

Dec. 1, 1931.

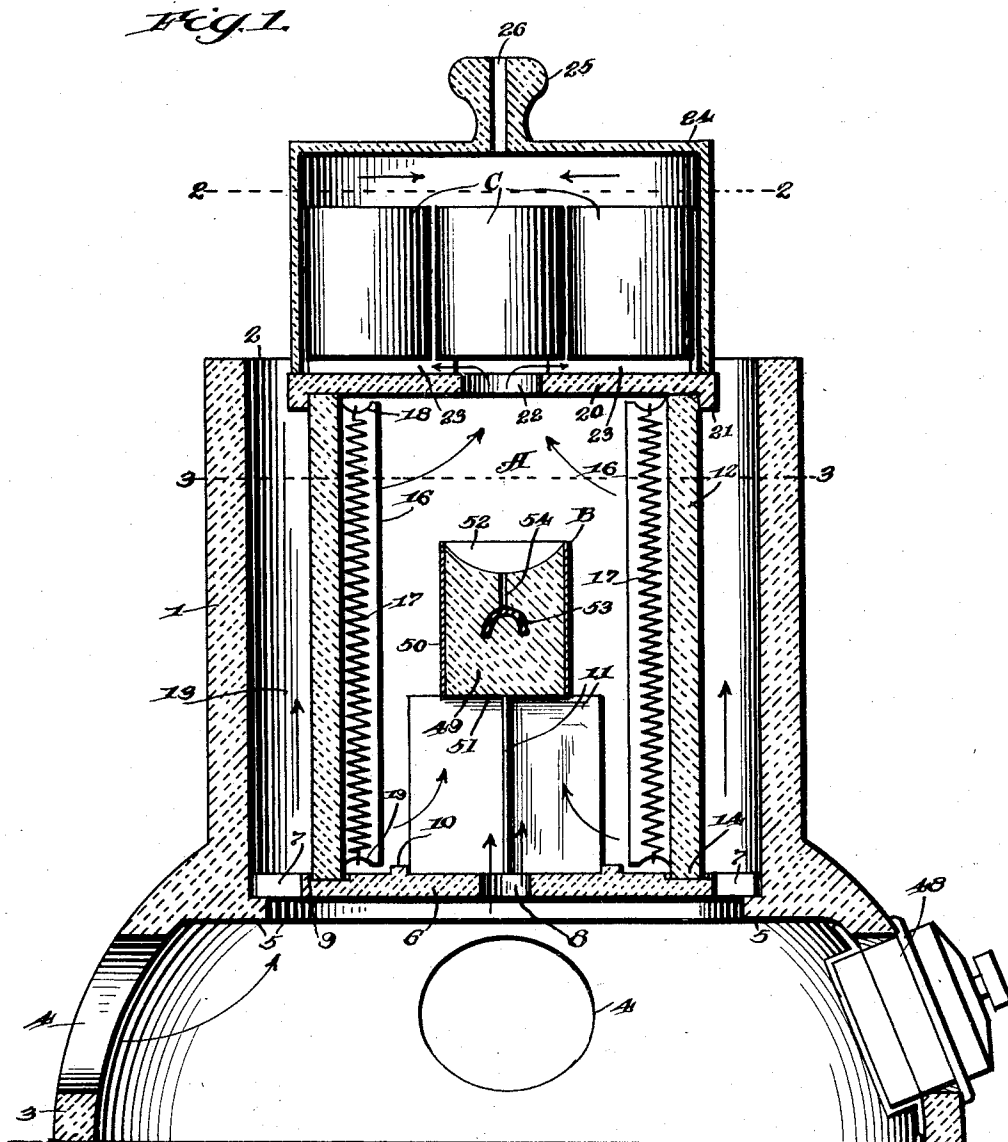
C. P. SHOUDY

1,834,353

RETARDED AIR CIRCULATING DENTAL OVEN

Filed Feb. 15, 1928

2 Sheets-Sheet 1



INVENTOR  
*Chester P. Shoudy*  
BY  
*Carl H. Crawford*  
ATTORNEY

Dec. 1, 1931.

