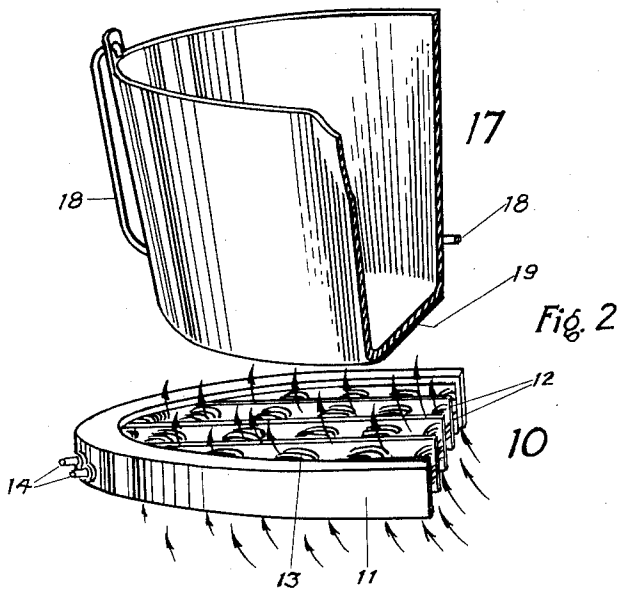
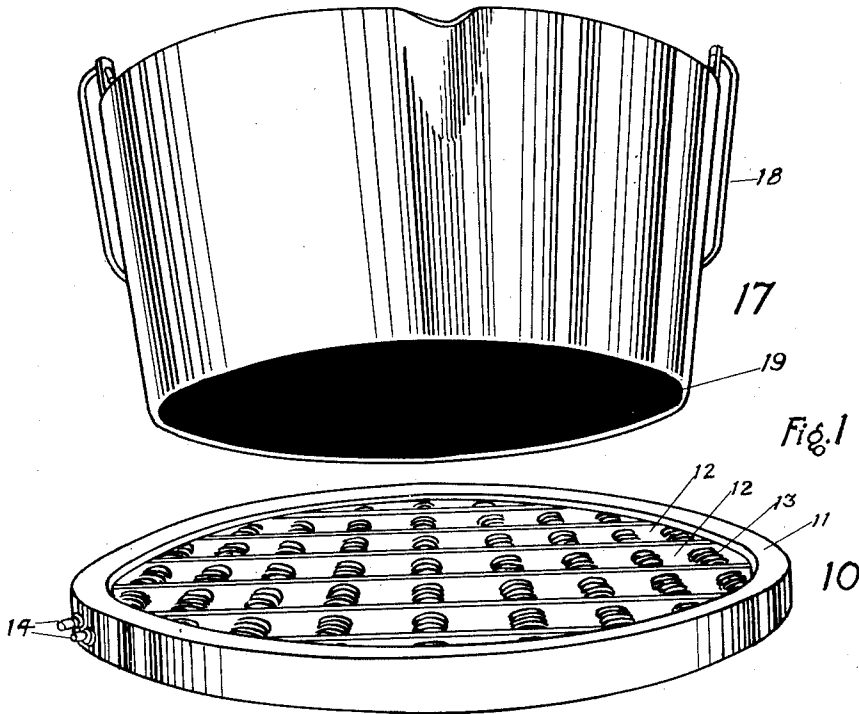


E. H. RICHARDSON.
ELECTRIC HEATING DEVICE.
APPLICATION FILED DEC. 16, 1918.

1,345,696.

Patented July 6, 1920.



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ELECTRIC HEATING DEVICE.

1,345,696.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, EARL H. RICHARDSON, a citizen of the United States of America, residing at Ontario, in the county of San Bernardino, State of California, have invented certain new and useful Improvements in Electric Heating Devices, of which the following is a specification.

My invention relates to the electric heating of fluids and semi-fluids and in general to the electric heating of any material in containers. Especially and peculiarly, however, my invention is applicable to electric cooking. For simplicity and in order that my invention may be more easily understood, I shall therefore, describe my invention hereinafter in detail with particular respect to electric cooking only. Its broader application to the electric heating of other materials will be readily understood therefrom.

Heat may be transferred in three different and distinct manners: (1) by convection, that is by the flow of a heated gas; (2) by conduction, which is by the flow of heat through a material without transference of the particles of the material; and (3) by radiation, in which the heat is transferred in the form of rays or waves of the radiant ether in a manner analogous to the propagation of light. Transference of heat by convection and by conduction requires the presence of physical bodies or material; transference of heat by radiation is independent of the presence of physical bodies or materials except that some materials more or less interrupt the propagation of heat by radiation just as opaque bodies interrupt the propagation of light.

In many instances heat is transferred from one body to another in part in one and in part in another of these manners of propagation, or in all three of these ways simultaneously. The escape of heated gases up a chimney is an illustration of heat transference by convection alone. The passage of heat through the top of an ordinary kitchen coal range is an illustration of the transference of heat by conduction. The transference of heat from the sun to the earth is an example of transference of heat by radiation.

In an electric range the heat is developed in a heating element, so called; this heating

element is a length of conductor offering considerable resistance to the current of electrical energy which accordingly heats the element. Two manners of transferring this heat from the heating element to the vessel containing the food predominate at the present time, and correspondingly there are two different types of heating units predominating. First, there is the radiant type unit, in which lengths of wire exposed to the atmosphere and more or less uninclosed, are brought to a high temperature and the heat therefrom conveyed to the food or food container above or below the heating unit mainly by radiation. There is indeed some further heat transference by conduction and by convection, and whether conduction predominates over convection or vice versa, depends on the sub-type of unit; but in all instances of this type there is considerable transference of heat by radiation and generally radiation greatly predominates over both conduction and convection. Second, there is the inclosed type of heating unit in which the heating element or wire is substantially totally inclosed in a mass of material through which the heat is conducted to the food or food container placed in physical contact therewith. With this type of unit also there may be some heat transference by radiation and convection, but in the true conduction type of unit, transference by conduction greatly predominates.

