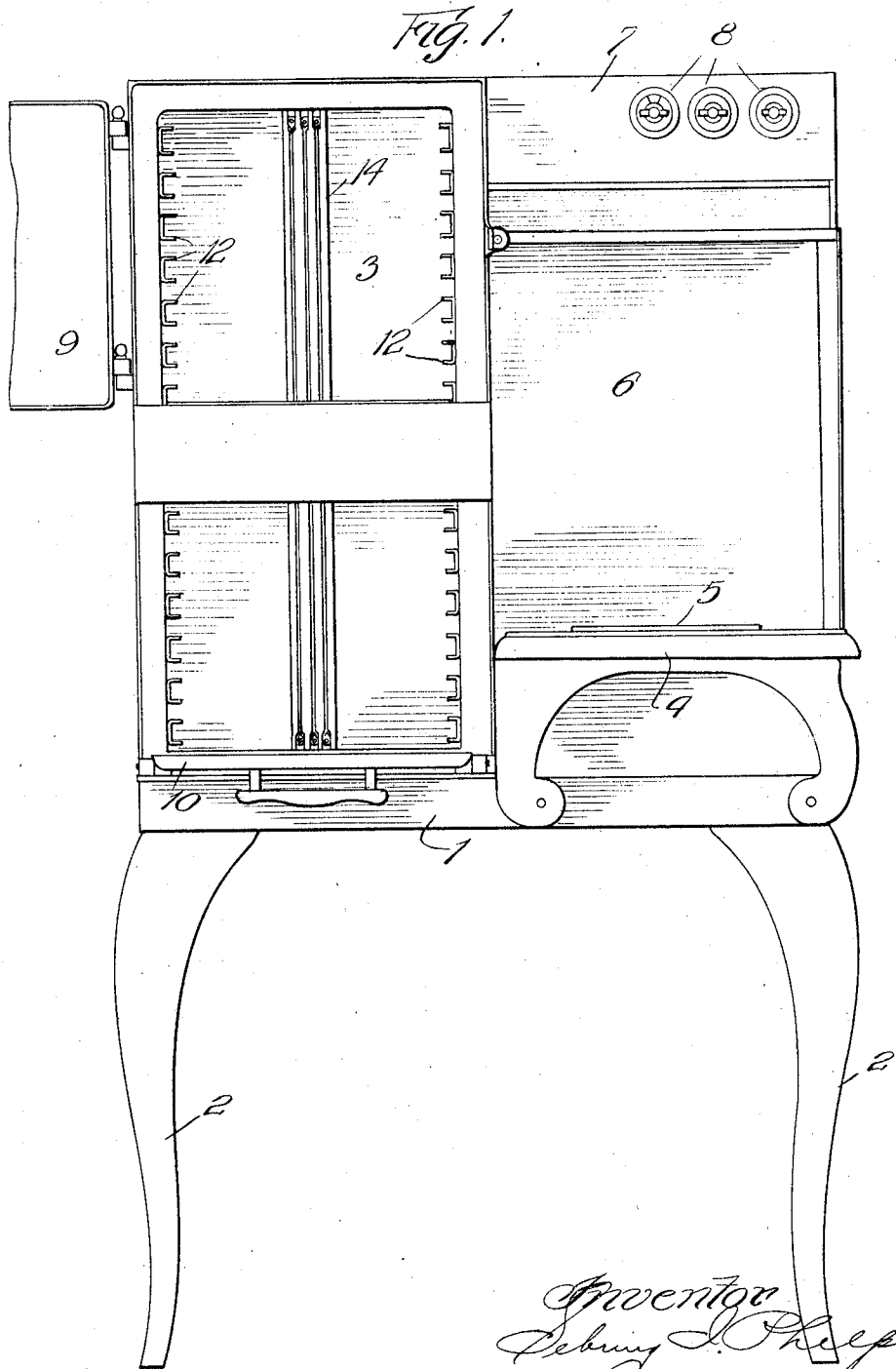


S. I. PHELPS.
ELECTRIC STOVE.
APPLICATION FILED MAY 10, 1919.

1,376,829.

