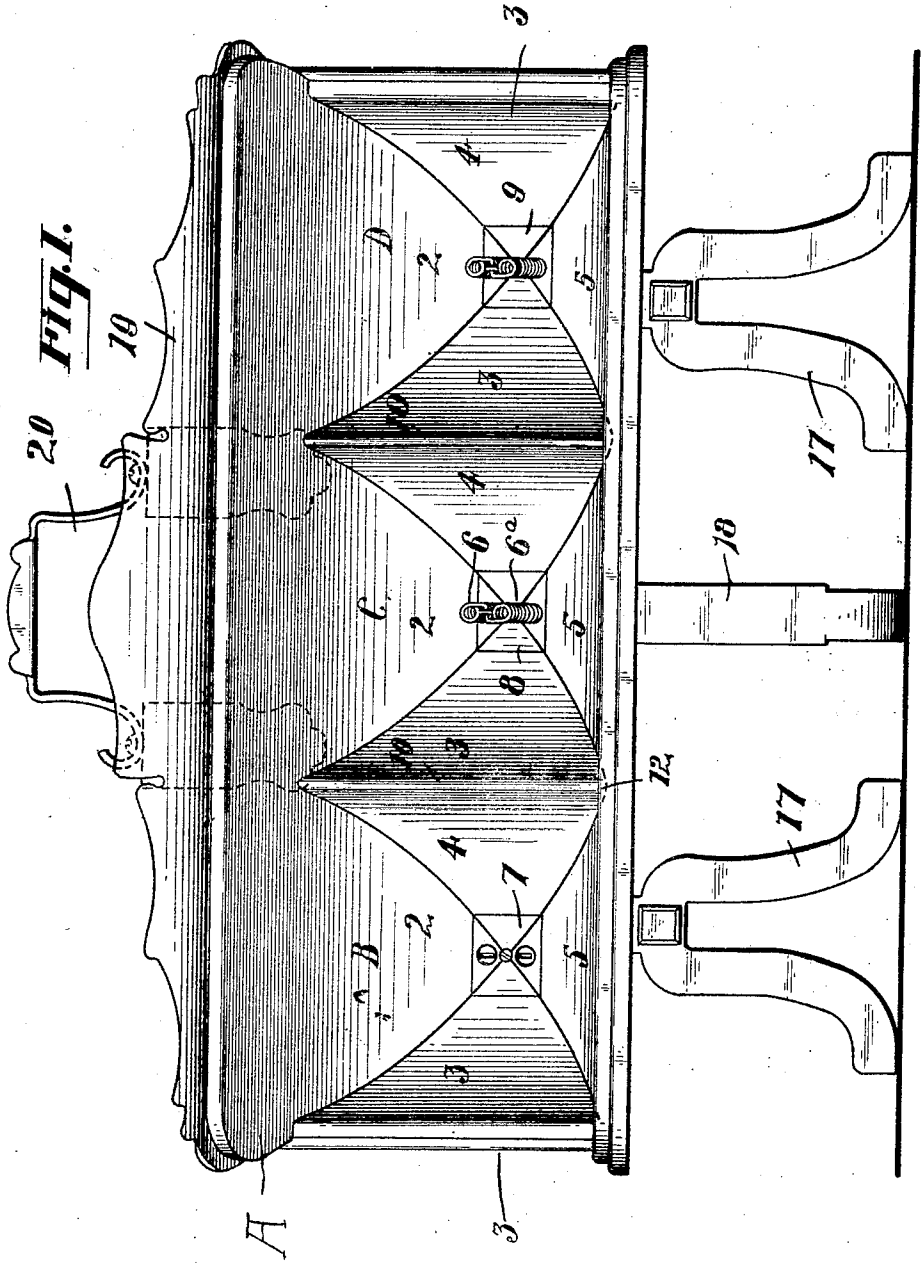
April 6, 1926. **1,579,402**

J. SCHOENFELD

ELECTRIC HEATER

Filed July 2, 1923 4 Sheets-Sheet 1

Fig. 1.



