

W. STANLEY.
STORAGE STOVE.
APPLICATION FILED SEPT. 30, 1911.

1,025,843.

Patented May 7, 1912.

3 SHEETS-SHEET 1.

Fig. 1.

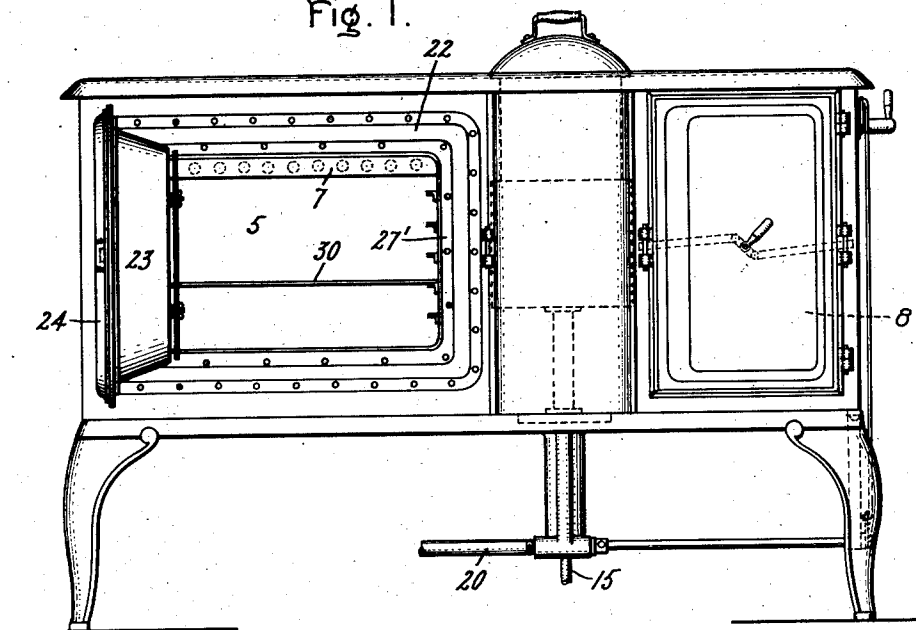
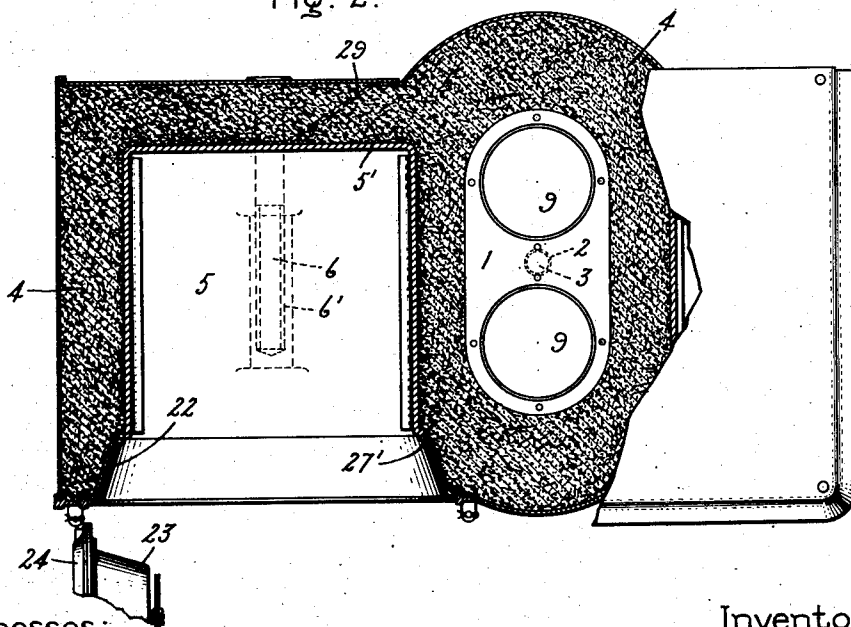


Fig. 2.



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3 SHEETS-SHEET 2.

Fig. 3.

