W. S. HADAWAY, JR.

ELECTRIC HEATING DEVICE.

APPLICATION FILED SEPT. 5, 1911.

1,157,100.

Patented Oct. 19, 1915.

2 SHEETS—SHEET 1.

Fig. 1.

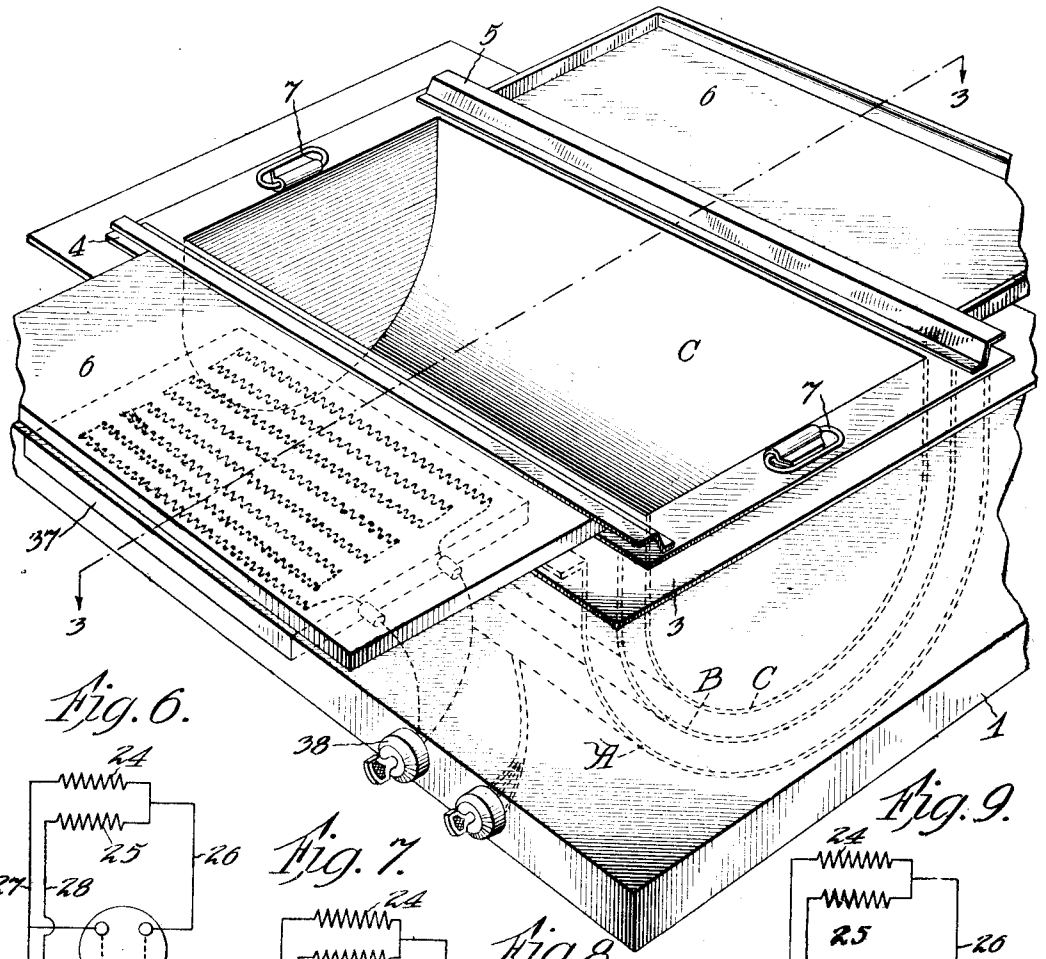


Fig. 6.

Fig. 7.

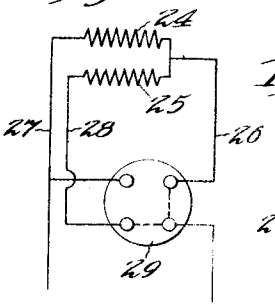


Fig. 8.

