E. N. BROWN AND M. H. SHOENBERG.

ELECTRIC HEATER.

APPLICATION FILED OCT. 2, 1919. RENEWED OCT. 18, 1921.

1,398,217. Patented Nov. 22, 1921.

3 SHEETS—SHEET 1.

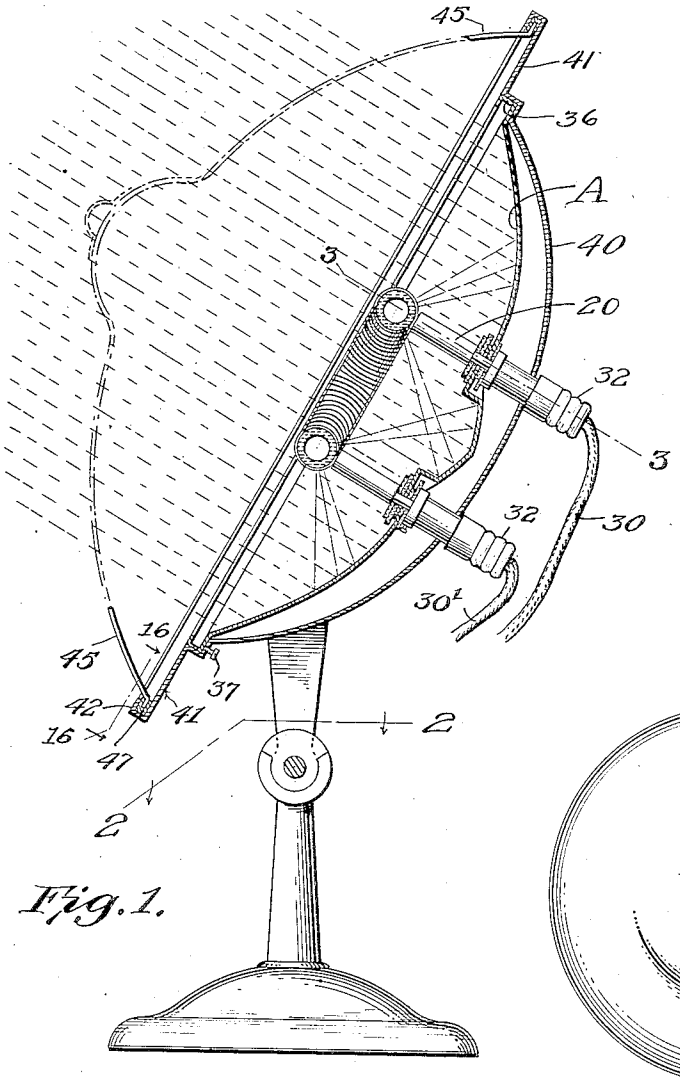

Fig. 1.

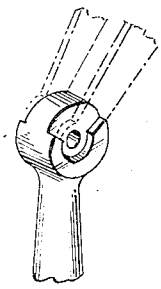

Fig. 4.

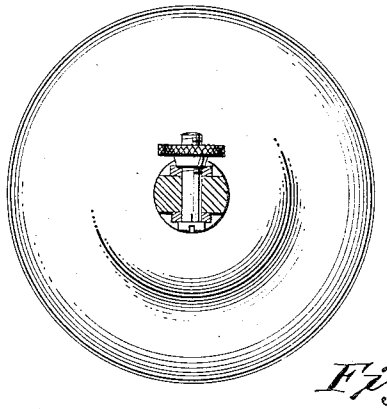

Fig. 2.

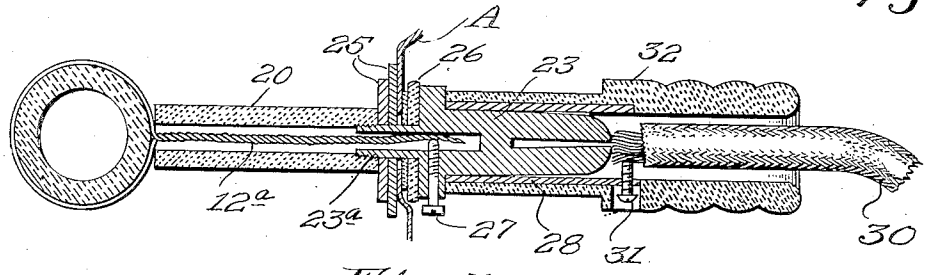

Fig. 3.

Witness

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3 SHEETS—SHEET 2.

Fig. 5.

