Feb. 20, 1923. 1,445,706.

A. PAPINI.

ELECTRIC HEATER.

FILED OCT. 15, 1919. 2 SHEETS—SHEET 1.

Fig. 1.

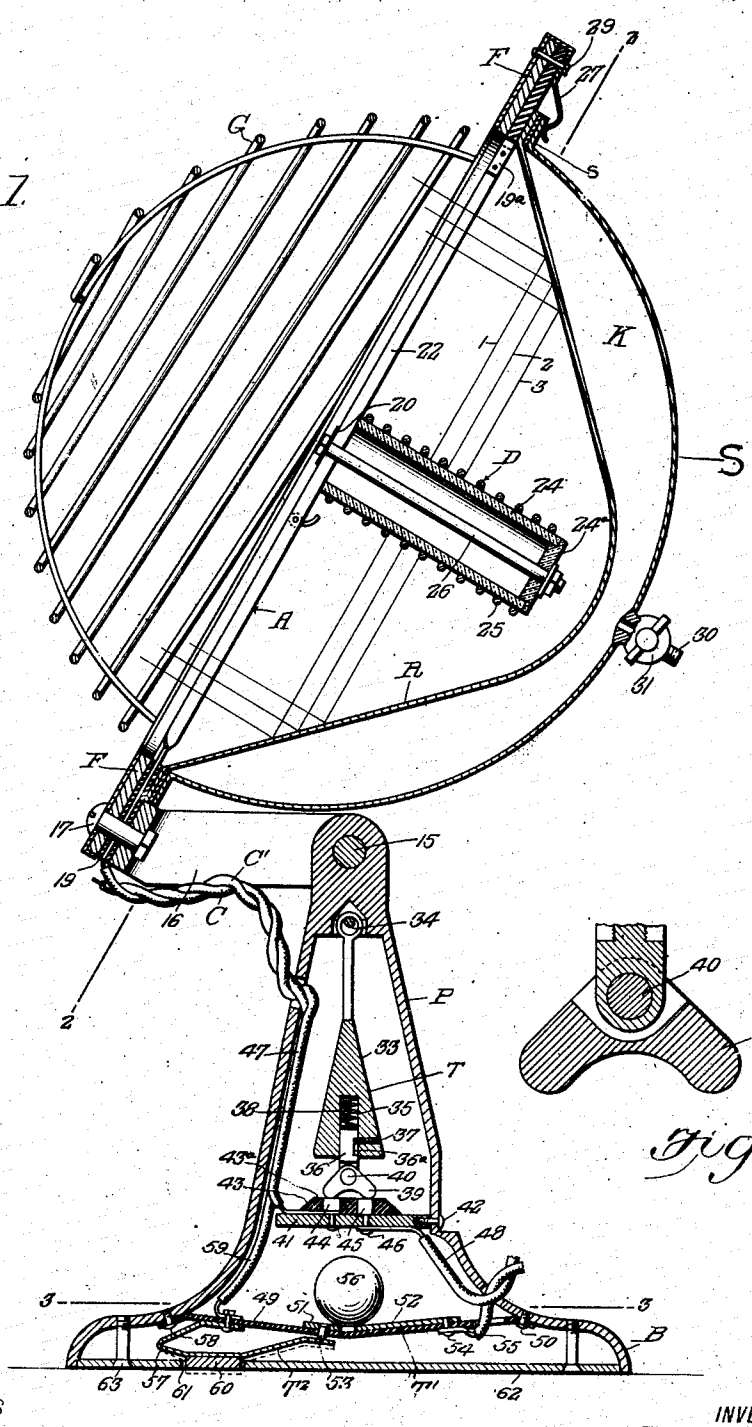



Fig. 4.

WITNESSES

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ELECTRIC HEATER.

FILED OCT. 15, 1919. 2 SHEETS—SHEET 2.

Fig. 2.

