Sept. 12, 1933. F. S. MEYER 1,926,344

DENTAL OVEN

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Fig. 1

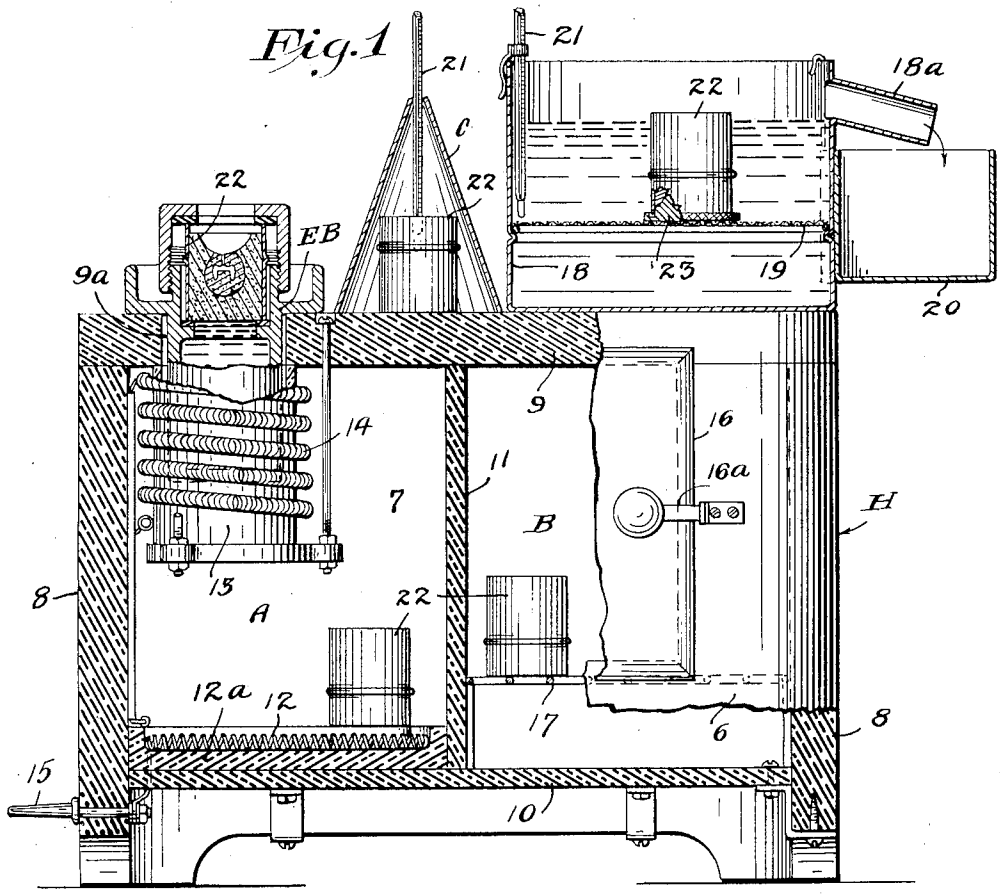
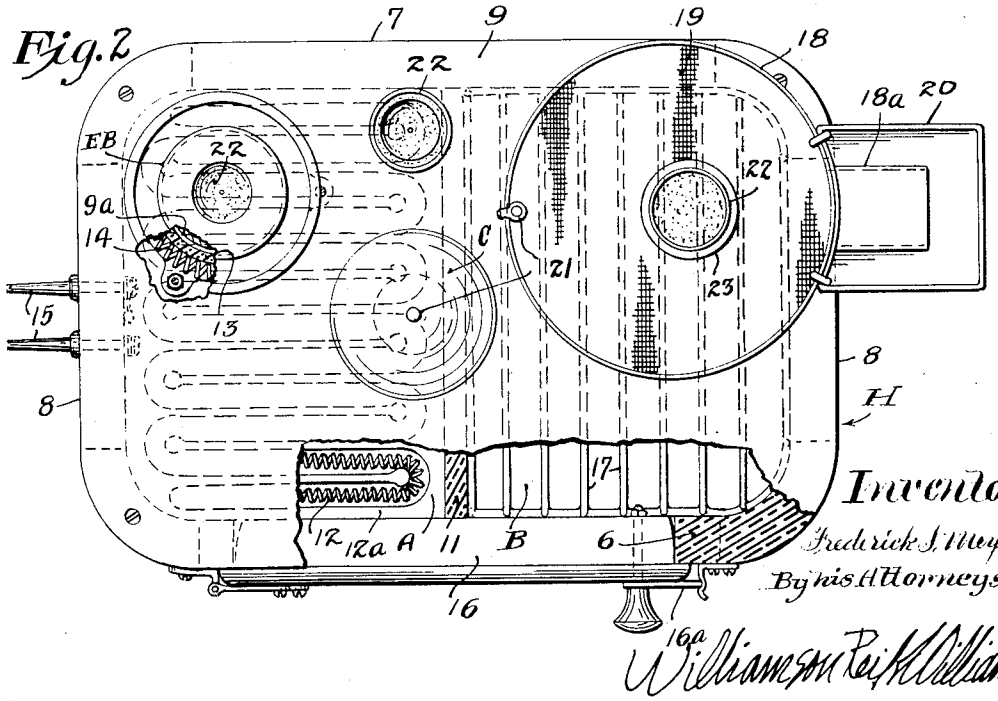