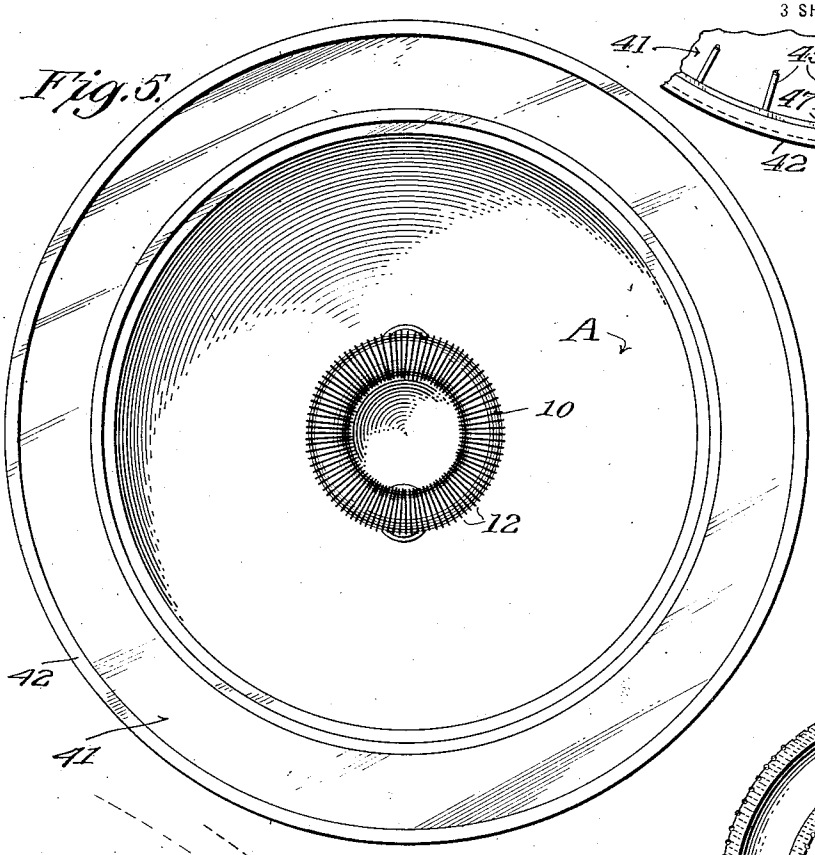


Fig. 16.

Fig. 6.

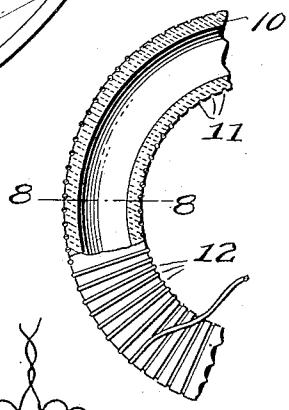
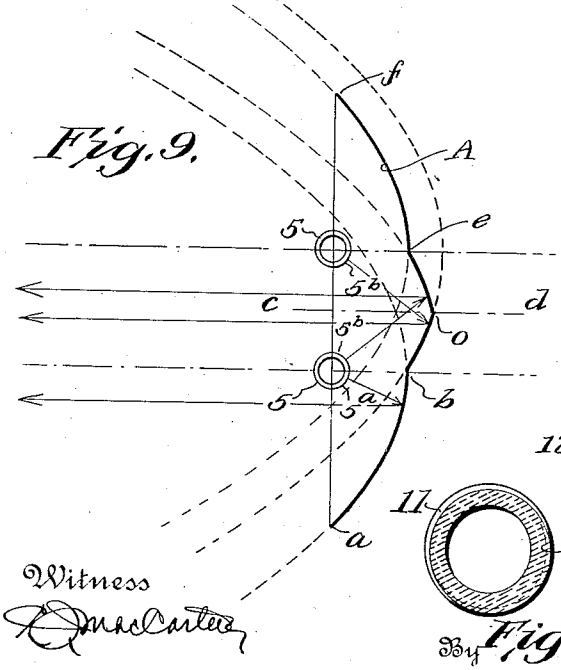


Fig. 9.



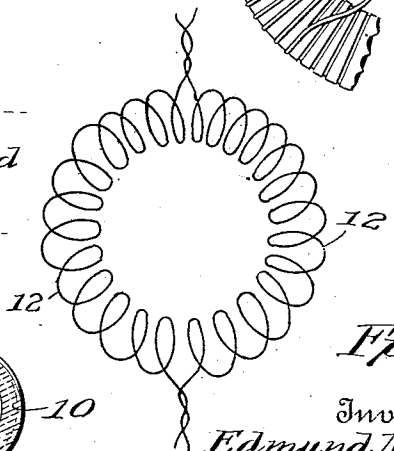


Fig. 7.

