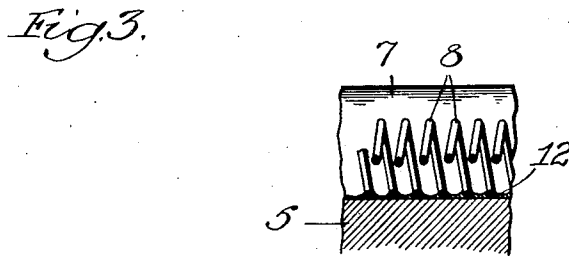
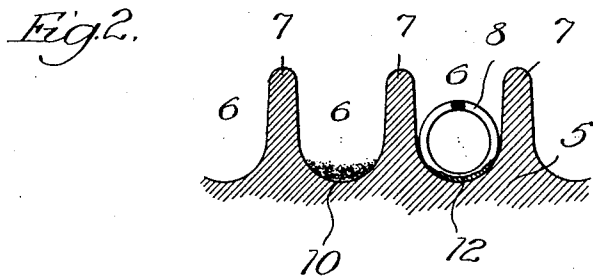
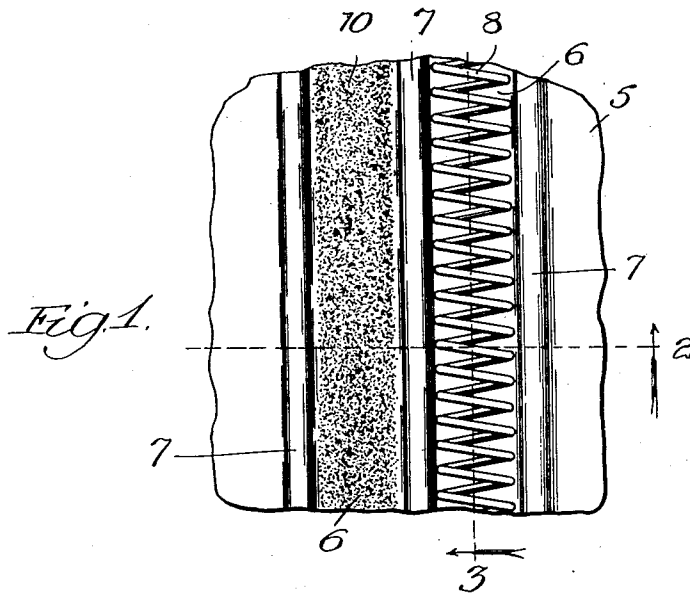


F. C. HUGHES.
ELECTRIC HEATER.
APPLICATION FILED OCT. 9, 1920.

1,399,428.

Patented Dec. 6, 1921.



Inventor:
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By *Wm. H. Chittenden, Jr.,*
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UNITED STATES PATENT OFFICE.

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ELECTRIC HEATER.

1,399,428.

Specification of Letters Patent.

Patented Dec. 6, 1921.

Application filed October 9, 1920. Serial No. 415,850.

To all whom it may concern:

Be it known that I, FRANK C. HUGHES, a citizen of the United States, residing at 5660 West Taylor St., Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Electric Heaters, of which the following is a specification.

This invention relates to improvements in electric heaters and more especially to that type of heater equipped with a substantially bare resistance element, usually made of a wire of an alloy of nickel and chromium formed into a helix or spiral with convolutions. In the form of heaters to which this invention relates the resistance element is usually supported by an electrically non-conductive support, being laid in grooves formed therein. The grooves within which the resistance element lies may be formed in parallel lines, in the shape of a spiral, or in any other desired formation.

In the type of heaters referred to, the resistance element is usually fastened in the groove in the supporting plate merely at its two ends, or else at infrequent intervals throughout its length. Where not fastened directly to the supporting plate, the resistance element merely lies or rests in the groove. In heaters so constructed, the heat from the resistance element is radiated to the surrounding air and thus conducted to the utensil or other ultimate object desired to be heated. Some of the heat radiated from the element also heats the supporting plate which in turn radiates the heat from the device. In the devices referred to, heretofore used, however, the amount of heat taken from the resistance element to the supporting plate and radiated therefrom is relatively small because of the fact that there is no good heat conducting connection between the element and the supporting plate. Most of the heat from the heater is obtained directly from the resistance element itself. In my improved heater, I attach the resistance element throughout its entire length to the supporting plate by an electrically non-conductive and thermally conductive cement. With this construction, it is obvious, that a relatively larger amount of heat will be conducted by means of the attaching cement directly from the resistance element to the supporting plate from which it is radiated to the cooking utensil or other ultimate object to be

heated. By this construction, the resistance element itself is maintained at a lower temperature with a consequent prolongation of its life.

