J. G. GRONBERG & W. D. HODSON.

ELECTRIC OVEN.

APPLICATION FILED FEB. 15, 1909.

1,022,545.

Patented Apr. 9, 1912.

5 SHEETS—SHEET 1.

Fig. 1.

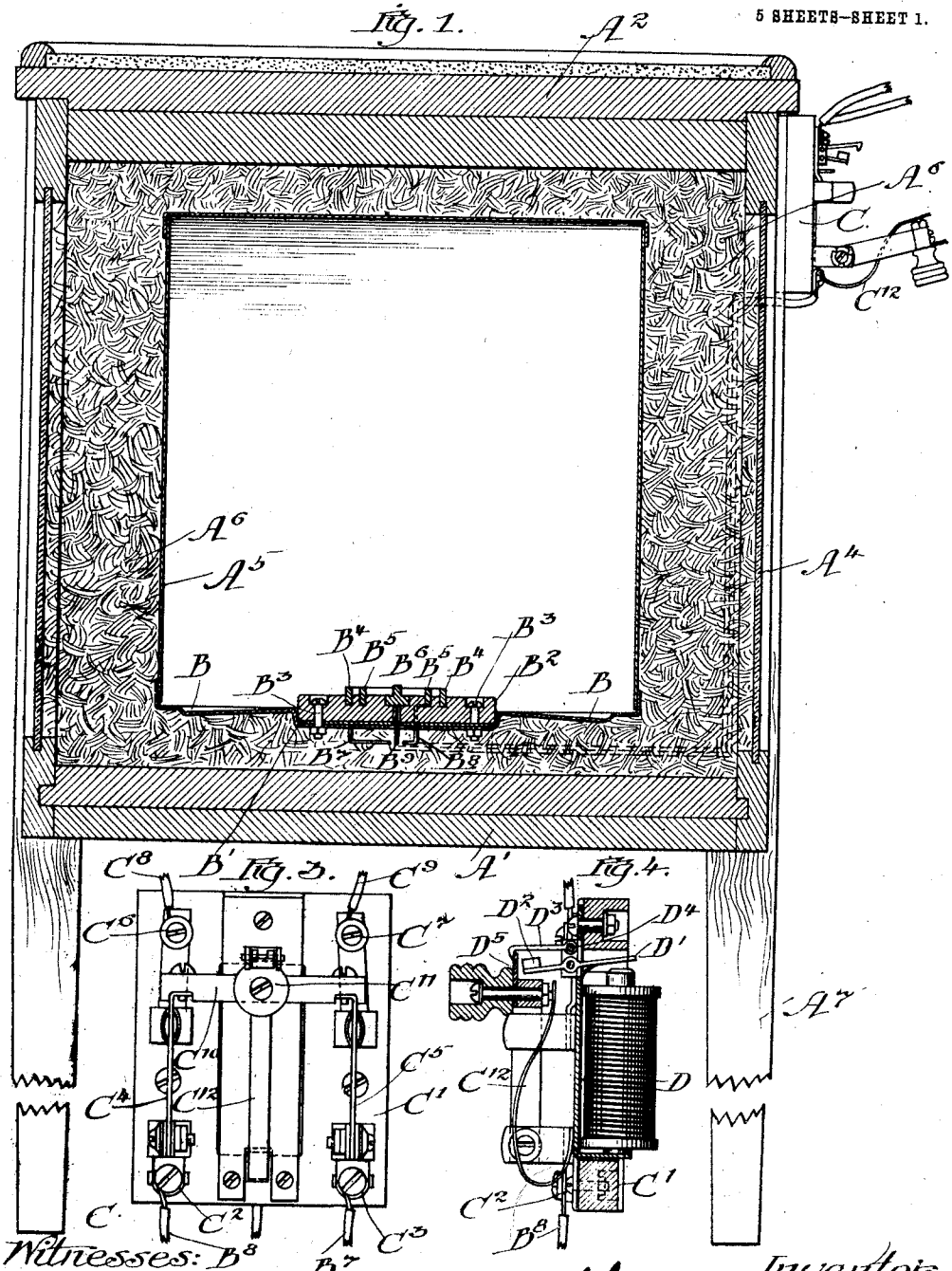

Fig. 3.

Fig. 4.