Fig. 8.

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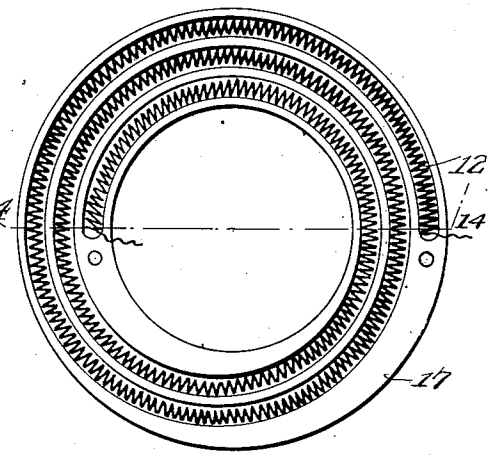
3 SHEETS—SHEET 3.

Fig. 13.



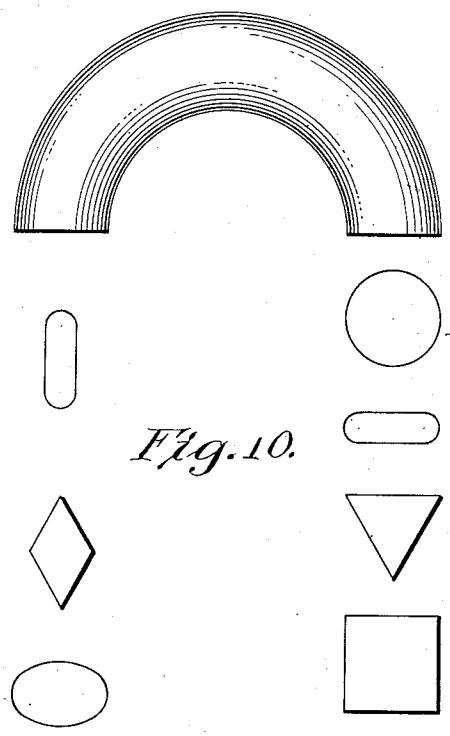


Fig. 10.

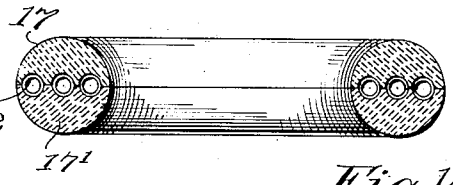
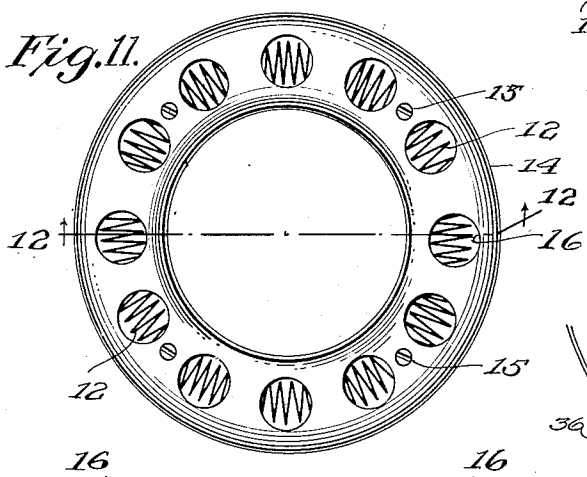


Fig. 11.



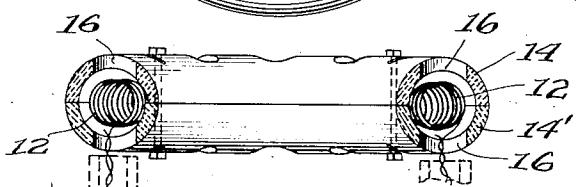


Fig. 12.

Fig. 14.

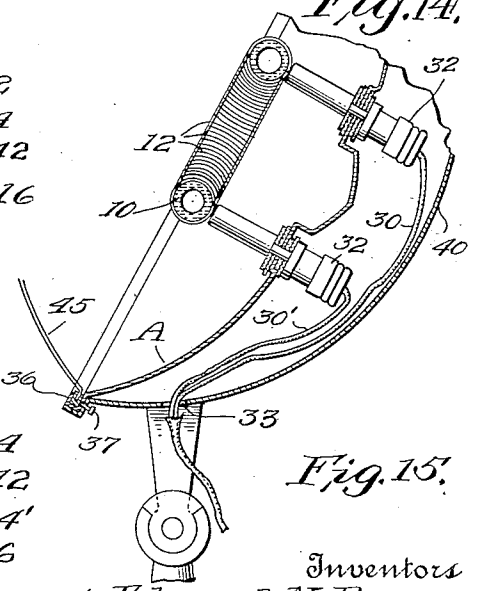


Fig. 15.