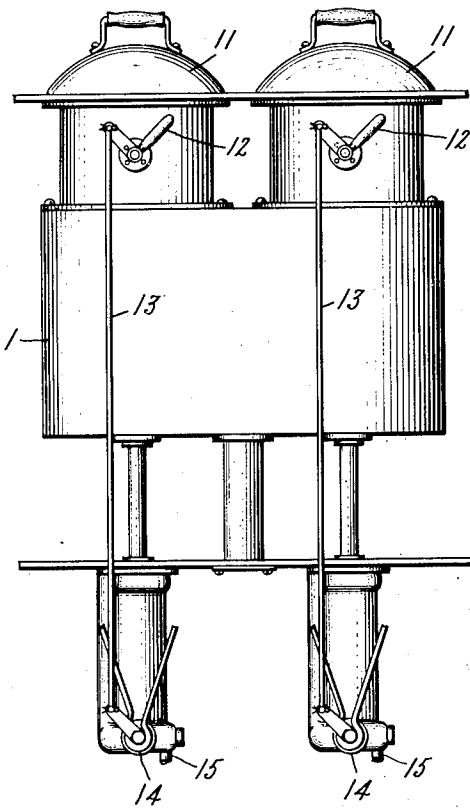
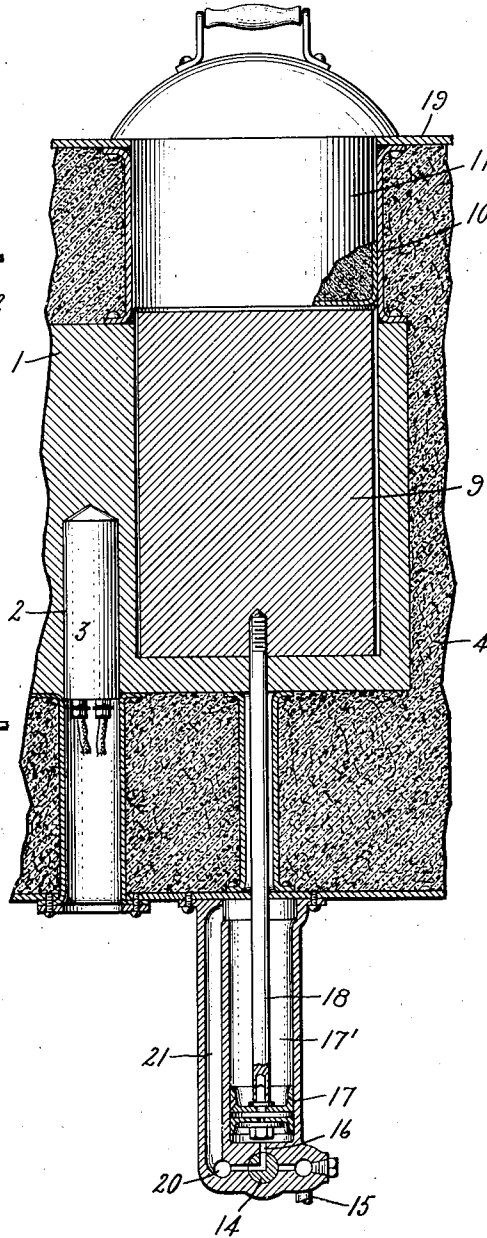


Fig. 4.



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3 SHEETS—SHEET 3.

Fig. 5.

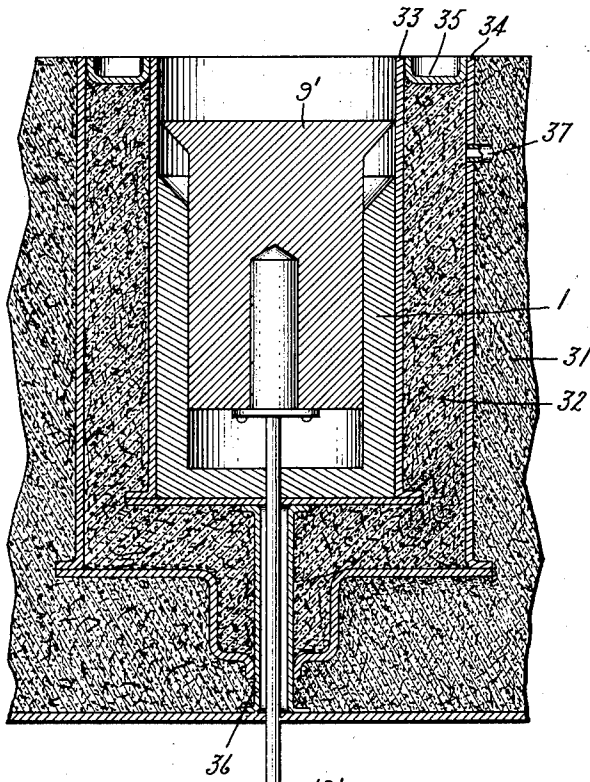


Fig. 6.

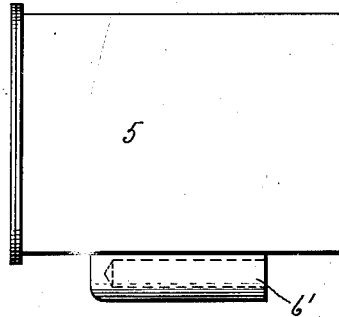


Fig. 7.

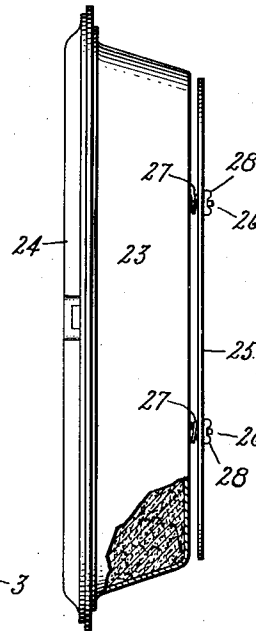


Fig. 8.