Witnesses: B8

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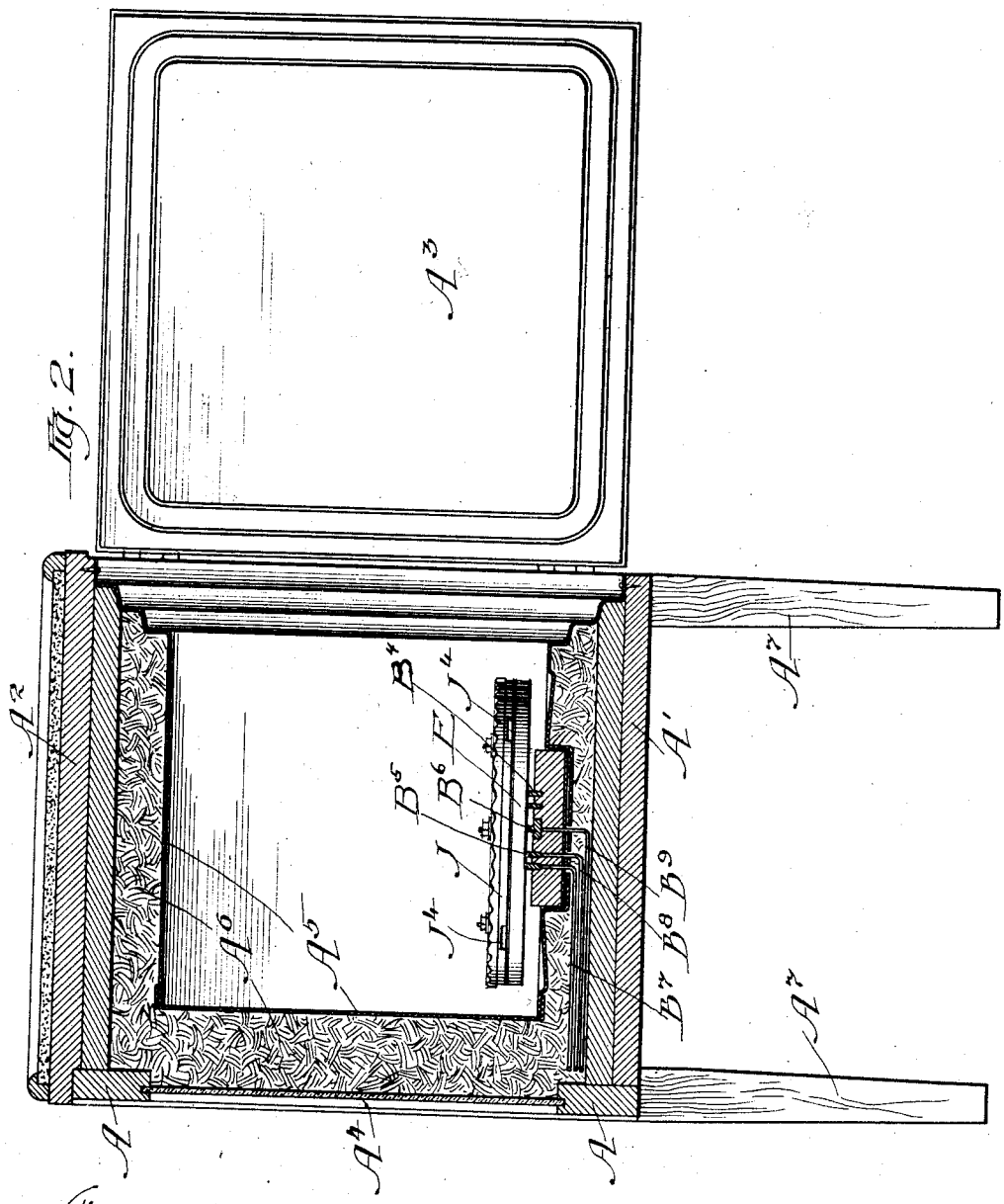
5 SHEETS—SHEET 2.

Fig. 2.



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5 SHEETS—SHEET 3.

Fig. 5.

