March 31, 1925. 1,531,520

L. SIMMONS

ELECTRIC HEATER

Filed July 15, 1924 7 Sheets-Sheet 1

Fig. 1.

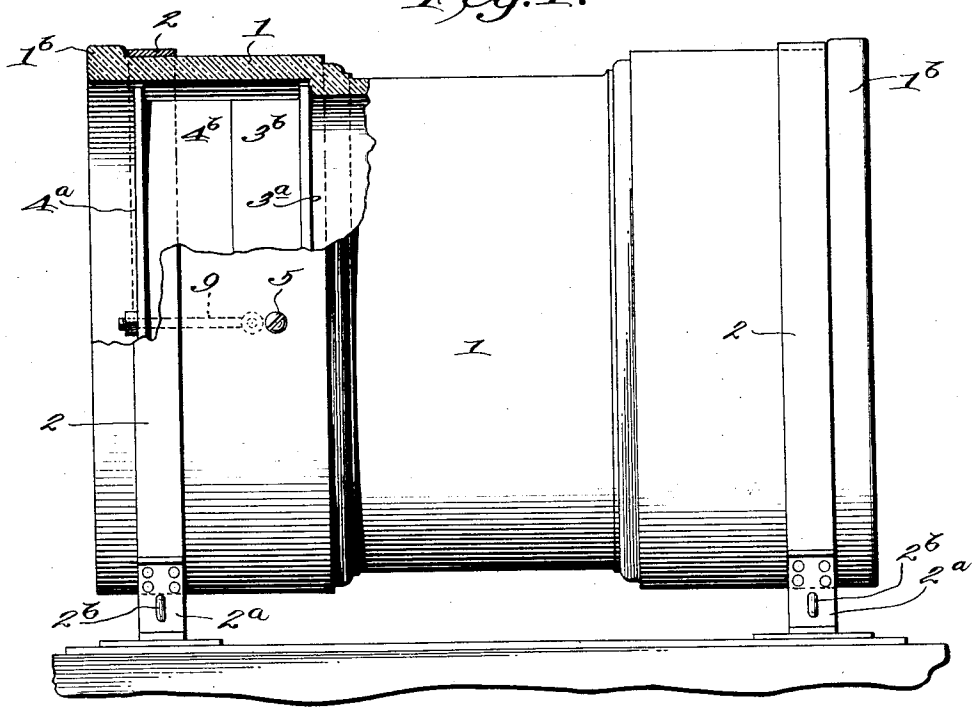
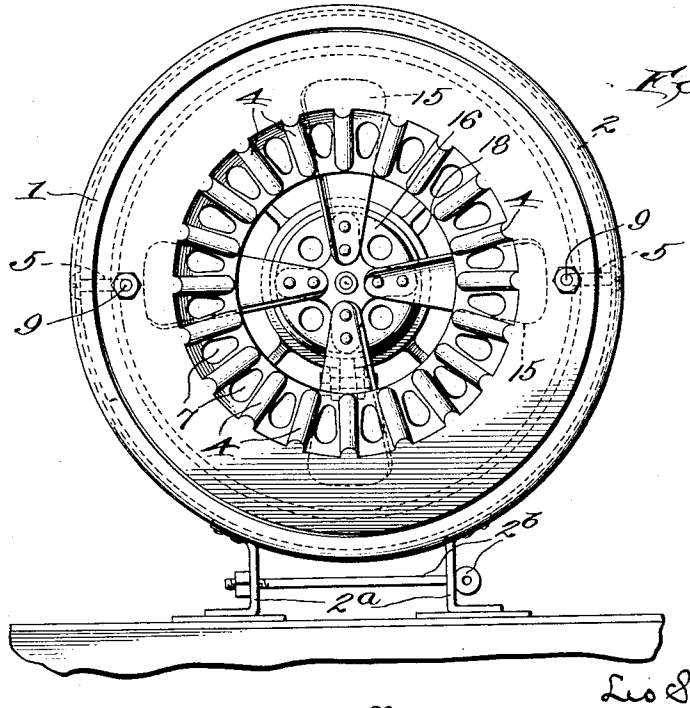


Fig. 2.