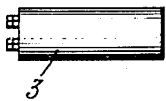
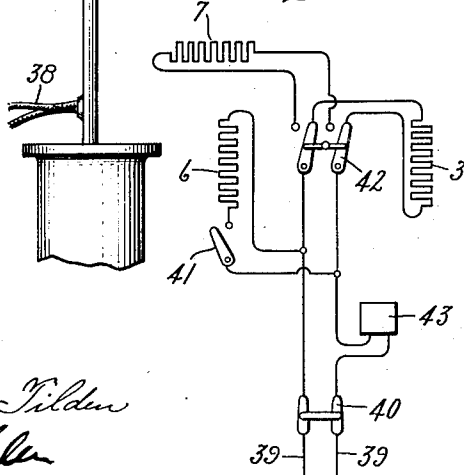


Fig. 9.



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UNITED STATES PATENT OFFICE.

WILLIAM STANLEY, OF GREAT BARRINGTON, MASSACHUSETTS, ASSIGNOR TO
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STORAGE-STOVE.

1,025,843.

Specification of Letters Patent.

Patented May 7, 1912.

Application filed September 30, 1911. Serial No. 652,174.

To all whom it may concern:

Be it known that I, WILLIAM STANLEY, a citizen of the United States, residing at Great Barrington, county of Berkshire, State of Massachusetts, have invented certain new and useful Improvements in Storage-Stoves, of which the following is a specification.

This application is a continuation in part of my application, Serial No. 642,324, filed August 4, 1911.

My invention relates to heat storage devices and methods of operating and utilizing the same, and has hitherto found its greatest utility in the application of the electric heat storage principle to such operations as are ordinarily performed on a domestic range, though it is useful for other purposes, as will hereinafter appear.

The conditions under which electric energy is ordinarily supplied are such that most generating stations find themselves heavily loaded during a few hours of the day, the so-called "peak" hours, and during the other hours of the day are able to find useful employment for only a small portion of their generating capacity. For this reason the ordinary station can afford to sell electric current at greatly reduced rates to persons who are willing to contract for it on a twenty-four hour basis.

One of the principal advantages obtained by my invention is a means whereby a small amount of electric energy furnished twenty-four hours a day, or, where the circumstances warrant it, furnished only during the hours of the day other than the hours of peak load, may be stored, accumulated and used to maintain a heating device in such condition that it is capable of useful employment whenever such employment may be desirable.

Electric energy is inherently an expensive form of energy; to justify its use it is essential that it be most carefully conserved, and the waste reduced to a minimum. My invention therefore seeks to provide means which shall reduce to the lowest possible amount the quantity of heat which escapes into the atmosphere or is otherwise wasted. As a portion of such means, I herein set

forth certain improvements in heat insulation.

I have herein shown my invention in what I regard as its most useful embodiment; namely a cooking range provided with a baking oven, a vegetable cooking chamber, and a heat storage unit of considerable mass in operative relation to the oven and chamber. The heat-storage unit is normally completely heat-insulated and buried in the structure of the range. It is necessary however that in such a cooking range there should be available one or more highly heated surfaces constituting a stove on which water may be placed to be boiled and various cooking operations performed; that is to say, it is desirable to provide means whereby the heat stored in the mass above referred to may be rendered available at the surface of the range, or at some other convenient point, for the performance of various culinary operations, and as the rate of heat input to a range embodying my invention is ordinarily low, it is highly desirable that this withdrawal of heat may be brought about at a rate considerably greater than the rate of heat input.

My invention therefore comprises means for bringing about such withdrawal of heat at will, and, broadly speaking, I may accomplish this result in two ways: that is to say, I may create an opening in the heat insulation, and provide a path of good heat conductivity from the point of heat generation to the surface of the range whereby the heat may be conducted to the point at which it is desired to be utilized; or, I may bring the heat-insulated mass, or a portion thereof, bodily to the surface of the range. Evidently if the entire mass were thus brought to the surface of the range by moving either the mass or the insulation and the article to be heated were placed directly upon it, the portion of the mass at the top would be cooled first, and would thereupon serve as a conducting means for carrying the heat stored in the other portions to the point of utilization. In general I find it most convenient to utilize a combination of the two methods by forming the heat-conducting, or heat-transferring, de-

vice out of a portion of the storage mass itself.

The heat storage body or mass should be maintained normally at a temperature higher than that at which the cooking operation is to be performed, so that it will constitute, as it were, a reservoir of high temperature heat.

I also provide means by which it is possible to change the character of the conductive path and thus to secure any desired rate of heat transference, within reasonable limits.

Having thus described in a general way the nature and object of my invention, I refer to the claims hereto attached for a statement of its scope, and refer for a better understanding of the invention itself to the drawings which form part hereof and to the following description.

