Feb. 21, 1933. L. A. BEAN 1,898,167

REFLECTOR

Filed May 6, 1930

Fig. 1.

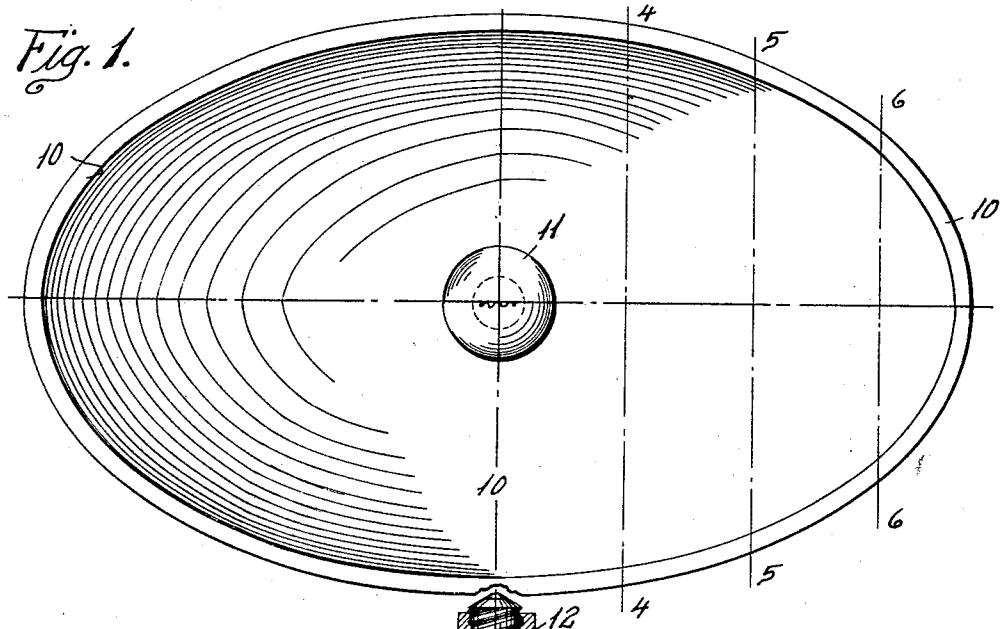


Fig. 2.

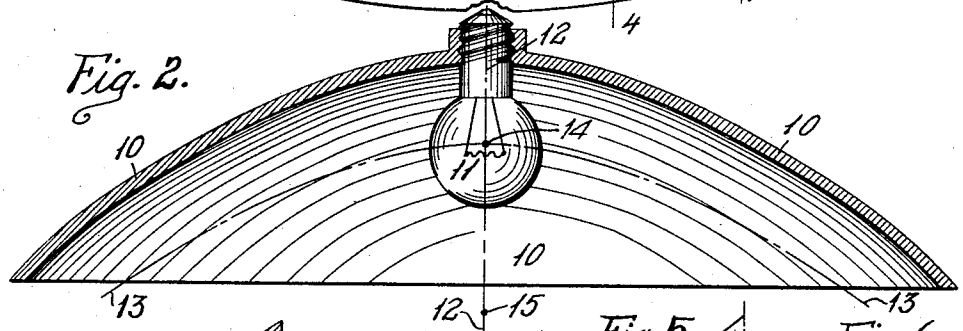


Fig. 3.

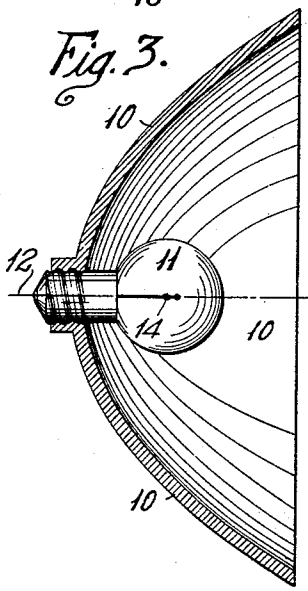


Fig. 4.