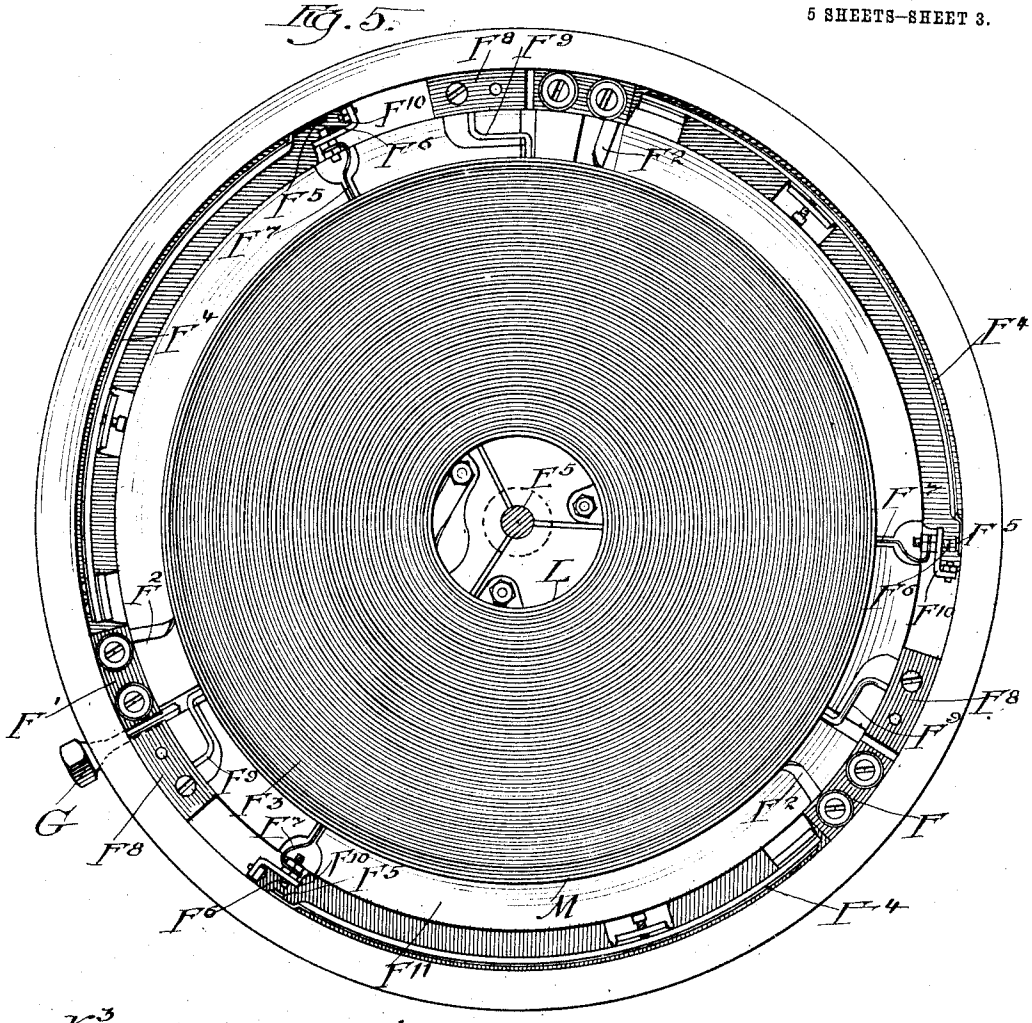
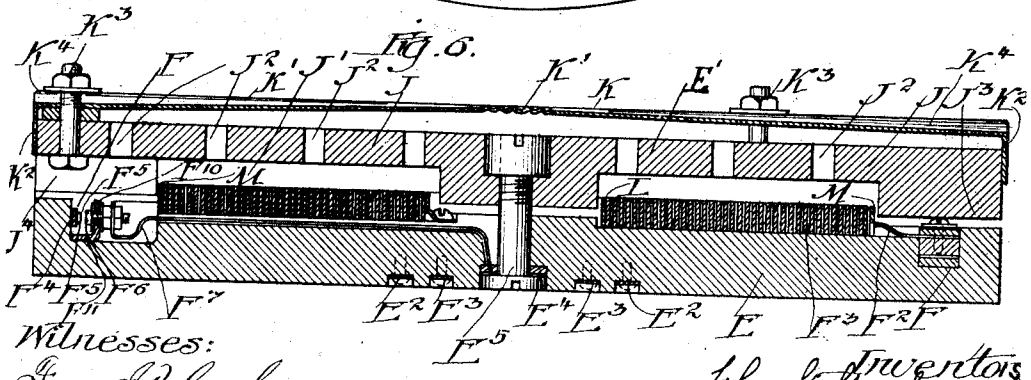


Fig. 6.