C. P. SHOUDY

1,834,353

RETARDED AIR CIRCULATING DENTAL OVEN

Filed Feb. 15, 1928

2 Sheets-Sheet 2

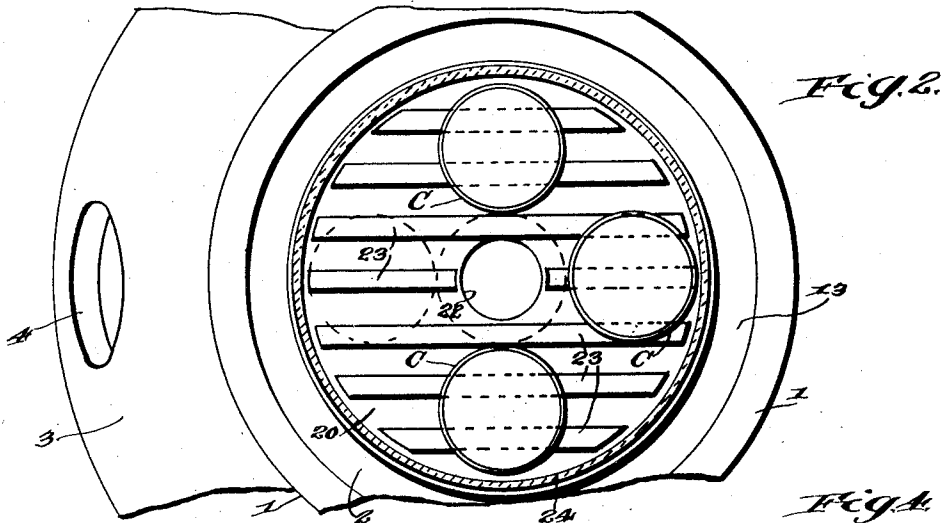
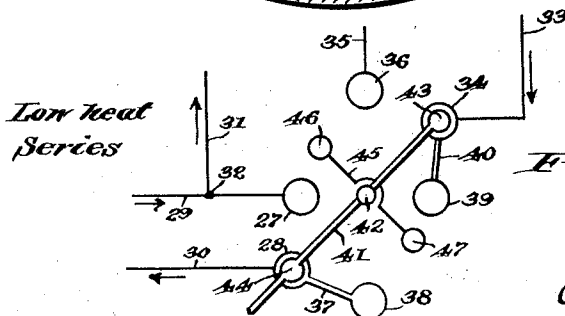
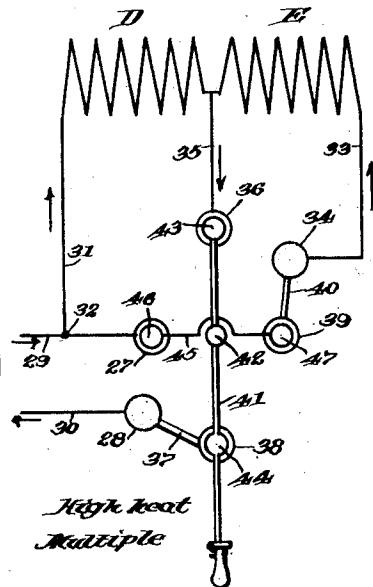
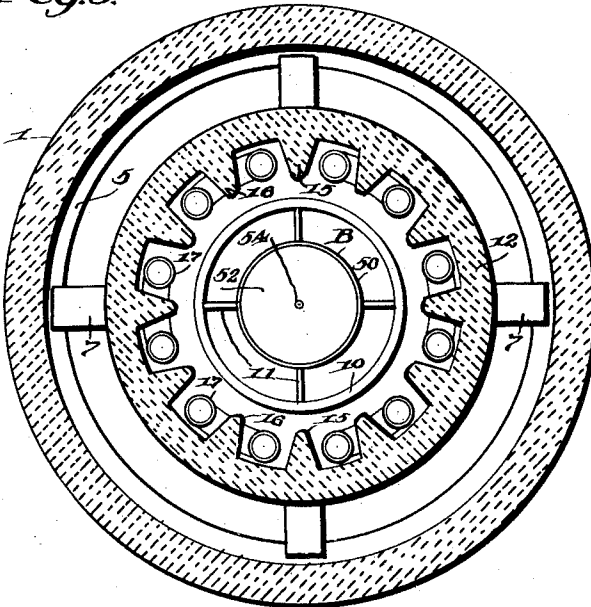


Fig. 3.