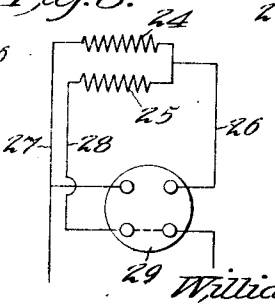
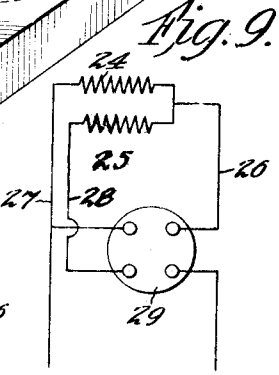


Fig. 9.



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2 SHEETS—SHEET 2

Fig. 2.

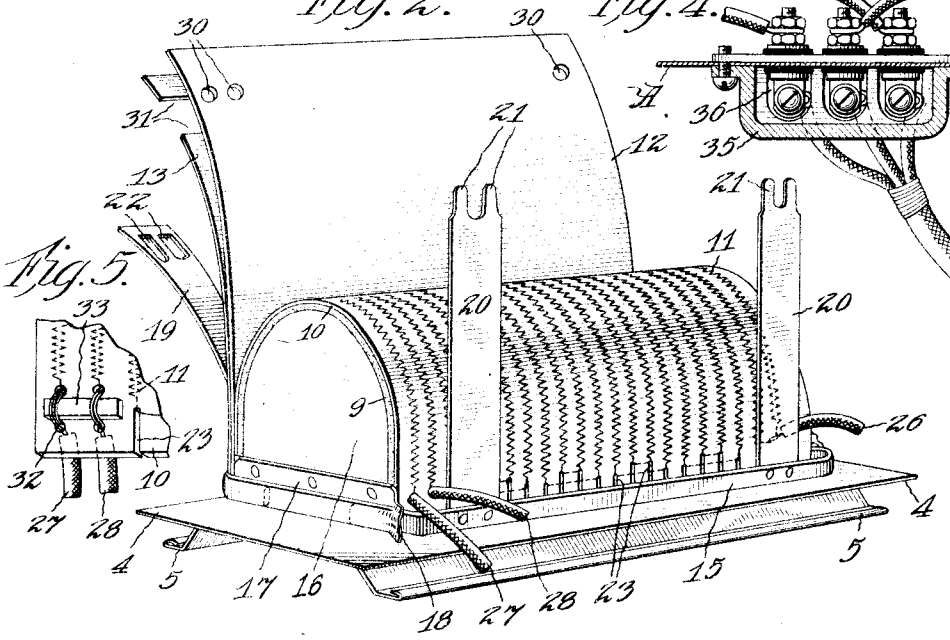
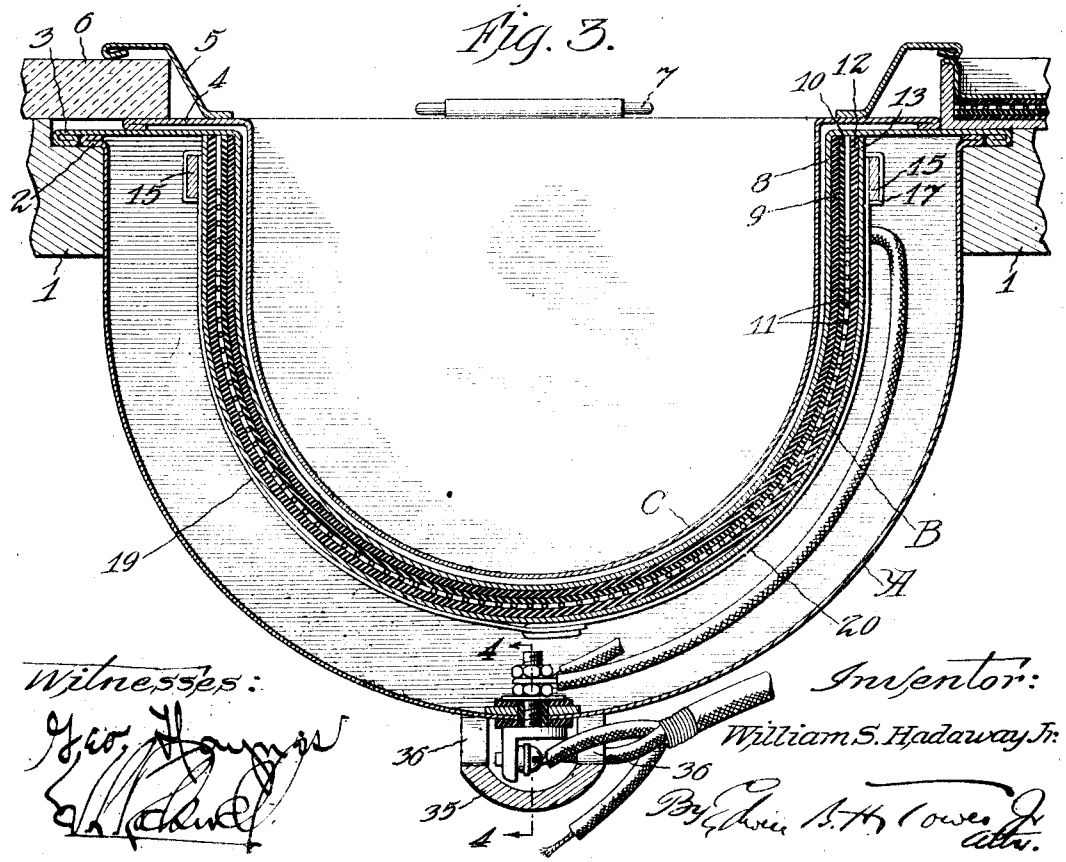