INVENTOR
JOSEPH SCHOENFELD
BY Dewey, Strong, Jaenund & Lofting
ATTORNEYS

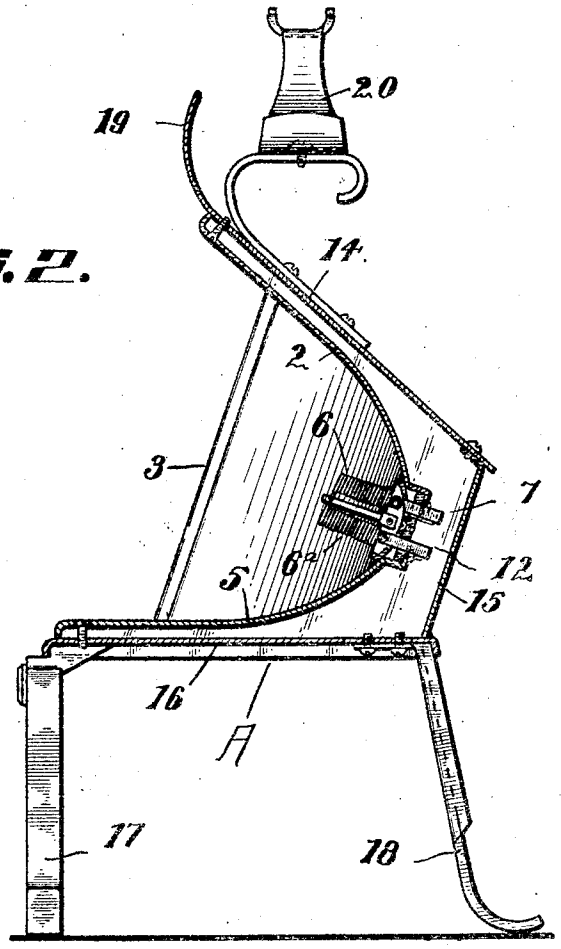
April 6, 1926. 1,579,402

J. SCHOENFELD

ELECTRIC HEATER

Filed July 2, 1923 4 Sheets-Sheet 2

Fig. 2.



INVENTOR.
JOSEPH SCHOENFELD.
BY
Dewey, Strong,
Townsend & Loftus.
ATTORNEYS.

April 6, 1926. 1,579,402

J. SCHOENFELD

ELECTRIC HEATER

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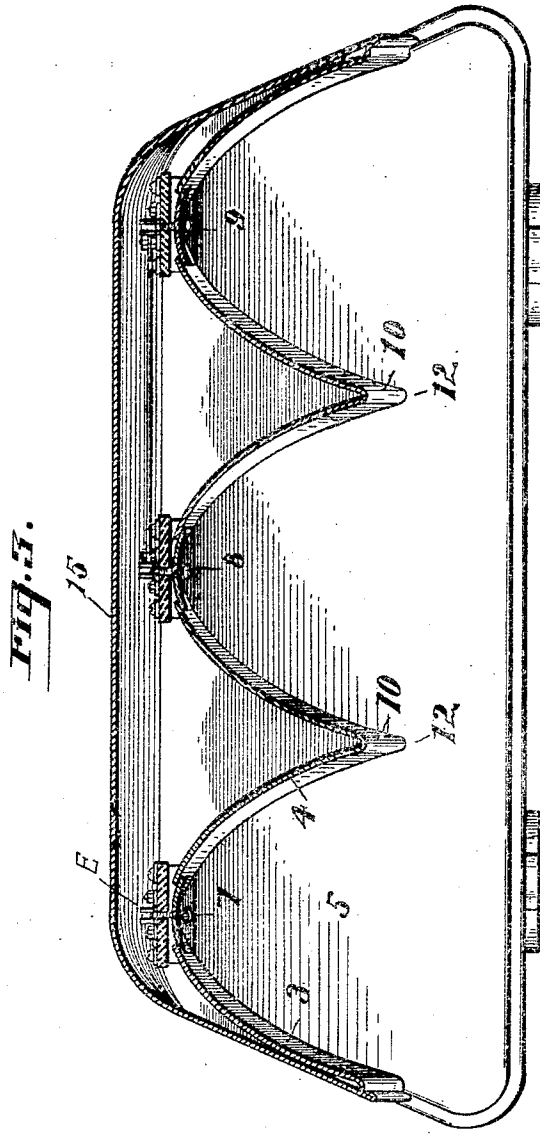


Fig. 3.