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March 31, 1925. 1,531,520

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ELECTRIC HEATER

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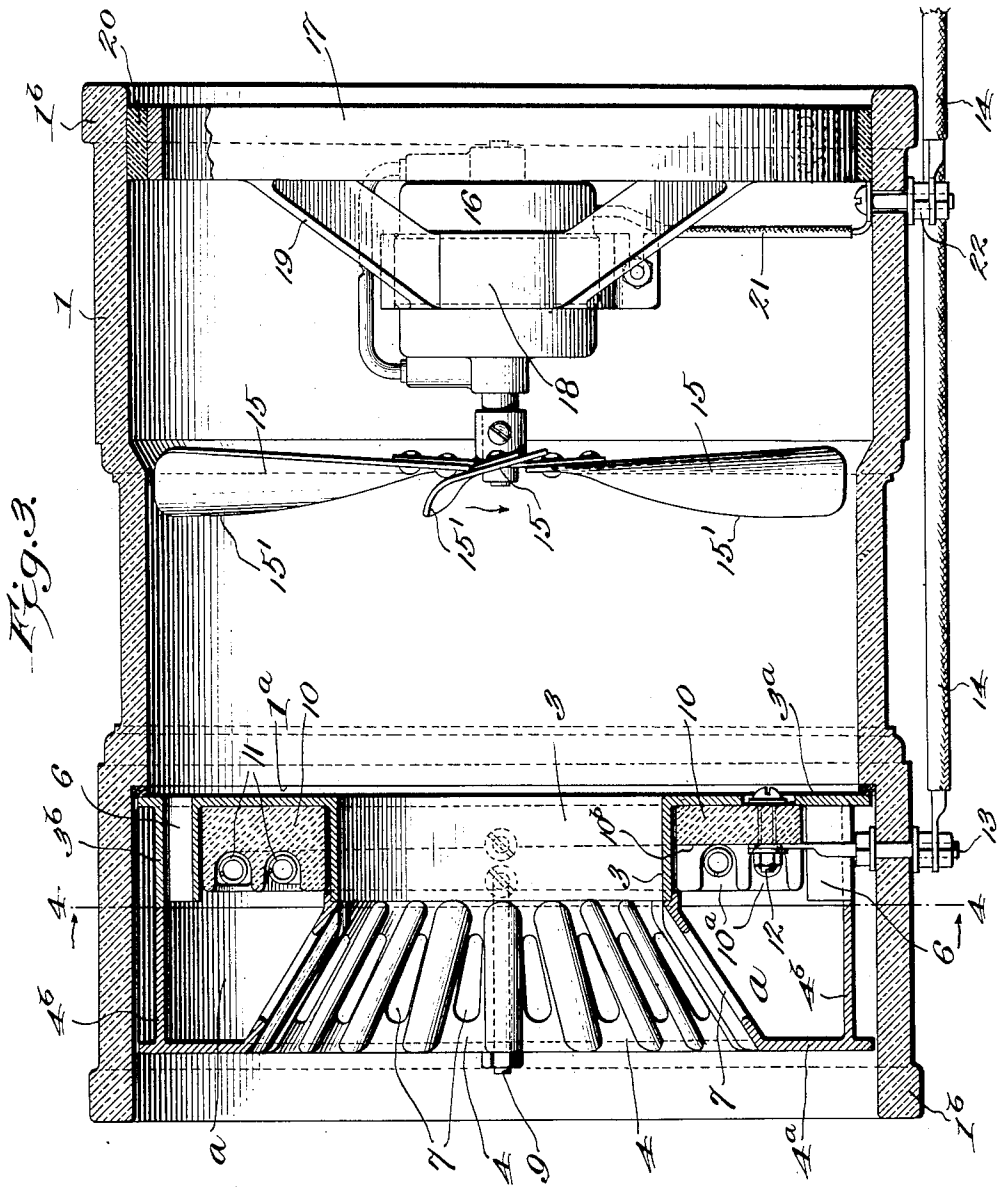


Fig. 3.

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ELECTRIC HEATER

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Fig. 4.

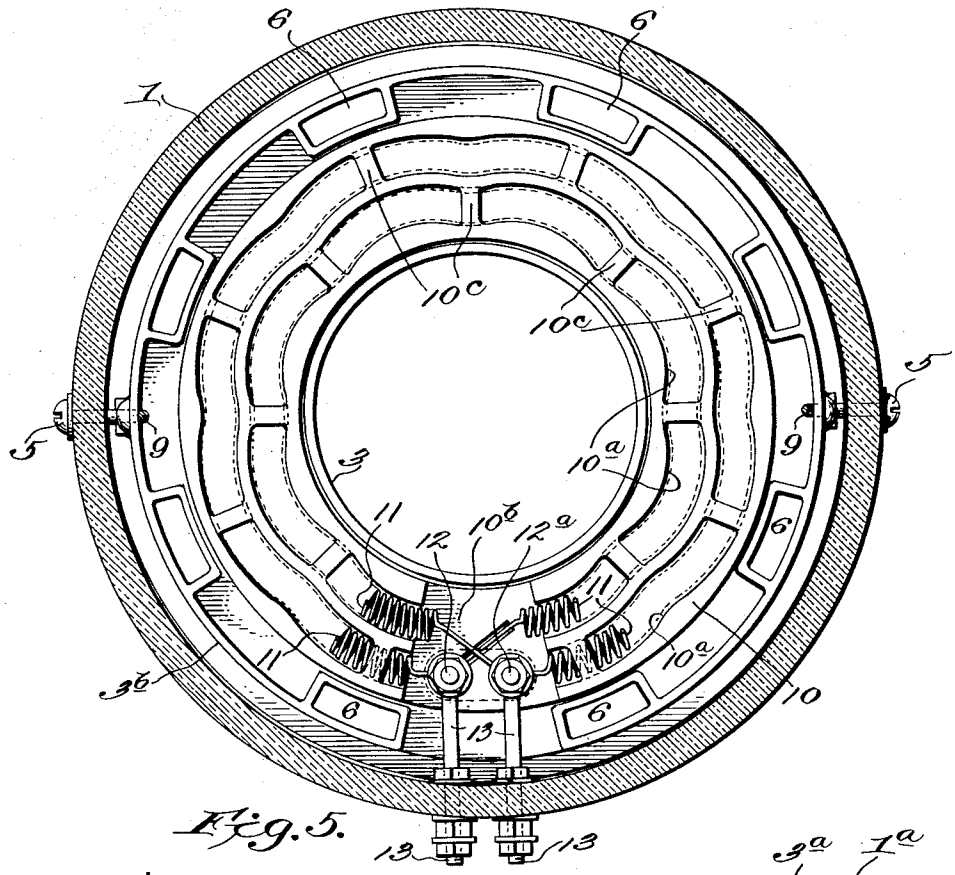
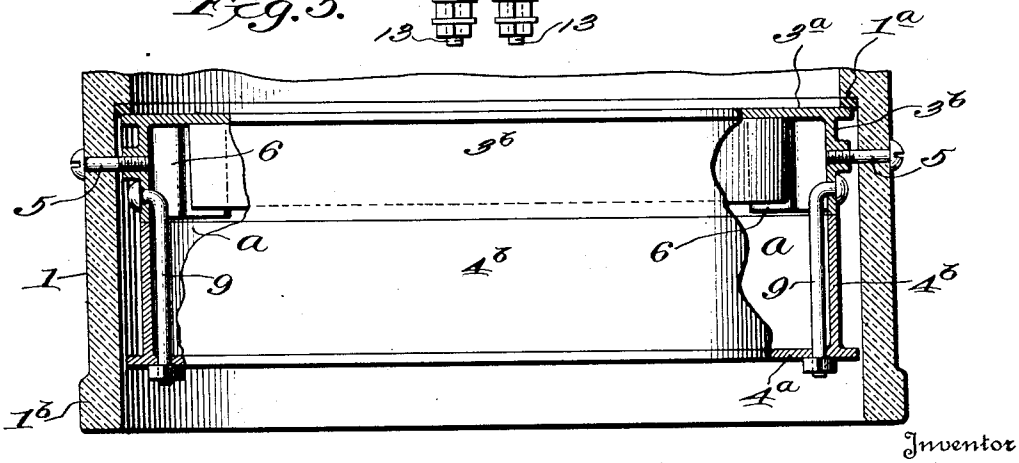