Fig. 2



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Fig. 4

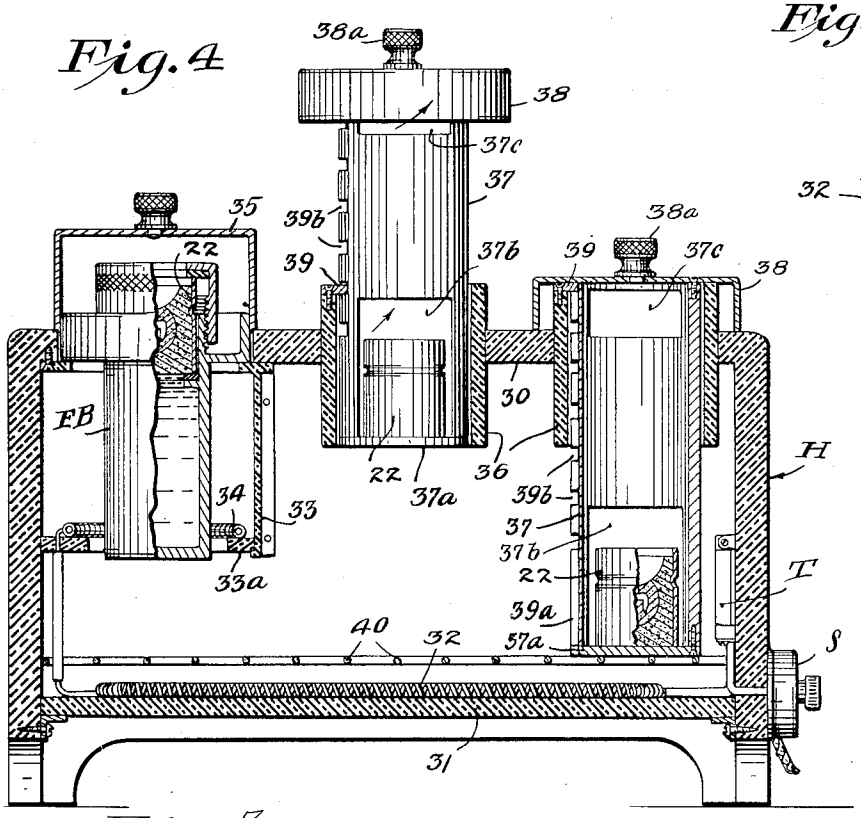


Fig. 5

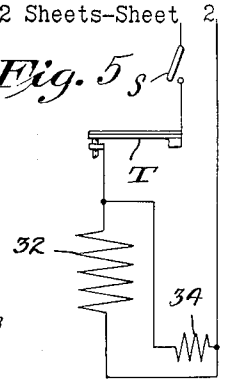
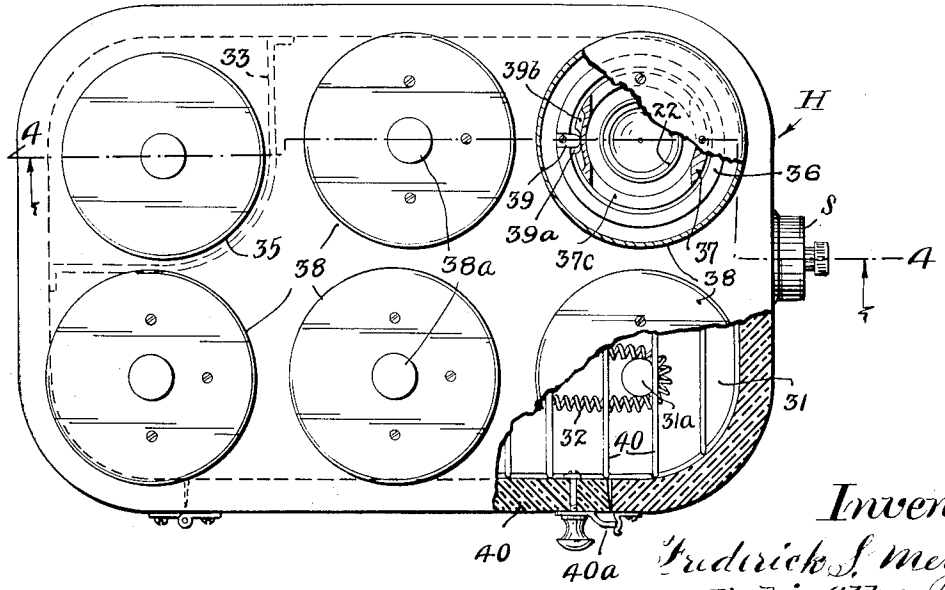


Fig. 3



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UNITED STATES PATENT OFFICE

1,926,344

DENTAL OVEN

Frederick S. Meyer, Minneapolis, Minn.

Application June 6, 1929. Serial No. 368,962

3 Claims. (Cl. 219—35)

This invention relates to multi-temperature dental ovens and furnaces especially adapted for carrying out the different heating steps in the methods and processes used extensively at this time for making dental molds.

While my present invention is especially adapted for carrying out my novel method and technique described in my co-pending applications for U. S. Letters Patent entitled "Method and apparatus for making inlays and crowns", Serial No. 239,427, filed December 12th, 1927 and "Dental apparatus for eliminating wax from the mold", Serial No. 203,238, filed June 2, 1927 and allowed October 23, 1928, it is also well suited for use in connection with other well known methods or processes used at this time for the making of molds for dental castings.

It is an object of my invention to provide a comparatively simple but highly efficient dental oven wherein heat at several different predetermined temperatures may be obtained simultaneously, in different portions of my oven.

It is a further object to provide a dental oven or furnace wherein a wide variety of temperatures between certain limits may be obtained without the use of variable resistance elements or several heating elements of different value.