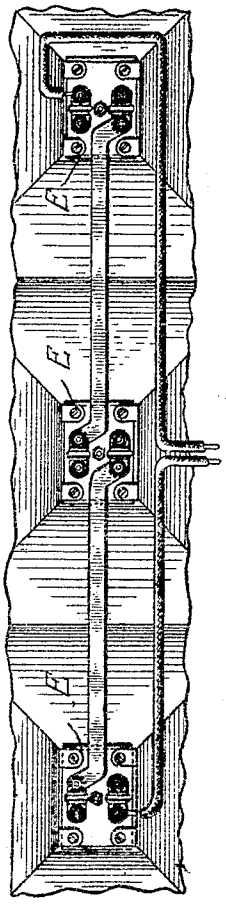


Fig. 4.

INVENTOR
JOSEPH SCHOENFELD.
BY Lewey Strong
Townsend & Lettis
ATTORNEYS

April 6, 1926. 1,579,402

J. SCHOENFELD

ELECTRIC HEATER

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Fig. 6.

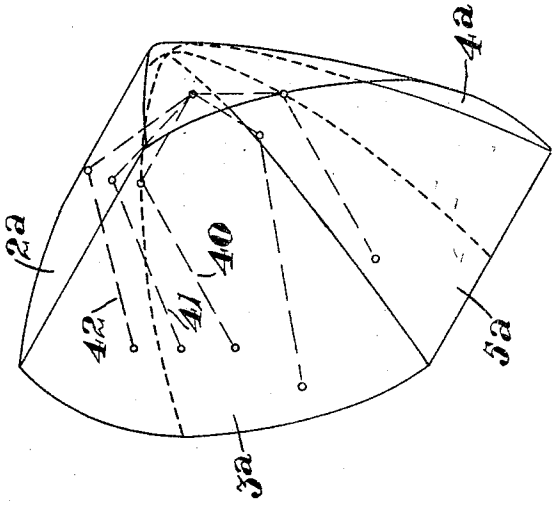
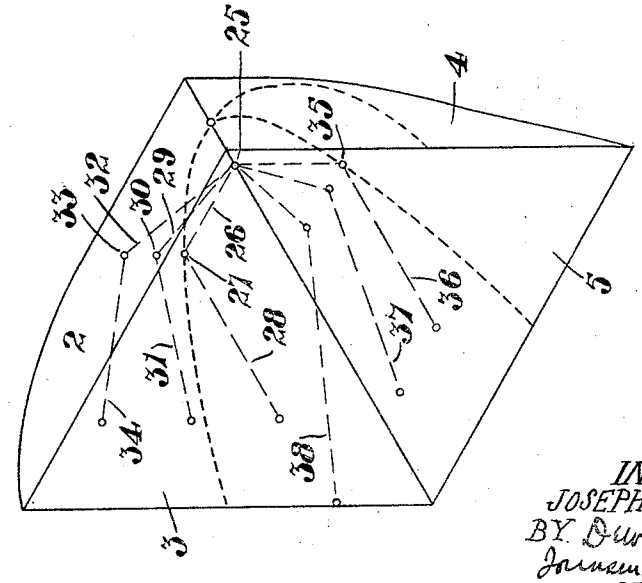


Fig. 5.



INVENTOR
JOSEPH SCHOENFELD
BY Dewey, Strong, Jaenicke & Loftus
ATTORNEYS.

Patented Apr. 6, 1926. 1,579,402

UNITED STATES PATENT OFFICE.

JOSEPH SCHOENFELD, OF ALAMEDA, CALIFORNIA, ASSIGNOR TO THE MAGNAVOX CO., OF SAN FRANCISCO, CALIFORNIA, A CORPORATION OF ARIZONA.