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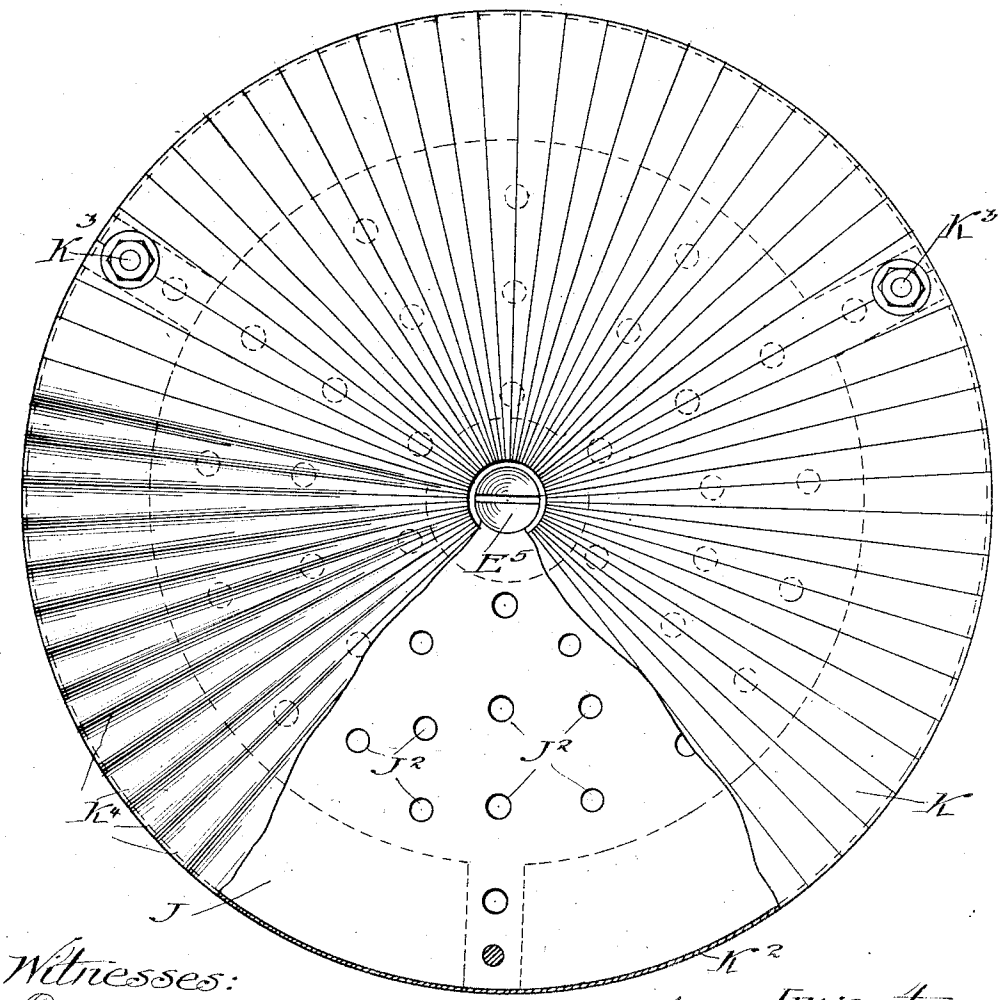
5 SHEETS—SHEET 4.

Fig. 7.



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5 SHEETS—SHEET 5.

