H. W. DENHARD.

ELECTRIC HEATER.

APPLICATION FILED OCT. 31, 1911.

1,143,578.

Patented June 15, 1915.

2 SHEETS—SHEET 1.

Fig. 1.

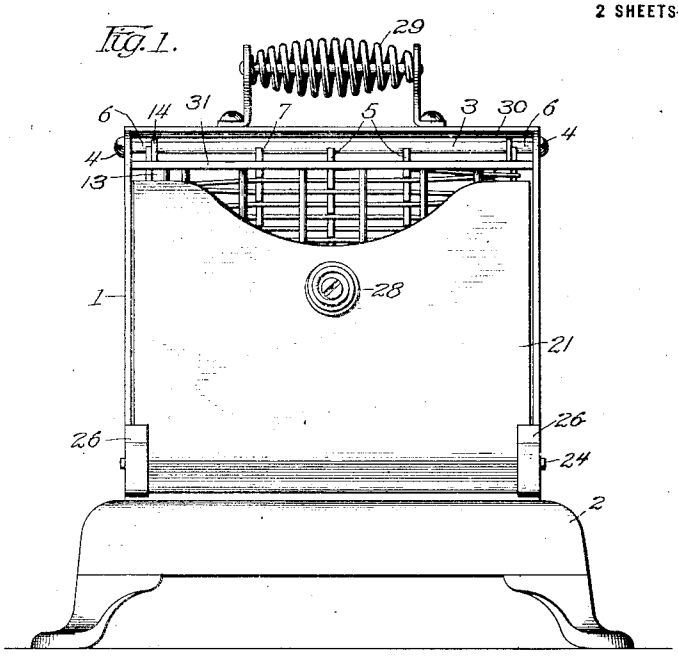


Fig. 2.

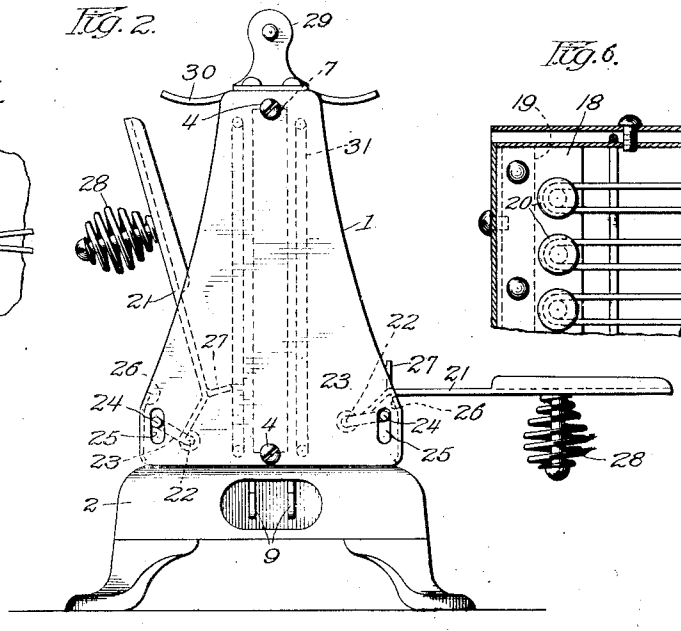


Fig. 5.

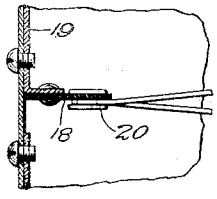


Fig. 6.

Witnesses:

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2 SHEETS—SHEET 2.

Fig. 3.