ELECTRIC HEATER.

Application filed July 2, 1923. Serial No. 649,007.

To all whom it may concern:

Be it known that I, JOSEPH SCHOENFELD, a citizen of the United States, residing at Alameda, county of Alameda, and State of California, have invented new and useful Improvements in Electric Heaters, of which the following is a specification.

This invention relates to an electric heater and especially to that type in which the heat generated is projected in the form of reflected heat and light rays.

Under the rules of the National Board of Fire Underwriters, it is not permissible to connect an electric heater to an ordinary lamp socket circuit when the current consumption is in excess of 660 watts per hour. Heaters which consume current in excess of 660 watts per hour require special installations or, in other words, heavier wiring to transmit the required load. It may also be stated that the electric power companies do not grant any special current rates except where the total consumption is at least 2 kilowatts per hour. It can, therefore, be seen from the above that electric heaters which consume wattages in excess of 660 watts and less than 2 kilowatts per hour are not so desirable; first, because they require a special wiring or installation and, secondly, they do not get the benefit of the low rate except where it has already been granted due to the installation of other equipment consuming 2 kilowatts or more per hour. In this case a 660 watt burner would also receive the rate. The 660 watt heater is at the present time the most popular type of heater as it requires no special installation and burns such a small amount of current that its operating cost is not excessive. This type of heater has certain objections however, first of all, a large heating element must be employed; secondly, a support of one character or another must be used as the coil would otherwise sag and become displaced. Such supports are objectionable as considerable heat is lost by conduction. Such supports are also objectionable as they screen out or interfere with the projected heat and light rays. Third, an unsupported coil is also objectionable as it is difficult to position it within the limits of the focal point of a reflector, particularly where a parabolic type of reflector is employed; this condition being further aggravated if sagging or distortion of the coil takes place; fourth, reflectors of considerable size and depth must be employed in connection with a large heating element as the amount of heat and light rays projected would otherwise be fairly small, in fact the size of the heater usually becomes so large that it is cumbersome to move from place to place; and fifth, another objection to most reflector heaters and particularly to that type employing a parabolic reflector is that the heat and light rays are entirely too concentrated. A comparatively small area is thus heated and no beneficial result is obtained. The purpose of the present invention is to construct an electric heater of the reflector type which is capable of being operated by a small load, for instance, with a current consumption not in excess of 660 watts. I accomplish this result by connecting two or more small heating units in series, the several coils when operated in unison not to consume current in excess of 660 watts. By doing this, supports for the individual heating coils can be eliminated as their size is such that sagging or distortion due to heat is prevented; loss of heat by conduction is reduced, and more heat and light rays are liberated as they are not screened out or interfered with by any support. I furthermore eliminate the use of a single large reflector by employing a series of small reflectors, one reflector for each heating element. These reflectors, however, present a large area when comparison is made with the small elements and a greater amount of heat and light rays are thus intercepted and projected. I furthermore provide a type of parabolic reflector which avoids excessive concentration of the projected heat and light rays and as this is the case a greater spread is obtained and a larger area is heated; this area being increased in proportion to the number of reflectors employed. Other objects and advantages will hereinafter appear.

One form which my invention may as-

sume is exemplified in the following description and il ustrated in the accompanying drawings, in which—

Fig. 1 is a front view of a multiple unit heater.

Fig. 2 is a central vertical cross section of the same.

Fig. 3 is a longitudinal plan section taken on line 3—3, Fig. 1.

Fig. 4 is a detail view showing the manner in which a series circuit is formed through the several heating units.

Fig. 5 is a perspective view of one form of reflector employed.

Fig. 6 is a perspective view of another form of reflector employed.