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UNITED STATES PATENT OFFICE.

EDMUND N. BROWN AND MILTON H. SHOENBERG, OF SAN FRANCISCO, CALIFORNIA, ASSIGNORS TO MAJESTIC ELECTRIC DEVELOPMENT COMPANY, OF SAN FRANCISCO, CALIFORNIA, A CORPORATION OF CALIFORNIA.

ELECTRIC HEATER.

1,398,217. Specification of Letters Patent. Patented Nov. 22, 1921.

Application filed October 2, 1919, Serial No. 327,880. Renewed October 18, 1921. Serial No. 508,611.

To all whom it may concern:

Be it known that we, EDMUND N. BROWN and MILTON H. SHOENBERG, citizens of the United States, residing at San Francisco, in the county of San Francisco and State of California, have invented certain new and useful Improvements in Electric Heaters, of which the following is a specification.

Our invention relates to electric heaters of the reflector type and having reflecting surfaces of parabolic contour, with the heating element centered about the focus of the reflecting surface so that the heat rays will be projected outwardly in substantially parallel lines, as pointed out in Patent No. 1,255,814.

The object of our invention is to increase the efficiency of heaters of this type. To this end we provide a reflector comprising two or more parabolic surfaces and an annular or ring form heating element having its outer portion coöperating with the outer surface of revolution generated by revolving one parabolic curve and its inner portion coöperating with a surface of revolution generated by the revolution of another parabolic curve.

Our invention will be understood from the following description in connection with the accompanying drawings in which Figure 1 is a vertical sectional view of an electric heater embodying our invention; Fig. 2 is a cross-sectional view on the line 2—2 of Fig. 1; Fig. 3 is an enlarged sectional view on the line 3—3 of Fig. 1; Fig. 4 is an enlarged fragmentary view of the hinge joint in the standard or support; Fig. 5, is a front elevation of the reflector; Fig. 6 is an enlarged fragmentary view, partly in section, of the heating element or unit shown in Fig. 5; Fig. 7 is a diagrammatic view of the heating coils or resistance wire in the heating element of Fig. 5; Fig. 8 is a cross section on the line 8—8 of Fig. 6; Fig. 9 is a diagrammatic view showing the relation of the curvature of the different parts of the reflector; Fig. 10 illustrates different cross sectional shapes which may be employed in the muffles of the heating units; Fig. 11 is a plan view of another form of heating unit; Fig. 12 is a cross-sectional view on the line 12—12 of Fig. 11; Fig. 13 is a plan view of one of the halves of another form of heating unit; Fig. 14 is a cross sectional view on the line 14—14 of Fig. 13; Fig. 15 is a fragmentary vertical sectional view of a modified form of our heater; and Fig. 16 is a fragmentary view showing the overlapping ends of the retaining band attached to the outer ends of the guard wires.

The reflector comprises an outer portion A, formed as a surface of revolution by revolving a parabolic arc *a*—*b*, about the axis *c*—*d*, see Fig. 9; and an inner concave portion *b o e*, formed by revolving a parabolic arc *bo*, about the axis *c*—*d*, the reflector being thus formed of two parabolic surfaces of revolution and may be said to constitute a compound parabolic surface.

The heating unit 5, is of annular or ring form and is so located that its outer peripheral portion 5^a is centered about the focus of the outer parabolic surface, while its inner peripheral portion 5^b is centered about the focus of the inner parabolic surface, the rays from any point coöperating with the opposite or far side of the concave surface, as indicated in Fig. 9.

We have devised various forms of heating units. Figs. 6 and 8 show a circular tubular muffle 10 of porcelain or other refractory material and preferably provided with external grooves 11 to receive the resistance heating wire 12, which is coiled about it and which may be one continuous coil with two end terminals, or it may be made in two halves as indicated in Fig. 7 the adjacent meeting ends being united into opposite terminals, so that the current will traverse the two halves in parallel.

The muffle may be of various cross-sectional shapes, as indicated in Fig. 10.

In Figs. 11 and 12, we have shown a tubular muffle constructed of two circular semi-cylinders 14, 14′, which inclose the resistance coil and are secured together by bolts or rivets 15, apertures 16 being provided to permit the escape of the heat and the radiation from the coils. The interior walls of the muffle may be grooved or fluted to receive the convolutions of the resistance wire and keep them separated.