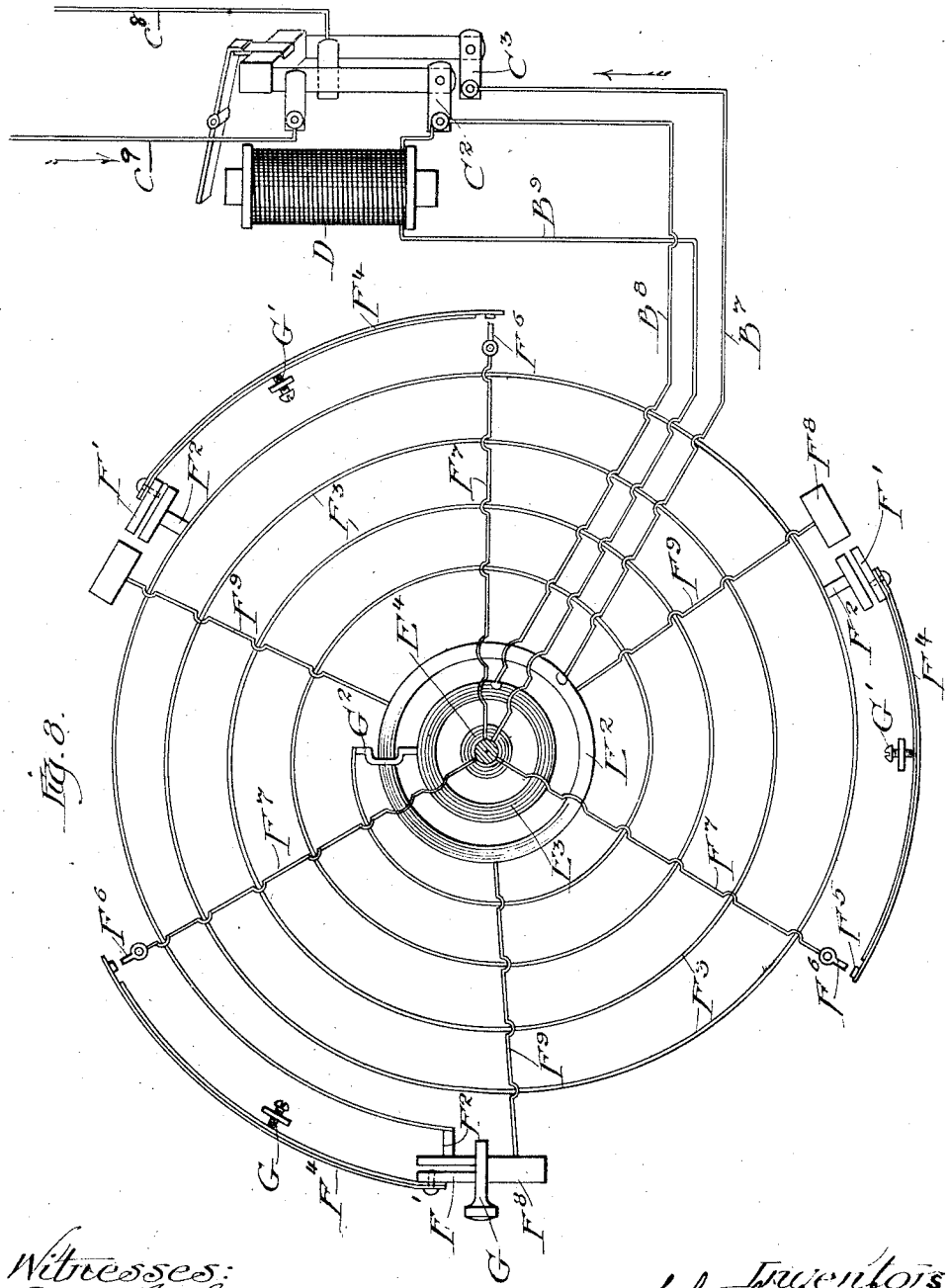

Fig. 8.

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UNITED STATES PATENT OFFICE.

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ELECTRIC OVEN.

1,022,545. Specification of Letters Patent. Patented Apr. 9, 1912.

Application filed February 15, 1909. Serial No. 478,012.

To all whom it may concern:

Be it known that we, JOHN G. GRONBERG and WALTER D. HODSON, citizens of the United States, residing at Grand Rapids, in the county of Kent and State of Michigan, and Janesville, in the county of Rock and State of Wisconsin, respectively, have invented a certain new and useful Improvement in Electric Ovens, of which the following is a specification.

Our invention relates to electric ovens.

It is illustrated in the accompanying drawings, wherein—

Figure 1 is a vertical section through an oven arranged to receive our heating device; Fig. 2 is a similar view at right angles to Fig. 1; Fig. 3 is a plan view of the controlling switch; Fig. 4 is a section of the controlling switch showing a cut-out magnet; Fig. 5 is a plan view of the lower section of the heater plate, with parts removed; Fig. 6 is a cross section therethrough; Fig. 7 is a plan view of the heater plate, and Fig. 8 is a diagrammatic view showing the circuits.

Like parts are indicated by the same letter in all the figures.

A A are the frame portions of a box or receptacle having the bottom A^1, the top A^2, the door A^3, the glass panels A^4, the interior compartment wall A^5, the insulation packing A^6 and the supporting legs A^7. Inside the interior compartment and forming the bottom thereof is the depressed pan B provided preferably with a central depression B^1 in which lies the terminal plate B^2 which is secured in position by the bolts B^3 and is provided with the rings B^4, B^5 and the central pin B^6, whence lead respectively the conductors B^7, B^8 and B^9 to the switch terminals. This switch is shown as contained in the box C and consists of the table C^1, the terminals C^2, C^3, whence lead the heater conductors B^8 and B^7 respectively, the switch arms C^4, C^5 which make contact with the terminals C^6 and C^7, whence lead the line wires C^8 and C^9 respectively. The two switch arms are connected by the cross piece C^{10} and have the controlling knob C^{11}. They are associated with a spring C^{12} which tends to force them out so as to break the contact. Mounted on the switch is a cut-off magnet D having one end D^1 of the pivoted armature exposed to it. The other end of this armature is provided with a block D^2 opposed to a detent D^3 which is pivoted at D^4 and is adapted to engage a projection D^5 associated with the switch arms. These parts are secured in any desired position as indicated in Fig. 1 where the switch arms are shown as thrown back by the spring C^{12}. The conductor adapted to aid in controlling the cut-out magnet is indicated by the letter B^9 and it leads from the central terminal B^6 to the magnet D. The heating plate consists of the body E which is preferably of soapstone, and the top E^1 likewise preferably of soapstone. In the body E are the conductor rings E^2, E^3 and E^4. The conductor ring E^2 is adapted, when the plate is in position, as indicated in Fig. 2, to make contact with the contact ring B^4, while the conductor ring E^3 makes contact with the contact ring B^5, and the central terminal B^6 makes contact with the head of a screw E^5 which bears against the contact ring E^4. When the plate body E is placed within the receptacle as indicated in Fig. 2, these several rings which it carries are thus in electrical connection with the several conductors above referred to.