Referring to the drawings in detail, and particularly to Figs. 1, 2 and 3, A indicates in general an electric heater which in this instance is divided into three units generally indicated at B, C and D. Each unit consists of a series of parabolic reflectors such as indicated at 2, 3, 4 and 5, and each unit is provided with one or more electric heating elements such as indicated at 6 and 6ª, the heating elements in each unit being connected in series with a power circuit as will hereinafter be described. The reflectors shown at 2 and 5 extend from end to end of the heater and are in reality formed from one continuous sheet of metal, the inner surface of which is polished to produce the best reflecting qualities possible. This sheet of metal forms an elongated trough-shaped reflector which is parabolic in cross-section; that is, any vertical section taken through the reflector at any point intermediate its respective ends will present a parbolic curve as shown in Fig. 2.

The continuous reflector just described is perforated at three points such as indicated at 7, 8 and 9 to receive switch plugs such as generally indicated at E. These plugs serve the function of closing the circuit through the heating elements 6 and 6ª and they also perform the function of closing and breaking the circuits through the elements as will hereinafter be described.

The reflectors shown at 3 and 4 are also made from a continuous sheet which is bent on the line indicated at 10 to form a parabolic curve on each side of the line; that is, the reflectors 3 and 4 if cut on a horizontal line at any point intermediate the upper and lower ends indicated at 11 and 12 will present a parabolic curve. The end reflectors indicated at 3 and 4 are not formed of a continuous sheet but they are, nevertheless, parabolic in form if a horizontal section is taken at any point intermediate the upper and lower end thereof. All of the parabolic sections indicated at 3 and 4 terminate at a point adjacent the heating elements 6 and 6ª and it can therefore be seen that the reflectors shown at 2, 3, 4 and 5, at one end cooperate with the heating elements indicated at 9; that the reflectors shown at 2, 3, 4 and 5, and centrally arranged, cooperate with the heating elements indicated at 8, and that the reflectors shown at 2, 3, 4 and 5, at the opposite end cooperate with the heating elements indicated at 7; that is, the interposition of the reflectors 3 and 4 in groups as shown divides the main elongated trough-shaped reflector into a series of units, said units cooperating with their respective heating elements. The main elongated reflector presented by the several faces indicated at 2 and 5 is supported in an exterior housing indicated by an upper section 14, an end section 15, and a bottom section 16, these sections being suitably bolted or otherwise secured with relation to each other and being provided with supporting legs as indicated at 17 and 18. The upper metal section of the housing is slightly curved in front and the peripheral edge is cut to form an ornamental effect as indicated at 19. This upper section is also provided with a handle 20 so that the heater may be readily carried from place to place.

It should be remembered that the present heater is designed with the object in view of using a load not in excess of 660 watts per hour. It is also designed with the object in view of permitting the use of heating elements which are so small that supporting cores or the like may be eliminated, thereby reducing conduction losses and furthermore permitting projecting and radiation of a greater number of heat and light rays. It is furthermore constructed with the object in view of permitting a greater reflection efficiency and also with the object in view of permitting the heat and light rays to be projected over a greater area. These several objects may be explained in detail as follows:

By dividing the load of 660 watts by passing it through three sets of heating elements, it is obvious that these elements may be materially reduced in size; that is, the coils forming the elements become fairly small and as such eliminate the tendency of sagging and distortion when subjected to high temperatures. The small elements furthermore permit closer positioning with relation to the focal center of the reflectors and they also permit liberation of a greater number of heat and light rays as no cores or supports are required; conduction losses being at the same time eliminated to a great degree. By employing small heating elements it is obvious that reflectors which are comparatively deep and large may be employed and as this is the case a greater number of heat and light rays may be intercepted and projected.

