Feb. 14, 1933. G. DIETZ 1,897,364

SPOTLIGHT

Filed Feb. 10, 1930

Fig. 2.

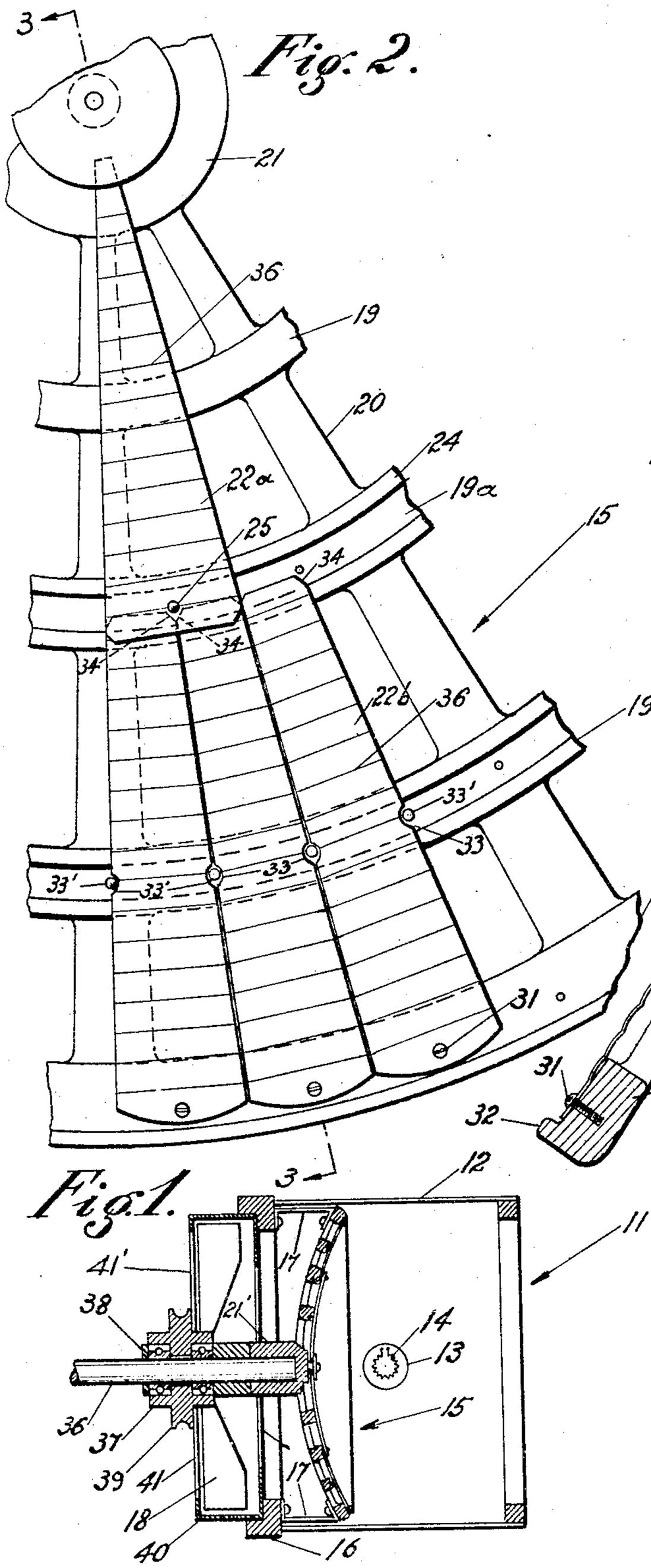
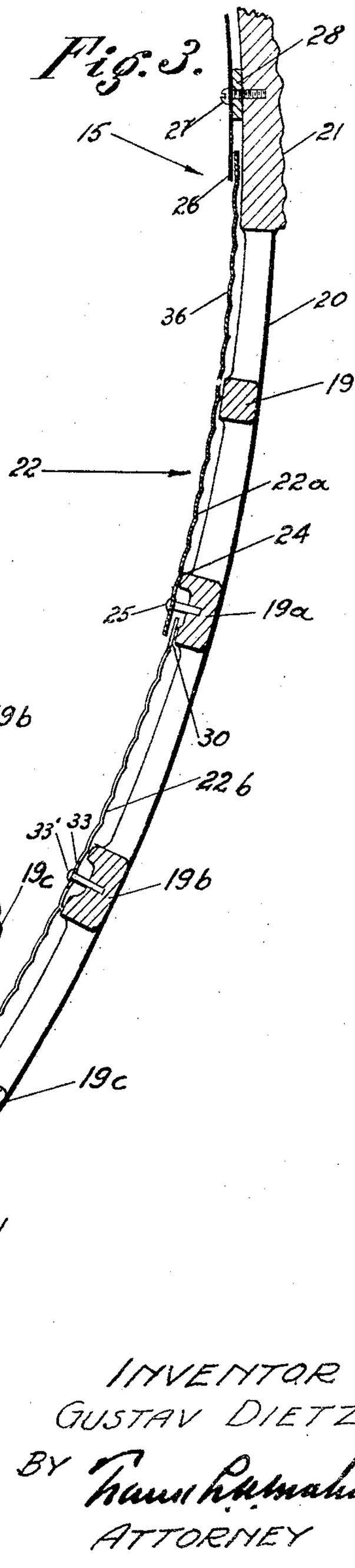