On the top of the body E is formed a circular groove F. There are three sections to this top of the body portion and we shall describe one of them. In one section of this groove is placed the terminal F^1 in opposition to the terminal F^2 which latter is in contact with the outer coil of the resistance F^3 which usually takes the shape of a ribbon wound with insulation between its several coils. From this same terminal F^1 projects a two part curved thermostat spring F^4 which carries at its outer end a contact point F^5. This point is in opposition to a contact point F^6 associated with an inleading conductor F^7 which makes contact with the contact ring E^4 from which contact ring leads the conductor B^9. Opposed to the terminal F^1 is the terminal F^8 whence leads a conductor F^9 to the outer contact ring E^2 in the bottom of the heat-

ing plate body. From the inner ring E^3 leads the conductor B^8 to one pole of the switch while the conductor B^7 leads from the outer ring E^2 to the other pole of the switch. The contact or terminal point of the conductor F^7, indicated by F^6, is supported on an angular projection F^{10} from a plate F^{11} which lies in the bottom of the groove F.

By referring now to the diagram of Fig. 8, keeping in mind the structures of Figs. 5 and 6, we can trace these circuits. G is a plug which, when inserted, closes the connection between the otherwise separated terminals F^1 and F^8. When this is done a circuit is created as follows, beginning at the line wires back of the switch which are indicated as C^8 and C^9. Assuming that the current is flowing through C^9 in the direction indicated by the arrow, if the switch be closed it will pass through the switch arm to the terminal C^2, thence along conductor B^8 to the inner ring E^3, thence along the short conductor G^2 to the inner end of the resistance coil through the resistance coil to the terminal F^2, through block G to terminal F^8 through conductor F^9 to the outer ring E^2, thence by the conductor B^7 to the other arm of the switch, thence out onto the line wire C^8. Thus a circuit is established through the resistance and heat begins to be generated. As soon as sufficient heat has been generated to inwardly bend the resistance spring F^4 another circuit is established as follows: through conductor C^9, through the switch arm terminal C^2, through the cut-out magnet D, along conductor B^9 to the central contact ring E^4, thence along conductor F^7 to the contacts F^6 and F^5 which are brought into connection by the forward flexing of the spring F^4, thence along F^4 to the terminal F^1, plug G, terminal F^8, conductor F^9, outer ring E^2, conductor B^7, and out in the other main line. This energizes the magnet D, causing it to bring down its armature in the structure shown in Fig. 1 or in the structure shown diagrammatically in Fig. 8, whereupon the switch arm is released and the spring C^{12} forces it out as shown in Fig. 1, thus breaking both circuits.

G^1 G^1 are stop screws to vary the tension on the springs F^4 and thus vary the time within which, at a given heat, they will be sufficiently flexed to close their respective circuits. The arrangement of these stop screws and thermostat springs is such as to give three differing results. If a temperature of a certain height will flex the first of these springs, the set screws are so adjusted on the others that one hundred degrees more of heat is required before the second one is flexed, and a still higher degree before the third is flexed, or, if the parts are properly adjusted, they may be so arranged that it will take a certain amount of time at a given temperature to flex each spring and they will vary among themselves as to time. The object is to have a variation between these several thermostatic springs so that by plugging in at a given point in the structure as shown, the current will be turned into the heater and at the same time provision will be made for automatically cutting out the heating current as soon as desired and as predetermined by the arrangement of the devices connected with that particular thermostatic spring.

We have shown this structure generally as diagrammatic, fully realizing that a very large number of variations could be made without departing from the spirit of our invention. We shall set forth in the claims what appears to be essential.

The top of the heating plate J is preferably in the shape of an inverted dish, cut out at J^1 and it is perforated at J^2. Its lower rim J^3 is slotted as at J^4 to admit air under the rim into the interior of the dish above the heating coil and to permit such air when heated to pass out the holes.

Mounted on the top of the heating plate is the cover K preferably corrugated as indicated at K^1 and provided with a ring K^2 which overhangs the top of the heating plate. It is secured in position by the bolts and nuts K^3 K^3. These radial corrugations leave inwardly open grooves K^4 K^4 whereby the air escapes from under the cover and around its edges at the central opening K^1. For convenience we have connected the inner end of the coil with a ring L to which the conductor leads and we have surrounded the coil with a ring M to which the conductor leads.