Referring to the drawings, Figure 1 is an elevation view of the front of an improved range embodying my invention; Fig. 2 is a plan view with the top partly broken away; Fig. 3 is a view of the storage mass and the device adjacent thereto, removed from the range; Fig. 4 is a partial section through the storage mass, etc.; Fig. 5 is a section similar to Fig. 4, but of a modified form; Fig. 6 is a view of one of the oven bodies; Fig. 7 is a view of one of the doors; Fig. 8 is a view of one of the heating units; and Fig. 9 is a diagram of circuits.

Referring first to Fig. 4, 1 is a mass of metal such as cast iron, or other material of high specific heat per unit of volume and high specific heat conductivity. This mass 1, shown in plan in Fig. 2, extends transversely across the range and is pierced with one or more openings 2 into which may be introduced an electric heating unit 3, shown in detail in Fig. 8, consisting of a high-resistance conductor, preferably formed of a non-oxidizing metal or alloy, which may be connected to an electric circuit. In the particular device shown this unit is adapted to consume about three amperes at 100 volts or about 300 watts.

The mass of metal 1 with its contained heating unit 3 is surrounded by a mass of heat-insulating material 4, and this material should be one which retains its heat-insulating power at a temperature as high as will be reached by the mass 1, which may well be five or six hundred degrees centigrade. I find that powdered lamp black, silica, or infusorial earth are suitable materials for this purpose.

Since the economic operation of my device requires a reasonably high ratio between heat actually utilized and heat generated or total energy delivered to the device, the question of thermal insulation is vitally important, and since the total heat

lost through an insulation, with given thickness and temperature difference, varies directly as the area through which the heat flows, it is important to reduce the superficial area of the mass 1 as much as possible consistent with obtaining the desired storage capacity. This can be accomplished by choosing for the material of such mass a substance having a high specific heat per unit of volume, that is to say, a substance in which the product of the specific gravity times specific heat is high. Iron is such a substance.

Figs. 1 and 2 show the cooking oven 5, which is formed of a cast or drawn body of metal 5', and provided with a door, shown more in detail in Fig. 7. The wall of the oven should be of sufficient thickness so that it has a certain heat storage capacity. In one practical embodiment of my invention I have made this wall of an iron casting a quarter to half an inch thick, weighing about 100 pounds. The heat is supplied to this mass of metal 5', and to the oven, in either one or both of the following two ways: The oven is separated from the storage mass 1 by a certain amount of heat insulation, and as this heat insulation is reduced in thickness, or insulating power, more heat tends to flow from the mass 1 to the oven, and by this means alone the oven may be maintained at any predetermined temperature lower than the temperature of the mass 1. Another way which I may and ordinarily do use when it is desired that the temperature of the oven shall be more independent of variations of temperature of the mass 1 is to provide a special heating unit 6 similar to the unit 3 which may be inserted in the receptacle 6' (Fig. 6). This receptacle is further shown in dotted lines in Fig. 2 and is formed in the mass of the oven lining 5', as clearly shown in Fig. 6.

It will be obvious that if the insulation between the oven and the mass 1 is of considerable thickness it will be necessary to furnish a considerable portion of the energy required for the oven from the unit 6, whereas as this insulation is reduced the amount of energy which has so to be supplied is reduced and may disappear entirely.

The devices thus far described provide for a constant and steady flow of heat to the oven, but the rate at which heat is absorbed or utilized in the oven varies. Any considerable reduction of the oven temperature will cause an increased rate of flow from the mass 1 to the oven; but the thick oven lining 5' is provided in order still more accurately to maintain or equalize the temperature of the oven and insure that it shall at all times remain at proper cooking temperature regardless, within reasonable

limits, of the rate at which heat is withdrawn from it. In one actual embodiment of my invention the proportions are such that about 25 to 50 per cent. of the energy required by the oven flows from the storage mass 1 and the balance is supplied from the heating unit 6. Obviously if the percentage flowing from the mass 1 is reduced to the limit, the oven and the mass 1 become independent devices.

Referring to Fig. 1, it will be seen that I have also provided a flat widely extended heating unit 7 to which, as will be hereinafter explained, may be transferred the energy normally applied to the unit 3. By the use of the unit I can at any time temporarily increase the temperature of the oven without calling upon the station for an extra supply of energy. This unit may be used for broiling, or for browning or searing, or for other operations requiring a high temperature for a short interval of time. On the other side of the storage mass 1, I provide a vegetable-cooking chamber 8 which is also heat insulated from 1, and in this case, as in the former case, the heat insulation may be proportioned in such a way as to maintain this chamber at any desired temperature, as for example 150° C. The proportioning of these heat insulations may be arrived at either by calculation or by experiment, account being taken not only of the heat consumed in the various cooking operations but also of the heat necessarily lost from the oven 5 and the chamber 8.