Fig. 5.



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Fig. 6.

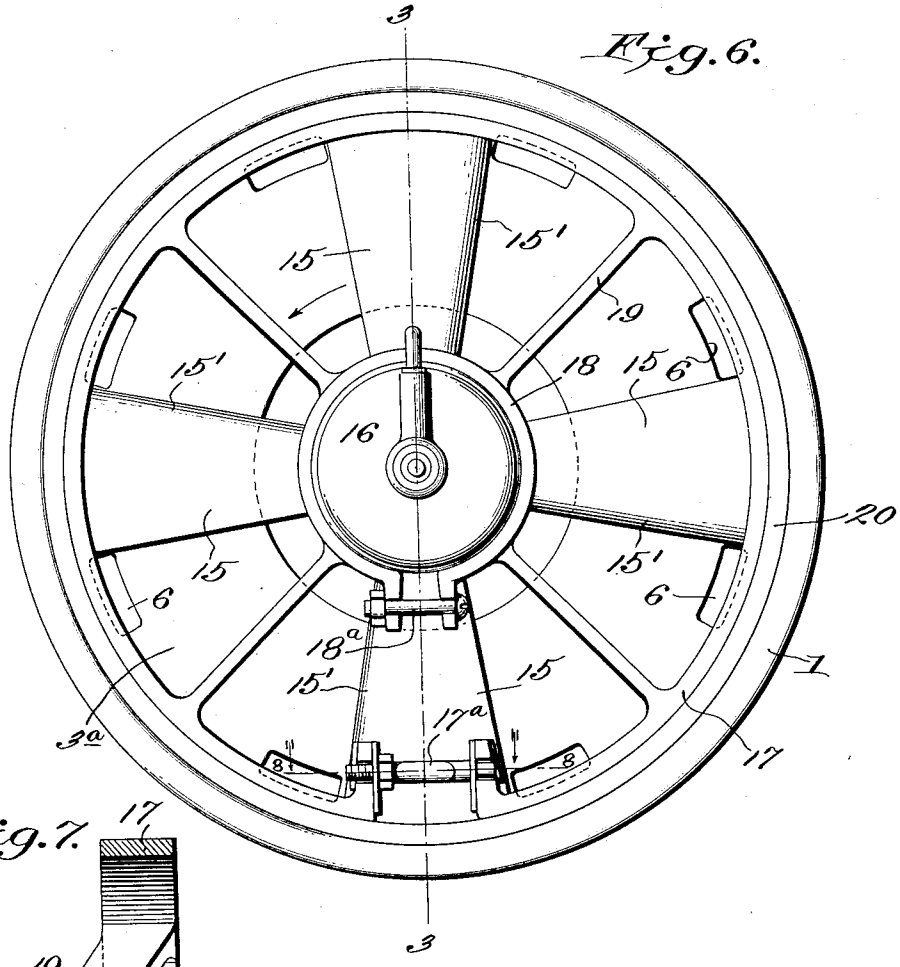


Fig. 7.

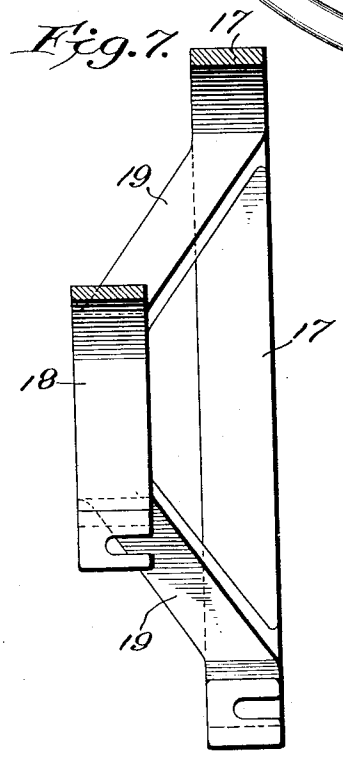
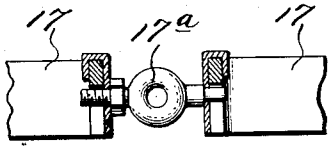


Fig. 8.



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ELECTRIC HEATER

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Fig. 10.