More specifically it is an object of my invention to provide an efficient furnace or oven adapted for supplying heat at the proper respective temperatures for expanding the plastic model while the mold is hardening, drying the mold and eliminating the plastic model from the mold and eliminating the moisture subsequent thereto, and moreover adapted to heat articles and material at certain temperatures while other articles and material are simultaneously heated at different temperatures.

These and other objects and advantages of the invention will be apparent from the following description made in connection with the accompanying drawings wherein like reference characters refer to similar parts throughout the several views and in which,

Fig. 1 is a view taken mostly in vertical section showing one form of my improved oven or furnace with several molds being heated at different temperatures;

Fig. 2 is a plan view of the same with some portions broken away;

Fig. 3 is a plan view of a somewhat different form of the invention;

Fig. 4 is a vertical section taken on the line 4—4 of Fig. 3; and

Fig. 5 is a simple wiring diagram showing the circuit of said second form of the invention.

The embodiment of my invention illustrated in Figs. 1 and 2 of the drawings comprises a box-like housing H having a front wall 6, a rear wall 7, end walls 8, a top wall 9 and a bottom wall 10. The entire housing is preferably constructed of some suitable material which is a very poor conductor of heat, such as the various insulating compositions containing asbestos and powdered stone. My oven is divided transversely by a relatively thin partition 11 of relatively non-conducting material, said partition forming in connection with the housing, left and right hand heating chambers A and B respectively. Heating chamber A may be provided at its bottom with a tortuously arranged heating element 12 mounted on a dielectric plate 12*a*.