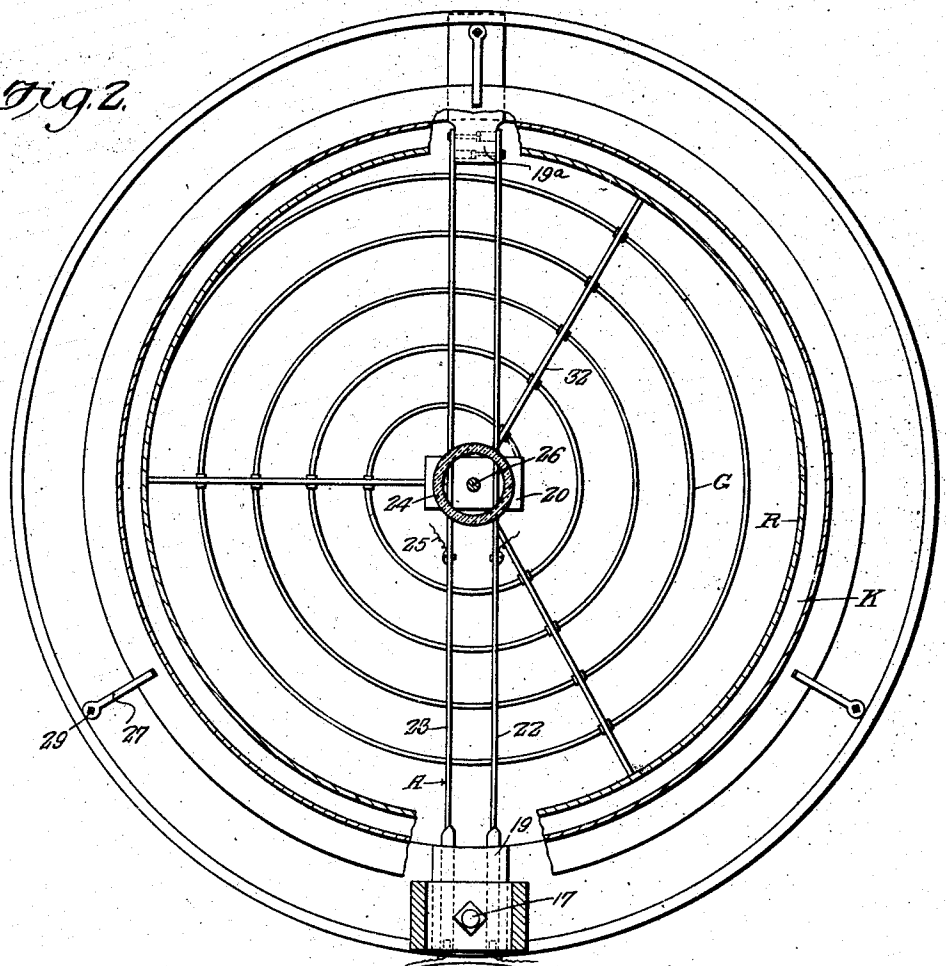
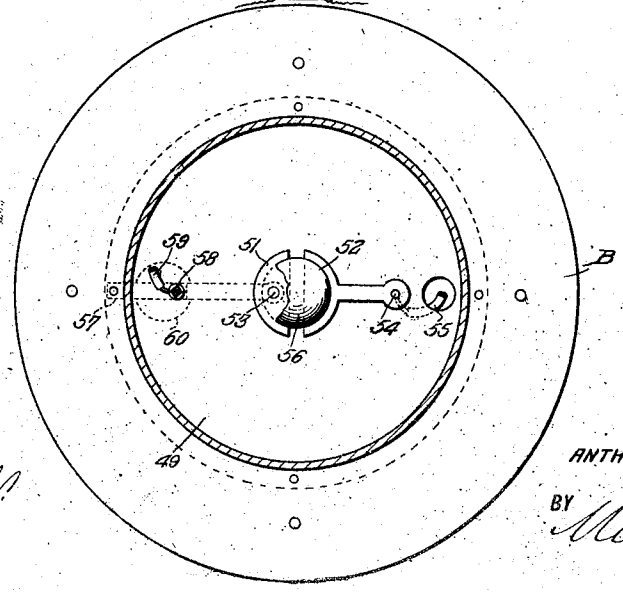



Fig. 3.




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# UNITED STATES PATENT OFFICE.

ANTHONY PAPINI, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO ELECTRICAL DEVELOPMENT AND MACHINE COMPANY, OF PHILADELPHIA, PENNSYLVANIA, A CORPORATION OF DELAWARE.

## ELECTRIC HEATER.

Application filed October 15, 1919. Serial No. 330,820.

*To all whom it may concern:*

Be it known that I, ANTHONY PAPINI, a subject of the King of Italy, and a resident of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Electric Heaters, of which the following is a specification.

My invention relates to portable electric heaters and particularly to that type commonly known as thermo-light heaters.

Because of the laws governing the action of reflected heat waves it is extremely difficult to produce a heater of maximum efficiency when employing a parabolic reflector in conjunction with a cylindrical heating element in that the contour of the reflector does not tend to effect the proper deflection of the heat waves, thus resulting in improper radiation and materially reducing the efficiency of the heater.