INVENTOR  
Chester P. Shoudy  
BY  
Carl H. Crawford  
ATTORNEY

## UNITED STATES PATENT OFFICE

CHESTER P. SHOUDY, OF SPOKANE, WASHINGTON

RETARDED AIR CIRCULATING DENTAL OVEN

Application filed February 15, 1928. Serial No. 254,523.

The object of this invention is to provide a novel means for preparing a dental investment for the casting operation.

One of the features of this invention is to not only subject the investment to a dry high temperature heat, but also to a heat that is in the form of circulating heated air, and it is a further feature to not only retard the circulation of the air but to interpose the investment in and substantially expose the latter to the circulating air in such a manner that the investment will be substantially uniformly desiccated.

A further feature resides in subjecting the investment to the action of a current of heated air that is retarded both as regards its rate of ingress and egress.

A further feature consists in providing a heater shell or body with a bore for passage of the air therethrough and disposing electrical heating means along the interior of the bore for heating and causing circulation of the air, the air being so retarded as to play upon the interposed investment in a manner to equally affect all portions of the latter by reason of such retardation, notwithstanding the fact that the investment is disposed out of contact with the heating means and radially inwardly thereof.

One of the special features of the invention is to provide a heater in which different degrees of temperature can be maintained without any fluctuation below the minimum temperature, so that in any event, the investment is prevented from cracking due to any expansion.

A further feature is to provide an improved means whereby after the investment is once disposed in the heater, its preparation for casting can be not only completed, but quickly completed, without changing the position of the investment from the position in which it was initially disposed in the heater.

A further feature consists in means whereby one character or degree of temperature may be employed to effect the performance of one stage of treatment of the investment, and another character or degree of temperature for another stage of treatment thereof.

A further feature resides in providing a casing for the heater and operatively or structurally connecting the casing with the heater in a manner to provide for a constant and free circulation of air between the two to thereby prevent the exterior of the heater from burning its support.

A further feature resides in novel means which not only functions as an air control, but also as a means of imparting a preliminary heating treatment to a plurality of investments while that investment in the heater is undergoing treatment.

My invention has many other features and objects which will be more fully described in connection with the accompanying drawings and which will be more particularly pointed out in and by the appended claims.

In the drawings:—

Fig. 1 is a vertical sectional view of the most preferred form of my invention.

Fig. 2 is a sectional view on line 2—2 of Fig. 1.

Fig. 3 is a sectional view on line 3—3 of Fig. 1.

Fig. 4 is a diagrammatic view of the circuit in a high heat adjustment.

Fig. 5 is a partial view thereof in a low heat adjustment.

Like characters of reference designate similar parts throughout the different figures of the drawings.

In the specific form shown, I have illustrated what I will generally term an insulating casing and while it is not essential to the invention that this casing be made of any particular material, by reason of the novel association of the casing with the heater, still, I prefer to make the casing of earthen ware, and have so shown the same. Said casing includes a cylindrical portion 1, having an open top 2. The lower portion is belled as shown at 3, partly to lend supporting stability to the structure. I also provide the supporting or lower portion 3 with one or more air ingress openings 4, the purpose of which will be later defined. The casing is provided with heater supporting means which may be in the form of an internally projecting flange 5.

A heater supporting means is provided which is shown in the form of a disc-like grill the same having a generally imperforate central portion 6, and a series of openings which  
 5 may be formed by a plurality of lugs 7, projecting radially outwardly and adapted not only to be supported on flange 5, but also to center the grill concentrically in the casing and afford passages for upward travel of air  
 10 as indicated by the arrows. Near the central portion of the supporting grill, I provide what I will term an air ingress opening 8, which will later be more fully described in function. On the upper face of the supporting  
 15 grill I provide means which may be an annular recess 9, for supporting and centering my improved heater body, to be presently described. Inside of said annular recess 9, I provide the upper face of the supporting  
 20 grill with a flange 10, adapted to center an investment support which I have shown in the form of a Greek cross, the wings of which I have indicated at 11. I desirably make this support for the investment of relatively thin  
 25 material, such as metal, and dispose the same on edge so that its restriction of movement of the air will be reduced to a minimum. Further, this winged or Greek cross form of support functions as a guide to the upwardly  
 30 flowing air to keep the latter in channels, for a portion of the travel of the air, as will later be described. This form of investment support permits me to dispose the same directly over the air ingress opening 8, without any  
 35 appreciable interference with air flow, which is an advantage that will later be functionally developed.