As has been set forth above, it is desirable that a range be provided with one or more hot surfaces, constituting a stove on which various cooking operations may be carried out. If an attempt were made continuously to provide such a surface in a range heated by electric energy, the losses would be such as to render the operation of the device prohibitively expensive; in fact, the heat so lost would be greatly in excess of the total energy supplied to my complete device. I have hereinbefore generally indicated the principles on which I have solved this problem; one form of arrangement is shown in detail in Fig. 4, which is a section of what may be called my "disappearing stove". The part 9, which is a portion of the heating mass, is fitted into a cylindrical opening in the main body of metal 1. The plunger 9 and the mass 1 form to all intents and purposes a single heat storage device. Above this plunger 9 is a throat or opening 19 into which there fits a heat-insulating cover 11, formed of sheet metal and filled with insulating material. When it is desired to perform some such operation as that above described, the handle 12, Fig. 3, is turned. This, through the rod 13, turns the valve 14, Fig. 4, into a position to connect the pipe 15 with the port 16. The pipe 15 is in con-

nection with a source of water supply, as, for example, the ordinary city water main. Water flowing from 15 through the valve 14 and the port 16 lifts the piston 17 in the cylinder 17', and thereby, through the agency of the rod 18, lifts the plunger mass 9, and, if the valve be left open, will ultimately lift this mass until its surface stands slightly above the surface 19 of the range. This operation also automatically lifts the cover 11. Now the rate of energy input, 300 watts in the particular stove illustrated, is such as will bring the mass 1 and the plungers 9, 9, to a temperature not far short of red heat, say to a temperature of 500° to 600° C., and the operation thus performed will therefore automatically expose a surface at or near this temperature upon which the operations above mentioned may be carried out in the same manner as is followed in cooking with a domestic range, and not only will this surface be thus exposed by the operation described, but it will be maintained at the desired useful temperature for a considerable period of time, for the reason that it will continue to receive heat from the main body of the heated mass 1, as a portion of the plunger still remains in good heat-conducting relation with such mass. The plunger 9 under these circumstances forms not only a portion of the heat storage mass, but also a heat-conducting path of very high heat conductivity, by which the heat energy stored in the main body of the mass 1 may rapidly be transferred to a utensil as may be desired, and through which path energy in the form of heat may be delivered to the utensil at a rate many times (even from ten to fifty times) the rate at which energy is normally delivered to the range. By giving to this path such form and by constructing it of such material as affords very high heat conductivity, I reduce the temperature difference between the top of the plunger and the body of the mass 1, and thus, for any given temperature required at the top of the plunger, reduce the temperature to which the mass 1 must be raised, thus reducing the heat losses through the insulation surrounding the mass. For the same reason it is desirable that the mass 1 as well as the plunger should be formed of a material of high heat conductivity, so that the heat stored therein may rapidly and efficiently be delivered at the desired point or points.

As soon as the operation in question is completed, the cover is replaced on the plunger 9, and the handle 12 is moved in such a direction as to cause the valve 14 to rotate to the position shown in Fig. 4, whereby the port 16 and the cylinder 17' are connected with the exhaust pipe 20, thus allowing the water under the piston to flow out through the exhaust pipe, permitting

the plunger 9 and the cover 11 to recede to the position shown in the drawing. The exhaust or waste pipe 20 is shown connected with a passage 21 which connects with the top of the cylinder 17', thus permitting any water which leaks by the piston to escape without causing damage. The plunger 9 being thus restored to its normal position, the accumulation and storage of heat will immediately continue. The mass 1 and the plunger 9 will tend to come to the same temperature, and this temperature will gradually increase to whatever may be the predetermined maximum. In case it is desired to reduce the temperature to which the utensil placed on the plunger mass 9 is subjected, the valve 14 may be opened for a short time only, and the plunger 9 thus retracted to any desired amount. In this way a body of air will be interposed between the utensil and the plunger and a resistance adjustable in amount will be interposed in the path of heat flow. It will be seen that the moving plunger 9 with its connections thus forms a sort of thermal switching device whereby the flow of heat from the storage mass 1 may be switched on or off from a utensil placed upon the top of the stove and the amount of heat flowing may be regulated in the same way in which an ordinary electric switch or controller turns current on or off from an electric motor and regulates the current flow, and with the same beneficial results, namely, the heat is not consumed except as and when it is needed and can usefully be employed, and the amount utilized can be regulated and controlled with nicety.

Mechanical necessities require not only that the range as a whole shall be provided with a metal surface 19, Fig. 4, but also that the throat or opening 10 shall be lined with some durable substance. For the same reason it is necessary that the openings or throats 22 which necessarily exist at the oven doors shall be lined in the same manner. While it is a comparatively simple matter to insulate a body against heat losses when it is entirely surrounded by insulating material, great difficulties arise when there is any point of discontinuity in the heat insulation, as at the throats just described. I have found that the loss developed at such openings may be reduced to a small amount and the desired durability maintained by constructing these throats of thin sheet metal of high specific resistance. The metal which I have thus far found most suitable for this purpose is known to the trade as "calorite" and is described in a certain Dempster Patent No. 901,428. This metal has a specific heat resistance about eighteen times that of copper. However the use of a metal having high specific heat resistance in the construction of various parts of my de-

vice forms no part of the invention covered by this application, the same forming part of the subject matter of my application Serial No. 678,858, filed February 20, 1912. In a similar way, the rim 23 of the door itself is made of a thin high resistance metal, the door-frame 24 being formed of cast iron or other suitable material. The door is constructed like the oven itself of sheet metal filled with heat insulating material.