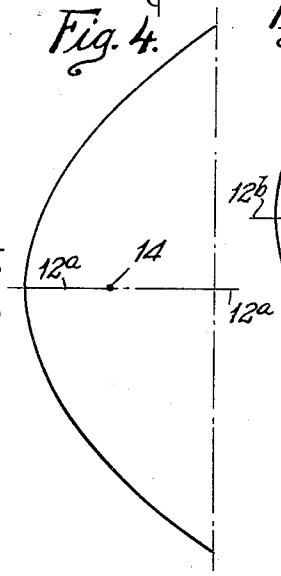


Fig. 5.

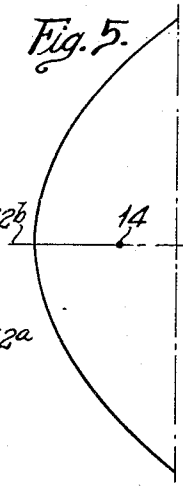
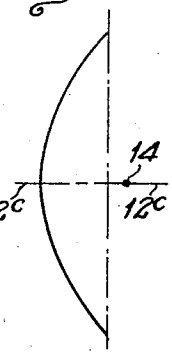


Fig. 6.



Inventor:
Louis A. Bean.
By Homer H. Sweet.
Attorney.

Patented Feb. 21, 1933 1,898,167

UNITED STATES PATENT OFFICE

LOUIS A. BEAN, OF DENVER, COLORADO, ASSIGNOR TO IVAN L. BEAN, OF DENVER, COLORADO

REFLECTOR

Application filed May 6, 1930. Serial No. 450,152.

An object of this invention is to provide an improved light reflector wherein parabolically concave reflecting surfaces of different focal lengths are arranged for successful operation as a light projector with a source of light located at any point on the reflector axis between the limits of said focal lengths.

A further object of the invention is to provide an improved light reflector operable to project a uniformly-expanding beam of light free from glare, shadows, streaks and dark spots and of substantially uniform distribution throughout a relatively wide spread.

My invention consists in the construction arrangement and combination of elements hereinafter set forth, pointed out in my claims and illustrated by the accompanying drawing, in which—

Figure 1 is a front elevation of my improved reflector. Figure 2 is a cross section through the improved reflector on the long axis of the showing of Figure 1. Figure 3 is a cross section through the improved reflector on the shorter axis of the showing of Figure 1. Figure 4 is a diagram of the contour of the reflector on the indicated line 4—4 of Figure 1. Figure 5 is a diagram of the contour of the reflector on the indicated line 5—5 of Figure 1. Figure 6 is a diagram of the contour of the reflector on the indicated line 6—6 of Figure 1.

In the construction of the improved reflector as shown, the numeral 10 designates a reflector body formed in any suitable manner of any suitable material and preferably integral. The reflector body 10 is preferably concavo-convex, but insomuch as only the concave portion of the body is employed for reflecting purposes it is immaterial what specific form the non-concave portion of the body may have, the drawing illustrating a body formed of a shell of uniform thickness and having parallel interior and exterior surfaces.

The concave or reflecting surface of the improved reflector is a combination of parabolic curves, but is not a surface of rotation about any axis, being a surface generated by moving a given lesser parabolic curve linearly along a greater parabolic curve in such manner that the axis of the lesser curve shall lie at all times in the plane of the greater curve, the vertex of the lesser curve shall lie in and follow the greater curve and the planes of the two curves shall be at all times perpendicular one with another. The surface thus formed has two planes of symmetry containing each one of the parabolic curves and perpendicularly intersecting on a line containing the axes of both of said curves, said line of intersection being the axis of the reflecting surface and intersecting the vertex of said surface at the point where the vertices of the two parabolic curves coincide. The margin of the reflecting surface generated as above described is defined by a plane perpendicular to the planes of symmetry of said surface at any desired distance from the vertex of said surface, the line of intersection of said plane with said surface being a close approximation of an ellipse but differing from a true ellipse in that its greater axis has a length in excess of that found in the corresponding mathemetically exact curve.