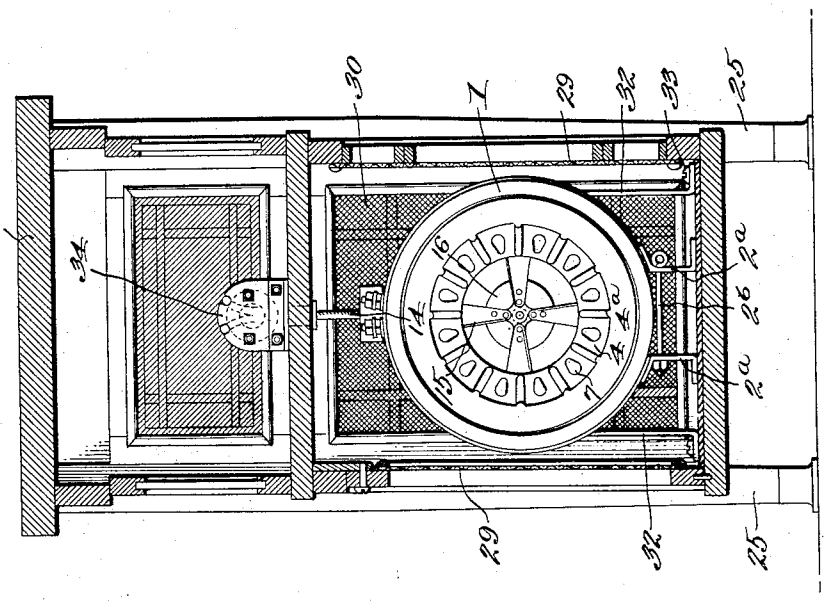
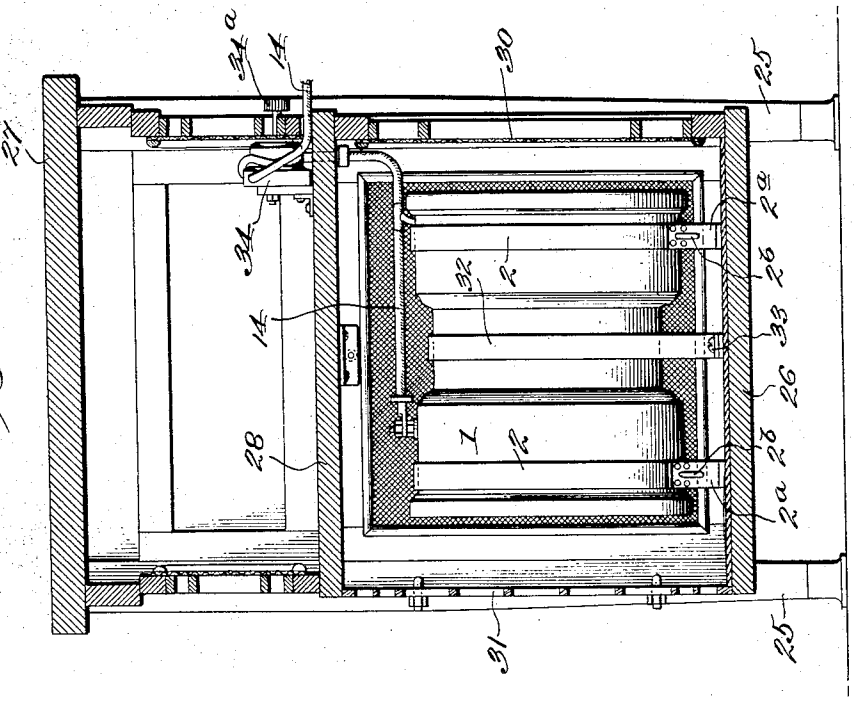


Fig. 9.



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Fig. 12.

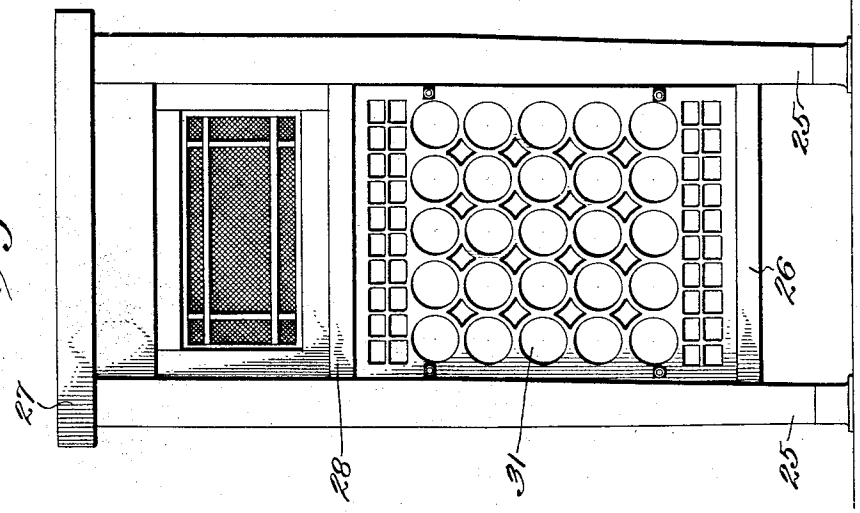
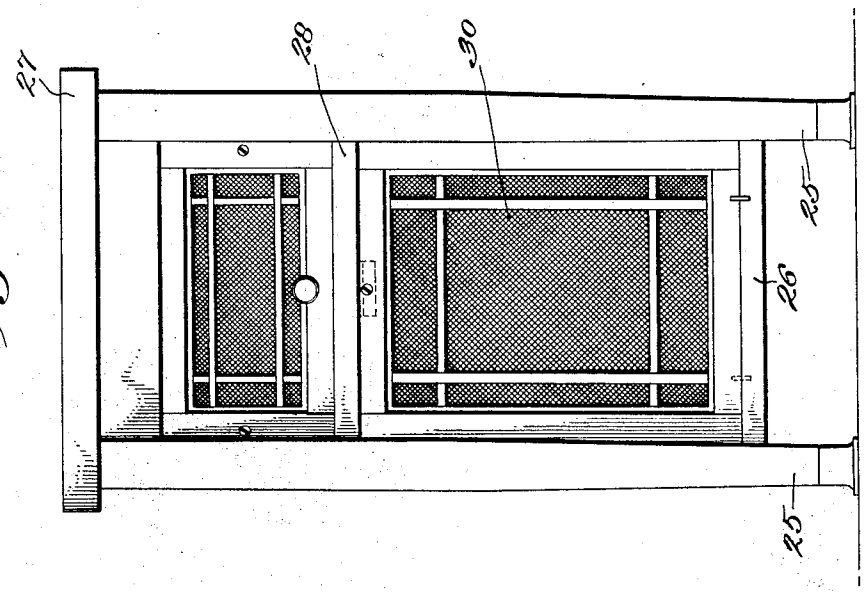


Fig. 11.