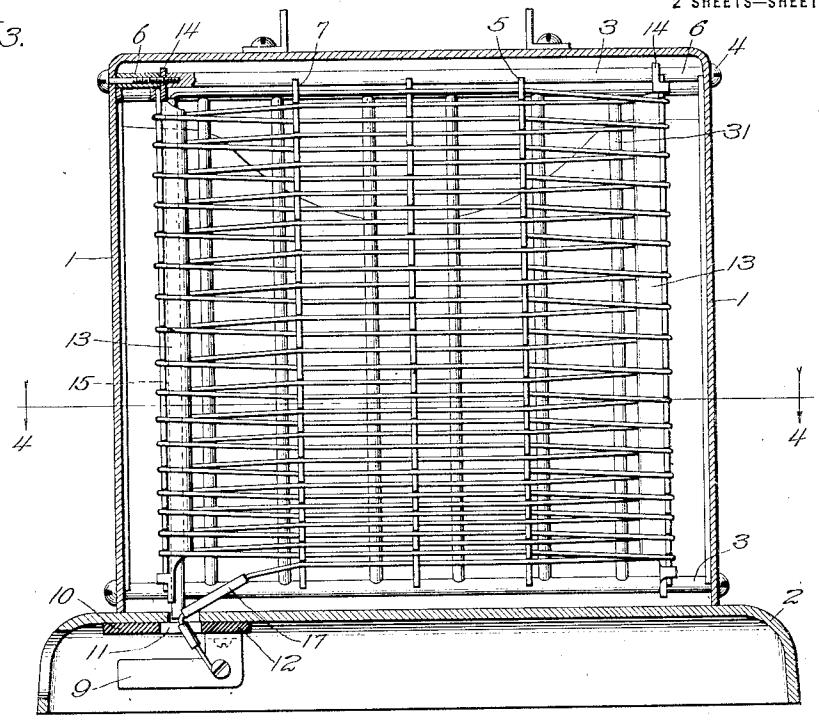
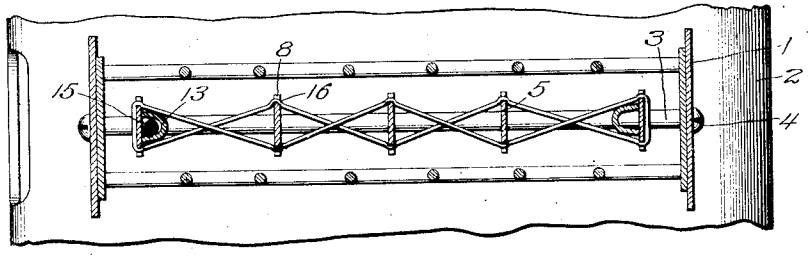


Fig. 4.



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UNITED STATES PATENT OFFICE.

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ELECTRIC HEATER.

1,143,578. Specification of Letters Patent. Patented June 15, 1915.

Application filed October 31, 1911. Serial No. 657,808.

To all whom it may concern:

Be it known that I, HARRY W. DENHARD, a citizen of the United States, residing at San Francisco, in the county of San Francisco and State of California, have invented new and useful Improvements in Electric Heaters, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawing, forming a part of this specification.

This invention relates to electric heaters.

One of the objects of the invention is to provide an improved electric heater.

Another object is to provide a simple efficient heater of rugged construction which may be readily manufactured at small expense.

Other objects and advantages of the invention will hereinafter appear.

The accompanying drawings illustrate an embodiment of the invention.

In the views of these drawings: Figure 1 shows a side elevation of a heater. Fig. 2 shows an end elevation of the same and the door mechanism. Fig. 3 shows a side elevation of the heating element with a portion of the casing in section. Fig. 4 shows a transverse sectional view on the line 4—4 of Fig. 3. Figs. 5 and 6 show detail views of a modified form of heating conductor support.

I have, for the purposes of illustration, shown my improved heating device applied to use as an electric toaster of the portable type, wherein the heating element stands vertically upon a frame and is so arranged that the articles to be toasted may be placed on opposite sides of the same and inclosed between the element and suitable doors.

In the form shown, the heating element is carried in a frame 1 supported upon a base 2. Within this frame the heating element is preferably mounted upon transversely extending rods 3 which extend across the frame at the top and bottom of the same. These rods may be secured to the frame at their ends by screws 4 or other suitable means. As illustrated in Fig. 3, this heating element may include a plurality of vertically extending insulating members 5 which are spaced from each other between the sides of the frame 1. In a preferred form, the ends of the outer members are held in position, spaced from the sides of the frames by sleeves 6 which inclose a portion of the shank of the screw and fit between the side of the frame and the members 5, as shown in Fig. 3. In order that the insulating vertical members 5 may fit upon the rods, their upper ends are preferably notched as at 7 to permit them to fit snugly upon or around the outer surface of the rod. If desired, a more perfect union may be provided by means of the use of a suitable cementing compound. All of the members 5 are preferably provided with notches 8 between their ends, the notches on one edge of the members being off-set with respect to those on the other edge, so that a resistance material, preferably in the form of a wire, may be wound back and forth across the members 5 to form a web.