It is a purpose of my invention to provide a heater of maximum efficiency by dispensing with the use of a parabolic reflector and employing a reflector which is so arranged as to completely project all of the heat waves from a heating element at a predetermined angle with relation to the axis of the reflector.

It is also a purpose of my invention to prevent the escape of heat waves from the rear side of a reflector by providing the same with a vacuum chamber, thus retaining within the reflector that heat which is generally lost and thereby maintaining the reflector at a very high temperature whereby all elementary beams of thermo-light will be projected from the front of the reflector.

It is a further purpose of my invention to provide a plurality of circuit brakers for disrupting the circuit of the heating element at a plurality of points, such controllers being operated automatically when the heater occupies an abnormal position.

I will describe one form of heater and three forms of circuit controllers, each embodying my invention, and will then point out the novel features thereof in claims.

In the accompanying drawings:

Figure 1 is a view showing in vertical section one form of heater embodying my invention;

Figure 2 is a sectional view taken on the line 2—2 of Figure 1;

Figure 3 is a transverse sectional view taken on the line 3—3 of Figure 1;

Figure 4 is a detail sectional view of a part of one of the circuit controllers shown in Figure 1.

Similar reference characters refer to similar parts in each of the several views.

Referring specifically to the drawings and particularly to Figure 1, B designates a base upon which is formed a pedestal P, and both of which are hollow and formed of any suitable material. Pivoted to the upper end of the pedestal P as at 15, is a U-shaped bracket 16 which is designed to adjustably support the main body of the heater so as to project the heat waves in any desired direction, it being understood that any suitable means may be provided for clamping the bracket in any adjusted position. As shown in Figures 1 and 2, an annular frame F is rigidly supported upon the medial portion of the bracket 16 by a bolt 17. Interposed between the frame and the bracket 16 is a block of insulating material 19 in which is secured one end of a conducting bridge A. The bridge A comprises parallel strips of metal 22 and 23, one of their ends being flattened and secured within the block 19, while their opposite ends are secured to a block $19^a$ of insulating material fixed to the frame F at a point diametrically opposite the block 19. Arranged medially of the bridge A is a cylindrical casing 24 formed of insulating material. The outer end of the casing 24 is closed by a wall $24^a$, and extending through such wall is one end of a bolt 26 which is arranged within the casing 24 with its opposite end passing between the strips 22 and 23 and secured to the bridge A by a plate 20. Surrounding the casing 24 is a heating element D which, in the present instance, comprises a coil of resistance wire 25 having the opposite end thereof connected to the portions 22 and 23, respectively of the bridge A.

The casing 24 being disposed medially of the bridge A is consequently axially of the frame F. Secured to the frame F is a frusto-conical reflector R formed of any suitable material as polished copper, and, as

shown in Figure 1, its axis coincides with the axis of the casing 24. The inner face of the reflector D is substantially at an angle of 45° with respect to its axis so that the thermo-light waves emanating from the heating element D are projected onto the surface of the reflector at such an angle that they will be deflected on lines parallel to the reflector's axis. For example, the elementary beams indicated by the lines 1, 2, and 3 in Figure 1, are projected onto the surface of the reflector R in a direction perpendicular to the axis of the heating element D and from the reflector's surface they are reflected forward in waves which are parallel to each other and to the axis of the reflector.

Should it be desired to project the thermo-light waves in such manner as to effect a concentration of the same, reflecting surface of the reflector will be arranged at an angle of less than 45° with relation to its axis. On the other hand should a diffusion of the waves be desired a reflecting surface of the reflector is made to occupy an angle greater than 45° with relation to the axis of the reflector, but preferably not greater than 55°.

As shown in Figure 1, the reflector R constitutes the front wall of a vacuum chamber K, the rear wall being formed by a semi-spherical cup S. A vacuum is obtained within the chamber K by withdrawing the air through a nozzle 30 and then closing such nozzle by means of a valve 31. With the chamber K under vacuum it will be obvious that the radiation of heat to the rear of the reflector R is prevented so that all of the heat waves emanating from the heating element D are projected to the front of the reflector. This of course materially increases the normal temperature of the reflector so that the elementary thermo-light beams are more readily projected.

The reflector R and cup S are removably associated with the frame F so as to permit ready cleaning or polishing of the former's reflecting surface. To this end the frame F is provided at suitable points with spring clips 27 which are secured to the rear side of the frame by bolts 29. These clips 27 engage a flange *s* formed on the cup S and thus securely retain the reflector and cup in proper position upon the frame.

The frame F having connection with and supported by the bracket 16 upon the pedestal P may be regarded as a mount for the bridge A and the heating element carried thereby, the reflector R and the cup S.

