the apparatus under abnormal thermal conditions for tripping said trigger to release said disconnecting means.

3. Apparatus of the kind described, comprising an electric resistance element, circuit connections thereto having a disconnectible

plug, a spring arranged to act on said plug for disconnecting the same, a trigger for normally holding said spring inactive, and means operated by abnormal pressure conditions in the apparatus for tripping said trigger.

4. Apparatus of the kind described, comprising an electric resistance element, circuit connections thereto having a disconnectible element, a spring for disconnecting said element, means for normally holding said spring inactive, and a diaphragm controller for said means.

5. Apparatus of the kind described, comprising an electric resistance element, circuit connections thereto having a disconnectible portion, motive means for disconnecting said portion having a trigger control normally holding the same inactive, and a toggle device arranged to be operated by expansion within the apparatus for governing said trigger.

6. Apparatus of the kind described, comprising an electric resistance element, circuit connections thereto including a disconnector plug, a spring for disconnecting said plug having a trigger control to normally hold the same inactive, a diaphragm of stiff material and dished form adapted to serve as a toggle arranged to govern said trigger, and means for applying fluid pressure to operate said diaphragm.

7. Apparatus of the kind described, comprising an electric resistance element having circuit connections, including a disconnector plug, a spring adapted to act on said plug for disconnecting the same having a controlling trigger, and a diaphragm in position to operate said trigger, the parts being arranged to provide space for the generation of steam to act on said diaphragm and there being connections to lead the steam thereto.

8. Apparatus of the kind described, comprising an electric resistance element having a housing of inverted cup shape, a tube extending vertically from said housing, a second housing fitted to the top of said tube and having fixed thereto terminal connections for the resistance element, a circuit connector plug removably fitted to said terminal connections, a spring fitted within said second housing adapted to disconnect said plug, a controlling trigger for said spring to hold the same normally inactive, and means for releasing said trigger upon the occurrence of abnormal thermal conditions in the apparatus.

9. Apparatus of the kind described, comprising an electric resistance element having a housing of inverted cup shape, a tube extending vertically from said housing, a second housing fitted to the top of said tube and having fixed thereto terminal connections for the resistance element, a circuit connector plug removably fitted to said terminal connections, a spring fitted within said second housing adapted to disconnect said plug, a controlling trigger for said spring to hold the same normally inactive, a dished diaphragm of stiff material in position to act on said trigger, and connections for conveying fluid pressure generated by abnormal thermal conditions in the apparatus to act on said diaphragm.

10. Apparatus of the kind described, comprising electric heating means, terminals therefor having separable connections, a disconnector arranged to separate said connections, means for holding said disconnector normally inactive, with provision for holding water of crystallization in thermal contact with said heating means, the parts being so arranged as to cause such water of crystallization to create a pressure when the device is run under abnormal conditions, and means operable by the pressure so created for releasing said disconnector.

11. An electric heater having a circuit opening device associated therewith, comprising a toggle joint, and means expansible by heat operating through said toggle joint for operating the circuit opening device.

12. An electric heater having a circuit opening device associated therewith, comprising a diaphragm, and means expansible by heat operating through said diaphragm to release the circuit opening device.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

EDWARD J. OVINGTON.

Witnesses:
C. L. ROGERS,
R. G. HERSEY.