In a preferred form, the resistance material is in the form of a single length of wire, one end of which is brought in at the terminals 9 of the device. As shown in Fig. 3, these terminal members 9 may assume the usual form and are preferably located in the base 2 and at one end thereof. By preference the terminals are insulated from the base 2 by means of an insulating plate 10. This plate preferably is provided with a perforation 11 registering with a perforation 12 in the top of the base through which the heating conductor extends. In the present form the end of the heating conductor is brought upward from one of the terminals 9 through the perforations 11 and 12, to a tubing 13, preferably made of metal, which extends upward along the inner side of the left hand member 5, being preferably provided with one flat surface so that it may rest snugly against the surface of this member. In a preferred form, the ends of this tubing are slightly compressed or flattened as at 14 and provided with perforations so that the holding screws 4 may pass through the same. By preference, the sides of the flattened ends of the tube 13 are provided with projections which are bent around about the upper and lower ends of the members 5 in order to hold the tubing and member together and through the attachment of the flattened ends of the tubing to the rods, provide a sturdy structure. At points adjacent the flattened ends of the tubing 13, openings are formed, and through these openings are inserted one or more tubular insulating members 15, preferably in the form of quartz glass or the like. These

insulating tubings serve to effectually insulate the conductor as it is brought up along the frame of the device. After the conductor has been passed through the tubing 15, it is then wrapped successively and in a zigzag manner upon the upright members 5, being passed first upon one side of one member and then upon the other side of the member. If desired, it may be slightly bent as at 16 at the points where it passes through the notches 8 in order to hold it more snugly in place. As the conductor is brought back and forth across the members 5, it is also preferably wound spirally and closer together so that the heat developed at the bottom is the greatest. When it reaches the bottom of the members 5, its lower end is preferably brought out through a suitable insulating tube 17, as shown in Fig. 3, to the other terminal member 9. As illustrated in Figs. 3 and 4, the opposite outer member 5 is also preferably provided with a similar member 13 similarly secured to provide a sturdy structure.

In Figs. 5 and 6 I have illustrated a modified form of support which may be used to support the ends of the convolutions of the heating conductor. In this construction the conductors may be carried on a vertically extending plate or strip 18 which extends substantially at right angles to the side of the frame. If desired, an L-shaped angle plate 19 may be fixed to the frame and serve as a support for the plate 18. In a preferred form a plurality of eyelets 20 are seated in suitable openings near the outer edge of the plate 18, as shown in Fig. 6. These eyelets are preferably formed of insulating material and if desired the plate 18 may be formed of this material or a suitable insulating support may be provided for the same. In a preferred form, the eyelets 20 are so arranged that there is a space between the front wall of the same and the front wall of the plate 18 so that resistance material may be slipped over the protruding end of the eyelet and passed in loops back and forth across the device as shown in Fig. 7. The ends of the convolutions may be twisted, as shown in Fig. 6 and applied to a unit of the construction shown in Fig. 3. However, the strips may be wound successively from one side of the unit to the other in substantially parallel convolutions, as shown in Fig. 7.

The end members of the frame 1 are slightly enlarged at their lower ends so that a door may be swiveled or otherwise secured in the same. In Fig. 2 I have illustrated a preferred means of attaching the doors. As shown in this construction, the doors are preferably formed of a bent piece of metal 21, preferably carrying a transversely extending swivel rod 22. The outer ends of the rod 22 are preferably bent downward substantially at right angles as shown at 23 in Fig. 2, and they are again bent at right angles to form extensions 24, which extensions are arranged to move in vertically extending slots 25 in the sides of the frame 1. In order to limit the backward movement of the door and guide the door in its forward movement, the forward edge of the side frame may be bent over as at 26 (shown in Figs. 1 and 2) or an additional plate may be attached to the end of the frame. In a preferred form, this extension or plate extends at right angles to the end of the frame. In order to suitably space the door from the material to be heated, or if desired to carry this material, the door may be provided upon its inner surface with an extension or flange 27 preferably adjacent to the point where it is bent. Obviously the door may be provided with a suitable heat insulated handle 28, as illustrated.

When it is desired to close the doors equipped with this form of door mechanism, all that is necessary to do is to raise the door to closing position. As the door is raised, the curved back of the same rides over the upper edge of the extension 26, the end of the rod 22 remains substantially stationary in the slot. When, however, the door is brought almost to its closed position, the end 24 slides down in the slot. In opening the door, all that is necessary to do is to draw the handle 28 outward, whereupon the door is swiveled about the rod 22, which in turn moves about a pivot in its slot and may be opened to any desired degree, remaining in that position as long as desired. With this improved construction the doors may be very readily and quickly operated and serve to inclose the articles to be heated to any desired degree.

It is of course, obvious that the frame 1 may be provided with a handle 29 at its top, suitably insulated from the device so that the latter may be placed in any desired position. In a preferred form the frame 1 is also provided with transversely extending extensions 30 on its top, (shown in Fig. 2) which serve to prevent the heat from passing upward too rapidly from the device and deflect it upon the material to be heated. In order that the heating element may be suitably protected and spaced from the articles to be heated, grid members 31 may be provided. Further, the base 2 may be provided with a suitable opening in its end through which a connection plug may be connected to the terminal members 9.