To maintain the heating element D at a safe distance at all times from inflammable objects, I provide a guard G which is suitably secured to the frame F and comprises a single length of wire bent in the form of a helix and supported in semi-spherical position by arcuate rods 32. The rods 32 are also supported by the frame F, and are preferably connected at the points of intersection with the convolutions of the guard G by welding or suitable forms of metallic clips (not shown).

As shown in Figure 1, current is supplied to the resistance coil 24 of the heating element D by conductors C and C′ which are connected to a suitable source of current (not shown), at one of their ends, while their opposite ends are connected to the portions 22 and 23 respectively of the bridge A. To control the supply of current to the coil 24 to effect a disrupting thereof when the heater is over-turned, I provide circuit controllers T, T′ and T². As shown in Figure 1 the circuit controller T comprises a pendulum 33 arranged within the pedestal P and pivotally connected at its upper end, as at 34. The lower or weighted end of the pendulum 33 is provided with a pocket 35 which slidably receives a plunger 36. The plunger 36 is provided with a groove 36ª in which works a pin 37 mounted within the pendulum and arranged to allow limited longitudinal movement of the pin but to prevent circumferential movement thereof. The plunger 36 normally occupies the position shown in Figure 1 by virtue of a spring 38, the lower end of the plunger being provided with a pair of rigidly connected contact fingers 39 which are pivotally connected to the plunger, as at 40. The detail construction of this connection is clearly shown in Figure 4. Arranged within the pedestal P is a plate 41 formed of insulating material, such plate being supported in horizontal position by means of a screw 42. Arranged upon the upper surface of the plate 41 is a block 43 formed of insulating material and having its upper surface concaved as at 43ª. The body of the block 43 is formed with suitable openings to receive contact points 44 and 45 which are connected to screws 46 which extend through the plate 41 and serve to secure the block 43 in proper position. The contacts 44 and 45 constitute the terminals of two sectional wires 47 and 48, which latter constitute the conductor C. As shown in Figure 1, the contact fingers 39 are adapted to move horizontally over the concave surface 43ª of the block 43 and in the normal position of the pendulum 33, the fingers 39 bridge the contact points 44 and 45 thus completing one side of the circuit for the heating element D. This circuit controller T completes one side of the circuit for the element D so long as the pedestal P occupies a vertical position. However, as soon as the pedestal P occupies any other position other than a truly vertical one, the pendulum 33 will swing to one side or the other about the pivot 34, thus causing the fingers 39 to move out of contact with the points 44 and 45 thereby disrupting the circuit of the heating element D. It will be manifest that by

virtue of this operation, should the heater be accidentally knocked over so as to cause the pedestal P to occupy an inclined position, the circuit controller T will automatically disrupt the circuit and thus discontinue the supply of current to the heating element.

As shown in Figures 1 and 3, the circuit controller T′ comprises a concaved disc 49 secured in horizontal position within the base B by a screw 50. This disc 49 is formed of insulating material and supports axially thereof a smaller disc comprising sections 51 and 52 which are formed of conducting material and constitute the terminal contacts of the circuit controller. The section 51 is secured to the disc 49 by a fastening member 53 which projects through and to the lower side of the disc 49 for a purpose which will be hereinafter described. The section 52 is secured to the disc 49 by a screw 54, to which latter is connected a sectional conductor 55 constituting a portion of the conductor C′. As shown in Figure 1, the sections 51 and 52 support a contact bridging member 56, which in the present instance comprises a ball formed of conducting material. It will suffice to say for the present that in the normal position of the pedestal P the ball 56 bridges the contacts 51 and 52, but should the pedestal occupy any position other than the vertical position, the ball will roll so as to disconnect the sections 51 and 52 thus opening the circuit controller.

The circuit controller $T^2$ comprises a spring contact arm 57 which is connected to the marginal edge of the disc 49 by a screw 58, and to this same screw is connected a sectional conductor 59 which constitutes the other portion of the conductor C′. The contact arm 57 is bent upon itself as shown in Figure 1 with its free end normally contacting with the fastening member 53 carried by the disc 49. Intermediate its ends, the contact arm 57 is provided with a block 60 which works within an opening 61 formed in a cover plate 62 which latter forms a closure for the base B and is secured in position by screws 63. With this arrangement it will be seen that when the heater is placed upon the floor the block 60 is forced upwardly through the opening 61 thus causing the contact arm 57 to move into engagement with the member 53 and completing the following circuit: conductor 59, screw 58, contact arm 57, member 53, terminal contact 51, ball 56, terminal contact 53, screw 54, and conductor 55 to the source of current. This circuit is completed so long as the pedestal is resting upon a flat surface and in a vertical position. However, as soon as the pedestal is lifted or overturned the block 60 is allowed to move outwardly through the opening 61 under the biasing action of the spring arm 57, as shown in dash lines in Figure 1. In the expanded position of the arm 57, its free end moves out of engagement with the member 53 thereby disrupting the circuit just described.