In Figs. 13 and 14, the inner surfaces of the two mating muffle sections 17, 17′ are

provided with a spiral groove in which is housed the resistance wire, which may be coiled or spirally wound to provide a great length of heating surface if desired. The entire muffle 17 becomes highly heated and radiates heat from its surface.

We have devised terminal connectors and supports for the heating unit which are illustrated in Figs. 1 and 3. The element may be secured to the support by means of the ends or terminals 12^a of the resistance wire and, if desired, an additional binding wire may surround the muffle at these points and be twisted with said terminals as a reinforcement, or other suitable fastening means may be provided. The heating element is held at opposite points against a tubular standard 20, which is internally threaded at its inner end to screw onto the threaded tubular end 23^a of the metal connector 23. Mica washers 25 and 26 are clamped against the inner and outer sides of the reflector A to insulate the connector. The terminals of the resistance heater wire 12^a pass through the standards 20 and are clamped by screws 27 within the connectors 23. A metal sleeve 28 slides with a tight fit over the outer end of the connector 23, which is split to provide a yielding plug which presses outwardly against the inner walls of the sleeve. The end of the cord conductor 30 is clamped and electrically connected to the sleeve by a screw 31. An outer sleeve 32 of porcelain or other insulating material, slides tightly over the metal sleeve and forms a protecting insulating sheath. In the arrangement shown in Fig. 1, the terminal connectors project through the outer back cover, while in Fig. 15, the connectors are inclosed by the cover and the insulated conductors 30, 30′ pass through an aperture 33 in the cover plate.

The outer margin of the reflector is bent or shaped into an annular channel form at 36, and fits into an angle recess formed in the cover plate and may be secured in place by screws 37 or in any other suitable manner. The outer cover or back member 40, consists of sheet metal of concavo-convex shape, spaced from the reflector to provide a heat insulation. It may terminate in an angular margin fitting about the rim of the reflector, as shown in Fig. 15, or may be provided with a marginal flange 41, having a channel shape rim 42, as in Fig. 1.

The wire guard or cage 45, has a spring metal marginal band 47, having separated ends 47^a, 47^b which overlap when the band is contracted for the purpose of inserting within the channel groove 36 or 42, the inner end 42^b being formed into an eye or knob to facilitate removal, as shown in Fig. 16.

While we have illustrated the reflector herein described in connection with heaters mounted on a pedestal, it will be understood that the reflector may be used in heaters of other types such as grates and logs. It will also be evident to engineers that various structural changes and modifications may be made without departing from our invention.

We claim:—

1. A heater, comprising a reflector of concave form, the central portion being a surface of revolution of one curvature and the outer surrounding portion being a surface of revolution of a different curvature, and a heating element substantially centered about the focus of said outer portion.

2. A heater, comprising a reflector of concave form, the central portion being a surface of revolution of one curvature and the outer surrounding portion being a surface of revolution of a different curvature, and an annular heating element substantially centered about the foci of the inner and the outer portions.

3. A heater, comprising a reflector of concave form having central and outer portions being surfaces of revolution generated by curves of different curvature and each substantially parabolic in section, and an annular heating element substantially centered about the foci of said inner and outer portions.

4. A heater, comprising a reflector of concave form having central and outer portions being surfaces of revolution generated by curves of different curvature and each substantially parabolic in section, and an annular heating element substantially centered about the foci of said inner and outer portions and supported over the junction of the two curved portions.

5. A heater, comprising a reflector of concave form having central and outer portions of different curvature, each being a surface of revolution formed by the rotation of a section of a parabola, said parabola sections being of different curvature and an annular heating element centered substantially about the foci of said parabolic surfaces so that the heat rays from the outer lower portion of the heating element will be reflected by the outer reflecting portion and the heat rays from the inner lower portion of said element will be reflected from the central reflecting portion and both said reflected heat rays being projected outwardly in substantially parallel lines.

6. A heater as set forth in claim 1, and an outer casing or back member spaced from the reflector and having an annular marginal portion provided with an annular recess forming a seat to receive the rim of the reflector.

7. A heater as set forth in claim 1, and an outer casing or back member spaced from the reflector and having an annular marginal portion provided with an annular

recess forming a seat to receive the rim of the reflector, said marginal portion being formed with a channel shaped rim, and a wire guard or cage having a marginal band adapted to seat in said channel shaped rim.

8. A heating element for electric heaters, comprising an annular refractory muffle having complementary sections adapted to support a resistance wire and maintain its parts in the desired configuration or shape.

In testimony whereof we affix our signatures.

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MILTON H. SHOENBERG.