Another important feature of the present invention is the provision of a series of reflectors constructed and arranged as here described; that is, a plurality of flat faced reflectors are employed in connection with each unit. These flat faced reflectors however present a parabolic curve when a section is taken through their longitudinal axis. Such reflectors produce a concentrating action but they at the same time permit slight spreading of the projected light and heat rays. This is best illustrated in the perspective view of one of the reflectors shown in Fig. 5. In this figure we will suppose that the point indicated at 25 represents the focal center of the reflector. A heat or light ray projected along the line indicated at 26 and striking the reflector 3 at the point shown at 27 is projected forwardly along the line indicated at 28. A heat or light ray projected from the focal center along the line shown at 29 strikes the reflector 3 at the point 30 and is then projected forwardly along the line 31. Similarly, a heat or light ray projected from the focal center along the line 32 and striking the reflector 3 at the point 33 is projected along the line indicated at 34. In other words, all rays striking the reflector 3 above or below the horizontal line indicated at 26 and 28 are slightly deflected and a certain amount of spreading thus takes place and a fairly large area is affected by the heat and light rays. Rays projected on a vertical line from the focal center and striking the reflector 5 at the point indicated at 35 are projected forwardly and horizontally along the line indicated at 36, but any rays which strike the reflector 5 on either side thereof will be slightly deflected as indicated by the lines indicated at 37 and 38. All the reflectors act in a similar manner and it can therefore be seen that, even though the major portion of the rays is deflected, that this deflection is controlled and practically any deflection or concentration may be obtained. Where it is desired to decrease the amount of deflection, it is only necessary to slightly curve the side reflectors indicated at 3 and 4. This is perhaps best illustrated in Fig. 6, this figure illustrating a modified form. In this instance the upper and lower reflectors indicated at 2^a and 5^a are identical to those shown at 2 and 5 in Figs. 1 and 2, but the side reflectors indicated at 3^a and 4^a are slightly curved so as to decrease the deflection of the rays. The amount of decrease in deflection is represented by the lines indicated at 40, 41 and 42. These lines do not diverge with relation to each other to as great an extent as the lines indicated at 28, 31 and 34 as shown in Fig. 5; this being due to the fact that the side reflectors 3^a and 4^a are slightly curved. From this it can be seen that practically any degree of concentration or deflection desired may be obtained and the area heated may thus be increased or decreased as desired.

Another important feature of the present invention is the provision of switch plugs which permit ready removal of the heating elements so as to permit cleaning or polishing of the reflectors. It is well known that the efficiency of a reflector heater depends upon the condition of the reflectors; that is, the reflectors are readily tarnished at points adjacent the heating elements due to the excessive heat at these points and as the tarnished condition becomes worse and worse as time passes, it is obvious that the reflecting efficiency of the heater will become materially reduced unless the reflectors are cleaned from time to time. In the present instance this is readily accomplished as the switch plugs support the heating elements and may be readily removed. The switch plugs are furthermore connected in series as shown in Fig. 4 and this is of further importance as the removal of one heating element breaks the circuit through the heater, thus preventing accidental transmission of shock or otherwise to the person cleaning the heater. The combined switch plug and heating element support here shown forms the subject matter of a copending application entitled, "Combination switch plug and heating element support", filed July 2, 1923, Serial No. 649,008, and it is for this reason that a detail description thereof is thought unnecessary.

While certain features of the present invention are more or less specifically illustrated, I wish it understood that various changes in form and proportion may be resorted to within the scope of the appended claims. I similarly wish it understood that the materials and finish of the several parts employed may be such as the experience and judgment of the manufacturer may dictate or various uses may demand.

Having thus described my invention, what I claim and desire to secure by Letters Patent is—

1. In a heater of the character described, a parabolic reflector comprising a plurality of flat sections, the central longitudinal axis of each section presenting a parabolic curve.

2. In a heater of the character described a parabolic reflector comprising a plurality of flat sections, any longitudinal section of said reflectors presenting a parabolic curve.

3. In a heater of the character described an elongated trough-shaped reflector, said reflector being parabolic in cross-section at any point throughout its length, and a plurality of reflectors disposed intermediate the ends of said reflector.

4. In a heater of the character described

an elongated trough-shaped reflector, said reflector being parabolic in cross-section at any point throughout its length, and a plurality of reflectors disposed intermediate the ends of said reflector, said intermediate reflectors being parabolic on a line drawn through their longitudinal axis.

5. In a heater of the character described an elongated trough-shaped reflector, said reflector being parabolic in cross-section at any point throughout its length, and a plurality of reflectors disposed intermediate the ends of said reflector, said intermediate reflectors being parabolic in cross-section on a line drawn through the longitudinal axis of the elongated reflector.