Patented May 3, 1921.
3 SHEETS—SHEET 1.



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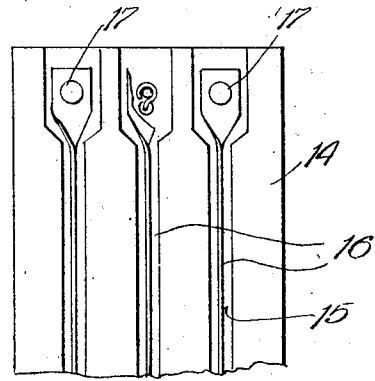
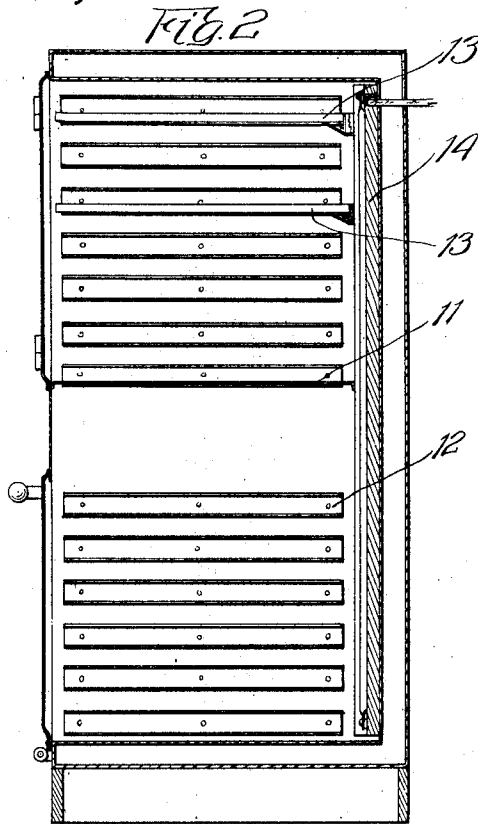
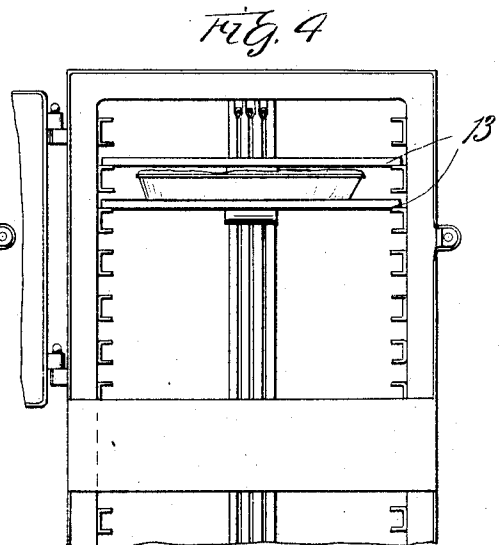
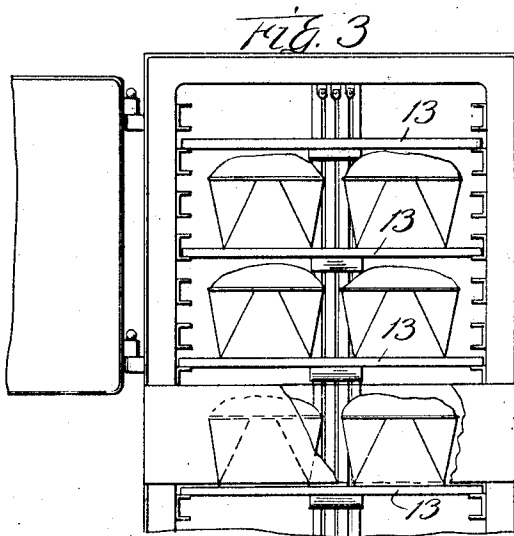


