W. S. HADAWAY, JR.

ELECTRIC HEATING APPARATUS.

APPLICATION FILED SEPT. 26, 1913.

1,167,749.

Patented Jan. 11, 1916.

3 SHEETS—SHEET 1.

Fig. 1

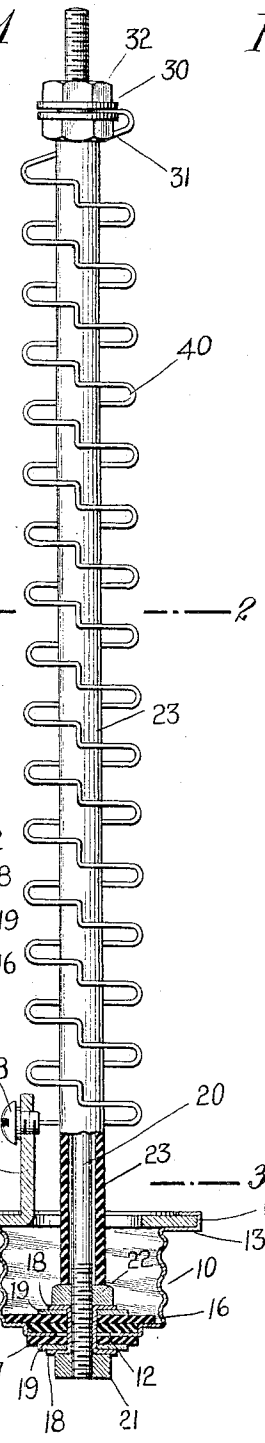


Fig. 2,

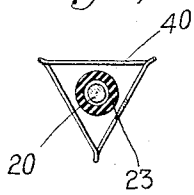


Fig. 3,

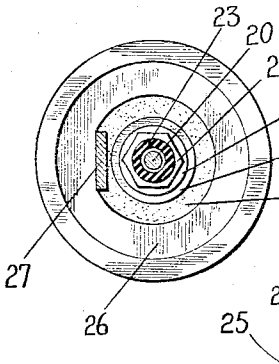
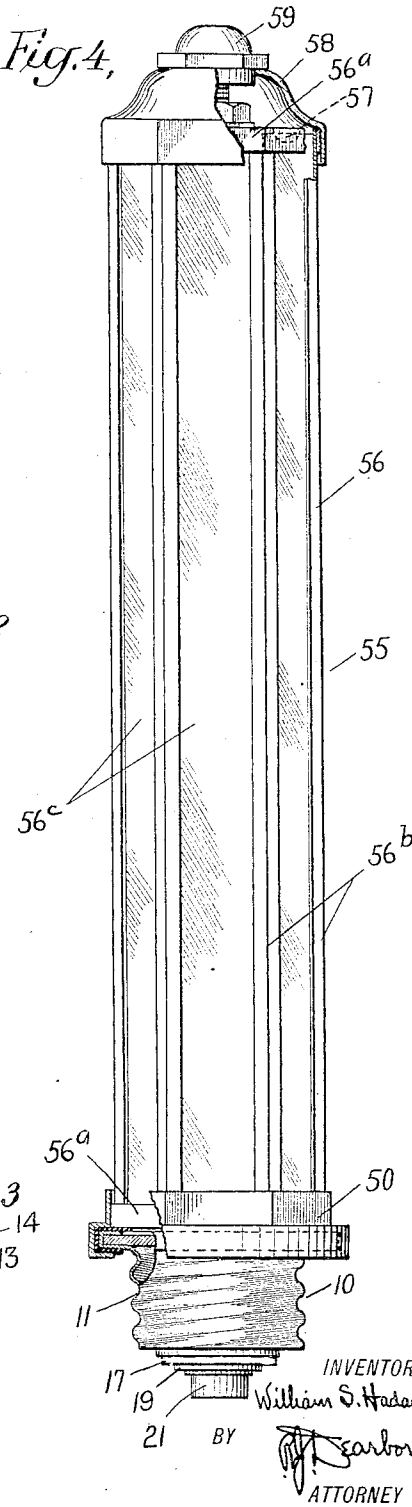


Fig. 4,



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3 SHEETS—SHEET 2.

