

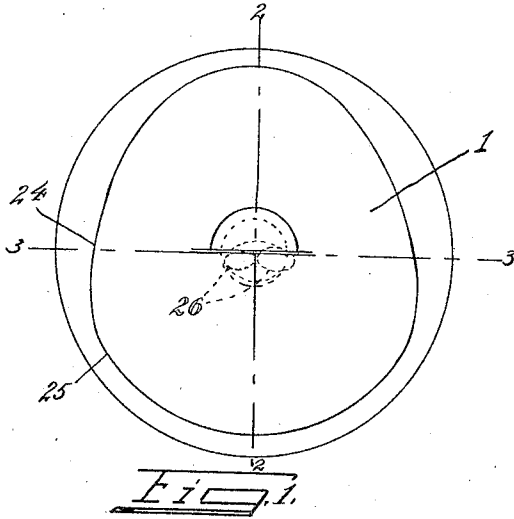
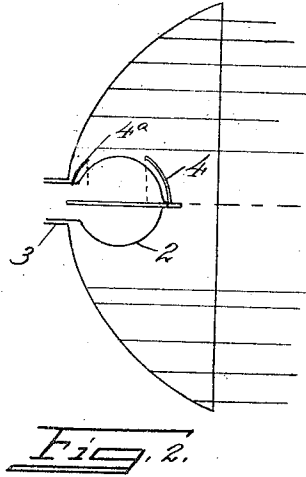
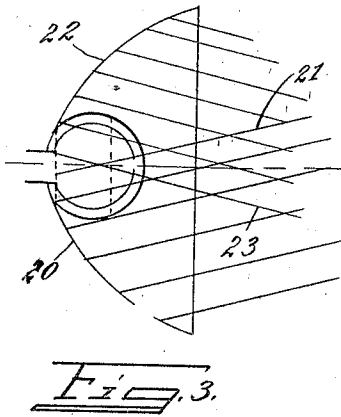
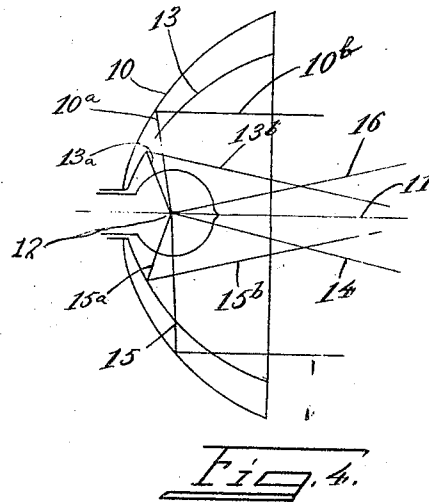
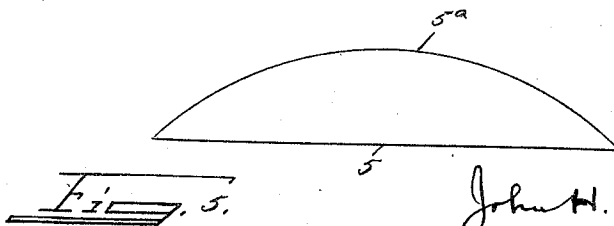
Oct. 19, 1926.

J. H. LAIRD

1,603,476

HEADLIGHT

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UNITED STATES PATENT OFFICE.

JOHN H. LAIRD, OF LOUISVILLE, KENTUCKY.

HEADLIGHT.

Application filed September 11, 1923. Serial No. 662,111.

My invention relates to headlights, particularly where used for vehicles of various types for illuminating their prospective path of motion. In the embodiment illustrated, an automobile headlight is shown, in which instance a roadway extending ahead of the vehicle is the object to be lighted up.

There have been a number of instances where the designers of reflectors for headlights have departed from the true parabolic curve, and introduced flattened portions, elliptical portions and hyperbolic portions in their reflectors in order to accomplish a desired form of deflection of light, but in these forms, areas are always left which give an undesired distortion to the light rays.