Now my invention relates only to the radiant type of heating and cooking unit, that is to those units in which heat transference by radiation predominates or at least is a considerable factor; where radiation is a considerable factor my invention may be utilized even though there is considerable conduction or convection or both. One of the objects of my invention is to improve the efficiency of electric heating with the type of unit in which radiation is a considerable factor. Another object of my invention is to increase the efficiency of electric cooking with such radiant type of units.

Various kinds of cooking utensils are used with electric ranges. For various reasons it is in many cases, desirable however, to use aluminum cooking utensils. Now I have discovered that the efficiency of the combination of an aluminum cooking utensil, and to an extent of any normally bright metallic

cooking utensil, with an electric range or heating units of the radiant type, may be surprisingly improved by darkening, preferably blackening, and preferably also roughening, the surface or surfaces of the vessels or containers which are exposed to the radiant type heating unit. I find indeed, that the efficiency of the combination including an aluminum utensil may thus be increased between 20% and 40%. Darkening or blackening the surface exposed to the radiant unit is very effective, but roughening also is preferable and of assistance in increasing the efficiency. Only the surface or surfaces exposed to the radiant heating unit or units need to be thus treated. Indeed it is preferable to have the other surfaces as bright and smooth as possible to reduce the escape of heat therethrough. The surface to be treated may be roughened by means of a mild sand blast, by a revolving wire brush, by pickling in a mild solution of an acid or alkali, or in numerous other ways. A dark surface can be secured by chemical treatment, by applying any one of several kinds of heat resisting compounds or paints, or in numerous other ways.

My invention involves both the combination of a container having a darkened or blackened, and preferably also roughened surface with a radiant type electric heating unit operating on that surface, and the method of electric heating of materials in containers which consists in exposing a darkened or blackened, and preferably also roughened, surface of a container to an electric heating unit of the radiant type, for it is by reason of such combinations and such methods that I have been able to increase the efficiency of radiant type electric heating units between 20% and 40%.

It will be seen from the above that my invention has nothing whatsoever to do with electric heating or cooking by heating units wherein the heat is transferred predominately by conduction or convection, or at least predominately in such manner to a great degree. Heat transference by conduction and convection is subject to other laws than radiation. For example, with the inclosed conduction type of heating unit, the polished smooth surfaced container is preferable to a blackened roughened surface.

In the accompanying drawings and the following detailed description, I have illustrated and described, in some detail, the application of my invention to electric cooking.

Figure 1 shows in perspective an electric radiant heating unit and a black and rough bottomed aluminum cooking vessel or container adapted to be used with the heating unit shown. Fig. 2 is a sectional perspective view of the cooking vessel and heating unit of Fig. 1.

The heating unit 10 is a well known example of heating units of the radiant type. This heating unit comprises mainly an angular rim 11 within which is carried parallel metal bars 12. Perpendicular to the bars 12 are parallel lines of the heating element 13. This heating element 13 is a high resistance conducting wire wound into a helix and threaded back and forth through openings in the parallel bars 12. Suitable means (not shown) are provided for insulating the heating element 13 from the bars 12 and also from the rim 11. The terminals of the heating element and heating unit are shown at 14. The heating unit is open above and below as shown in the drawing; air may therefore, pass freely through the heating unit.

The cooking vessel 12 is of aluminum or other normally bright metal. 18 is the bail thereof. The flat bottom 19 of the container 17 is somewhat rough and is also black as shown in the drawing. In cooking, the food container 17 rests in contact with and is carried by the cross bars 12, or rim 11, or both, of the heating unit 10. Current passing through the terminals 14 and the heating element 13 develops heat in and heats the heating element 13. This heat in great part is transferred to the container 17 by radiation. A smaller part is transferred by convection through the passage of air through the heating unit somewhat as shown by the arrows in Fig. 2, and another part is transferred to the container 17 by conduction through the bars 12, or rim, or both. Since, however, a considerable part of the heat from the heating unit 10 is transferred by radiation, my invention is particularly applicable to this unit. As indicated before, roughening and blackening surfaces 19 increases, I find, the efficiency of the combination of this radiant heating unit 10 with the container 17 between 20% and 40%.

The method of my invention, which broadly consists in exposing a darkened surface or surfaces which is (or are) also rough, of a normally bright metallic container to an electric heating unit of the radiant type, will be understood from what has gone before.

While I have illustrated and described the best embodiment of my invention of which I am now aware, it will be understood that my invention is not limited to the devices illustrated and described, but that my invention is set forth in the following claims. I claim:

1. The combination with an electric heating unit of the radiant type, of an aluminum cooking utensil having a permanently darkened surface exposed to the radiant heat.

2. The combination with an electric heating unit of the radiant type, of a normally

bright metallic container having a permanently darkened surface exposed to the radiant heat.

5 3. The combination with an electric heating unit of the radiant type, of an aluminum utensil having a permanently blackened rough surface exposed to the radiant heat.

4. The combination with an electric heat-

ing unit of the radiant type, of an aluminum utensil having a permanent dead black surface exposed to the radiant heat, the other outer surfaces of the utensil being undarkened.

In testimony whereof I have signed my name at Chicago, this 11th day of December, 1918.

E. H. RICHARDSON.