

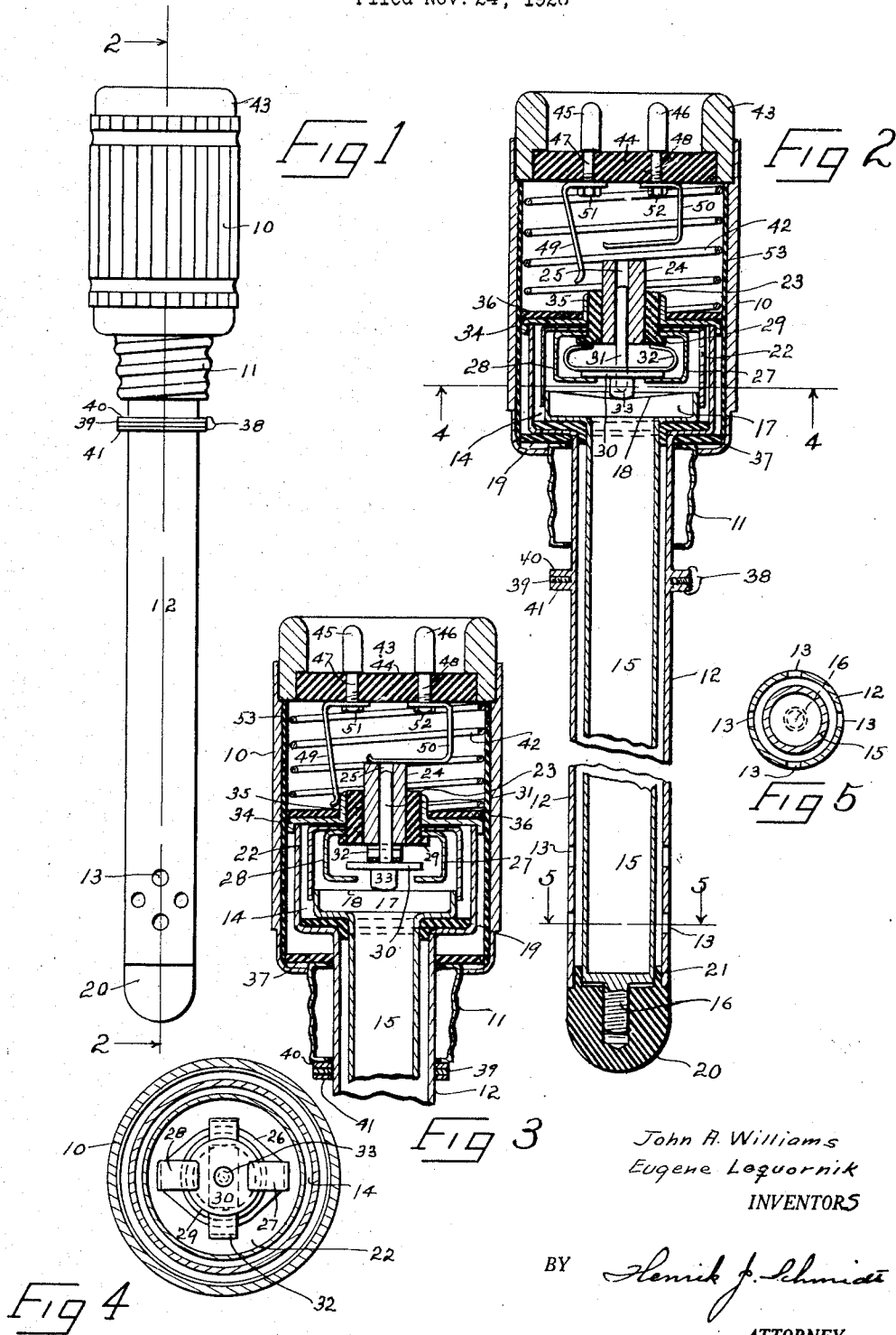
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ELECTRIC HEATER

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ELECTRIC HEATER.

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Our invention relates to electric heaters of the class in which a part of the heater is immersed in water for the purpose of heating same. It has for its main object to provide a heater which utilizes part of the water in which it is immersed as a part of its electric circuit and in which the making and breaking of the circuit is automatically governed by the decrease and increase of the temperature of the water so that it may be kept at an even, predetermined temperature.

A further object is to provide a heater very economic in its consumption of current and safe from imparting shocks or burns to the person using it. A still further object is to provide a heater of simple, strong construction having no coils, elements or other parts likely to burn out or get out of order, easy to manipulate, and comparatively inexpensive to manufacture.