A cylindrical heating chamber 13 depends from the top of heating chamber A having a closed lower end and an open upper end communicating with an aperture 9*a* in the top of my furnace. Heating chamber 13 is especially adapted for receiving my so-called wax eliminating apparatus, disclosed in my co-pending application, Serial No. 203,238, as will hereafter more fully appear. Heating chamber 13, as shown, is wound with a spiral heating element 14 electrically connected with heating element 12 in either series or multiple arrangement, said heating elements being electrically connected to a pair of electric terminals 15 adapted to be received in an electrical plug.

Chamber A is heated by the heating elements 12 and 14 and is consequently maintained at a relatively high temperature. Heating chamber B is entirely heated by the transmission or convection of heat from chamber A through partition 11 and will consequently be maintained at a considerably lower temperature than chamber A. Chamber B, if desired, may be provided with one or more horizontal gratings 17 for supporting articles therein.

Front wall 6 of my housing is provided with a central door opening, and a suitable closure or door 16 is provided preferably being constructed of similar material to my housing, and as shown, hinged at one of its vertical edges and provided with a latch 16*a*.

The top 9 of my oven is utilized for heating purposes, some amount of heat being transmitted through the relatively non-conductive insulating material from which said top is constructed. The right hand portion of the top, being above the cooler heating chamber B will, of course, be

maintained at a considerably lower temperature than the left hand portion above the hotter heating chamber A. A wide variety of temperatures may be obtained by moving articles to be heated from right to left over the top.

As a part of my furnace or oven, I provide a water bath which is movable over the top of my heater housing to vary the temperature thereof, said bath comprising, as illustrated, a cylindrical receptacle 18 having a horizontal netting or grating 19 spaced some distance above the bottom thereof and provided with an overflow spout 18*a* adjacent the top thereof. In connection with overflow spout 18*a* I provide an overflow trough 20 which may be detachably connected with the upper edge of container 18 and which is adapted to be disposed below the delivery end of spout 18*a*. Receptacle 18 is preferably equipped with a detachable thermometer 21 whereby the temperature of the water in the bath may be quickly ascertained. It will be noticed that the height of overflow spout 18*a* above supporting netting 19 is slightly less than the height of the ordinary dental investment ring 22 attached to a crucible former 23. The water bath may be moved from right to left until the thermometer shows the temperature of the water in the receptacle 18 to be as desired. In actual practice, with the temperature in chamber A between 700 and 800° Fahrenheit I find that the water in receptacle 18 may be maintained between 105 and 130° Fahrenheit depending on the position of receptacle 18 relatively to the top 9 of the oven.

In Fig. 1 and Fig. 2, I illustrate several investment rings having molds therein supported upon different portions of my oven or furnace for heating at different temperatures. I also illustrate one of my wax eliminating boilers EB of the type disclosed in my application Serial No. 203,238 with a mold therein nested in cylindrical heating chamber 13 and supported therein, by means of its overflow flange for elimination of the plastic model from the mold. The lower portion of this boiler is filled with water or other suitable liquid and the lower end of a mold is in sealed communication therewith. One of the investment rings on the top 9 of my oven is surrounded by a cone C having a vertically disposed thermometer therein. I have found that by so doing the temperature at which the mold within the investment is maintained is raised between 125 and 160° above its temperature when heated on the top of the oven without the cone.

In carrying out my technique, as disclosed in my herein identified applications for United States patents, I preheat the thin outer investment forming the mold, to a temperature of between 100 and 125° Fahrenheit. I prefer to do this by placing a receptacle containing the thin outer investment on the right hand side of top 9 of the oven.

The next use for my oven in carrying out my said technique is to expand the wax model while the mold is hardening. The mold is formed within an investment ring 22 connected to a crucible former 23 and as disclosed in my United States Patent 1,715,465, of date June 4th, 1929, I prefer to use a crucible former which will have a sealed connection with the lower end of the investment ring. The connected crucible former and the investment ring with the mold may, therefore, be disposed within the water bath supported on grating 19 with the upper or open end of the investment ring slightly above the level of the water in receptacle 18. In this way, the wax model may be subjected to an even temperature. In practice, I have obtained excellent results with the temperature of the water maintained between 110 and 115° Fahrenheit while the mold is hardening.