It will now be clear that with the construction shown, I am able to make the grill support of earthen material and avoid precision  
 40 fitting of parts, and that the elements so far described are easily assembled, and readily renewable, and are not encumbered with movable fittings or attachments.

Reference will next be made to my improved heater body and the manner in which the latter coacts with the elements just described.

Said heater body is shown in the form  
 50 of a cylindrical shell 12 of a sufficiently reduced diameter or size with respect to the casing as to permit of an ample insulating flow of air in the annular and vertical passage resultantly formed, as indicated at 13. Said  
 55 body 12, is preferably formed of earthen material and is open at both ends and forms, by reason of its bore, a heating air passage which I will designate at A. The lower end 14 may be seated and centered on the supporting grill by engagement with the walls of  
 60 recess 9, and it will now be clear that except for the ingress opening 8, the lower end of the body 12 is closed by the supporting grill. The heater body 12 is provided on its interior  
 65 with means for heating the air in passage A

and causing circulation upwardly of such air in the upright passage A, and as shown, said means is electrical. I have provided the body 12 with a series of radially inwardly  
 70 projecting and vertically extending ribs 15 and 16, in alternate order, there being six of each, in the present construction. Coils of resistance wire are mounted on ribs 16 and a length of coil is disposed in each  
 75 chamber or channel formed by the adjacent ribs 15 and 16, as shown in Fig. 3. I will generally designate the coils at 17 and will later refer to an electrical diagram for tracing the current therethrough. However, in the description of the present phase  
 80 of the structure, it will be clear that the coils are strung on ribs 16 and that the ends 18 and 19, of said ribs, are suitably recessed, as shown in Fig. 1, to accommodate said coils. The investment to be desiccated, is generally  
 85 indicated at B, and it will be clear that the latter is disposed concentrically inwardly with respect to and out of engagement with the heating means described and it will also be clear that the disposition of the investment  
 90 is between the ends of said body 12.

Reference will next be made to an improved air egress means for retarding air egress from passage A.

As shown said means is a closure in the  
 95 shape of a generally imperforate disc 20, which may have a flange 21 for engagement with body 12 to center the parts. I prefer to make this closure 20 of earthen material, although this is not absolutely essential. Said  
 100 closure 20, is provided, substantially centrally thereof, with an air egress opening indicated at 22. This opening 22, is larger than ingress opening 8, to take care of expansion of the heated air and the central disposition  
 105 of said openings insures a radial inward movement of the heated air, as will be later described.

I will next describe a feature whereby the device of my invention serves to treat a plurality of investments, in a preliminary manner, to facilitate the final treatment when  
 110 anyone thereof is disposed in the heater.

The closure 20, is shown provided with a plurality of elevated ribs 23, which as shown  
 115 in Fig. 2, extend across the upper face thereof. Said ribs are suitably interrupted by the opening 22 and preferably terminate short of the peripheral edge of the closure. One or more investments, as indicated at C, may be  
 120 disposed on said closure and the ribs 23 form air channels in which the heated air travels outwardly and about the investments C. A heat retaining and air restricting cap 24, preferably of earthen material, is disposed over  
 125 the investments C, as shown, and rests on the closure 20, annularly about the outer ends of ribs 23, so as to be effectively centered on the closure 20. Said cap 24, is provided with  
 130 a handle 25, through which a vent 26, extends.

This vent 26, is relatively restricted to retard the passage of heated air therethrough, when the additional investments are being treated. However, the device of my invention is clearly operative when the cap 24, is removed or omitted.

Reference will next be made to the diagrammatic circuit which is shown in Figs. 4 and 5, illustrating the means whereby I can apply different temperatures for different stages of treatment of the investment.