Fig. 4.

Fig. 5.

Fig. 3.



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UNITED STATES PATENT OFFICE.

WILLIAM S. HADAWAY, JR., OF NEW YORK, N. Y.

ELECTRIC HEATING DEVICE.

1,157,100. Specification of Letters Patent. Patented Oct. 19, 1915.

Application filed September 5, 1911. Serial No. 647,692.

To all whom it may concern:

Be it known that I, WILLIAM S. HADAWAY, Jr., a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented new and useful Improvements in Electric Heating Devices, 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.

My invention relates to electric heating devices.

It has among its objects to provide an electric heater, in which the loss of heat by radiation is cut down to the minimum, and in which the heat directed to the surface to be heated may be regulated to any desired degree.

My invention further has among its objects to provide an improved heater, wherein the parts are compactly assembled and the heating element may be made up into any desired form.

Other objects and advantages of my improved construction will hereinafter appear.

In the accompanying drawings, I have for purposes of illustration, shown my invention as applied to a chocolate warmer, of the type used in the manufacture of chocolate candy, and in this application I shall describe my invention as applied to this use. My invention, however is not limited in its application to this use, nor to the specific construction hereinafter described.

In the views of these drawings: Figure 1 shows a perspective view of the assembled heating device in position. Fig. 2 shows a perspective view of the heater in inverted position with the heating element exposed. Fig. 3 shows a transverse sectional view through the assembled device, shown in Fig. 1. Fig. 4 shows a detail sectional view on line 4—4 of Fig. 3. Fig. 5 shows a detail view of the means for attaching the conductors to the heating element. Figs. 6, 7, 8, and 9 show circuit diagrams for the heater.

In the construction shown in these figures, the chocolate heater consists of three pans, A, B and C, formed of heavily tinned plate which are of a substantially similar conformation, each having a substantially semi-circular cross-section. The pan A, is preferably set within an opening in a suitable support or table 1, so that its top is substantially flush with the top of the table. The pan B, which in this instance contains the heating element and will be more fully hereinafter described, is carried within the pan A, as shown in Figs. 1 and 3, so that an air space is formed between the outer surface of the pan B and the inner surface of the pan A. These surfaces are preferably highly polished.

In the form illustrated, the upper edges of the pans A and B are provided with flanges 2 and 3, which are soldered together, so that these pans may be inserted in an opening in a table, as a single device. The pan C which holds the material to be heated is carried within the pan B, as shown in Fig. 3, and is provided with suitable flanges 4 and 5, on its sides, which are adapted to receive marble slabs upon which the operators work. As illustrated in Fig. 3, the pan C rests upon the flanges 3 of the pan B, and the slabs 6 are inserted between the flanges 4 and 5 of the pan C, so as to hold the parts of the device in position. The pan C is provided with suitable handles 7 at its ends, so that when the slabs 6 are pushed back, it may be readily removed for cleaning or other purposes.