6. In a heater of the character described an elongated trough-shaped reflector, said reflector being parabolic in cross-section at any point throughout its length, a plurality of reflectors disposed intermediate the ends of said reflector, said intermediate reflectors being parabolic in cross-section on a line drawn through the longitudinal axis of the elongated reflector, and a heating element disposed between each set of interposed reflectors.

7. In a heater of the character described an elongated trough-shaped reflector, said reflector being parabolic in cross-section at any point throughout its length, and a plurality of reflectors disposed intermediate the ends of said reflector, said intermediate reflectors being parabolic in cross-section on a line drawn through the longitudinal axis of the elongated reflector, said intermediate reflectors being disposed in pairs and having a common focal center with the first named reflector, and a heating element disposed between each pair of interposed reflectors and disposed in the focal center of said reflectors and the first named reflector.

8. In a heater of the character described, a reflector divided into a plurality of coprating reflecting faces, and a heating element disposed between said faces.

9. In a heater of the character described, a reflector divided into a plurality of cooperating reflecting faces, and a heating element disposed between said faces and adjacent one end of the same.

10. In a heater of the character described, a reflector divided into a plurality of cooperating reflecting faces, said faces being disposed on an incline and converging toward a common point, and a heating element disposed between the converging faces adjacent said point.

11. In a heater of the character described, a single reflector comprising a plurality of reflecting surfaces, said surfaces being curved longitudinally to coincide with a parabolic curve.

12. In a heater of the character described, a single reflector comprising a purality of reflecting surfaces, said surfaces being curved longitudinally to coincide with a parabolic curve, and each of said reflectors having a common focal center.

13. In a heater of the character described, a reflector comprising a plurality of reflecting surfaces, said surfaces being curved longitudinally to coincide with a parabolic curve, said surfaces being plain at right-angles to the curve.

14. In a heater of the character described, a single reflector comprising a plurality of adjacent sections, each section being curved to a parabolic shape, and a heating element disposed between the reflector sections and substantially at the focal center of all of said sections.

15. In a heater of the character described, a single reflector comprising a plurality of reflector sections, each section being plain in one direction and curved in a relatively right-angular direction, the curved faces of the sections extending inwardly toward a common point, and a heating element disposed adjacent said point.

16. In a heater of the character described, a single reflector comprising a plurality of reflecting sections, each section being plain in a transverse direction and curved to the shape of a parabola in a relatively longitudinal direction, said parabolic curved faces having a common focal center.

17. In a heater of the character described, an elongated trough-shaped reflector, said reflector being parabolic in cross-section, a pair of parabolically curved reflectors disposed respectively at the ends of the trough, and a heating element disposed between the several reflectors and substantially at a focal center common to the several reflectors.

18. In a multiple heater of the character described, an elongated trough-shaped reflector, said reflector being parabolic in cross-section, a pair of curved reflectors disposed respectively at the ends of the trough, a plurality of interspaced curved reflectors disposed transversely of the trough in a manner to form a plurality of reflector heating units, and a heating element disposed within each of said units.

19. In a multiple heater of the character described, an elongated trough-shaped reflector, said reflector being parabolic in cross-section, a plurality of parabolically curved reflectors disposed transversely of the trough and interspaced with relation to each other in a manner to form a plurality of reflector heating units, said transversely disposed, parabolically curved reflectors having a focal center common with the trough, and a heating element disposed within each unit substantially at the focal center of the surrounding reflectors.

20. In a multiple heater of the character described, an elongated trough-shaped re-

flector, said reflector being parabolic in cross-section, a pair of curved reflectors disposed one at each end of the trough, a pair of curved reflectors disposed within the trough intermediate the ends thereof, the said pair of reflectors being formed of a single piece of metal bent upon itself along a central line therethrough, and a heating unit disposed between each end reflector and said intermediate reflectors.

21. In a heater of the character described, a reflector consisting of four parabolic sections which join each other on angles of 90° and all having a common focal center, and a heating element disposed in the focal center.

JOSEPH SCHOENFELD.