All the coils 17, are in one continuous circuit and in Fig. 4, I have shown all the coils of one half of the heater at D and the remaining coils at E, which simplifies the illustration of the circuit. I have shown a switch having terminals 27 and 28, connected with lines 29 and 30, respectively. One end coil conductor 31, is connected with line 29, at 32, and the remaining coil end conductor 33, is connected with terminal 34. An intermediate coil conductor 35, is connected with terminal 36. Terminal 28 is connected by strap 37 with terminal 38 and terminal 39 is connected by 40, with terminal 34. The switch lever 41 is pivoted at 42 and carries contacts 43 and 44. A cross arm 45 is fixed to the switch lever 41, and insulated therefrom, and carries contacts 46 and 47. When the switch is in the position shown in Fig. 4, all the coils are connected in multiple, and assuming that the device is connected with a usual voltage lamp socket, then one hundred and ten volts would be entering the coils through conductors 31 and 33, and leaving through intermediate conductor 35, as indicated by the arrows. Specifically, the current would pass from line 29, through 27, 46, 45, 47, 39, 40 and 34, to conductor 33. From conductor 35, the current would leave through 36, 43, 41, 44, 38, 37, 28, and 30. This hook-up would afford a high heat temperature in the passage A, of the heater body 12.

To obtain a low heat, the switch would be adjusted to the Fig. 5, or series position. In this position, contacts 46 and 47 are in open circuit relation to terminals 27 and 39, respectively, and the current would flow from 29 to 31, through the coils and back through 33 to 34, 43, 41, 44, 28 and out through line 30. In either position of the switch, all the coils will be in circuit and consequently, an even and steady heat will be transmitted. I have shown a switch 48, mounted in one of the openings 4, of the casing and accessible from the exterior thereof for the heat adjustment just described and I deem it unnecessary to show electrical connections from switch 48, to the coils 17, in view of the illustration in Figs. 4 and 5.

I will next describe the operation of my improved heater and the manner and method in which it functions.

As one of the main objects of the invention

is to prepare an investment for the casting operation, I will first briefly describe the investment shown. As usual, the investment material 49, is disposed in a metal cylinder or band 50 and the lower end 51, is flat, whereas the upper end is concave, as indicated at 52. This cavity 52, is made by the sprue former and its usual function is to receive the gold, in casting. I have shown a wax pattern of an inlay, at 53, and the bore 54, is formed by withdrawal of the sprue wire. The investment material, at this stage of the work, which is considered as being before the heater has been started, is very wet, and consequently, not porous. Therefore, I first desire to drive the water out of the investment material preferably to such an extent as to desiccate the same, and to do this, I adjust switch 48, to correspond to the low heat or series adjustment, as shown in Fig. 5, sending the current through all the coils 17. This generates a constant heat that is sufficiently high to drive off the water and yet not sufficiently high to melt the wax pattern. This low heat never fluctuates downwardly, hence, there can be no danger of cracking the investment. If anything, this low heat, by reason of the heat accumulation in the refractory heating body, rather increases slightly, as the first stage of desiccation is being carried on. Now after the water has been driven off from the investment, the latter becomes porous, and capable of initiating and sustaining capillary attraction.

The next stage of the operation consists in getting rid of the wax pattern to leave the mold cavity free for gold casting. Hence, after driving off the water, I change the switch to the high heat adjustment shown in Fig. 4, wherein all the coils 17 are likewise in service, but twice the amount of current is entering each conductor 31 and 33, that was only entering one of said conductors, in the low heat adjustment. Thus, it will be seen that I can use the same lamp socket attachment for both degrees of heat, which is a very great convenience.

Of course, in this last stage of treatment, or wax melting stage, the investment will be inverted from the position shown in Fig. 1, to dispose the cavity end 52, lowermost. In some instances, or according to the requirements or methods of the operator, the investment may be initially disposed in such inverted position and retained in such position throughout the treatment.

As the temperature increases, the wax pattern will melt and when it becomes sufficiently liquid, capillary attraction will draw the melted wax in all directions through the porous investment and the exposed ends thereof will finally afford an outlet for the melted wax and the latter will finally be entirely destroyed, leaving the investment completely free therefrom. Further, this high heat will

also destroy all residues in the mold cavity thereby leaving the walls thereof free and clear from any foreign matter so that the resultant inlay will be accurately cast.