The door itself is shown in an elevation in Fig. 7. In illustrating the best manner in which my invention can be carried out, I have shown a device for reducing heat leakage at the door, consisting of a metal plate, 25, which is mounted on pins 26 and held out from the door by springs 27 but held in place by wing-nut 28. When the door is closed this plate 27 fits snugly, urged by the spring pressure, against a flat portion 27' (Fig. 2) formed in the throat lining of the door, and thereby loss of heat is reduced. This feature, however, does not form part of my invention.

For the sake of mechanical strength and rigidity the oven 5 and chamber 8 are braced by braces such as that shown in Fig. 2 at 29. These are formed preferably of metal of high thermal resistance like calorite, and while they afford a heat-conducting path from the hot oven lining to the outside of the stove, this path is of such length and section that the amount of heat escaping therethrough is small.

The interior of the oven 5 and of the chamber 8 may be provided with shelves 30, and other arrangements common in ovens, none of which need here be described; and indeed, my invention, although illustrated in connection with a domestic range, obviously is not confined thereto; as heat storage devices such as I have invented may be applied to many other purposes.

Fig. 5 shows a modification. I have found by experiment that many heat insulating materials which are commonly used and are satisfactory at low temperatures tend to lose their insulating power when exposed to high temperatures, such as are required for the best use of my invention. To avoid this difficulty I have devised, and have shown in Fig. 5, a double heat insulation consisting of two heat insulators around the mass 1; the outer insulation 31 corresponding to the insulation 4 of Fig. 2, while inside of this insulation and surrounding it is placed a chamber 32 having metal walls 33, 34, and top 35, and further closed by a throat 36, which allows the passage of the piston-rod already described. The space 32 thus inclosed is filled with a material such as lamp-black, or powdered silica, and is made vacuum tight by brazing the seams; after being thus prepared the air is exhausted through the pipe 37 which is then sealed off. I find

that the maintenance of even an imperfect vacuum, as for example a vacuum of only ten or twenty millimeters of mercury, will under these circumstances add greatly to the heat-insulation of the chamber, and an insulation so constructed is well adapted to obstruct heat flow at high temperature, so that the rate of heat flow is in nearly direct proportion to the difference of temperature between the inside and the outside of the insulation. By this means I am able to conserve the heat of the mass 1, even if that mass be heated to the high temperature already specified, and at the same time am not obliged to use a large amount of expensive heat insulation, since the temperature gradient is such that the wall 34 is at a temperature low enough to be well within the heat-resisting properties of the ordinary low-grade insulation 31 already described. This system of duplex heat insulation makes it possible to conserve the heat with a minimum amount of insulating and at a low cost. In this arrangement, as well as in the forms shown in the earlier figures, all surfaces which form throats, that is to say, which connect areas differing in temperature and are capable of carrying heat away from the insulated mass, are formed of high heat resisting material, and are as thin as is consistent with reasonable mechanical strength.

In Fig. 5 I have also shown a modified arrangement of the plunger 9' and the mass 1'. In this case the heating unit instead of being mounted in the stationary mass of metal is inserted directly in the plunger 9'. The cylindrical mass of metal which surrounds the piston may vary in thickness, but I prefer to have its weight at least as great as that of the plunger. Such a relation of parts is shown in Fig. 5. It is obvious, however, that the proportions of the metallic masses to be heated may be varied within extremely wide limits, depending upon the results desired, the design of the range as a whole, and various other conditions. It will be seen, for instance, that the surface area of the top of the plunger is necessarily fixed by the commercial requirements of the device itself, but the area or sections of the body of the plunger need only be sufficient to carry heat at the rate at which it is required that the heat shall flow. In Fig. 5 I have illustrated the top surface somewhat enlarged and the main area somewhat restricted. This relation of parts may be varied within wide limits. In all cases the dimensions of the metallic path will depend upon the amount of heat which is required to be transferred under known conditions of operation. If the mass of the plunger be increased, that of the main body 1 may be reduced, until the part 1 may become merely a mechanical guide for the plunger, or, on the other hand, the plunger may be reduced in

section to the minimum size consistent with a sufficiently-rapid conductive transfer of heat. At one extreme it will be seen that substantially the whole mass is bodily lifted to the surface of the range; at the other extreme the mass 1 remains stationary and a conductive path is provided whereby its heat may be carried to the point where it is to be utilized. In either case, or in any combination of the two, I obviously have provided means whereby the stored heat may when desired be conductively transferred through the insulation of the range by a path of low thermal resistance. Another difference between the structure shown in Fig. 4 and that of Fig. 5 is that the mass 1 in Fig. 4 is common to both plungers, while in Fig. 5 it serves only for one plunger, 9'. The former arrangement allows for an exchange of heat between two plungers and then provides more flexibility in the use of the stored heat. The latter has obvious advantages from the point of view of manufacture and transportation. In Fig. 5 the unit is shown located in the plunger 9' while in Fig. 4 it is placed in a recess in the mass 1. Each arrangement has its advantages.