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ELECTRIC HEATER

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Fig. 14.

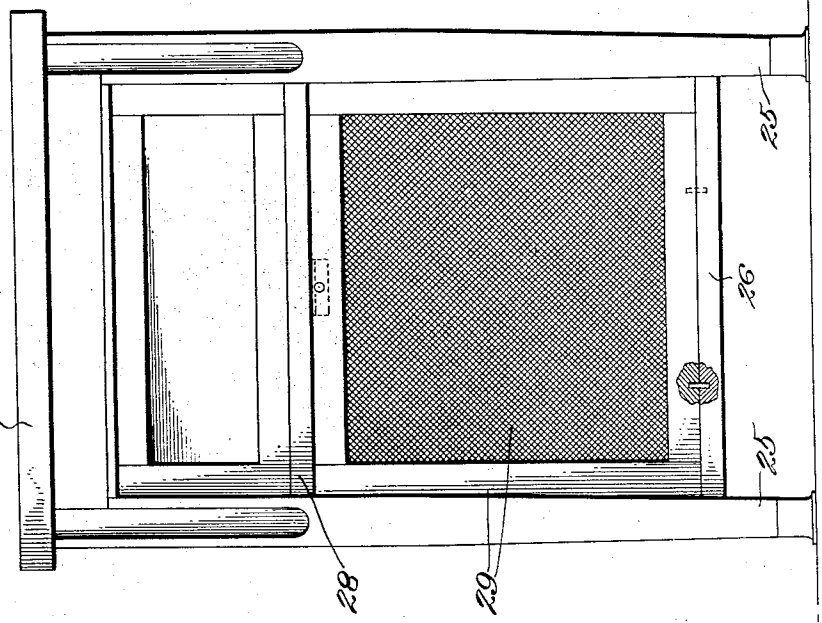
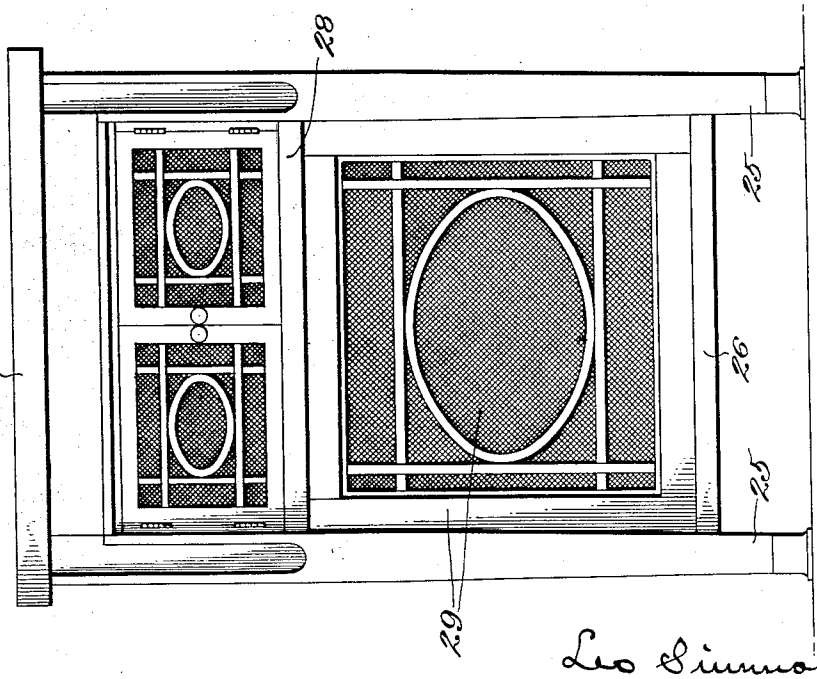


Fig. 13.



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By Hubert E. Rick Attorney

Patented Mar. 31, 1925. 1,531,520

UNITED STATES PATENT OFFICE.

LEO SIMMONS, OF WASHINGTON, DISTRICT OF COLUMBIA.

ELECTRIC HEATER.

Application filed July 15, 1924. Serial No. 726,103.

To all whom it may concern:

Be it known that I, LEO SIMMONS, a citizen of the United States of America, and resident of Washington, District of Columbia, have invented certain new and useful Improvements in and Relating to Electric Heaters, of which the following is a specification.

This invention involves improvements in and relating to electric heaters; and the objects and nature of the invention will be readily understood by those skilled in the art in the light of the following explanations of the accompanying drawings illustrating what I now believe to be the preferred mechanical expressions or embodiments of the invention from among other forms, constructions, and combinations within the spirit and scope thereof.

An object of the invention is to provide certain improvements in combinations and constructions with the ends in view of providing means, embodying an electric resistance heating unit, that can be efficiently and economically operated to raise the temperature within a room or rooms, or other enclosure, by forced air circulation.

A further object of the invention is to provide a cabinet of an ornamental character embodying such electric heating and air circulating means, enclosed within and carried and protected by an enclosure useful as an article of furniture.

With these and other objects in view, my invention consists in certain novel features in construction and in combinations and arrangements, as more fully and particularly set forth and specified hereinafter.

Referring to the accompanying drawings forming a part hereof:

Fig. 1 is a side elevation of the heater of the cabinet, said heater being partially broken away.