Assuming that the user has a plurality of investments that are ready to be treated as soon as the investment in the heater has been fully desiccated, he will dispose such investments on closure 20, as indicated at C, and they will be subjected to a preliminary drying out action that will greatly hasten the first stage of treatment when such investments have later been disposed in the heater. The heated air will not only engage the bottoms of the investments C, but the peripheries, in passing toward the outlet 26. By reason of the fact that the outlet 26 is relatively restricted with respect to the volume of heated air that enters cap 24, it will retard passage of said air and hence the tops of said investment will also be acted upon by said air.

I next desire to point out a very important feature of my invention whereby substantially uniform heat is applied to the investment B that is interposed in the path of the heated air.

Because of the restriction afforded by opening 22, to an absolutely free and unrestrained egress of the hot air, there will be a certain resistance against free and unrestrained ingress through opening 8. Therefore, as such ingress is relatively slow, the air will not be able to rush toward the bottom 51, of the investment but will quickly be heated as it ascends, and before it reaches the bottom 51, it will be at maximum temperature. According to my theory, the air heated near the lower ends of the coils will rise, but will also travel radially inwardly as it rises and will therefore merge with the incoming cold air entering ingress opening 8, and be heated to a maximum temperature almost as soon as it enters passage A. Further, the wings 11, of the investment support (which substantially fully expose the bottom and periphery of the investment) form channels acting to facilitate mixture of the hot air ascending from the lower ends of the coils 17 and the cold air entering through opening 8. It will also be noted that after the heater has been started, the air that has passed through openings 4, will have been thoroughly warmed before it enters passage A.

It will now be clear that even the lowermost end of the investment, which is engaged by the supporting wings 11, is fully or substantially fully exposed to the heated air and that by reason of the axial disposition of the ingress opening 9 and egress opening 22, and the restriction of air passage caused by the latter, together with their novel disposition, the heated air is caused to play upon all exterior portions of the investment to uniformly dry out the latter. This retardation is not affected by the fact that egress opening 22

is larger than ingress 8, as this difference in size of the respective openings is to compensate for expansion of the heated air after it has passed through ingress 8 and entered the chamber A. It will also be noted that after the heater has been started, and before the investment has been inserted, the air entering openings 4, will have been thoroughly warmed before it enters through ingress 8, in fact, such air will have been warmed above room temperature.

Now it should be clear that even though the investment B is out of contact with the heating means 17, and disposed radially inwardly thereof, still, because of the circulating restraint imposed upon the hot air, the latter will play uniformly upon not only the ends but the entire periphery of the investment. At first, the exposed ends of the investment will have the water driven therefrom and thus become porous, and then these exposed ends, partly because of their porosity, and partly because of the capillary attraction thus resulting, will greatly aid in drawing water from inner portions of the investment toward the ends thereof to effect the consummation of desiccation.

It is believed that my invention will be fully understood from the foregoing description and while I have herein shown and described one specific form of my invention, I do not wish to be limited thereto except for such limitations as the claims may import.

I claim:

1. In a retarded air circulating dental oven, a refractory body having an upright air passage therethrough, electrical heating means on the wall of said passage for heating and causing circulation of air through said passage, means for supporting an investment substantially centrally of said passage and between the ends thereof, and closures for the ends of said passage having relatively compensatively reduced openings disposed axially of said passage for retarding movement of the heated air and causing the latter to play upon all portions of the investment.

2. In an electric heater of the class described, an outer casing having an open top and provided with an air ingress opening near its lower portion, a hollow heater body disposed in spaced relation in said casing for free flow of air therebetween, a grill removably supported in said casing and having a generally imperforate portion supporting said heater body and having an air ingress opening communicating with said body and supplied by warm air entering said casing, and a winged investment support resting on said grill over said ingress opening and said wings forming channels for mergence of incoming air and heated air flowing toward and exposing the lower portions of said investment thereto.

3. In an electric heater for preparing den-

tal investments for casting, a heater body  
having an upper open hot air discharge end,  
and a lower air ingress end, a closure for said  
upper end having an egress opening for dis-  
5 charge of the heated air, said closure having  
elevated portions on its upper face for sup-  
porting one or more investments for prelimi-  
nary heating thereof, and a cap engaging  
said closure and adapted to enclose said in-  
10 vestments and provided with an egress open-  
ing for the heated air.

In witness whereof I have hereunto set  
my hand and seal.

CHESTER P. SHOUDY.

15

20

25

30

35

40

45

50

55

60

65