In Fig. 9 I have shown a diagram of the circuits. 39, 39 are wires leading to the mains from which current is supplied. 40 is a switch designed to cut the whole device out of circuit. 41 is a special switch leading to and controlling the heating unit 6, which is placed under the oven 5, and 42 is a two-way or transfer switch. In the position shown, which is the normal position, current is flowing through this switch 42 to the heater 3 placed in the mass 1. In case, as above explained, it is desirable to raise the temperature of the oven 5 for a short time, or to perform a broiling or searing operation, this can be effected by throwing the switch 42 in a position the reverse of that shown in the drawing, thereby breaking the circuit of the heater 3, and throwing the current into the heater 7, which is located as above explained in the top of the oven 5. I may also provide an ordinary time switch 43, interposed in the circuit of the whole device, arranged to break the circuit during the peak hours, which will justify the sale of current at a still lower rate than would otherwise be considered. These switches are ordinarily adjustable and may be set to open the circuit say from 5 to 8 p. m. The switch is surrounded by a cover and sealed in the same manner as an ordinary electric or gas meter.

By the use of the arrangements above described, not only is it possible, as above explained, for a central station to furnish current sufficient for the culinary operations of an ordinary family at a very low rate per month, and thereby to facilitate the introduction of electricity into households to a

degree hitherto unattained, but also certain incidental advantages result. For example the fact that the connections are such that the device can only take a certain maximum load predetermined by the design of the heating unit makes it possible for a station to contract to furnish current to this device without the use of a meter, the contract being at a flat rate of so much per month. To take a concrete example, a device of this character consuming 500 watts total, will take 12000 watt hours per day of twenty-four hours, or approximately 360 kilowatt hours per month, which at 2 cents per kilowatt hour, (a fair price under average conditions for a twenty-four hour load,) will amount to \$7.20 per month. Owing to the continuous service and low maximum demand, the supply station can well afford to contract at this rate to supply current to the device. The device is also easily introduced commercially, since the user knows just how much he will pay for its use, and need trust neither to a meter nor to the statements and estimates submitted to him by the station. Further a great objection to the use of electricity for domestic purposes is avoided, in that the quantity of electricity used and paid for does not depend on the carefulness of the cook or servant. Carelessness, as for example leaving the plunger in its exposed position unnecessarily, will merely result in cooling the mass 1 to an unduly low temperature, and the servant will soon learn that it is necessary that she should use reasonable care in this respect. Another incidental advantage, but one of considerable practical importance, arises from the low rate of energy supply. As the average house is wired with conductors of limited size and as an electric range of the intermittent type of equal cooking capacity to that here described would require a maximum from 5 to 7½ kilowatts of energy, its installation necessitates the installation of special large sized conductors leading from the street mains to the range and in many cases would require the installation of a special transformer to supply the increased demand. The device shown in this application takes but 560 watts (which is less than the energy required for an electric flatiron) and therefore may be connected into an ordinary lamp socket by an ordinary cord and plug, or in any other convenient and cheap way may be connected to any existing house wiring, without fear either of undue drop of potential or fire risk through overloading of the house conductors.

In practice I have found that with my device the rapidity of the usual cooking operations is far greater than when carried out by means of gas or coal ranges of the usual domestic type.

What I claim as new, and desire to secure by Letters Patent of the United States, is:—

1. The method of storing and utilizing electrically produced heat which consists in heating a normally heat-insulated body by the energy of the electric current, and conductively transferring heat from said body at will by providing a thermal path of low resistance extending through the insulation.

2. The method of storing and utilizing electrically produced heat which consists in heating a normally heat-insulated body by the energy of the electric current, and conductively transferring the heat at will from said body through a thermal path of low resistance extending through the insulation at a rate greater than the rate of heat input.

3. The method of storing and utilizing electrically produced heat which consists in heating a normally heat-insulated body by the energy of the electric current, and conducting heat from said body as and when desired by a path of low thermal resistance extending through the insulation.

4. The method of storing and utilizing electrically produced heat which consists in heating a normally heat-insulated body by the energy of the electric current, conducting heat from said body as and when desired by a path of low thermal resistance extending through the insulation and varying the said thermal resistance to vary the flow of heat.

5. The method of storing and utilizing electrically produced heat which consists in heating a normally heat-insulated body by the energy of electric current, and conveying said heated body when desired through the insulation so as to expose a high temperature surface.