Fig. 2 is a front elevation of said heater.

Fig. 3 is a longitudinal vertical section on the line 3—3, Fig. 6.

Fig. 4 is a cross-section on the line 4—4, Fig. 3.

Fig. 5 is a detail horizontal longitudinal section of the ceramic tunnel or housing showing the heating or throat ring in plan partially broken away.

Fig. 6 shows the heater in rear end elevation.

Fig. 7 is a vertical detail section of the blower support.

Fig. 8 is a detail section on the line 8—8, Fig. 6.

Fig. 9 shows the cabinet heater in longitudinal vertical section.

Fig. 10 shows said cabinet heater in vertical cross section.

Fig. 11 is a rear end, and

Fig. 12 is a front end elevation of the cabinet heater.

Figs. 13 and 14 are opposite side elevations of the cabinet heater.

The heater embodies a horizontally disposed air tunnel formed by an open end longitudinally hollow somewhat elongated approximately-cylindrical one-piece housing or pipe length 1, composed of vitrified earthenware or other ceramic material, although I do not wish to so limit all features of my invention. In the particular example shown, the tunnel is of reduced diameter intermediate its end portions, thereby forming annular forwardly facing shoulder 1^a, although the end portions are internally cylindrical, nevertheless I do not wish to so limit my invention.

In the drawings, the tunnel is shown with exterior annular end beads or rims 1^b, that serve as stops for exterior metal bands 2, approximately surrounding the opposite end portions of the tunnel, and below the tunnel having a pair of depending ends that form the supporting feet or base 2^a, of the heater. The opposing depending ends of each band 2 are connected by a transverse connecting bolt 2^b by which the band can be contracted and tightened on the tunnel and the ends braced and stiffened to form supporting feet or a base.

Within the front end portion of the tunnel, I provide a hollow annulus that carries and encloses an electric resistance heating unit, and forms a throat ring and an annular heating chamber, surrounding a central longitudinal bore or air passage.

I also provide an air blower within the tunnel to cooperate, in a peculiar manner, with the throat ring and the heating means, and cause circulation of the air of the room or enclosure, in which the heater is located, through the tunnel and therefrom throughout such room or enclosure.

The throat ring forms a hollow metal annulus having a central longitudinal open-end bore alined with the longitudinal axis of the tunnel or with the axis of rotation of the blower. The rear portion of this bore is

cylindrical and is surrounded by a cylindrical wall 3 of the ring, from which the bore enlarges or flares forwardly and is surrounded by the flaring or conical wall 4 of the throat ring.

The ring is formed with a flat vertical annular rear wall 3^a, a flat front vertical annular wall 4^a, and a surrounding peripheral cylindrical wall or rim 3^b, 4^b.

This annulus or ring is located in the tunnel between the front end thereof and the shoulder 1^a, and the rear end or wall of the ring is usually seated against said shoulder. The ring is normally fixed or secured in the tunnel in any suitable manner, although I happen to show clamping screws or bolts 5, for this purpose (Fig. 5) passing through radial holes in the tunnel wall and entering the rim portion 3^b, of the throat ring.

The rear end of the ring forms a rearwardly facing abrupt contraction, or annular stop or baffle wall within the tunnel surrounding the central forwardly-opening contracted air blast bore or throat through the ring.

The interior of the rear portion of the annulus or throat ring, provides a seat for the electric resistance heating element or member, and the ring forms an annular air heating chamber *a* in front of said unit or member and surrounding the flaring portion of the ring throat or bore. The ring or annulus is formed, preferably at its outer portion just within its rim, with an annular series of spaced longitudinal air ducts 6, arranged outwardly beyond the heating unit or member, and at their inlet or rear ends opening through the rear wall 3^a, and at their front or outlet ends opening into the heating chamber *a*. The conical or flaring wall 4 of the ring throat or bore is formed with an annular series of spaced suction openings or air outlets 7 from the air chamber *a*. In the particular example shown, the throat ring or annulus is composed of two annular trough like sections, with their open sides placed together with the edges of rim walls 4^b, 3^b, meeting and the edges of the throat walls 4, 3, meeting (Fig. 3). The two throat ring sections can be secured together by any suitable means or arrangements, although I show bolts 9 (Fig. 5) for this purpose. These bolts 9, are at their rear ends confined to the rim portion 3^b of the rear ring section and extend forwardly within the front section and through the front wall 4^a, with clamping nuts on their projecting front ends.

The electric resistance heating element comprising one or more annular electric resistance units within the throat ring and surrounding the throat therethrough and a ring 10 of porcelain or other insulating and heat resisting material carrying and holding the electric resistance. This porcelain ring surrounds and is centered on the throat wall, and at its vertical rear side fits the rear wall 3^a, of the throat ring, and at its outer circumference is surrounded by the circle of air ducts 6. The front vertical wall of the porcelain 10 is exposed to the air chamber *a*, and is formed with one or more sockets or grooves 10^a, open to chamber *a*, in which the electric resistance unit or units is or are arranged.

In the particular example illustrated, I show the vertical porcelain 10 formed at its front vertical side, with two separate concentric resistance unit approximately-annular grooves or sockets 10^a, to receive two approximately annular electric resistance units or coils 11, one in each groove. The porcelain is formed with a radial depression 10^b intersecting the two grooves 10^a, so that each groove has opposite ends opening into said depression. Binding posts 12, 12^a, are arranged in said depression and secured to the porcelain and electrically connected with binding posts 13, extending to the exterior of the tunnel to receive the power circuit wires 14.

In this instance, each electric resistance unit is in the form of a long electric resistance wire coil 11, extending throughout the length of a porcelain groove 10^a, and confined therein by bridge pieces 10^c, and at one end electrically connected to one post 12 and at the other end to the other post 12^a, in such manner that the circuit flows in opposite directions through the two electric resistance coils 11.