The next step in the formation of a dental mold is to eliminate the plastic model from the mold. This I do with my wax eliminating apparatus described in my co-pending application Serial No. 203,238. As illustrated in Fig. 1, my eliminating boiler is nested in the eliminating heater chamber 13. The interior of said eliminating chamber is maintained at a relatively high temperature (as practiced between 800 and 900° Fahrenheit), thereby boiling the water in the eliminating boiler EB and causing water and steam to pass through the mold, softening and washing out through the sprue passage the wax or plastic model.

After the wax model is eliminated from the mold, the mold is removed from eliminating boiler EB and the next step is to eliminate the moisture from the mold. If I wish to do this quickly I subject the mold to heat at a relatively high temperature by disposing it either in cylindrical chamber 13 or on the plate 12 directly above heating element 12*a* in chamber A for a relatively short time to eliminate most of the moisture and then I may remove the mold and place the same in compartment B or on top 9 which is maintained at a temperature considerably lower than compartment A usually between 200 and 350° Fahrenheit. At this temperature the remainder of the moisture may be eliminated without danger of scorching the mold or disintegrating the investment material.

The top 9 of my oven may be used for heating purposes where it is desired to maintain the temperature of a mold or article between 150 and 325° Fahrenheit, the hotter temperatures naturally being obtained from the left hand portions of the top.

The temperature of chamber A in practice is maintained by heating elements 12 and 14 at between 700 and 800° Fahrenheit.

From the foregoing description it will be seen that I have provided a comparatively simple but highly efficient dental oven or furnace having an unvariable source of heat energy but nevertheless operative to supply heat at a great variety of different temperatures between certain limits and adapted to carry out all of the heating steps of my method for forming dental molds.

In Figs. 3 to 5, inclusive, I illustrate another form of the invention wherein different temperatures are obtained by disposing articles to be heated in different positions and in different relations with respect to the heating chamber of the oven. This embodiment comprises a box-like housing or closure H having a top 30 and bottom 31. A tortuously arranged heating element 32 is supported on bottom 31 preferably being wound about studs 31*a* projecting upwardly from bottom 31. As shown, the rear and left hand corner of housing H is partitioned off by means of a curved vertical partition 33 depending from the top 30 of the housing and supported therefrom, said partition terminating at its lower end at some distance above bottom 31. Partition 33 carries at its lower end an element supporting ring 33*a* constructed of dielectric material and a circular heating element 34 is mounted on said supporting ring electrically connected as shown in multiple with the heating element 32.

Partition 33 cooperates with the adjacent corner of the housing H to form a heating chamber for the reception of my eliminating boiler EB previously described and a suitable aperture is formed in the top 30 of the housing communicating with said chamber, the overflow flange of the boiler being supported by a suitable flange connected with the upper edge of partition 33 and the water container portion of the boiler being disposed within the said compartment and surrounded at its lower end by heating coil 34. If desired, a cap member 35 may surround the upper end of eliminating boiler EB supported upon the top 30 of the oven.

A suitable thermostat T is mounted within housing H connected in circuit with heating coils 32 and 34 and adapted to maintain the temperature within housing H at a predetermined value. An electrical switch S is provided in the circuit, the complete circuit being clearly diagrammed in Fig. 5. A series of circular apertures are formed through the top 30 of the oven and a vertical sleeve 36 is provided for each apertured portion of the top 30, sleeves 36 projecting a short distance above the top 30 and depending for some distance within housing H. Adjustable article supporting cages 37 are provided for each of the sleeves 36, as shown, each cage comprising an elongated cylinder adapted to be telescoped within one of the sleeves 36 and having a supporting bottom 37*a* provided with a plurality of (as illustrated 2) relatively large circumferentially spaced apertures 37*b* of sufficient size to permit an ordinary sized investment ring 22 to be disposed within the cage supported on bottom 37*a*. The upper end of cage 37 is rigidly secured to a cap member 38 of larger internal diameter than sleeve 36 and a handle 38*a* is preferably affixed to the top of cap 38 to manipulate and lift the cage. The upper end of cage 37 is provided with one or more air escape ports 37*c*, said ports extending to the upper extremity of the cylinder 37. Each of the sleeves 36 is provided at its upper edge with an inwardly projecting supporting lug 39 which is adapted to work in a vertical slot 39*a* formed in each cylinder 37 and extending longitudinally thereof. A series of short vertically spaced transverse locking slots 39*b* communicate with longitudinal slot 39*a* and are adapted to engage with supporting lug 39 to maintain the cage 37 at a plurality of different heights relative to housing H.