Fig. 1.

Fig. 3.



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Patented Feb. 14, 1933

1,897,364

UNITED STATES PATENT OFFICE

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SPOTLIGHT

Application filed February 10, 1930. Serial No. 427,187.

This invention has to do with spot lights, or spot lamps, such as are ordinarily used in the illumination of sets in motion picture photography, and is more particularly related to reflectors, such as are used in spot lights of this character, having as its primary object the production of such a reflector, wherein the reflecting surface is composed of metal and is of a character such that it does not affect the light beam during its expansion or contraction with changing temperatures.

It is well known to those familiar with the art, that the usual type of spot light embodying either an incandescent lamp or an arc associated with a lens or merely with a reflector, if brought to a perfect focus, projects an image of the filament or the arc upon the focal plane. Such images are very undesirable in photographic work and for this reason the light source is usually positioned "out of focus" to destroy the image of the filament. By arranging the light source in this manner, the beam projected by the reflector contains a series of dark spots or light and dark rings which produce shadows and make the proper illumination of the set and the actors thereon extremely difficult.

The type of reflector ordinarily used in lamps of this character is a properly shaped silvered glass mirror, since the high temperatures encountered in lamps of this character will cause warpage in the ordinary metal reflectors, making them impractical for this use. It is an important object of this invention to produce a metal reflector which is so constructed that it may be subjected to any temperature without warping and consequently destroying the effectiveness of the light beam. This object is accomplished by making the reflecting surface as a series of angular plate segments mounted upon a suitable frame or support, each of the segments being secured at one end only so that the unsecured end may move back and forth with the expansion of the metal, thereby maintaining the same curvature in the plate under all temperature conditions.

It is a further object of this invention to produce a reflector, of the class described, which is designed so as to break up the light beam and prevent the formation of an image of the filament regardless of the position of the light source with respect to the reflector. This is accomplished by knurling the reflecting plates or segments mentioned above so that they may be considered as consisting of a plurality of flat, or substantially flat, reflecting surfaces. I prefer to make these surfaces of a uniform width which is less than the width of the lamp filament. This construction breaks up the image of the lamp filament, and prevents the formation of light and dark rings. In the use of a reflector of the type contemplated by this invention, it will be seen, therefore, that a uniformly distributed beam of light is produced which may be softened without showing light and dark rings or may be brought to a focus without showing an image of the filament in the focal plane.