Fig. 9

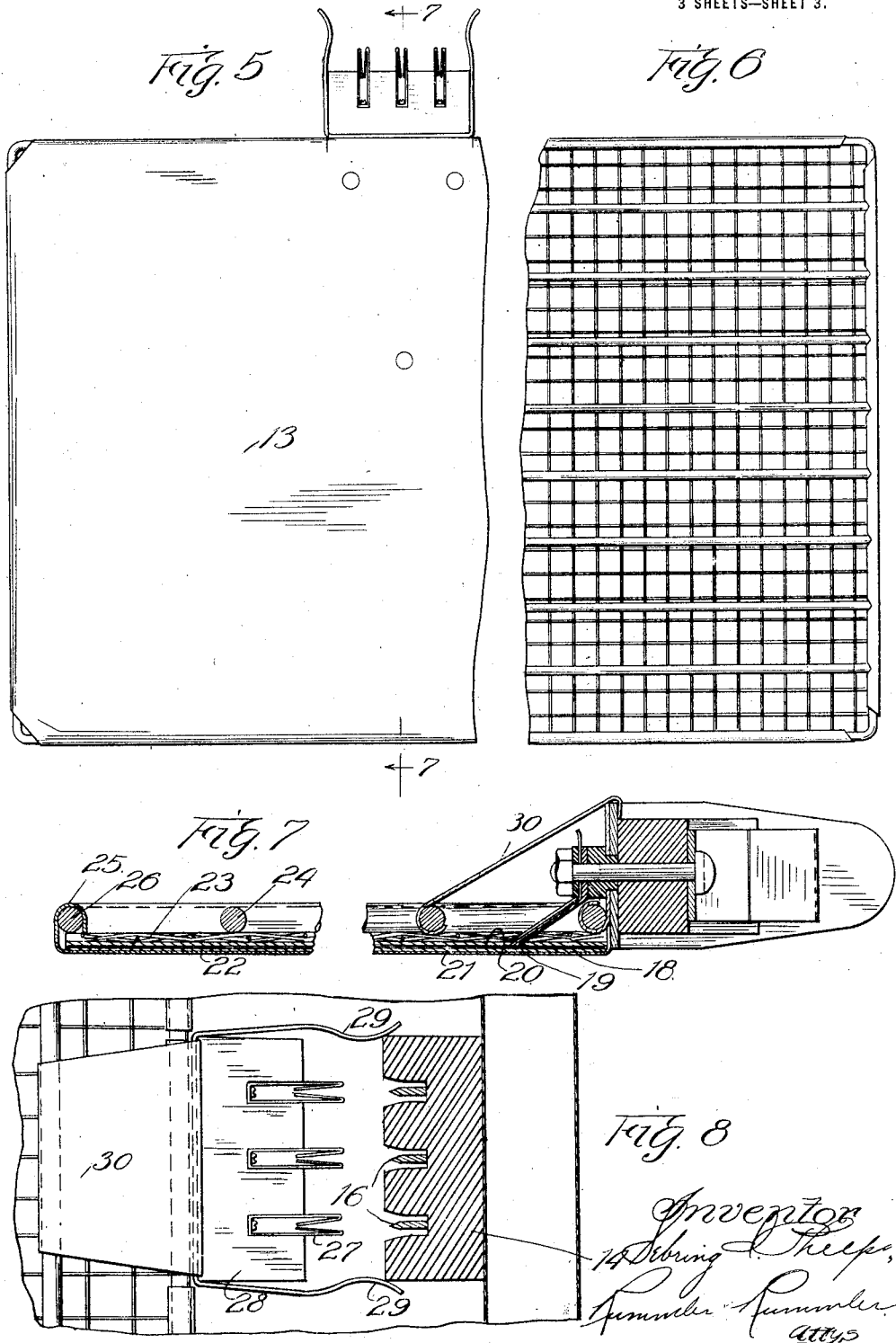


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UNITED STATES PATENT OFFICE.