Fig. 5,

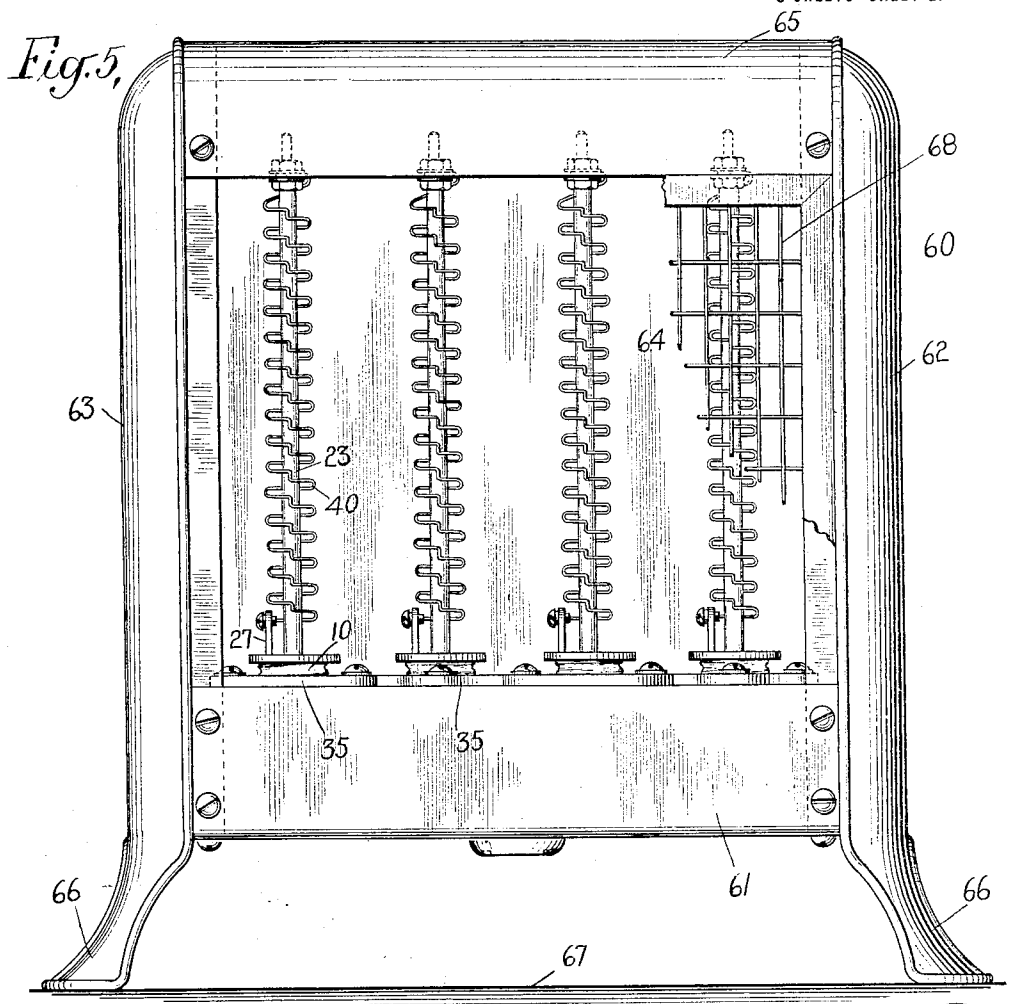
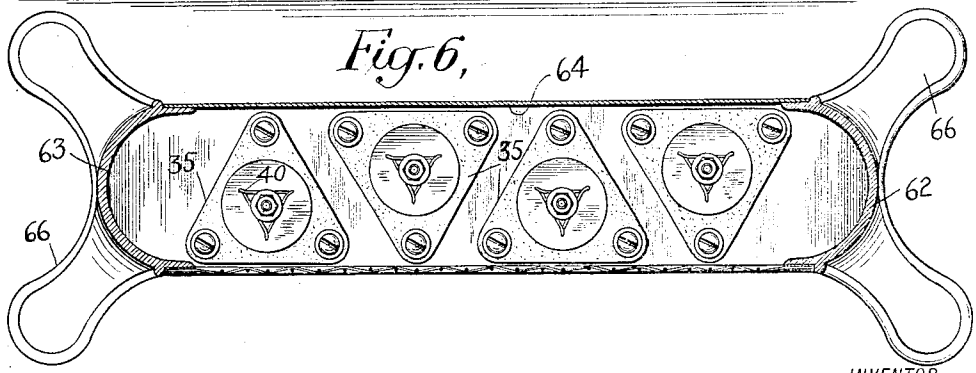


Fig. 6,



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3 SHEETS—SHEET 3.