The generating curves of the surface above described, being parabolas, may be mathematically identified by the formula $Y^2=PX$ where the X ordinate of the maximum curves coincides with the axis of the generated surface, variations in the numerical value of P naturally affecting the degree of concavity of the reflecting surface and altering the spread of the beam projected therefrom, best results being obtained when P in the formula for the lesser parabola has a value of 3.3 and in the formula for the greater parabola a value of 10.4, which ratio between the P values of the two curves should be preserved for efficient, uniform, non-glaring light projection irrespective of the actual P value of either curve.

The reflecting surface generated as above described has as a characteristic the fact that the line of intersection of any plane parallel to one of the planes of symmetry with said surface will be a curve having the same formula as the curve lying in the parallel plane of symmetry, so that, all planes parallel to the plane containing the curve $Y^2=3.3X$ and the axis of said curve will intersect said

surface in curves having each the formula $Y^2=3.3X$, and all planes parallel to the plane containing the curve $Y^2=10.4X$ and the axis of said latter curve will intersect the surface in curves having each the formula $Y^2=10.4X$.

The coincident axes of the perpendicularly related curves above described are indicated in Figures 2 and 3 by the line 12—12, the focus 14 of the vertical curve and the focus 15 of the horizontal curve being indicated on said line in spaced relation on opposite sides of the light source; the line 13—13 of Figure 2 containing the foci of all curves lying in planes parallel to that containing the axial vertical curve. In Figures 4, 5 and 6, the axes of the curves shown are indicated by the lines 12*a*—12*a*, 12*b*—12*b* and 12*c*—12*c*; respectively, whereon the focus 14 of each curve is located.

The foci of the intersecting curves of the reflecting surface lying in the vertical and horizontal axial planes of the reflector lie in spaced relation in the axis of said surface, hence it is elementary that the source of light should lie along the same axis and between the said foci, a conventional electric bulb 11 being illustrated as supported in the vertex of the reflecting surface with its filament properly positioned on the axis of said surface, it being of course immaterial what specific supporting relation exists between the source of light and the reflecting surface so long as the actual light source lies on the axis of said surface between the foci of the generating curves. Variation in the position of the light source along the surface axis between the curve foci will vary the spread of the projected light beam but will have no effect on the distribution and non-glaring feature of the projected beam.

The beam projected from the reflecting surface above described will present in all sections perpendicular to its central axis a well defined outline corresponding in shape and proportion to the approximate ellipse marginally defining the reflecting surface and a field of illumination within said outline entirely free from streaks, shadows and dark spots.

The reflecting surface may be finished in any desired manner to enhance its reflecting efficiency, for example, it may be polished, enameled, lacquered, plated or silvered, and any suitable means may be provided for supporting the reflector and its source of light in either fixed or adjustable relation.

Since variations in the structural details of the improved reflector may be almost infinite and since the uses to which the improvement is adaptable may require constructions in a multiplicity of sizes and proportions, all of which are properly included within the spirit of the invention, I wish to be understood as being limited solely by the scope of the appended claims rather than by any details of the illustrative showing and foregoing description.

I claim as my invention—

1. A light reflector comprising a reflecting surface generated by moving one of two parabolic curves having different constants through successively parallel positions linearly along, perpendicular to and with its vertex in contact with the other of said curves and marginally defined by a plane perpendicular to the coincident axes of said curves.

2. A light reflector comprising a reflecting surface generated by moving one of two unequal parabolic curves through successively parallel positions linearly along, perpendicular to and with its vertex in contact with the other of said curves and marginally defined by a plane perpendicular to the coincident axes of said curves, the constants of said curves being in the ratio of thirty-three to one hundred and four.

Signed at Denver, in the county of Denver and State of Colorado, this 13th day of February, 1930.

LOUIS A. BEAN.