SEBRING I. PHELPS, OF WILMETTE, ILLINOIS.

ELECTRIC STOVE.

1,376,829.

Specification of Letters Patent.

Patented May 3, 1921.

Application filed May 10, 1919. Serial No. 296,118.

To all whom it may concern:

Be it known that I, SEBRING I. PHELPS, a citizen of the United States of America, and a resident of Wilmette, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Electric Stoves, of which the following is a specification.

In practically all the electric cook stoves which have heretofore been placed on the market, the baking and roasting ovens have been constructed so as to operate upon the same general principle as that upon which the ordinary flame stove (gas, oil, coal, etc.) operates; namely, to produce a comparatively high temperature within the compartment whereby the foods are cooked mainly by radiated heat. Such electric stoves have been arranged to obtain the heat from electrical heating elements arranged on the sides or on the top and bottom, or both, of the cooking compartment. The amount of heat which it is possible to obtain from the present kinds of resistance material is limited. Accordingly, in order to approach the efficiency of flame stoves, the electric stoves heretofore put on the market have had to provide a compartment made as nearly air-tight as possible and highly insulated against the loss of heat by radiation, so as to retain as much as possible of the heat generated within the compartment. These stoves have necessarily required a large consumption of electricity and for a period of time considerably greater than that required to do the cooking itself, with the result that their operation has been so expensive as to prohibit their going into general use.

It is a fact that can readily be proven, that it requires only a certain amount of heat for a given length of time to produce the chemical changes necessary to convert raw food into cooked food. Any heat generated in excess of said amount, and for a longer time than that required to produce the chemical changes, is waste. It is obvious that the more directly the heat can be applied to the foods, the greater the saving in the quantity of heat required and the time during which it must be generated.

The main objects of this invention are, therefore, to provide an improved electric stove wherein the heat generated may be applied in the most direct manner to the foods to be cooked; to provide an improved construction and arrangement of removable

electric heating elements adapted to be arranged in any part of the cooking compartment, whereby only as much of the compartment as is needed for each particular cooking operation has heat generated therein; to provide an improved construction and arrangement of spacing means in the cooking compartment whereby the heating elements may be variously spaced in said compartment so that one serves as a support upon which the utensil, containing the food to be cooked, is adapted to rest, and another is arranged in the closest proximity above such utensil, whereby the heat from said one element is conveyed by conduction to the utensil resting thereon, and heat from the other element is conveyed by radiation to the utensil on the element below; and to provide an improved construction and arrangement of contact members for providing for electrical connection between the heating elements and switching means located exteriorly of the compartment.

An illustrative embodiment of the invention is shown by the accompanying drawings, in which—

Figure 1 is a front elevation of an electric cook stove, the baking and roasting oven of which has been constructed in accordance with this invention.

Fig. 2 is a longitudinal sectional elevation of the oven.

Fig. 3 is a front elevation of the upper part of the oven, showing the relative arrangement of the heating elements when the greater part of the entire compartment is used for cooking food contained in comparatively large utensils, such as are used in the baking of bread.

Fig. 4 is a similar view showing the arrangement of the heaters when only a small part of the compartment is to be used for cooking food, for instance, the baking of a pie or cake.

Fig. 5 is a fragmentary plan view of one of the heating elements.

Fig. 6 is a bottom plan or underside view of the same.

Fig. 7 is an enlarged sectional detail of the heating element, taken on the line 7—7 of Fig. 5.

Fig. 8 is an enlarged fragmentary detail showing the manner in which the contact members on the heating elements are guided into engagement with the contact members in the oven.

Fig. 9 is an enlarged fragmentary view in elevation of the contact members arranged in the oven.