The general construction of the reflector, contemplated by this invention, consists of a metal support or frame, preferably made in the form of a cage-like dome which consists of a plurality of concentric ring members connected by radial arms. The reflecting plates mentioned above are attached to the ring members by means of pins or small screws, and I prefer to arrange these plates so that they are not in tight engagement with each other. This construction permits expansion of the plates and also facilitates the ventilation of the lamp.

With regard to the ventilation of the lamp, I consider it a further object of this invention to produce a reflector of the class described which is provided with ventilating means preferably designed to draw air from within the enclosing drum, or body of the lamp, through the passages between the reflecting plates and to exhaust the same behind the reflector. This not only cools the reflector, maintaining a uniform and bright reflecting surface, but it also decreases the temperature of the region in front of the lamp.

Details in the construction of a preferred form of my invention, together with other objects attending its production, will be best understood from the following description

of the accompanying drawing, which are chosen for illustrative purposes only and in which

Fig. 1 is a plan section taken through a spot light, of the class described, which is equipped with a preferred embodiment of my invention,

Fig. 2 is a partial elevational view with parts broken away showing the details in the construction of a preferred form of reflector contemplated by this invention, and

Fig. 3 is an enlarged sectional elevation which may be considered as having been taken in the plane represented by the line 3—3 in Fig. 2.

More particularly describing the invention as herein illustrated, reference numeral 11 indicates a lamp of the class described which consists of an enclosing drum or housing 12 and a reflector 15; the housing containing a light source, shown as comprising an incandescent lamp 13 which has a filament 14. The rear portion of the housing 12 is shown as having mounted thereon, or formed integrally therewith, an annular reflector supporting flange 16 which supports the reflector through the medium of a plurality of brackets generally indicated by reference numeral 17. Reference numeral 18 indicates a ventilating fan which will be hereinafter more fully described.

The reflector 15 is shown as embodying a cage-like dome and is made up of a plurality of concentric supporting rings 19, 19^a, 19^b, and 19^c, connected by means of a plurality of radial arms 20. This frame or support is preferably made as an aluminum casting and the arms 20 are all connected at their mid-point with a hub member 21, their outer ends being connected to the outer ring 19^c. The support may be described as being formed into zones, the hub 21 and rings 19 and 19^a comprising one zone while the rings 19^a, 19^b and 19^c comprise another zone. The reflecting surface, generally indicated by reference numeral 22, consists of a pair of corresponding reflecting zones each formed by a plurality of metal reflecting plates 22^a and 22^b respectively. These plates are made in the form of angular segments, which are secured at one end only upon the frame member by means of pins or screws.

It will be noted, in Fig. 3, that the ring member 19^a is provided with an inwardly projecting shoulder 24 against which the outer ends of the reflecting segments 22^a are held in pressure engagement by means of small pins or screws indicated by reference numeral 25. The inner ends of the segments 22^a are held against outward movement by means of a plate or disk 26, which is retained upon the hub member 21 by means of a screw 27, and is spaced a slight distance away from the hub member by means of the washer 28. The space provided between the disk 27 and the inner surface of the hub 21 permits the free longitudinal expansion of the segments 22^a. The ring member 19 provides a supporting surface which, during the expansion of the segments 22^a, provides a support for the mid-section of such segments, maintaining thereby a uniform reflecting surface throughout the entire area or zone formed by the segments 22^a. It will be noted that the outer ends of the members 22^a extend a slight distance beyond the pins 25, and the shoulder 24 holds these end portions slightly above a ledge or shoulder 30 formed on the outer periphery of the ring member 19^a, so as to leave a space between the segments 22^a and the ring member 19^a, such space being adapted to receive the inner end portions of the segments 22^b. The space mentioned above is sufficient to permit the free longitudinal movement of the ends of the segments 22^b, and the outer ends of these segments are secured to the frame or support by means of screws or pins 31, which are positioned in the outer ring member 19^c. The outer ring member 19^c is provided with a ledge or shoulder 32, which is engaged by the segments 22^b, and is adapted to assist in holding the segments in position while the reflector is being assembled.