The pan B, containing the heating element, is shown in Fig. 2, with the heating element exposed. As shown in this figure and in Fig 3, this pan is provided with an inner rounded bottom plate 8, preferably formed integral with the flange 3. Over this rounded bottom is placed a sheet 9 of insulating material. If desired asbestos may be used. Over this sheet of insulation is placed a sheet of insulating material 10, carrying upon its surface the resistance material 11. In a preferred form I use a sheet of mica as the insulating material. Over this resistance material is placed a sheet of insulation 12, which may be formed of asbestos and over this sheet 12, is placed a sheet 13 of a highly polished metal, such as tinned plate. The edges of the various sheets may be secured to the bottom 8, in any suitable way. For instance, as shown in Fig. 2, I may hold these edges in position by means of strips 15, which are slightly spaced from the plate 8 so that the edges of the sheets may be slipped between the same and said plate. These strips extend along beneath the flanges 3, and are bent at their ends to extend around the square ends of the pan.

Upon the ends 16, of the pan, are carried strips 17, suitably fixed to the ends and

adapted to receive the bent ends of the strips 15. The ends 18 of the strip 17, are adapted to be bent over upon the strips 15, as shown in Fig. 2. In the form shown, both of the edges of the strips 9 and 10 are held in position by this means and the sheets 12 and 13 are then bent over to conform to the rounded surface of the bottom of the pan and are held close upon the resistance material by suitable bands 19 and 20, suitably fixed to the strips 15 near the opposite ends of the pan. In a preferred form, the bands 19 and 20 are provided with interfitting ends, so they may lock together and hold the sheets 12 and 13 firmly upon the resistance material. As illustrated in Fig. 2, the strips 20, may be provided with ears 21, and the strips 19 may be slotted, as at 22, to receive these tongues.

From the foregoing description it is evident that the bright surfaced carrier 13 performs the dual function of supporting the resistor firmly in contact with the surface to be heated, thus producing more efficient conductivity of heat thereto and obtaining better surface distribution of the heat and, by reason of the properties of polished surfaces as regards heat travel, aiding in making the heat insulation more effective.

As illustrated in Fig. 2, the resistance element proper consists of a suitable sheet of insulating material 10, upon which the resistance material is carried. In a preferred form, I employ a sheet of mica, since I find that this material is able to withstand the temperatures to which such a device is subjected, and may be obtained in extraordinarily thin sheets, being at the same time flexible and capable of being bent into any desired shape. In a preferred form, I cover the sheet of mica with a thin coating of shellac. As illustrated in this figure, the resistance material is preferably carried upon the outer surface of the sheet 10. It is obvious that this resistance material may be of any desired type. In a preferred form, however, I employ a resistance material of the reflex type, in which a fine reflexed wire is wound in convolutions across the sheet. This reflexed wire is wound back and forth across the sheet in substantially parallel rows, and at the edges of the sheet is passed between notches 23. These notches are preferably formed of varying depths, and as shown in Fig. 2 may be arranged alternately in several series, two short notches being immediately between two long notches. The reflexed wire is wound in between these notches on the opposite edges of the sheet, one of the convolutions passing to a short notch and then across on the back of the sheet to the next short notch, while the other convolution passes between the two long notches which are between the two short notches, just mentioned. Any suitable circuit connections may be made for the resistance element; but in a preferred form, I form this element of two sections, so that it may be connected either in series, or in parallel, to vary the heat as desired.