In the construction herein illustrated, this improved oven is shown in Fig. 1 as part of a complete electric cook stove. Such stove comprises a frame 1 supported on legs 2 and having the oven arranged at one side thereof, adjacent to which is a base plate 4 upon which is mounted electric heating elements 5 for use in "outside" cooking operations such as boiling and frying. Above the back 6 of the stove is arranged a switchboard 7 upon which is mounted a plurality of electrical snap switches 8 connected to control the outside heating elements 5 and the heating elements in the oven 3.

The oven 3 as herein illustrated is substantially the same as that constructed for the usual gas stove, the same being provided with two cooking compartments open at the front and equipped with doors 9 and 10, forming closures for the upper and lower compartments. These compartments are separated by means of a removable partition 11 (Fig. 2), which when removed throws both of the compartments into one. The oven is a double-walled construction, as most clearly shown in Fig. 2, and the space between the walls may be filled with a heat insulating packing if it is desired, but it is no wise essential to the successful and practical operation of this device.

Within the oven 3, along opposite sides thereof, are arranged a plurality of ledges 12 upon which the electric heating elements 13 are supported. These ledges are herein shown to be channel-shaped members formed of sheet metal and secured to the sides of the oven so that the distance between adjacent members is substantially the same as the distance between the transverse parts of the same member. This provides a uniform spacing of the ledges 12 throughout substantially the entire height of the double cooking compartment and because of the ledges being closely spaced makes it possible to obtain a great variation in the spacing of the heating elements.

At the back of the compartment is arranged a block 14 of insulating material such as soapstone, which has a plurality of grooves 15 longitudinally cut or formed therein in substantially parallel relation. In each of the grooves 15 is seated an electrical conductor 16, comprising a strip of thin copper arranged edgewise in the respective grooves and having the ends thereof twisted so as to lie flat for the purpose of facilitating attachment of said strips to the block 14 by the binding posts 17. The front edges of the strips 16 are tapered, as shown in Fig. 8, so as to facilitate the proper engagement therewith of the contacts on the heaters 18. Electrical conductors (not

shown) lead from the binding posts 17 out through the back of the oven to one of the switches 8 arranged on the switchboard.

The heating elements 13 are a combination supporting rack and heating element. Each comprises a sheet of insulating material 18 (Fig. 7), preferably mica, upon which is wound electrical resistance material 19. The strip of insulating material 18, with its winding 19, is placed between layers of other insulating material 20 and 21, also preferably mica, and the whole is then arranged with a metal casing comprising plates 22 and 23 which are firmly clamped together around the perimeters so as to urge all of the parts firmly against each other in their assembled relation. In the construction herein shown, the plate 22 is of solid construction, whereas the plate 23 is of foraminous construction, being preferably a coarse wire screen. The heating element is reinforced by a rack 24 which is firmly secured to the same by having the edges 25 of the plate 22 bent around the perimetric wire 26 of said rack. The use of the screen plate 23 facilitates the radiation of heat to food below that face of the heater, due to the fact that the mica insulation being more or less transparent, the heat meets with less resistance than where a solid or opaque covering is used.

The casing is made of a width so that the element spans the compartment and rests upon opposed ledges 12, and being light of weight, may be easily handled and placed in the oven in any desired manner with regard to the matter of spacing. Also the depth of the casing (the dimension from front to back) is nearly equal to the corresponding dimension of the oven. Thus the space between any two heaters, or between one heater and the top or bottom of the oven, constitutes a cooking compartment separate from the remainder of the oven.

Such a heater construction provides an element which is quite thin and a number of them take up very little space in the oven, and are handled in practically as convenient and easy a manner as the racks in an ordinary flame stove oven. All of the parts being firmly clamped together, each in physical contact with the other, the heat generated by the resistance material is communicated to the utensil resting thereon in the most efficient manner, viz., by conductivity.