These and other objects and advantages will be clearly understood from the following description and from the accompanying drawing of a preferred embodiment, but it will be readily seen that various modifications may be made without departing from the scope of the invention.

In the drawing,

Fig. 1 is a side elevation of a preferred embodiment of the invention.

Fig. 2 is a cross-sectional, side elevation taken on line 2—2, Fig. 1.

Fig. 3 is a cross-sectional, side elevation similar to the upper part of Fig. 2, but showing various members in other positions.

Fig. 4 is a cross-sectional, bottom view taken on line 4—4, Fig. 2.

Fig. 5 is a cross-sectional, top view taken on line 5—5, Fig. 2.

Figs. 2, 3, 4 and 5 are drawn to a larger scale than Fig. 1.

Referring now to all the views, simultaneously, the heater may, in a general way, be described as consisting of a handle member from which extends, slidably, a comparatively long tube having perforations at its lower end and enclosing an inner, sealed tube. This inner tube, having a diaphragm at its upper end, acts as a thermostat. The switch mechanism and other parts being contained within the handle member.

The handle member 10 is, in this particular case, provided with a downwardly extending, threaded portion 11 in which the tube 12 is free to slide. This outer tube, which has a plurality of perforations at its lower end, is

enlarged at its upper end so as to form a circular and comparatively deep chamber 14. Inside the tube 12 and concentric therewith, an inner tube 15 is located. This tube, the lower end of which is closed and provided with a threaded stud 16, is also enlarged at its upper end to form a circular, but comparatively shallow, chamber 17. A diaphragm 18 is placed over the upper end of the chamber 17 and securely sealed thereto.

Before sealing the diaphragm in place, a quantity of quickly expanding liquid, such as for example alcohol, is poured into the tube 15. A part of the air is also exhausted from this tube. This causes the diaphragm, under normal temperature, to assume the downward or inwardly-drawn position shown in Fig. 2.

The tube 15 is held in its concentric position inside the tube 12 by means of the resilient, insulating washer 19 and the insulating nut 20. The washer 19, which rests in the bottom of the chamber 14 and extends some distance down between the tubes, makes a water-tight joint between the tubes when the nut 20 is screwed up tight on the stud 16. The nut 20 is also provided with an annular shoulder 21 for correctly spacing the tubes at the bottom.

A cover 22 fits over the chamber 17 and inside of this cover is contained the thermostatic switch. This switch and its parts will now be described. The metal cover 22 is provided with a circular opening in which a shouldered, insulating bushing 23 is inserted. This bushing is provided with a metal bushing 24 which extends some distance above its upper end. It has a hole 25 drilled longitudinally through its center.

A double armed, metal, switch bracket, consisting of a body-part with a central opening 26 and two downwardly and inwardly extending arms 27 and 28, is placed on the insulating bushing 23 between the cover 22 and the shoulder 29. The shape of this bracket will best be understood by referring to Figs. 2 and 4.

A metal disk 30 is secured to a metal rod 31 slideably mounted in the hole 25 of the metal bushing 24. A bow spring 32, made from a flat metal strip and having a hole through which the rod 31 passes, is inserted between the disk 30 and the insulating bushing 23. It tends to hold the disk in contact with the arms 27 and 28. In Figs. 3 and 4, this spring has been shown in a position at right angles to that in which it is shown in Fig. 2. This

has been done to make its shape more readily understood. A button 33, made of insulating material, is attached to the other side of the disk 30 and rests on the diaphragm 18. The operation of this switch will be explained later.

A cover 34 fits over the chamber 14 and has a circular opening in its center surrounded by an upwardly projecting shoulder 35 which is slightly rounded at its upper edge. An insulating washer 36 fits over the shoulder 35 and rests on the cover 34.

As previously stated, the outer tube 12, and consequently all the parts connected thereto, is slideably mounted in the handle member 10. This slideable movement is limited downwardly by the bottom of the chamber 14 abutting against the insulating washer 37 which rests upon the upper part of the threaded portion 11 and upwardly by a stop 38 rigidly attached on the periphery of the outer tube. The stop consists of an intermediate, metal ring 39 and two resilient, insulating washers 40 and 41. A compression spring 42, inserted in the handle member between the washer 36 and a metal rim 43 in the top of the handle, normally tends to hold the tube in the extended position shown in Fig. 2.