Another advantage in connecting the resistance element to the supporting plate throughout substantially its entire length, is to prevent it from being distorted or broken. In heaters where it is joined to the supporting plate merely at its ends, or at infrequent intervals, those portions not joined, are likely to be displaced, lifted out, or removed from the groove and consequently subjected to breakage or injury.

In that form of device embodying the features of my invention shown in the accompanying drawings, Figure 1 is a top plan view of a portion of a supporting plate provided with parallel grooves adapted to receive a resistance element, showing one of the grooves with the resistance element removed, Fig. 2 is a view taken as indicated by the line 2 of Fig. 1, and Fig. 3 is a view taken as indicated by the line 3 of Fig. 1.

As shown in said drawings, 5 represents a supporting plate made of porcelain, lava, or other suitable electrically non-conductive material having formed in its upper surface the parallel grooves 6, 6 separated by the projecting fins 7. 8 indicates a resistance element made of a wire formed from a suitable alloy of nickel and chromium, or other suitable resistance material, and bent into the form of a helix. My improved heater is made by putting in the grooves 6 a small amount of powdered borax as indicated by 10. The resistance element 8 is then laid in the groove with the bottoms of its convolutions resting in the powdered borax. If desired, the resistance element may be put in place first and the powdered borax then poured in. The resistance element is then heated by passing an electric current through it until the powdered borax melts to form a sticky glassy substance. This sticky glassy substance firmly cements the bottoms of the convolutions of the resistance element to the bottoms of the grooves 6. A portion of the resistance element is shown so cemented to the supporting plate in the drawings, in which the sticky glassy substance formed by melting the borax, as described above, is indicated by 12. The attachment of the resistance element to the supporting plate is clearly shown in Fig. 3, from which it will

be noted that each convolution of the element is attached to the plate 5. The glassy substance formed from the borax conducts a portion of the heat from the element to the supporting plate 5 from which it is radiated. The radiation of the heat from the supporting plate 5 may be increased, or aided, or facilitated by forming the fins 7 between the grooves. If desired, more radiating fins, or points, may be provided.

Although I have described the use of borax for cementing the element to the supporting plate, it is to be understood that I am not to be limited to the use of this substance alone, since there are many other substances which will serve the purpose. Any electrically non-conductive substance which will conduct a portion of the heat from the element to the supporting plate may be used for attaching the element to the supporting plate, without detracting from the spirit of this invention.

Although I have shown the use of a resistance element formed in the shape of a helix and composed of an alloy of nickel and chromium, it is to be understood that I am not to be limited to the use of a resistance element formed of such a substance, or so shaped. In the use of my invention, a resistance element of any other desired shape or composition may be employed without detracting from its spirit.

Although I have shown the use of a support formed of electrically non-conductive material, it is obvious that it need not necessarily be electrically non-conductive. By

raising the resistance element a slight distance from the support so that there will be no electrical contact, and filling the intervening space with the electrically non-conductive cement formed from the borax, a support may be used which is electrically conductive.

While I have shown and described certain embodiments of my invention, it is to be understood that it is capable of many modifications. Changes therefore in the construction and arrangement may be made without departing from the spirit and scope of the invention as disclosed in the appended claims, in which it is my intention to claim all novelty inherent in my invention as broadly as possible in view of the prior art.

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

1. In an electric heater, a substantially bare resistance element attached to a support by an electrically non-conductive and thermally conductive cement whereby a portion of the heat from the element is conducted to the support and radiated therefrom.

2. In an electric heater, a substantially bare resistance element attached to an electrically non-conductive support by an electrically non-conductive and thermally conductive cement whereby a portion of the heat from the element is conducted to the support and radiated therefrom.

In witness whereof, I have hereunto set my hand and seal this 5th day of October 1920.

FRANK C. HUGHES. [L. S.]