Spring contact members 27 are arranged on each of the heating elements 13, the same being set in a block of insulating material 28, preferably soapstone, which is secured at the back of the heater. The heat unit 19 for each heating element preferably comprises two windings separately arranged upon the insulating material 18, each of which has one end connected to the central contact

member 27 and the other ends connected respectively to the outer contact members. This enables the generation of three different heats in the heating element, as is well known.

As shown in Figs. 7 and 8, the block 28 in which the contacts 27 are supported is arranged below the plane of the top or solid plate of the heater, and the terminal connections of the resistance material with contacts 27 is protected by a shield 30. Thus there are no obstructions on the upper side of the heaters to interfere with the placing of utensil thereon, and the utensil can not be accidentally brought into contact with any part of the electrical circuits.

In order to insure the engagement of the contact members 27 with the conductors or contact members 16, each of the heating elements is provided with a pair of spring arms 29 secured to the block 28 and extending forwardly beyond the contact members 27. These spring arms are arranged to engage the sides of the block 14 and guide the contact members 27 and 16 into proper engagement, as indicated in Fig. 8.

The operation of the device is as follows:

The arrangement of the heating elements within the cooking compartment depends primarily upon the size of the utensil in which the food is to be cooked and the number of such utensils that are to be used at one time. If, for instance, several loaves of bread are to be baked, the heating elements will be spaced rather far apart as indicated in Fig. 3, the spacing between each two heating elements being such that the one above the utensils containing the dough will be as close as it is possible to have it, allowing for sufficient room to prevent interference with the rising of the dough as it is baked. If, on the other hand, a single pie or cake is to be baked, two of the heating elements would be arranged closely together at the top of the compartment, as indicated in Fig. 4.

The heating elements, being thin and light, may be readily handled and spaced apart as indicated. Those which are to be used are pushed to the rear of the oven so that the contacts 27 engage the contacts 16, the same being guided into the proper engagement by the spring arms 29. The heating elements that are not to be used in a particular cooking operation may be pulled slightly outward sufficiently to disengage the contacts 27 and 16.

By reason of this construction and arrangement of heating elements, it is unnecessary to preheat the oven before placing the foods in their raw state therein. Accordingly, the current is not turned on until after the utensils containing the raw food have been placed in the oven.

As the heat is generated in the element

upon which a utensil rests, it is transmitted to the utensil directly by conductivity, and it is this heat which effects the major part of the cooking operation. The heat from the element above the utensil is radiated to the food below and serves primarily to brown the exposed surface of the food in order to give it the color which is so desirable. As soon as the cooking operation is completed, the switch is turned so as to cut off the electric current and the food is removed.

During the cooking operation, the oven may be opened as frequently as may be necessary in order to examine the food and make any changes in the placing of the utensils or the heating elements as may seem necessary.

Although but one specific embodiment of this invention has been herein shown and described, it will be understood that numerous details of the construction shown may be altered or omitted without departing from the spirit of this invention as defined by the following claims.

I claim:

1. In an electric stove, the combination of a cooking compartment, a plurality of ledges arranged along opposite sides thereof, a plurality of removable electric heating elements adapted to be supported on said ledges in varying spaced relation, electrical contact members arranged on each of said heating elements at the rear thereof, a vertically disposed block of insulating material arranged at the back of said compartment, and a plurality of electrical conductors arranged on said block so as to coact with contact members on said heating elements when said heating elements are supported on said ledges.

2. In an electric stove, the combination of a cooking compartment, a plurality of ledges arranged along opposite sides thereof, a plurality of removable electric heating elements adapted to be supported on said ledges in varying spaced relation, electrical contact members arranged on each of said heating elements at the rear thereof, and a plurality of electrical conductors vertically arranged along the back of said cooking compartment and insulated therefrom, said conductors being arranged to engage with the contact members on said heating elements when said heating elements are supported on said ledges.