By my improved construction I have provided an improved electric heating device of an exceedingly simple and rugged construction, wherein a heating unit of high efficiency is securely fixed within the frame in such a position as to permit it to readily radiate the heat generated by the passage of the current through the wire. By my

improved arrangement of the wire the heat is also delivered in the proportion required. Further, the parts of the heating unit are effectually insulated from the frame. By the provision of my improved door mechanism, I have been able to provide a construction which is well adapted to permit the doors to move readily within a large range and to hold the doors in any desired position. Further, my improved device is exceedingly easy to manipulate and may be readily used by an inexperienced person. Further, my improved heating device is of an exceedingly simple construction, which may be readily manufactured at small cost.

While I have in this application described one form which my invention may assume in practice, I do not wish to be limited to the form of construction herein described for purposes of illustration, but wish rather to cover in this application all of those forms and uses of my invention which fall within its spirit.

What I claim as new and desire to secure by Letters Patent is:—

1. An electric resistance unit having a frame provided with end members and a plurality of cross members, a resistance wire wound back and forth across said cross members from one end of the frame to the other, one of said cross members being hollow to form a conduit for the return of the resistance wire whereby the terminals of said wire are adjacent each other.

2. In an electric resistance unit, a plurality of supporting members, a plurality of connecting members, one of said members being hollow and an electric resistance material wound spirally on certain of said members in such a manner that the convolutions are closer together at the bottom of the unit, a portion of said resistance material extending through said hollow member and being insulated therefrom.

3. In an electric resistance unit, a plurality of supporting members, a resistance material carried thereby, a hollow member extending between said supporting members and having flattened ends attached thereto and means for attaching said hollow member to one of said insulating strips.

4. In an electric resistance unit, a plurality of supporting members, an electric resistance material wound thereon, and a hollow member extending between said supporting members and having its ends attached thereto, said hollow member being provided with extensions bent over one of said insulating strips.

5. In combination, a support, a plurality of spaced supporting members carried thereby, a plurality of insulating strips carried between said supporting members, an electric resistance material wound thereon and a hollow member serving as a conduit for a portion of said resistance material, having one of its ends attached to said supporting members and one of said insulating strips.

6. In an electric resistance unit, a plurality of spaced rods, a plurality of insulating strips carried between the same, a resistance material wound thereon, and a plurality of hollow members attached to said rods to form a frame, one of said hollow members being arranged to serve as a conduit for a portion of said resistance material.

7. In an electric resistance unit, a plurality of spaced members, a plurality of insulating strips carried between the same, an electric resistance material wound thereon, a plurality of hollow members having flattened ends attached to said spaced members to form a frame, one of said hollow members being arranged to serve as a conduit for a portion of said resistance material.

8. In an electric resistance unit, a plurality of spaced supporting members, a plurality of insulating strips extending between the same, a hollow member extending between said supporting members and having its ends attached to the latter and a resistance material wound on said insulating strips and having a portion extending through said hollow member and insulated therefrom.

9. In combination, a support, a plurality of spaced supporting members carried thereby, a plurality of insulating strips carried between said supporting members, an electric resistance material wound thereon a hollow member carried by said supporting members and serving as a conduit for a portion of said resistance material and terminal members carried by said support adjacent the end of said hollow member.

10. In an electric heating device, a support a plurality of supporting members carried thereby, a plurality of spaced insulating strips carried between said members, a plurality of hollow members carried between said supporting members and attached to the same to form a frame, and a resistance material wound upon said strips and extending through said hollow members.

11. In an electric heating device, a support, a plurality of substantially parallel rods, a plurality of spaced insulating strips carried between said rods, an electric resistance material wound spirally on said strips, a plurality of hollow members having flattened ends attached to said rods to form a frame, and an insulating tubular member carried in said first mentioned tubular member and serving as a conduit for one of the ends of said resistance material.

12. In an electric heating device, a frame including a plurality of spaced rods and a plurality of hollow members having flattened

ends attached to said rods, a plurality of spaced insulating strips carried in said frame, an electric resistance material wound on said insulating strips and having one end extending through said hollow member, and an insulating tubular member carried in said first-mentioned tubular member for insulating said resistance material.

In witness whereof, I have hereunto subscribed my name in the presence of two witnesses.

HARRY W. DENHARD.

Witnesses:
H. L. ROCKWELL,
GEO. B. JONES.