In order that the segments may be guided during their longitudinal expansion, I provide the outer segments 22^b at their mid-portions with elongated notches 33, such notches being adapted to receive pins 33′, which are driven or otherwise secured in the ring members 19^b. It will be noted, from Fig. 2, that the inner end portions of the segments 22^b are of a width such that the inner ends of two of these segments are positioned beneath the outer end of one of the segments 22^a. It will also be noted that the inner end portions of the segments 22^b are cut away, as indicated by reference numeral 34, so that the cut-away portions of two adjacent segments are opposite the securing pins 25, which hold the outer ends of the inner segments 22^a to the support. This construction permits the free longitudinal expansion of the outer segments 22^b without interference from the securing pins 25.

It will be observed from the construction so far described, that the reflecting segments 22^a and 22^b are of a floating nature; in other words, these segments are secured at only one end, and are free to move longitudinally during their natural expansion or contraction with the changing temperature; during such movement there is no warpage or distortion in the reflecting surface. This construction, therefore, permits the manufacture of an all-metal reflector, which has a uniform reflecting surface under all temperature conditions; the plates may be easily and quickly replaced in the event they are damaged in any way; and the segments are preferably arranged so that there is a small space between adjacent seg-

ments, which permits the ventilation of the lamp by means of the fan 18, the details of the construction of which will be hereinafter more fully described.

It was previously mentioned, as one of the objects of this invention, to produce a reflector of the class described, by means of which the light beam was broken up in a manner such that the formation of a perfect image of the light filament, in the focal plane of the reflector, was prevented. This object is accomplished by knurling the reflecting plates or, more specifically, by bending or breaking the segments at right angles to their length so as to form a series of substantially flat reflecting surfaces. I have found that for the most satisfactory accomplishment of this object, it is preferable to make these reflecting surfaces of a width which is less than the width of the filament in the lamp. This serves to completely break down any images of the filament, and produces a light beam which is of uniform intensity, and does not contain the usual light and dark rings, or dark spots, obtained in the use of the ordinary type of reflector when the lamp is positioned out of focus. The breaks in the plates or reflecting segments are indicated in Figs. 2 and 3 by reference numeral 36. The illustration in Fig. 3 is slightly exaggerated to clearly illustrate this knurl or broken effect. In actual practice, the surfaces 36 are more nearly flat than they are as shown in the drawing.

The fan 18, as shown in Fig. 1, may be of any well known construction, and while I consider it preferable, especially for motion picture work, to employ an exhaust fan which will draw the heated air through the spaces between the plate segments 22^a and 22^b from the region in front of the reflector, it will be understood that a blower type of fan, in which the cool air from the region behind the reflector is blown therethrough into the drum 12, may be advantageously employed in connection with some types of lighting units such as, for example, the lights which are used for illuminating airplane landing fields. This circulation of air as mentioned above is designed primarily to cool the reflecting blades.

The type of fan shown in Fig. 1 consists of a shaft or arm 36, the inner end of which is mounted in a hollow projection 21′ formed on the hub 21 at the rear of the reflector. The fan 18 is mounted on a suitable hub 37 which is carried by a bearing 38 mounted on the bar 36. The hub 37 is provided with a pulley wheel 39 by means of which the fan may be driven from any suitable source of power not shown. A fan housing 40 is shown as being mounted in the rear flange 16 formed on the lamp drum 12, such housing being provided with front and rear openings 41 and 41′, respectively, to admit the passage of air therethrough.

It will be apparent from the above description that the lamp contemplated by this invention is of simple form and construction, and embodies a novel type of reflector, which lends itself to various uses and may be advantageously used in combination with a fan for not only cooling the region illuminated by the lamp, but also for cooling the reflector itself. It will be apparent that while I have described the reflector as being made up of two concentric sets of reflecting plate segments, that this type of construction may be employed in making reflectors of any desired size simply by using a greater number of segments, or in the event a small reflector is desired, the unit may consist of a single set of segments of any desired radius. It will also be apparent that while I have described the reflector as being mounted upon a cage-like frame support, that any well known type of support may be employed as, for example, a solid dome provided with ribs to support the reflecting plates, and if the lamp is to be ventilated, this dome may be provided with a series of apertures for admitting free circulation of air.