It will be understood that the ball 56 controls the same side of the circuit as the circuit controller $T^2$ and therefore a detail description of this circuit is thought to be unnecessary.

From the foregoing description of the circuit controllers, it will be evident that should the pedestal P be overturned or caused to occupy any position other than the vertical position, the circuit through the heating element D will be disrupted in three separate and distinct points, thus insuring discontinuance of the supply of current to the heating element, and thereby preventing any possibility of fire should the heater be accidentally overturned.

Although I have herein shown and described only one form of the heater and three forms of circuit controllers, it is to be understood that various changes and modifications may be made herein without departing from the spirit of the invention and the spirit and scope of the appended claims.

Having described my invention, what I claim is:

1. An electric heater comprising a conical reflector, a vacuum chamber in the rear of the reflector, and a heating element in the front of the reflector and disposed axially of the latter.

2. A reflector for electric heaters comprising a conical member, and a spherical member disposed in the rear of and in spaced relation to the conical member to provide a vacuum chamber.

3. A reflector for electric heaters comprising walls hermetically connected at their edges and spaced apart intermediate their edges to provide a chamber from which the air is adapted to be withdrawn.

4. An electric heater comprising, a reflector, a heating element at one side of the reflector, and a vacuum chamber at the other side of the reflector.

5. An electric heater comprising, a conical reflector, a bridge spanning the reflector, and a heating element supported axially within the reflector by said bridge.

6. An electric heater comprising, a conical reflector, a bridge spanning the open end of the reflector, a heating coil supported within the reflector by said bridge so that the axes of the reflector and coil coincide, and a circuit including both coil and bridge.

7. An electric heater comprising, a pedestal, a frame pivotally mounted on the pedestal, a reflector secured to the frame, a bridge on the frame, and a heating element supported on the bridge and disposed axially within the reflector.

8. An electric heater comprising, a pedestal, a frame pivotally mounted on the ped-

estal, a reflector secured to the frame, a guard supported on the frame, a conducting bridge on the frame and spanning one end of the reflector and a heating element supported on the bridge and disposed axially within the reflector.

9. An electric heater comprising, a pedestal, a frame pivotally mounted on the pedestal, a reflector detachably mounted on the frame, a bridge carried by the frame, and a heating element supported on the bridge and extending axially into the reflector.

10. An electric heater comprising, a pedestal, a frame, a bracket secured to the frame and pivotally supported on the pedestal, means for locking the bracket in adjusted position upon the pedestal, a reflector detachably secured to the frame, a conducting bridge carried by the frame, and a heating element supported on the bridge and extending into the reflector.

11. An electric heater comprising, a frusto-conical reflector, the inner face of which is disposed at an angle not less than 45° and not more than 55° with respect to the axis of the reflector, and a heating element disposed axially within the reflector.

12. An electric heater comprising, a reflector, a bridge spanning the reflector, a heating element supported by the bridge and disposed within the reflector, and a guard comprising a single length of wire bent in the form of a helix.

13. An electric heater, comprising a frusto-conical reflector, the inner face of the reflector being disposed at an angle of 45 degrees with respect to its axis, and a heating element disposed axially of the reflector.

14. An electric heater comprising a reflector, a bridge spanning the reflector, a heating element supported by the bridge and disposed within the reflector, and a guard for protecting said heating element.

15. An electric heater comprising a reflector, a mount therefor, a bridge extending across the front of the reflector, and a heating element carried by the bridge and extending rearwardly within the reflector and co-axially thereof.

16. In an electric heater, a reflector, a heating element therefor, a bridge support for the heating element extending transversely of the reflector, and a mount for the reflector and bridge, the said mount being common to the said reflector and bridge and supporting them independently of each other.

17. In an electric heater, a reflector having a forwardly facing concaved surface in combination with a heating element, and means in front of said reflector for supporting the said element in front and independently of said reflector.

18. In an electric heater, a reflector, supporting means therefor, a heating element supported in front of the reflector, and conductors feeding the said heating element from the front end of the said element.

19. In an electric heater, a reflector, means for supporting the reflector, a heating element mounted in front of the reflector, and electrical connections for said heating element extending from the side, crossing to the heating element in front of the reflector, and connected to the heating element.

ANTHONY PAPINI.