The rim 43, which is forced into the top of the handle member, is provided with a seat for an insulating disk 44. Two contact points 45 and 46, having threaded, shouldered portions 47 and 48, are inserted in this disk and to these are attached the main switch springs 49 and 50. These springs are held in place by the nuts 51 and 52. An insulating sleeve 53 is placed inside the handle member as shown, thus completely insulating it from the parts contained therein.

The heater operates in the following manner:

The preferred embodiment shown is such as would be used with a hot water bag, such as are commonly used in sick-rooms for alleviating pain. To adapt the heater to this purpose, the threaded portion 11 has been employed.

When it is desired to heat the water in the bag, the tube 12 is inserted and the threaded portion screwed into the neck of the bag. This causes the stop 38 to abut against the seat generally provided in the neck of such bags and forces the tube and the parts attached thereto up into the handle member. The stop also makes a water-tight, insulated joint between the heater and the bag.

The upward movement of the tube causes the top of the bushing 24 to engage with the main switch spring 50 and the projecting shoulder 35 to engage with the other main switch spring 49. If the contact points 45 and 46 are now connected to an electric current, the current will flow through spring 49, shoulder 35, cover 34, tube 12, through the water which has flowed in between the tubes

12 and 15 through the perforations 13, and back through the tube 15, cover 22, bracket body 26, arms 27 and 28, disk 30, rod 31, bushing 24, main switch spring 50 to the contact point 46. The resistance offered by the water between the tubes as the current passes through it, causes the heat which increases the temperature of the rest of the water in the bag. The distance between the tubes governs the resistance.

As the temperature of the water reaches a certain predetermined degree, the alcohol in the inner tube expands and pushes the diaphragm upward which, on account of the contact between the diaphragm and the button 33, lifts the disk 30 from engagement with the arms 27 and 28. This breaks the current. As the temperature of the water decreases, the diaphragm drops and closes the current.

It will be seen that by placing the proper amount of alcohol in the inner tube, the temperature at which the water will operate the thermostatic switch may be greatly varied. It will also be noted that any injury to the inner tube will destroy the partial vacuum created therein and thus break the current. If the heater is removed from the bag while the current is on, the action of the spring 42 immediately breaks the current by disengaging the main switch. These features add greatly to the safety of the device.

While we have described and illustrated a heater for use with a hot water bag, we do not wish to limit our invention to any particular device. In like manner, while the heater illustrated employs round tubes, tubes of any other shape may be employed. Likewise, other liquids than water and alcohol may be used.

Having described our invention and its operation, what we claim as new and wish to protect by Letters Patent is:

1. In an electric heater of the class described, a metal tube, a smaller metal tube located concentrically within said first tube and electrically insulated therefrom, said inner tube closed at one end and provided with a diaphragm at the other end, a quick expanding substance placed in said inner tube, a switch actuated by said diaphragm, and means for connecting said outer tube and said switch to an electric current, the circuit being completed when the tubes are immersed in a liquid.

2. In an electric heater of the class described, a metal tube, a smaller metal tube located concentrically within said first tube and electrically insulated therefrom, said inner tube closed at one end and provided with a diaphragm at the other end, a quick expanding substance placed in said inner tube, the air partly exhausted from said inner tube, a switch actuated by said diaphragm, and means for connecting said outer tube and said switch to an electric current, the circuit being

completed when the tubes are immersed in a liquid.

3. A handle member, a metal tube projecting from one end of said handle member, a
5 smaller tube located concentrically within said first tube, said tubes electrically insulated from each other and from the handle member, both tubes closed at their outer ends, a plurality of perforations drilled in the
10 outer tube, a diaphragm provided on the other end of the inner tube, an expanding medium placed in said inner tube and the air partly exhausted therefrom, a switch actuated by said diaphragm, and means for connecting
15 said outer tube and said switch to an electric current, the circuit being completed when the tubes are immersed in a liquid.

4. A handle member, a metal tube projecting from and slideably mounted in one end of

said handle member, a smaller tube located 20 concentrically within said first tube and connected thereto, said tubes electrically insulated from each other and from said handle member, both tubes closed at their outer ends, a plurality of perforations drilled in the 25 outer tube, a diaphragm provided on the other end of said inner tube, an expanding medium placed in said inner tube, a switch actuated by said diaphragm connected to the outer tube but electrically insulated there- 30 from, a second switch actuated by the sliding motion of said outer tube, and means for connecting said second switch and the outer tube to an electric current, the circuit being completed when the outer tube is immersed in a 35 liquid.

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