In Fig. 4 one of the cages 37 is illustrated in extreme lowered position, while another cage 37 is shown in elevated position. The first mentioned or right hand cage in Fig. 4, it will be noticed, is disposed with its bottom 37*a* just above the supporting grating 40 which is spaced slightly above heating element 32. The cap 38 of said right hand cage surrounds the upper edge of its sleeve 36 and closes off passage of hot air from the upper apertured end of the cage, cap 38 being supported upon the top 30 of the oven and also upon the upper edge of sleeve 36. In this position, the investment ring and mold or other article supported in the cage will be maintained at a relatively high temperature, since the article to be heated is directly over the heating element and is exposed to the radiation and convection of heat. If the right hand cage is raised above the position shown in Fig. 4, with the supporting lug 39 engaging the upper locking slot a slight escape of heated air will take place through the discharge apertures 37*c* at the upper end of cylinder 37 over the upper edge of sleeve 36 and under the edges of cap 38. This will cause the articles supported in the cage to be maintained at a slightly lower temperature. If the cage is successively elevated the article to be heated is moved farther above the heating coil 32 at each step and a greater escape of heated air is permitted at each step. When cage 37 is disposed in the position shown in the middle cage of Fig. 4, it will be noticed, that the bottom 37*a* of the cage substantially shuts off communication of hot air with the interior of the cage. The article 22 to be heated, therefore, in such position receives heat only by transmission through the bottom 37*a* and through sleeve 36. The temperature at which the article is maintained in this position is, therefore, much lower than the temperature with the cage disposed in the manner of the right hand cage in Fig. 4.

To adjust the positions of the several cages 37 it is only necessary to slightly turn the cage by its handle 38*a* until the lug 39 is in registration with the longitudinal slot 39*a*, then raise the cage to the desired point and turn slightly to cause supporting lug 39 to interlock with one of the short transverse slots 39*b*.

Housing H is preferably provided with a door 41 in the forward wall hinged along a vertical edge thereto and preferably having a suitable latch 40*a*. The interior of the oven is then accessible and if desired articles may be supported on the grating 40 to be heated at the predetermined temperature of the interior of the oven as controlled by thermostat T.

With the above described form of my invention it will be seen that I may secure a wide variety of different temperatures by shifting the positions of the several supporting cages relatively to the bottom 31 of the oven, the interior of the oven being maintained at a predetermined temperature. It will also be seen that one article may be maintained at a relatively high temperature while another article, supported in a different cage, may be maintained at a considerable lower temperature. The oven is, therefore, highly efficient for carrying out the heating steps in my novel method or technique and also for carrying out the different heating steps in other techniques extensively used at this time.

What is claimed is:

1. In an oven, an insulated housing having an aperture in a wall thereof, a tubular heating chamber mounted within said housing and communicating at its outer open end with the apertured portion of said wall, said heating chamber and apertured wall accommodating a receptacle and an electrical heating element mounted upon the exterior of said tubular heating chamber for heating the interior of said chamber as well as heating the interior of said housing.

2. In an oven, a housing having a substantially horizontal top, said top being provided with a substantially vertical passage therein communicating with the interior of said housing, a cup-shaped heating chamber mounted within said housing below said passage and substantially aligned and in communication with said passage for receiving a depending receptacle supported on said top and an electrical heating element mounted upon and surrounding said cup-shaped heating chamber for heating the interior of the same as well as heating the interior of said housing.

3. In a multi-temperature oven, a closed housing constructed of relatively non-heat-conducting material, said housing having a top con-

structed of material having a predetermined relatively low heat conductivity, said top having a vertical passage therein communicating with the interior of said housing, a cup-shaped heating chamber mounted within said housing below said passage and communicating at its upper end with said passage for receiving a depending receptacle supported on said top, an upstanding partition within said housing dividing the interior of said housing into a pair of independent closed and adjacent heating chambers and an electrical heating element mounted upon and surrounding said cup-shaped heating chamber for heating the interior of the same, as well as heating the interior of said housing whereby one of said chambers will be heated to a predetermined temperature and said adjacent chamber will be continuously heated to a predetermined lower temperature and said top will be continuously heated through conduction of the material thereof.

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