The electric resistance coils are arranged loosely in their grooves or sockets 10^a, and as the porcelain and coils are vertically arranged, the coils when rendered soft by intense heat tend to stretch and sag downwardly under gravity. Such action tends to cause closing together of convolutions of the coils at the lower portions of the units, and consequent burning out or destruction of the units. I have effectively stopped this stretching and sagging tendency, by providing a waving or serpentine form of groove or socket 10^a, approximately as shown by Fig. 4 of the drawings.

Each coil is thus deflected from right to left at intervals in such manner as to form depressions that support the coil at opposite sides at intervals throughout its length and counteract the tendency to stretch from the elevated portion of the groove toward the lower portion of the groove.

For the purpose of maintaining the desired air circulation within and through the tunnel, I provide a rotary blower fan, the axis of which is alined with the longitudinal axis of the ring throat, and in the example illustrated, the diameter of this fan is but slightly less than the internal diameter of

the central portion of the tunnel in which the fan is located, and about equal to the diameter of the throat ring rim 3^b and the diameter of the circle of air ducts 6, and consequently far in excess of the diameter of the throat of the throat ring.

In the example illustrated the blades 15 of this blower are inclined transversely from their front or advancing edges to advance the air toward the throat ring and are curved forwardly at their rear or following edges 15′ (Fig. 3) to impart a rotary or whirling motion to the air while pressing the same forward in the tunnel and against the annular baffle or obstruction formed by the rear wall of the throat ring.

This blower is designed to cause the body of air in the tunnel to whirl while pressing forward so that the whirling body of air between the blower and the throat ring wall 3^a, is under pressure, whereby air shoots forward under pressure through the air ducts 6 and into the air chamber *a*, and also forwardly in a whirling body through the throat or bore of the throat ring.

The twisting or whirling body of air advancing rapidly through the throat acts to suck or draw heated air from heating chamber *a*, through the openings 7. The electric resistance coils are exposed to the heating chamber *a*, to radiate heat, but are not directly exposed to the air blast or currents in said chamber, as the air tends to rush through said chamber *a*, from the inlets 6 to outlets 7, without contacting said coils.

These coils become incandescent or very highly heated and by conduction heat the porcelain ring to a high temperature, and the metal walls of the throat ring also become very hot by conduction. The air in chamber *a*, is subjected to this high temperature by radiation and conduction, and also the air contacting the rear wall 3^a, and passing through the throat is subjected to the high temperature of and the heat radiated from such walls.

The horizontally disposed air tunnel internally equipped with electric resistance air heating means, when combined with an air circulating blower, serves to rapidly heat air and circulate such heated air through the room in which the heater is located and this circulation is maintained by the action of the blower in constantly drawing air into the rear end of the tunnel, and forcing the same through the tunnel for reheating therein and discharge therefrom. This constant circulation of heated air causes the room temperature to quickly rise and serves to maintain the room temperature at a comfortable degree.

One of the important advantages of my invention, results from the utilization of an air circulating blower wherein the blades are so formed (as by the forwardly curved following edges 15′) as to impart a whirling, spiral or cyclonic action to the body of air in the tunnel in advance of the blower. The body of air is thereby driven forward with a cyclonic action and resulting rotary motion in contact with the hot surfaces of the throat ring, whereby the air takes up a maximum amount of heat as it bores forwardly in contact with the ring and through the throat and air passages.

It will also be noted, that while the electric resistance heating unit is exposed to give off maximum heat in the air heating chamber *a*, yet the arrangement of the air inlets and outlets is such that said heating unit is protected from direct contact with the air currents.

Suitable means are provided for supporting the blower fan and its electric motor 16 from the tunnel with the fan located at the desired point within the tunnel.

For instance, I disclose a blower fan support and mounting consisting of a major supporting ring 17 in the form of a split expanding clamp adapted to be expanded within the tunnel into tight holding engagement with the inner surface thereof, a contracting motor clamping ring 18, and supporting spokes or arms 19 fixed to or integral with said rings and radiating and diverging from ring 18 to ring 17 and inclined outwardly to inset the vertical ring 18 a distance inwardly beyond the vertical plane of the parallel ring 17.

If so desired, the parallel split rings 17, 18, and the connecting inclined spokes 19, can be composed of a single casting.

The ring 18 is designed to surround the motor housing 16 and to be tightly clamped thereon by bolt 18^a.

The ends of the major ring 17 tend to spring toward each other, and a ring expanding bolt 17^a is interposed between said ends to expand said ring within the tunnel end, if so desired, against suitable cushioning material 20, interposed between the inner surface of the tunnel and the periphery of the ring.

The major ring 17 serves to hold the parts rigidly in the desired position, while the inclined connecting spokes 19, tend to absorb vibration and reduce the noise of the blower when in operation.

This motor supporting arrangement is simple and efficient, and simplifies assembly and disassembly of the blower and tunnel, and avoids projections at the rear of the tunnel and locates the blower within the tunnel and out of the way.

The power current wires 21 to the blower motor extend from binding post 22 that extends radially through the tunnel wall to the exterior thereof to receive the power circuit wires.

The electric heater, per se, embodying the

tunnel and parts carried thereby, is portable, and can be located where desired, on the floor or elsewhere, to perform its enclosure heating functions, and can be transported from room to room or elsewhere about a house or other building.

Advantages are gained by the employment of a tunnel of ceramic material not only because of its insulating and heat radiating characteristics but for other reasons, although I do not wish to so limit all features of my invention.

Also, the ceramic tunnel renders the heater of peculiar advantage where combined with an enclosing and supporting stand or other article of furniture, in accordance with, one feature of my invention.