It is the primary object of my invention to provide a reflector for headlights in which provision is made for varying the axis of projection of light rays, to suit prescribed conditions, and to determine the principles whereby various results can be obtained in a reflector without improper results, and with scientific accuracy.

I desire to note particularly in connection with the headlight art that accuracy and permanence of results in avoiding glare to approaching persons while at the same time lighting up brightly the objects to be illuminated, require considerable refinement of structure and the careful following of principles of construction, since light variations in projection and direction of light rays at their source become greatly exaggerated in the resulting illumination at points distant therefrom.

In my present invention the objective for the particular form of reflector shown, is to throw light rays in a definite pattern, no upward rays being projected, and side rays being projected in a definite manner, so as to illuminate a road in one prescribed way. This is advisedly but one of the things which I can accomplish by my invention.

I accomplish the objects noted by that certain construction and arrangement of parts to be hereinafter more specifically pointed out and claimed.

In the drawings:

Figure 1 is a front elevation of the reflector.

Figure 2 is a vertical section on the line 2-2 of Figure 1.

Figure 3 is a horizontal section on the line 3-3 of Figure 1.

Figure 4 is a diagram illustrating the principle followed in forming the desired reflector surfaces.

Figure 5 is a plan of the light pattern which will be projected by the particular reflector noted.

I have merely illustrated a reflector generally marked 1, and a lamp bulb 2, held in a socket 3. Located about the lamp bulb is a shading device preferably having its inner surfaces of reflector character, acting so as to prevent direct escape of rays of light in an upward direction from the lamp without absorbing any appreciable amount of the rays emanating from the lamp.

The particular device shown is that of my application for patent, Serial No. 610,685, filed January 4, 1923, and for the purposes of the present application, I wish to note only the spherical reflector piece 4, the center of rotation of which is at the focus of the main reflector, the lamp filament itself being intended to be set at this common focus in order to have the headlight operate perfectly.

The light pattern illustrated in Figure 5 has the bottom line 5, which is intended to be the road line, and the arched top line 5'. This pattern will be made upon a vertical surface held up close to the headlight when in use, and is known as the "bright spot" of the lamp. The illumination of a roadway by a beam of light projected in a horizontal direction from vehicle headlights having pattern noted, will be bright clear across the sixty foot road at say around one hundred feet ahead, becoming more diffused as further distance is added, and will give good strong illumination for six hundred feet straight ahead without any glaring or bright rays rising above the height of the lamps at any point.

The best way, using my invention, of obtaining the pattern noted will be to preserve the axis of rotation of the parabolic reflector in its vertical components on a horizontal line, and vary the axes of rotation of the parabolic portions at the sides of the reflector so as to cross each other, moving the parabola so as to define by the shifting apex thereof, a pair of oval lines.

Referring to Figure 4 for the theory of construction of my reflector, it should be noted first that a parabola is a term referring more accurately to a line and a parabola of rotation is more accurate when referring

to areas. A perfect parabola of rotation is formed by revolving on its focal point and on a single axis of rotation a parabolic curved line.

5 I show in Figure 4 a parabolic curve 10, having an axis 11, and a focal point 12. I also show a parabolic curve 13, having the same focal point at 12 but having a different axis, as at 14. Any lines, such as at 10^a,
10 drawn from the focal point to the curve 10 will be reflected in line 10^b, parallel with the axis 11, considering the curve 10 as defining a component of the surface of a reflective mirror. So also lines 13^a from the
15 focus 12 to the parabola 13 would be reflected along lines 13^b parallel with the axis 14.

I also show another parabolic curve 15 on the same focus 12, in which the axis 16 converges toward the axis 14. Lines of reflection from the focus 12, as at 15^a, 15^b, will follow the same rule noted above, and considering the lines 13 and 15 as defining the cross section of a parabolic reflector or parabola of rotation, it may be observed that
25 rays of light emanating from focus 12 will be reflected in a series of parallel rays along lines 13^b and 15^b so as to cover a wider area of brilliance than if the curves 13 and 15
30 were on the same axis, as are the parts of the curve 10.