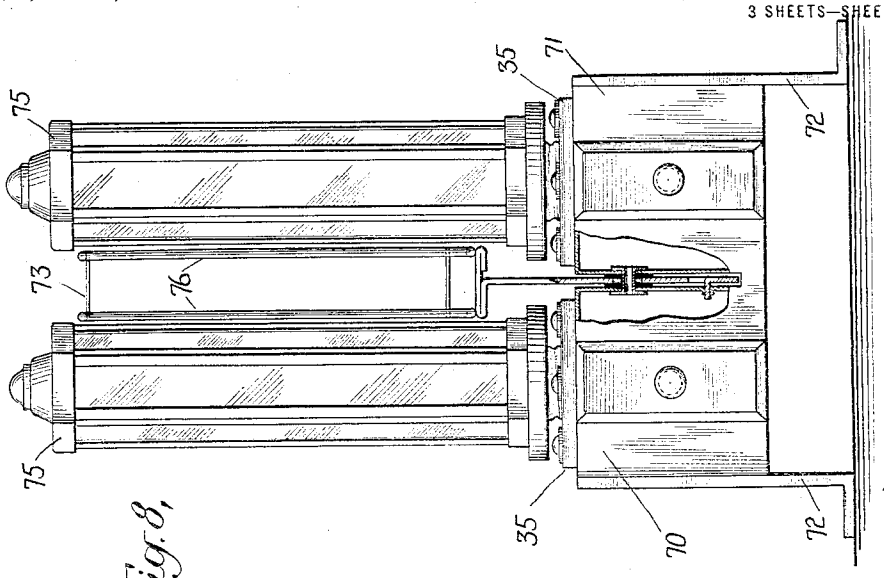


Fig. 8.

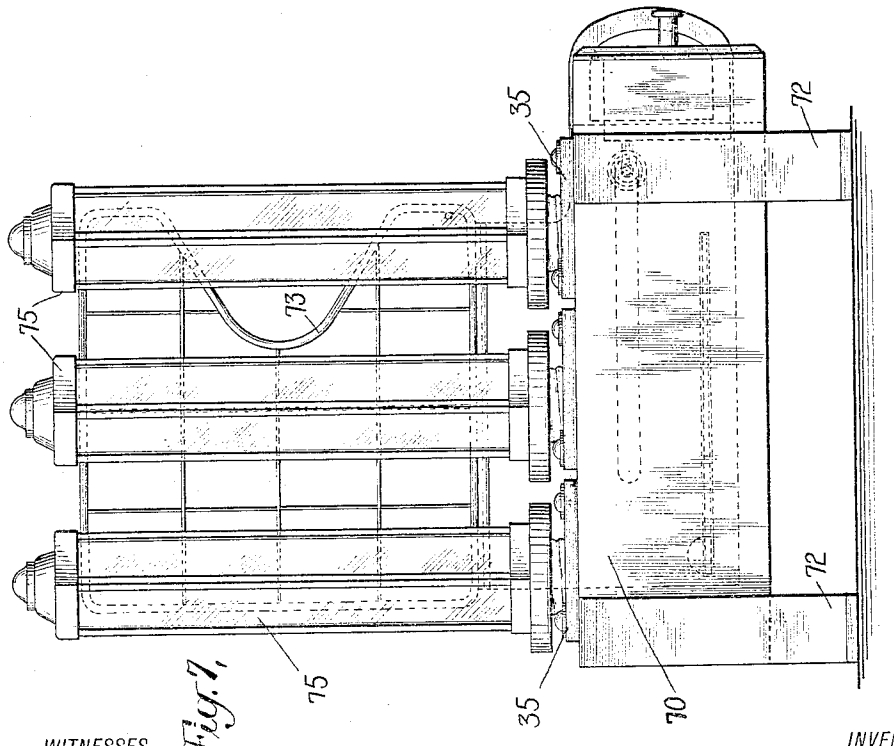


Fig. 7.

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ELECTRIC HEATING APPARATUS.

1,167,749. Specification of Letters Patent. Patented Jan. 11, 1916.

Application filed September 26, 1913. Serial No. 791,931.

To all whom it may concern:

Be it known that I, WILLIAM S. HADAWAY, Jr., a citizen of the United States, and a resident of New Rochelle, Westchester county, and State of New York, have invented certain new and useful Improvements in Electric Heating Apparatus, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof.

My invention relates to electric heating devices and particularly to such as are intended to impart heat to relatively distant objects.

One object of my invention is to provide a simple and durable heater that shall be arranged and constructed to transfer a large proportion of its heat by radiation.