The use and operation of our invention is as follows: An oven of the type shown in Fig. 2 having been provided, the switch is in position on the side and the three conductors are brought down inside and secured to the three terminals or contacts in the terminal plate in the bottom of the receptacle. The heating plate, having its several parts properly arranged and associated together as indicated, for example, in Fig. 6, is then placed in position in the bottom of the receptacle on top of the terminal plate, its two terminal rings and terminal center piece being placed in position so as to make electrical contact with the three contact rings on the bottom of the plate body. This leaves the parts in the position where the heating plate is resting on the terminal plate in the bottom of the receptacle indicated in Fig. 1. The switch is open as indicated in Fig. 1. The plug G is inserted between the predetermined pair of coil and cut-out terminals. The operator will select that pair which will bring into play the particular thermostatic spring which he desires to have acted upon. The objects or materials to be sub-

jected to the heat are then placed in position on the cover of the heating plate and the switch is closed. Thereupon the current, as previously described through the switch or inleading wires C^8 and C^9, is supplied which traverses the heating coil until the plate has been raised to a certain temperature or kept at a certain temperature for a certain predetermined time. Thereupon the thermostatic spring F^4, associated with the plug G, is moved forward until the points F^5 and F^6 contact, whereupon a circuit is made through the cut-out magnet D. This magnet throws down its armature, releases the handle and permits the spring C^{12} to open the switch and the current is cut off from both the magnet and heating coil. It will be understood that these heating plates could be arranged in any desired manner or that there might be a series of them in the receptacle, for example, one at the top and one at the bottom. It will also be understood that these receptacles and plates while shown as circular in outline, may be of any desired shape. Any species of switch can be used. Soapstone is the preferred material though other substances might be employed.

Broadly speaking, our invention embraces a switch, a cut-out, a heating coil, circuit closers whereby a current can be made to traverse the heating coil, a thermostatic circuit closer whereby a current may be made to traverse the cut-out responsive to variations in heat of the heating coil, and means whereby the cut-out can shut off the current from the heating coil.

The dish shaped bottom of the oven is intended to receive and drain away from the center the grease or other liquid which may tend to collect in the bottom of the oven. The series of thermostatic devices, and there may of course be any number of them, are to be adjusted and adapted so that when a sufficient degree of heat has been obtained or when the heat is continued for a sufficient length of time, the supply of current will be automatically cut off after which, of course, the heat remains without further increase and practically at a uniform stage for an indefinite period. One advantage of this arrangement is that no attention is required as the user may, upon applying the current by throwing the switch, the oven being closed and the cooking utensils in position, go away and leave the apparatus, knowing that there is no danger of overheating, and even assured that the requisite amount of heat will be obtained and that the device will then automatically cut itself out of further current supply.

Our invention can be used for enameling ovens, hot water heating systems, and other purposes as well as for fireless cook stoves.

We claim:

1. In a heater, the combination of a heating plate comprising a body and a top with intermediate space with a heating coil associated therewith, an electric supply circuit connected with the heating coil, a circuit breaker therefor, an electric circuit for said circuit breaker, additional means for closing the supply circuit and means responsive to the temperature for operating the circuit breaker to stop the heating process when any predetermined temperature has once been reached.

2. In a heater, the combination of a heating plate comprising a body and a top, with an air circulating space between them, a heating coil associated therewith, an electric supply circuit connected with the heating coil, a circuit breaker therefor, additional means for closing the supply circuit, and means responsive to the temperature for operating the circuit breaker to stop the heating process when once any predetermined temperature has been reached.

3. In a heater, the combination of a heating plate comprising a body and a top having discharge openings therethrough with an air space between them, and side inleading openings, a heating coil associated therewith, an electric supply circuit connected with the heating coil, a circuit breaker therefor, additional means for closing the supply circuit, and means responsive to the temperature for operating the circuit breaker to stop the heating process when any predetermined temperature has once been reached.

4. In a heater, the combination of a heating plate comprising a body, a top and cover, with air circulating spaces between them, a heating coil associated therewith, an electric supply circuit connected with the heating coil, a circuit breaker therefor, additional means for closing the supply circuit, and means responsive to the temperature for operating the circuit breaker to stop the heating process when any predetermined temperature has once been reached.

5. In a heater, the combination of a heating plate comprising a body and a top, with a space between them and a corrugated cover on the top, with a space between it and the top, a heating coil associated therewith, an electric supply circuit connected with the heating coil, a circuit breaker therefor, additional means for closing the supply circuit, and means for operating the circuit breaker responsive to variations in heat.