This principle is followed in the formation of my reflector, whereby I obtain a desired reflection of light rays in the pattern
35 required without departing from true parabolic curves on a common focus in any part of the reflector.

Referring to Figure 2 it will be noted that the parabolic curves shown in vertical section of the reflector are on a common axis, viz:—an axis in the intersection of the horizontal and vertical planes bisecting the lamp. Referring to Figure 3, however, it
40 will be noted that the curves 20 at one side of the reflector are on an axis 21, while those at 22 on the other side of the reflector are on an axis 23, neither of which axes is in the central vertical plane of the lamp. This results in a crossing of reflected rays of light
45 coming from the lamp bulb, but in no instance does the light emanate from other than the focus of any curve to be found in the entire reflector.

Referring to Figure 1 it will be noted that
55 I have formed my reflector by rotating a single parabolic curve on its focus, first making the rotation in the horizontal and vertical central plane of the lamp and gradually "revolving" the axis of rotation without changing the focus toward the sides of the reflector to a point 24; and then more rapidly
60 bringing the axis of rotation back to the true vertical plane of the reflector again at a point 25. The other side of the reflector is
65 formed in the same way, the axis of rotation

varying in the opposite direction to the variation in forming the first noted side of the reflector. A line traced by the apex of the parabola during rotation will form two small oval figures 26.

In forming the reflector the axis of rotation is changed, but the focal point remains the same, the axis of rotation being changed as the desire is, that the reflected rays of light shall vary in direction. In my illustrated form the axis of rotation at the two sides of the reflector will be pointing to the opposite sides and downwardly. Were the converging axes to be continued below the point 25, in the description above, the axes
70 of rotation would have to be tipped upwardly to maintain the parabolic nature of the curve, and in motor vehicle lamps this is not desirable, since it will be recalled that the rays of light will follow the axis of any
75 parabolic curve if the light emanates from the focus of that curve.

Thus my reflector is formed so as to reflect rays of light all of which are emanating from the focus of any portion of the reflector; in the directions desirable to meet given conditions. It is essential to my reflector that the line of intersection of any longitudinal plane cutting the reflector and passing through the focus will be the arc of a parabola.

With such a reflector it is possible to project a bright spot or pattern which is a prerequisite to best illumination, and this without having any ray of light reflected at other
80 than a line which has been deliberately chosen for it.

It will be noted that by tipping or shifting the axis of rotation of the parabolic curve of my reflector without changing the focus, that what might be termed the inner ends of the resultant curves, will form a very irregular pattern, as illustrated in a vertical plane at 26. But since the introduction of a light bulb socket is made at the apex of a reflector in commercial practice, this distorted area is eliminated from a lamp anyhow, by the cut-away portion necessary to admit said bulb socket.

The use of a truly confocal reflecting guard to block off upwardly extending direct rays without obstructing any other rays, together with a reflector of the character noted, and some method of avoiding improper reflection of rays deflected back by the guard (see the mirror portion 4^a and my former application hitherto referred to), the entire light from the bulb is available for illuminating purposes, and no rays can escape to form a glare or to illuminate undesired areas.

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

In combination with a partially shaded

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light globe, a reflector formed as a parabola of rotation, in which a parabolic arc is rotated on its focus, first in the horizontal and vertical central plane of the reflector and in which the axis of rotation is then gradually revolved without changing the focus toward the sides of the reflector, and in which the axis of rotation is then more rapidly brought back to the true vertical plane, and in which the axis of rotation at the two sides of the reflector is pointed to the opposite sides downwardly, so as to reflect a light pattern on a surface extending away from the reflector on the side opposite the shaded portion of the globe, of maximum intensity without reflecting a glaring light in an upwardly direction on the side of the shaded portion. 15

JOHN H. LAIRD.