One method of connecting the unit is clearly shown in Figs. 6, 7, 8 and 9. As shown in these figures, two sections of resistance wire 24 and 25, are arranged in parallel, and are connected with a lead 26, between the branches of the circuit, and leads 27 and 28, leading off from the branches 24 and 25. In a preferred form, a series-parallel switch 29, of any desired construction, illustrated diagrammatically in these figures, is connected in circuit in the lead 26, and is adapted to change the connections of the leads 26, 27 and 28. For instance, when it is desired to use the maximum heat from the heater the sections 24 and 25 of the resistance are placed in parallel, as shown in Fig. 6, the current passing through one side of the switch 29 to the conductor 26 and then dividing and passing in parallel through the two branches 24 and 25 of the heating element to the other side of the line. When it is desired to provide a medium heat, the circuit connections are preferably those shown in Fig. 7, wherein one of the sections of resistance is cut out, the circuit extending through the conductor 27, to the section 24, and then through the conductor 26 and the switch 29 to the opposite side of the line. When a still lower heat is desired, the connections are those shown in Fig. 8, wherein the current passes through the conductor 27 to the resistance section 24, resistance section 25, the conductor 28, and the switch 29 to the opposite side of the line. When it is desired to cut out the heater, the circuit connections are preferably those shown in Fig. 9, wherein the terminals of the switch are not bridged and the circuit is opened. It is evident, however, that these circuit connections hereinabove described may be changed if desired.

The conductors 26, 27 and 28 are attached to the resistance wire, as shown in Figs. 2 and 5, the ends of the conductors passing through suitable perforations 30, in one edge of the sheet 12; the conductor 26 being connected to the end of a convolution at one end of the resistance element, while the two conductors 27 and 28, are connected at the other end to the ends of adjacent convolutions. The sheet 13, is provided with a suitable slot or cutaway portion 31, to permit the passage of the conductors 27 and 28 through the same. As shown in Fig. 5, the conductors may be attached to the ends of the reflexed wires, by passing the ends of the conductors through suitable perforations 32, in the sheet 10, and binding the ends of the conductors to this sheet, by turning the ends

of either the conductors or the reflexed material over a piece of insulation 33. I find that such a connection prevents the tearing of the ends of the sheet carrying the reflexed material, but it is of course obvious that other means of connection may be adopted.

The conductors 26, 27 and 28 are insulated, preferably by a covering of asbestos. The ends of these conductors, not connected to the resistance element, are brought down around the side of the pan B, as shown in Fig. 3, to suitable binding posts, extending through the bottom of the outer pan A, where they are connected to suitable conductors leading off to the line. In Figs. 3 and 4, I have illustrated the construction of one form of binding post. The exposed ends of the binding posts are protected by a suitable metal cap 35, having openings 36, in its sides through which the conductors extend to the binding posts.

To compensate for the differences in temperature of the hands of different operators, I may provide a separate heating element 37, which is placed beneath one or more of the marble slabs 6. This heating element may be of any desired construction, and its temperature may be varied by any suitable switch such as for instance, the snap switch 38, illustrated in Fig. 1. If desired, the construction of the heating element 37, may be essentially the same as that of the heating element for the pan B and may be made of heavily tinned plate, as shown in section in Fig. 3, to replace the marble slab. By the provision of this improved side pan, I am able to keep the chocolate at the proper temperature, despite the variations in temperature of the hands of the operators, and am thus able to maintain the chocolate on the side pan at the proper consistency, so that it may be scraped back into the warmer whenever desired without causing the mass of chocolate therein to become lumpy.

By my improved construction, I have materially increased the heating capacity of an electric heater for a given amount of energy input. The heating element is of a very compact construction, and is held firmly in position, so that it transmits its heat directly to the surface to be heated. Further, the loss of heat by radiation is very small, since by the provision of the highly polished surfaces of sheet 13 and the inside of the bottom of A, the heat rays are reflected. For instance, in the particular construction herein described, wherein I have used tin as the material from which the pans are made, I have been able to cut down the wattage required by an amount varying from 10 to 20 per cent. Further, my improved heater is adapted for use in connection with any surface, whether it is flat or curved, since the resistance element may be made up into any desired shape. Thus it is seen that the resistance element may be applied to the heating of round tanks, if desired. Further, the parts of the heater are effectually insulated, so that there is no danger of fire, as is the case where gas is employed. Again, the heater may be very quickly and easily installed, and the regulation of the heat may be so effected that the heater may provide any desired temperature. Further, the parts of the heater are so arranged as to be very compact and yet while compactly arranged are readily accessible when desired. By the use of my improved resistance unit, I find that after long runs at high temperature, the reflexed wire, the mica sheet and asbestos sheets firmly adhere to each other forming a unitary construction, due to the use of shellac, so that the heating efficiency of the units is greatly increased. Further, by the use of the reflexed resistance material, the heat is very evenly distributed over the heater. Further, by my improved construction, I have provided a strong rugged, serviceable heater which may be constructed at small expense.