6. In a heater, the combination of a heating plate comprising a body, a top and a cover having opening therethrough, an air space between the top and cover and the body and top, said space having outside openings, a heating coil, associated therewith, an electric supply circuit connected with the heating coil, a circuit breaker therefor, additional means for closing the

supply circuit and means for operating the circuit breaker responsive to variations in the temperature.

7. In a heater, the combination of a receptacle with a terminal plate in the bottom thereof, a heating plate resting on such terminal and in electrical contact therewith, a heating coil associated therewith, an electric supply circuit connected with the heating coil, a circuit breaker therefor, and means responsive to the temperature for operating the circuit breaker to stop the heating process when any predetermined temperature has once been reached.

8. In a heater, the combination of a heating plate with a heating coil associated therewith, an electric supply circuit connected with the heating coil, a circuit breaker therefor, additional means for closing the supply circuit, and means responsive to the temperature for operating the circuit breaker to stop the heating process when any predetermined temperature has once been reached, a terminal plate on which the heating plate rests, and with which it is in electrical contact, and conductors leading from the outside to the terminal plate and forming part of the electric supply current.

9. In a heater, the combination of a heating plate with a heating coil associated therewith, an electric supply circuit connected with the heating coil, a circuit breaker therefor, additional means for closing the supply circuit, means responsive to the temperature for operating the circuit breaker to stop the heating process when any predetermined temperature has once been reached, an inclosing receptacle, a terminal plate in the bottom of the same on which the heating plate rests and which is in electrical contact therewith, and conductors from the terminal plate to the circuit breaker operating devices.

10. In a heater the combination with a heating plate of heating means therewith, comprising a pair of terminal rings one within the other a coil surrounding said rings and terminating at either end in one of them, a switch, and a conductor connecting said switch and said rings and means connecting said switch with any suitable source of power.

11. In a heater the combination with a heating plate of heating means therewith, comprising a pair of terminal rings one within the other, a coil surrounding said rings and terminating at either end in one of them, a switch and a conductor connecting said switch and said rings and a connection between said switch and any suitable source of power, and electric magnetically controlled operating means for said switch.

12. In a heater the combination with a heating plate of heating means therewith, comprising a pair of terminal rings one within the other, a coil surrounding said rings and terminating at either end in one of them, a switch and a conductor connecting said switch and said rings and a connection between said switch and any suitable source of power, and electromagnetically controlled operating means for said switch, a terminal concentric with said rings and a circuit from one of the terminals of said switch through said magnetic means to said terminal, thermostats dispesed about said coil and communications from said center terminal to one of the terminals of said thermostat a removable connection between the other terminal of said thermostat and the outer terminal ring.

13. In a heater, the combination of a heating plate with a heating coil associated therewith, an electric supply circuit connected with the two ends of the heating coil, a circuit breaker therefor, means including an electric circuit for operating the circuit breaker, and means consisting of a removable plug for simultaneously closing the two circuits.

14. In a heater, the combination of a heating plate with a heating coil associated therewith, an electric supply circuit connected with the two ends of the heating coil, a circuit breaker therefor, means including an electric circuit for operating the circuit breaker, and a thermostatic circuit closer in such circuit, and means consisting of a removable plug for simultaneously closing the two circuits.

15. In a heater, the combination of a heating plate with a heating coil associated therewith, an electric supply circuit connected with the two ends of the heating coil, circuit breaker therefor, means including an electric circuit for operating the circuit breaker, and a thermostatic circuit closing device in proximity to the heating plate and responsive to variations in heat, and means consisting of a removable plug for simultaneously closing the two circuits.

16. In a heater, the combination of a heating plate with a heating coil associated therewith and laid thereon, an outer conducting ring within the coil, an inner conducting ring within the coil, a supply circuit connected at its terminals with the inner and outer rings respectively, a switch in the supply circuit, and a series of means for throwing the switch unequally, responsive to variations in the heat of the plate.

17. In an electric oven, the combination of a receptacle with a central terminal block therein, a heating plate supported thereon, and mutually contacting rings on plate and block whereby the electric circuits are established when the plate is put in position on the block.

18. In an electric oven, the combination

of a receptacle with a central terminal block therein, a heating plate supported thereon and mutually contacting rings on plate and block whereby the electric circuits are established when the plate is put in position on the block, and a supply current with a switch on the outside of the oven.

19. In an electric heater, the combination of an oven with a support in the bottom thereof, a heating plate resting upon the support, and an outwardly inclined collecting dish in the bottom of such oven.

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