Another object is to provide a heater unit of the character above indicated that shall be inexpensive to construct and adapted to be utilized in groups or quantities depending upon the shape and size of the heating device of which it forms a part.

Other objects and advantages of my invention will be set forth hereinafter.

Figure 1 is a partially sectional elevation of a heater unit arranged and constructed in accordance with my invention. Figs. 2 and 3 are transverse sectional views on the lines 2—2 and 3—3 of Fig. 1. A modification of the unit of the preceding figures, with an inclosing casing, is shown in Fig. 4. The utility of the open unit of Fig. 1 is illustrated in Fig. 5 which is a front elevation of a portable air heater. Fig. 6 is a sectional plan view of the same heater. Fig. 7 is a front elevation and Fig. 8 an end elevation of a toaster stove equipped with and illustrating the utility of the inclosed heater unit of Fig. 4.

Corresponding parts are designated by the same reference characters in all of the figures.

Referring to Figs. 1, 2 and 3 of the drawings, the heater unit here shown comprises an attachment plug or thimble 10, a longitudinal rod 20, terminal members 25 and 30, and a relatively high resistance heating element 40. The plug or thimble 10 is preferably formed of sheet metal such as brass, and has helically corrugated side walls 11 which are formed to provide screw threads in a well known manner. The thimble is provided with an aperture 12 at one end and a flange 13 at the opposite end. The flange is bent back on itself to provide an annular groove 14 in which the body 26 of the terminal member 25 is supported. Insulating washers 16 and 17 are rigidly secured to the partially closed end of the thimble by means of a hollow rivet 18 which is headed over metal washers 19. One end of the rod 20, which is screw-threaded near each end, extends through the hollow rivet 18 in the base of the plug or thimble and is clamped in position by nuts 21 and 22. The body of the rod is separated electrically from the resistance wire 40 by means of an insulating sleeve 23 which extends from the nut 22 near one end to a nut 31 which forms a part of the terminal 30 at the other end. The nut 31 and a similar binding nut 32 are screwed onto the outer end of the rod 20 and clamp between them the outer end of the resistance wire 40. The resistance wire may be coiled about the insulating sleeve 23 in any suitable manner but I prefer to arrange it in the form of a triangular helix as clearly shown in Figs. 1 and 2 of the drawings, in order that the central rod may support it against vibration. The opposite end of the wire is secured to the terminal 25 which comprises the ring-shaped body 26, a tongue 27 extending upwardly therefrom and a binding screw 28 in the tongue. The inside diameter of the ring 26 is sufficiently large to permit the rod 20 and the insulating sleeve 23 to extend freely through it and the aperture 12 in the partially closed end of the thimble or plug is of such dimensions that the hollow rivet 18 and the thimble are electrically separated. The nut 21 and the corresponding end of the rod 20 are finished to a plane outer surface which is adapted to make contact with the central contact of an attachment socket (not shown) into which the plug 10 is adapted to be screwed. The electric circuit is established, when the plug is inserted in an energized socket, from the nut 21 through the rod 20 to the terminal 30, through the resistance wire 40 to the terminal 25 and thence to the body of the plug or thimble which is in engagement with the base ring of the terminal 25.

The inclosed heater of Fig. 4 is similar to the unit of the preceding figures, which has just been described except that the plug is provided with a casing socket 50 into which a hollow prismatic casing 55 is set. The casing comprises a frame 56 having hexagonal end pieces 56^a and angle ribs 56^b

connecting the end pieces. Transparent, heat resisting panels 56ᶜ preferably formed of mica, are set into the frame between the ribs and are held in place by overturned lugs 57 on the end pieces. A cap 58 covers the casing and is held in place by an insulating cap nut 59 on the end of the rod 20. It is a well known fact that heat may be transferred in three different ways, viz., by conduction, by convection, and by radiation. Conduction is the transfer of heat from one part of a body to another. Convection is the transfer of heat by the motion of heated matter and takes place only in fluids and gases. Radiation is the communication of heat from a hot body to a colder one across an intervening space and does not depend upon intervening air or any other tangible matter. The transfer of heat by radiation is supposed to be effected through the ether. Heat is transferred from electric heating devices, as ordinarily constructed, partly by radiation and in some cases by conduction, but ordinarily it is largely transferred by convection. In many ways this is the most unsatisfactory and uneconomical method of transferring heat and it has been my aim to produce a heater which is so designed and operated that a very large percentage of its heat is transferred, directly where it is wanted and used, by radiation. The intensity of heat radiation from a given source, varies as the temperature of the source, and inversely as the square of the distance from the source. Consequently I have designed my heater units to operate at a very high temperature. Nevertheless each unit is particularly simple in construction, requires no vacuum chamber or bulb and may be readily removed and replaced if destroyed or injured. The heater units may be utilized singly or in groups and it is not necessary to associate them with any particular reflecting or inclosing structure, but the units are well adapted for application to various devices and utensils for household and other purposes.