It is to be understood that while I have herein described and illustrated one preferred form of my invention, that the invention is not limited to the precise construction set forth above, but includes within its scope whatever changes that fairly come within the spirit of the appended claims.

I claim as my invention:

1. A reflector of the class described embodying: a hub; a plurality of curved radial arms extending outwardly from said hub; a plurality of concentric ring members secured to said radial arms and cooperating therewith to form a concave support; a plurality of metal reflecting segments radially mounted on said support with their backs engaging said concentric rings so as to form a substantially uninterrupted concave reflecting surface; and means for rigidly securing one end only of each segment to said support, the other ends of the segments being free to move along the support with expansion and contraction of the segments.

2. A reflector of the class described embodying: a support consisting of a hub, a plurality of radial arms extending outwardly from said hub, and a plurality of concentric ring members secured to said radial arms; and a reflecting member consisting of a plurality of concentric rings of metal segments radially mounted on said support and cooperating to form a substantially uniform reflecting surface; means for attaching the outer end portions only of said segments to said ring members; and means for guiding said segments during their expansion or contraction relative to said attaching means.

3. A reflector of the class described embodying: a concave support of predetermined focal length; a plurality of concentric supporting rings in said support forming a plurality of concentric reflector supporting zones therein; reflector means in each zone comprising a plurality of segments radially mounted in each zone; means for securing each segment to the outer supporting ring of the corresponding zone; and means for guiding the segments to the curvature of the concave support during their expansion or contraction.

4. A reflector of the class described embodying: a concave support of predetermined focal length; a plurality of concentric supporting rings in said support forming a plurality of concentric reflector supporting zones therein; reflector means in each zone comprising a plurality of segments radially mounted in each zone; means for securing each segment to the outer supporting ring of the corresponding zone, said zones and the segments therein being so arranged that the outer ends of the segments of an inner zone extend over the inner ends of the segments in the next adjacent outer zone; and means for guiding the segments to the curvature of the concave support during their expansion or contraction.

5. A reflector of the class described embodying: a concave support of predetermined focal length; a plurality of concentric supporting rings in said support forming a plurality of concentric reflector supporting zones therein; reflector means in each zone comprising a plurality of segments radially mounted in each zone; means for securing each segment to the outer supporting ring of the corresponding zone; and means in between the adjacent segments in one of said zones for maintaining a uniform separation between said segments and for guiding said segments to the curvature of said support.

6. A reflector of the class described embodying: a concave support of predetermined focal length, a plurality of concentric supporting rings in said support forming a plurality of concentric reflector supporting zones therein; reflector means in each zone comprising a plurality of long narrow slightly tapered segments radially mounted in each zone and means for fixedly securing each segment at its outer end only to the outer supporting ring of the corresponding zone.

7. A reflector of the class described embodying: a concave support of predetermined focal length; a plurality of concentric supporting rings in said support forming a plurality of concentric reflector supporting zones therein; reflector means in each zone comprising a plurality of segments radially mounted in each zone; means for securing each segment to the outer supporting ring of the corresponding zone, said zones and the segments therein being so arranged that the outer end of each segment of an inner zone extends over the inner ends of two segments in the next adjacent outer zone.

8. A reflector of the class described embodying: a concave support of predetermined focal length; a plurality of concentric reflector supporting zones formed in said support; and reflector means in each zone comprising a plurality of reflecting segments radially mounted in said zones, each segment being secured at one end only to the periphery of its supporting zone.

In testimony whereof, I have hereunto set my hand at Los Angeles, California, this 3rd day of February, 1930.

GUSTAV DIETZ.