While I have in this application described one form which my invention may assume in practice, I have chosen this form for purposes of illustration, and do not wish to be limited to it, since my invention may assume other forms.

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

1. In an electric heating device, the combination of a plurality of nested receptacles, one of said receptacles carrying a heating unit between its walls, the outer surface of said receptacle and the inner surface of an adjacent receptacle being highly polished.

2. In an electric heating device, a plurality of nested receptacles, one of said receptacles carrying a resistance unit of reflexed resistance wire between its walls and the outer surface of said receptacle and the adjacent surface of the adjacent receptacle being highly polished.

3. In an electric chocolate warmer, a plurality of nested pans, a heating pan between said pans having heating means distributed over the bottom and sides of said pan, and means for reflecting the heat generated by said unit and retaining the same within said pans.

4. In an electric chocolate warmer, a plurality of nested pans having rounded bottoms, and a heating pan arranged between said pans and conforming to the shape thereof, adjacent surfaces of certain of said pans being highly polished to reflect the heat generated by said unit.

5. In an electric chocolate warmer, a plurality of nested chocolate pans having curved bottoms, the middle of said pans being provided with a heating unit comprising

reflexed resistance wire wound in convolutions upon an insulating base, and means for reflecting the heat waves generated by said unit and confining the same within the outer receptacle.

6. In an electric chocolate warmer, an outer pan having a curved bottom, an inner chocolate pan arranged to extend into said outer pan and having a bottom of the same configuration as the bottom of said outer pan, and a heating pan intermediate said pans and of the same configuration as said pans, said heating pan including a heating unit of reflexed resistance wire wound upon an insulating base and inclosed between sheets of insulation.

7. In an electric chocolate warmer, an outer pan having a curved bottom, an inner chocolate pan arranged to extend into said outer pan and having a bottom of the same configuration as the bottom of said outer pan, a heating pan intermediate said pans and of the same configuration as said pans, said heating pan including a heating unit of reflexed resistance wire wound upon an insulating base, and means for reflecting the heat waves generated by said heating unit and retaining the same within said pans.

8. An electric heating pan for chocolate warmers, comprising a metallic pan, a heating unit therefor including a resistance wire carried upon an insulating base and inclosed between sheets of insulation, and means for holding said heating unit against one of the surfaces of said pans including an outer polished metallic sheet and transversely extending bands.

9. An electric heating pan for chocolate warmers, comprising a metallic pan, a heating unit therefor including a reflexed resistance wire wound in convolutions upon an insulating base and inclosed between sheets of insulation, and means including a metal sheet having a highly polished outer surface and transversely extending bands for holding said heating unit against the surface of said pan.

10. An electric heating pan for chocolate warmers, comprising a metallic pan, a heating unit therefor including a resistance material carried upon an insulating base and inclosed between sheets of insulation, and means for compressing said unit against one of the surfaces of said pan including an outer metal sheet having a highly polished outer surface and transversely extending interfitting bands carried by said pan.

11. In an electric heating pan for chocolate warmers, a metallic pan, a heating unit therefor including a reflexed resistance wire wound in convolutions upon a mica base and inclosed between sheets of asbestos, and means including an outer metallic plate for holding the unit against one of the surfaces of said pan.

12. In an electric heating pan for chocolate warmers, a metallic pan having a curved bottom, a heating unit therefor including a reflexed resistance wire wound upon a flexible insulating base and inclosed between sheets of insulation, and means for holding said heating unit snugly against the curved bottom of said pan, including an outer metal plate and transversely extending bands.

13. In an electric heating pan for chocolate warmers, a metallic pan having a curved bottom, a heating unit formed of convolutions of reflexed resistance wire, wound on an insulating base, sheets of insulation on both sides of said heating unit, and means including an outer sheet for clamping said resistance unit and the sheets of insulation snugly against the curved surface of said pan.