Referring to Figs. 5 and 6, the heater unit of Figs. 1, 2 and 3 is here shown as applied to an air heater for general heating purposes. This heater comprises a casing 60 having a hollow rectangular terminal box 61 which is secured at its ends to a pair of end frames 62 and 63 and a sheet metal back having a reflector surface 64 and an overhanging hood 65 at the top. The end frames have foot projections 66 at the bottom which are adapted to rest on the floor or some suitable horizontal supporting surface 67. They support the hollow terminal box 61 materially above the floor level. The top of the terminal box is perforated to receive a plurality of sockets 35 which are arranged with their adjacent sides substantially parallel in order that they may be set more closely together. The sockets are bolted or otherwise secured to the top of the terminal box. One of the open heater units of Fig. 1 is mounted in each of the sockets 35 and extends upwardly into the hood 65 in front of the reflecting surface 64. The heater is preferably provided with an open mesh wire screen 68 in front as a protection to the heater units. Radiated heat rays from the heater units are transmitted in all directions therefrom but may be reflected by the use of a suitable surface such as polished silver or brass. The surface 64 is a surface of this character and is intended and adapted to reflect the radiated rays so that all of the heat is radiated from the front of the heater.

The toaster stove shown in Figs. 7 and 8 clearly indicates the adaptability of the inclosed heater units of Fig. 4. This stove comprises a pair of terminal boxes 70 and 71 which are supported by foot projections 72 and constitute the body of the device, a rack 73 slidably mounted between the terminal boxes and a plurality of inclosed heater units 75. These units are arranged in two groups of three each, although the number employed will depend entirely upon the size of the stove and the work to be performed. The top of each terminal box is perforated to receive sockets 35 in which the inclosed heater units are mounted. The rack may be formed in any suitable manner and preferably comprises a pair of spaced screens 76 which are arranged to support a slice of bread between them.

The heater units may of course be applied to a large number of different devices within the spirit and scope of my invention, and I desire that only such limitations be imposed as are indicated in the appended claims.

What I claim is:

1. An electric heater comprising an attachment member having contacts adapted to engage coöperating receptacle contacts, a rigid conductor connected to one of said contacts adapted to be supported solely by the attachment member and extending outwardly therefrom, and a heater element supported by the conductor and electrically connected at its respective ends to the outer end of the conductor and to another of said attachment contacts.

2. A heater comprising a plug having a helically corrugated body adapted to engage and make electrical contact with the interior walls of a socket and an end contact electrically separated from the body of the plug and adapted to make contact with the interior bottom contact of a socket, a conducting rod secured to said end contact, an insulating sleeve surrounding the rod, a terminal member secured to the body of the plug, an opposite terminal member at the outer end of the rod and a heater element

connected at its respective ends to the terminal members.

3. An electric heater comprising an attachment plug, a casing socket secured thereto and insulated therefrom, a conducting rod extending outwardly from the plug, a heater element arranged above the rod as a support, a casing frame supported in said casing socket, translucent panels supported by said frame, a cap at the outer end of said casing and an insulating nut screwed onto the end of the conducting rod for holding the parts of the casing together in position.

4. An electric heater comprising an attachment member, a casing socket secured thereto and insulated therefrom, a central rod, a heater element, a casing frame supported in the casing socket, a cap at the outer end of the casing and an insulating nut screwed onto the outer end of the central rod.

5. An electric heater comprising an attachment plug, a polygonal casing socket secured thereto and insulated therefrom, a central rod extending outwardly from the plug, a heater element supported by the rod, a casing frame in the form of a hollow polygonal prism with open panels, set into the casing socket, a cap fitted onto the outer end of the casing frame, and an insulating means affixed to the outer end of the rod for holding the parts of the casing together in position.

6. An electric heater comprising an attachment member, a casing socket secured thereto, a central rod, a heater element, a casing frame having panels through which heat may be radiated and supported in the casing socket, a cap at the outer end of the casing frame and means coöperating with the rod for removably holding the casing in position.

In witness whereof, I have hereunto set my hand this 24th day of September in the year 1913.

WILLIAM S. HADAWAY, Jr.

Witnesses:
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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."