In Figs. 9–14, of the drawings, I show a cabinet heater of my invention that consists of the hereinbefore desscribed heater in combination with a suitable article of furniture or the like enclosing, protecting and carrying the heater. This cabinet is designed to constitute an ornamental piece of furniture and to perform the functions of a desk, table, telephone stand, or cabinet.

In the particular example illustrated, the cabinet embodies suitable supporting legs 25, to which are fixed a lower horizontal heater supporting floor or shelf 26, a horizontal desk top or shelf 27, and an intermediate shelf 28. The space between the top 27 and intermediate shelf 28 can be enclosed by vertical panels and one or more doors, if so desired, to form a compartment to receive telephone and other books or articles.

The floor 26 is designed to support the heater 1, and the space between the shelves 26 and 28 is enclosed to form a heater compartment with vertical walls formed to permit air circulation therethrough. The side walls of this last mentioned compartment, are formed by vertical panels 29 one or more of which can be removable. These side panels are usually in the form of open frames, the openings in which are covered by fine mesh wire cloth to permit air flow to the tunnel of the air heater as well as heat radiation therefrom into the room. The rear end wall of the compartment is also formed by an open panel 30 covered by wire cloth for the same purpose as panels 29. The front end wall of the heater compartment is closed by an open work panel in the form of metal grille 31 arranged more or less close to the front air discharge end of the air tunnel and this grille is formed for the free outward passage of the heated air blast or circulation from the tunnel while serving to protect the tunnel from children and preventing free access thereto. In the form shown, the grille provides a great multiplicity of closely arranged circular and other openings. One or both of the panels 29, 30, is, or are, removable for the application and removal of the heater.

The heater is supported by its feet 2^a, resting on the floor 26, and is normally fixed in position, arranged between the panels, by any suitable clamping or securing means. For instance, I show a metal clamping band 32, passed over the heater tunnel, intermediate its length, with the opposite ends of the band secured down on the shelf 26 by vertical screws 33.

If so desired, a switch 34 for controlling the heater and blower, whereby the same can be thrown into and out of action, can be located on the upper compartment floor or shelf 28, with an operating button or knob 34^a, accessible at the exterior of the cabinet.

When the heater is thus combined with an article of furniture, floor space is conserved, the heater is not readily accessible to children and is protected from contact and interference.

When in action, the heater draws air in through panel 30 as well as through panels 29, and the hot air blast is discharged through the metal grille 31.

Furthermore, the open-work panels permit radiation of heat from the heater, into the room, so that all heat is utilized, while permitting a circulation through and around the heater to keep down the exterior temperature of the heater to the point of safety thereby avoiding possibility of damage to adjacent woodwork.

It is evident that various changes, modifications, and variations might be resorted to without departing from the spirit and scope of the invention, and hence I do not wish to limit myself to the exact disclosures hereof.

What I claim is:

1. An electric heater comprising a ceramic material air tunnel, an annulus normally fixed therein and having a central air passage throat, an annular heating member in said annulus and comprising a ceramic material ring and an exposed electric resistance heating unit carried thereby, said annulus forming an air heating chamber having suction outlet openings into the throat and air inlet openings through the rear of the annulus, and an air blower for forcing air forwardly through the tunnel and against the rear side of the annulus.

2. An electric heater comprising a ceramic material open end air tunnel, a heat conducting and radiating throat ring in the front portion of the tunnel forming an annular air baffle in the tunnel and provided with an internal annular electric resistance heater, and a blower in the tunnel having its blades constructed and arranged to force the air under pressure against the rear side of the ring and to cause the body

of air to whirl and press forward against the ring and through the throat thereof.

3. An electric heater embodying an open end air tunnel, a heat radiating throat ring therein forming an annular air heating chamber and having air inlet openings from the rear of the ring and suction air outlet openings into the throat, and a blower constructed and arranged to whirl the air in the tunnel and press the same forwardly against the rear of the ring and through said throat.

4. An electric heater comprising an open end air tunnel, a blower for forcing the air forwardly through the tunnel, and a throat ring forming an annular baffle in the tunnel around the air throat through the ring, said ring forming an annular air heating chamber having air inlets from the rear of the ring and air outlets into the throat, and an annular insulating and heat radiating member in said ring having an exposed electric resistance heating unit in said chamber.

5. An electric heater embodying an air tunnel, an annular hollow metal heating ring forming a baffle in the tunnel and having a central air passage throat, said ring composed of annular channel sections clamped together, said ring having an internal heating member composed of a porcelain ring having a seat and an annular electric resistance heating coil in the seat, and a blower for forcing air forwardly through the tunnel and against the ring.

6. An electric heater embodying an air tunnel, electric resistance heating means therein, a blower for forcing air forwardly through the tunnel, said blower provided with and carried by a motor, and a motor support embodying a central advanced clamp for gripping and holding the motor, an expansible clamping ring adapted to fit the interior of the tunnel and having means for expanding the same therein to lock the ring within the tunnel, and spokes rigid with the motor clamp and with the ring and inclining forwardly from the ring to the motor clamp.

7. An electric heater embodying an air tunnel and an annular heating member therein and comprising a vertical porcelain ring having an approximately annular groove of a serpentine or wavy formation and an electric heating coil arranged in said groove.

8. A cabinet providing a heater compartment with a heater support and vertical projecting walls formed for the passage of air, in combination with an air heater comprising a horizontally-arranged open-end air-heating and circulating tunnel carried by said support and provided with an air circulating blower and internal electric resistance air heating means.

9. An electric heater comprising an open-end air heating and circulating tunnel, an electric resistance heating means in the tunnel protected from direct contact with the air blast, and an air circulating blower carried by the tunnel and provided with blades constructed and arranged to whirl and drive the air forwardly through the tunnel with a cyclonic action.

Signed at Washington, D. C., this 14th day of July, 1924.

LEO SIMMONS.