3. In an electric stove, the combination of a cooking compartment, a plurality of ledges arranged along opposite sides thereof, a plurality of removable electric heating elements adapted to be supported on said ledges in varying spaced relation, a plurality of spring electrical contact members supported on the rear edge of each of said elements, a block of insulating material ver-

tically arranged at the back of said compartment, and a plurality of comparatively thin strips of metal arranged longitudinally on said block in substantially parallel relation and adapted to engage with the contact members on said heating elements when said heating elements are arranged on said ledges.

4. In an electric stove, the combination of a cooking compartment, a plurality of ledges arranged along opposite sides thereof, a plurality of removable electric heating elements adapted to be supported on said ledges in varying spaced relation, a plurality of spring electrical contact members supported on the rear edge of each of said burners, a block of insulating material vertically arranged at the back of said compartment, a plurality of comparatively thin strips of metal arranged longitudinally on said block in substantially parallel relation and adapted to engage with the contact members on said heating elements when said heating elements are arranged on said ledges, and an electrical switch arranged exteriorly of said cooking compartment and connected to said strips and to a source of electricity.

5. In an electric stove, the combination of a cooking compartment, a plurality of ledges arranged along opposite sides thereof, a plurality of removable electric heating elements adapted to be supported on said ledges in varying spaced relation, each of said heating elements embodying two separately arranged resistance units, three spring contact members arranged at the rear edge of said heating elements, one of which is connected to one end of both of said resistance units and the other two of which are respectively connected to the other ends of said resistance units, three electrical conductors vertically arranged at the back of said compartment in substantially parallel relation and insulated therefrom, said conductors being disposed so as to engage respectively with the spring contact members on said heating elements when said heating elements are arranged on said ledges, and a three-way electrical switch arranged exteriorly of said compartment and connected to said electrical conductors and to a source of electricity.

6. In an electric stove, the combination of a cooking compartment, a plurality of ledges arranged along opposite sides thereof, a plurality of removable electric heating elements adapted to be supported on said ledges in varying spaced relation, a plurality of electrical contact members supported on the rear edge of each of said burners, a block of insulating material vertically arranged at the back of said compartment, said block having a plurality of grooves longitudinally arranged therein, and an

electrical conductor seated in each of said grooves and adapted to engage with the contact members on said heating elements when said heating elements are arranged on said ledges.

7. In an electric stove, the combination of a cooking compartment, a plurality of ledges arranged along opposite sides thereof, a plurality of removable electric heating elements adapted to be supported on said ledges in varying spaced relation, electrical contact members carried by each of said elements, coacting electrical contact members fixed in said compartment in substantial alinement with each of said ledges and adapted to engage with the contact members on said elements, and coacting means on said elements and said compartment for guiding the contacts on said elements into engagement with the contacts in said compartment.

8. In an electric stove, the combination of a cooking compartment, a plurality of ledges arranged along opposite sides thereof, a plurality of removable electric heating elements adapted to be supported on said ledges in varying spaced relation, a plurality of electrical contact members supported on the rear edge of each of said elements, a block of insulating material vertically arranged at the back of said compartment, said block having a plurality of grooves longitudinally arranged therein, an electrical conductor seated in each of said grooves and adapted to engage with the contact members on said heating elements when said heating elements are arranged on said ledges, and means on each of said heating elements adapted to coact with said block for guiding the contacts on said heating elements into engagement with the conductors on said block.

9. In an electric stove, the combination of a cooking compartment, a plurality of ledges arranged along opposite sides thereof, a plurality of removable electric heating elements adapted to be supported on said ledges in varying spaced relation, a plurality of electrical contact members supported on the rear edge of each of said elements, a block of insulating material vertically arranged at the back of said compartment, said block having a plurality of grooves longitudinally arranged therein, an electrical conductor seated in each of said grooves and adapted to engage with the contact members on said heating elements when said heating elements are arranged on said ledges, and a pair of spring arms arranged on each of said heating elements and adapted to engage the opposite sides of said block so as to guide the contacts on said heating elements into engagement with the conductors on said block.