6. The method of storing and utilizing electrically produced heat for cooking and heating purposes which consists in heating a normally heat insulated mass of high thermal conductivity by the energy of the electric current and conductively transferring heat therefrom at will through a thermal path of low resistance extending from the point of heat generation through the insulation.

7. The method of storing and utilizing heat for cooking and heating purposes which consists in converting electric energy into heat at a relatively low rate by means of an electric resistance in good thermal relation to a mass of metal of high thermal conductivity and high specific heat per unit volume, which mass is heat-insulated in all directions during the process of heat storage, and connecting the heated body at will to the article to be heated by a path of low thermal resistance extending from the point of heat generation through the insulation, whereby a large quantity of heat may be transferred to the article in a short time.

8. A heating stove consisting of a normally insulated heat storage mass, and means for thermally connecting said mass at will to an article to be heated by a conductive path of low thermal resistance extending through the insulation.
9. A heating stove consisting of a normally heat insulated storage mass of high thermal conductivity having an electrical heating unit inserted into said mass in good thermal relation thereto, and means for exposing said mass flush with the top surface of the said stove whereby heat may be conductively transferred from said mass to an article to be heated through a path of low thermal resistance.
10. A heating stove consisting of a normally insulated heat storage mass, and means for thermally connecting said mass at will to an article to be heated by a conductive path of low thermal resistance and for varying the resistance of said path.
11. A heating stove consisting of a mass of metal of high specific heat and low thermal resistance having a heating surface, heat insulation normally surrounding the mass and said surface, and means for moving the mass at will to expose the said surface.
12. A heating stove consisting of a body of heat insulation having an opening therein, a mass of material located in said opening, and means for adjusting the position of the mass in the opening.
13. A heating stove consisting of a mass of metal of high specific heat and low thermal resistance having a movable portion constituting a heating surface, heat insulation normally surrounding the mass and movable portion, and means for moving the said movable portion at will to expose the said surface.
14. A heating stove consisting of an electrically heated mass of material of high specific heat per unit of volume and low thermal resistance normally insulated to prevent heat losses in all directions, and means for providing when desired a path of low thermal resistance through said insulation to the body to be heated.
15. A heating stove consisting of a heat storage mass having a movable portion in intimate contact therewith, heat insulation normally surrounding said mass and said portion, an opening for the movable portion and means for causing said portion to project from the insulating body through the opening into intimate heating relation to the substance to be heated so as to constitute a path of low thermal resistance between said mass and the body to be heated.
16. A heating stove consisting of a mass of material of high specific heat and of low thermal resistance having a movable heating surface upon which articles to be heated may be placed, and means for insulating from heat losses the entire surface of said mass when the movable heating surface is in inactive position.
17. A heating stove consisting of a mass of metal of high specific heat and low thermal resistance surrounded by heat insulation, electrical means for raising the temperature of said mass, and means whereby said mass is moved at will through the insulation to expose a high temperature heating surface.
18. The combination with a normally insulated heat storage mass of high specific heat, of a thermal switch of low thermal resistance, and means whereby said switch may be operated to connect or disconnect at will the heat storage mass with an object to be heated.
19. In a stove, a mass to be maintained at a high temperature, heat insulation surrounding the same, and means under the control of the operator for causing the said mass to be lifted until its surface becomes readily accessible.
20. In a stove, a mass to be maintained at a high temperature, heat insulation surrounding the same, and hydraulic means under the control of the operator for causing the said mass to be lifted until its surface becomes readily accessible.
21. In a stove, a mass to be maintained at a high temperature, a plunger embedded therein and in heat conductive relation therewith, heat insulation surrounding the said mass and means under the control of the operator for lifting the said plunger until it becomes readily accessible.
22. A heating stove comprising an electrically heated mass of material of high thermal conductivity, heat insulation surrounding the same, one or more plungers movably embedded in said mass and means under the control of the operator for moving said plungers independently of each other to and from the surface of the insulation.
23. A cooking range comprising a body of heat insulation provided with an opening for an oven, an electrically heated mass of metal having a movable portion carrying a heating surface embedded in said insulation and separated from the oven by a wall of insulation and means for moving said portion to an exposed position.
24. A cooking range comprising a body of heat insulation provided with an opening for an oven, an electrically heated mass of metal embedded in said insulation and separated from the oven by a wall of insulation, a metallic plunger in good thermal relation with said mass and means for moving the plunger toward and from the surface of the insulation.
25. A cooking range comprising a body of heat insulation provided with two openings

for ovens, a heat storage mass embedded in
said insulation between the ovens and sepa-
rated therefrom by walls of insulation, me-
tallic plungers in good thermal relation with
5 said mass and means for moving said plun-
gers independently of each other toward and
from the surface of the insulator.

In witness whereof, I have hereunto set
my hand this twenty seventh day of Septem-
ber, 1911.

WILLIAM STANLEY.

Witnesses:

LILA C. STANLEY,
O. C. BIDWELL.