14. In an electric heating pan for chocolate warmers, a metallic pan, a heating unit therefor including a reflexed resistance wire wound in convolutions on a shellac-covered mica base, and inclosed between sheets of asbestos, means for holding said unit against one of the surfaces of said pan including an outer metallic plate and transversely extending bands fixed to said pan, and means for permitting electrical connections to be made to said resistance material.

15. In an electric heating pan for chocolate warmers, a metallic pan, a heating unit therefor and means for holding the same against one of the surfaces of said pan including a plurality of transversely extending bands, and a removable support for said bands carried by said pan.

16. In an electric heating pan for chocolate warmers, a metallic pan, a heating unit therefor including a resistance material wound upon an insulating base and inclosed between sheets of insulation, means for compressing said resistance unit against one of the surfaces of said pan including an outer metallic sheet and transversely extending bands, and removable supports for said bands carried by said pan.

17. In an electric chocolate warmer, the combination of a chocolate pan, an outer pan into which said chocolate pan extends, an electric heating pan between said chocolate pan and said outer pan, and means for reflecting the heat waves generated by said heating unit.

18. In an electric chocolate warmer, the combination of a chocolate pan having a curved bottom, an outer pan having a similar bottom and arranged to receive said chocolate pan, a heating pan arranged to be received between said chocolate pan and said outer pan, and means for reflecting the heat waves generated by said heating pan and retaining the same within said pans.

19. In an electric chocolate warmer, the

combination of a plurality of nested pans having curved bottoms, a heating pan having a similarly shaped bottom, fitted between said pans, means for varying the heat generated by said heating pan as desired, electrical terminal connections carried by said outer pan, and means for retaining within said pans the heat generated by said heating pan.

20. In an electric chocolate warmer, the combination of a chocolate pan, an outer inclosing pan, a heating pan nested between said previously mentioned pans, means for graduating the heat generated by said heating pan as desired, and means including highly polished surfaces on certain of said pans for reflecting the heat generated by said heating pan and retaining the same within said pans.

21. In an electric chocolate warmer, the combination of an electrically heated receptacle for containing chocolate and maintaining it in heated condition, an electrically heated flat side pan adjacent thereto, and a flange or apron on said receptacle overlying the edge of the side pan for preventing leakage during the transfer of chocolate from the receptacle to the side pan.

22. In a device of the class described, an electrically heated vessel for maintaining the contents in heated condition, said vessel having an approximately cylindrical bottom and having one of its upper edges substantially horizontal and rectilinear, an electrically heated substantially flat side pan whereon the material from the vessel may be manipulated by the operator, and interfitting connections between one edge of the side pan and said rectilinear edge of said vessel to thereby prevent leakage during transfer of said material from the vessel to the side pan.

23. In an electric heating device, a receptacle having a convex outer surface, a heating element, and a bright surfaced carrier outside of said heating element holding said heating element in close proximity to said receptacle, said heating element being suitably insulated from said receptacle and said carrier.

24. In an electric heating device, a receptacle having a rounded bottom, a resistor external thereto, a sheet of bright metal outside of said resistor and means for holding said metallic sheet close against said resistor, for the purpose described, said resistor being suitably insulated from said receptacle and from said metallic sheet.

25. In combination, a receptacle having a cylindrical bottom, insulating material adjacent thereto, an electric heating element adjacent to said insulating material, outer insulating material adjacent to said heating element on the outside thereof and a sheet of polished metal outside of said outer insulating material holding the parts within in close contact with each other.

26. In combination, a metallic receptacle having a bottom which is convex on the outside, a plurality of layers of insulating material outside of the bottom of said receptacle, a resistor interposed between two of said layers and a sheet of bright tin holding the parts mentioned in close contact with each other to thereby perform the dual function of supporting the resistor and its insulation and minimizing the heat loss.

27. A warmer comprising a metallic receptacle having a rounded bottom, a reflexed resistor external thereto, insulation outside of said resistor, and a metallic sheet, bright inside and out, pressing said insulation toward said receptacle.

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

WILLIAM S. HADAWAY, JR.

Witnesses:

A. B. HUBBELL,

EDWIN N. LIGHTFOOT