10. In an electric stove, the combination

of a cooking compartment, a plurality of closely spaced ledges arranged along opposite sides thereof, a plurality of removable electric heating elements, each comprising a comparatively thin heat-generating unit incased in metal and insulated therefrom, the metal casing for each of said elements being of a width whereby it will span said compartment and rest upon opposed ledges, said heating elements being adapted to be spaced closely together or far apart in any portion of said compartment and enable utensils of various heights to be set between any two of said heating elements, where a utensil rests directly upon one of said heating elements from which it receives heat by conduction and is disposed close to another heater from which it receives heat principally by radiation, contact members on each of said heating elements, and electrical conductors vertically arranged at the back of said compartment and adapted to engage with the contact members on said heating elements.

11. In an electric stove, the combination of a cooking compartment, a plurality of closely spaced ledges arranged along opposite sides thereof, a plurality of removable electric heating elements, each comprising a comparatively thin heat-generating unit incased in metal and insulated therefrom, the metal casing for each of said elements being of a width whereby it will span said compartment and rest upon opposed ledges, and of a depth nearly equal to the depth of said compartment whereby the space between adjacent heating elements constitutes substantially a separate cooking compartment, said heating elements being adapted to be spaced closely together or far apart in any portion of said compartment and enable utensils of various heights to be set between any two of said heating elements, where a utensil rests directly upon one of said heating elements from which it receives heat by conduction and is disposed close to another heater from which it receives heat principally by radiation, contact members on each of said heating elements, and electrical conductors vertically arranged at the back of said compartment and adapted to engage with the contact members on said heating elements.

12. In an electric stove, the combination of a cooking compartment, a plurality of closely spaced ledges arranged along opposite sides thereof, a plurality of removable electric heating elements, each comprising a thin layer of insulating material upon which is wound electrical resistance material, said sheet of insulating material and winding of resistance material being inclosed between other sheets of insulating material and then incased in metal rigidly secured together along its edges, said metal casing being of

such width as will span said compartment and rest upon opposed ledges, said heating elements being adapted to be spaced closely together or far apart in any portion of said compartment and enable utensils of various heights to be set between any two of said heating elements, where a utensil rests directly upon one of said heating elements from which it receives heat by conduction and is disposed close to another heater from which it receives heat principally by radiation, contact members on each of said heating elements, and electrical conductors vertically arranged at the back of said compartment and adapted to engage with the contact members on said heating elements.

13. In an electric stove, the combination of a cooking compartment, a plurality of closely spaced ledges arranged along opposite sides thereof, a plurality of removable electric heating elements, each comprising a thin layer of insulating material upon which is wound electrical resistance material, said sheet of insulating material and winding of resistance material being inclosed between other sheets of insulating material and then incased in metal rigidly secured together along its edges, the metal casing on one side of said heating element being of foraminous construction, said metal casing being of such width as will span said compartment and rest upon opposed ledges, said heating elements being adapted to be spaced closely together or far apart in any portion of said compartment and enable utensils of various heights to be set between any two of said heating elements, where a utensil rests directly upon one of said heating elements from which it receives heat by conduction and is disposed close to another heater from which it receives heat principally by radiation, contact members on each of said heating elements, and electrical conductors vertically arranged at the back of said compartment and adapted to engage with the contact members on said heating elements.

14. In an electric stove, the combination of a cooking compartment having a pair of doors arranged in the front thereof, a plurality of ledges arranged along opposite sides of said compartment throughout substantially the entire length thereof, a plurality of removable electric heating elements adapted to be supported on said ledges in varying spaced relation, coacting contact members on said heating elements and one of the sides of said compartment, and a removable partition adapted to be supported in said compartment for dividing the same into two sections, substantially as described.

Signed at Chicago this 5th day of May, 1919.

SEBRING I. PHELPS.