

Dec. 7, 1926.

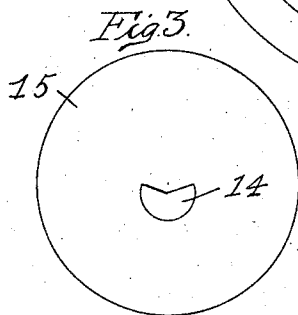
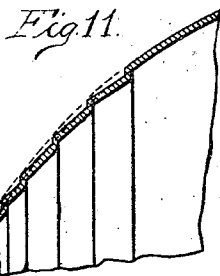
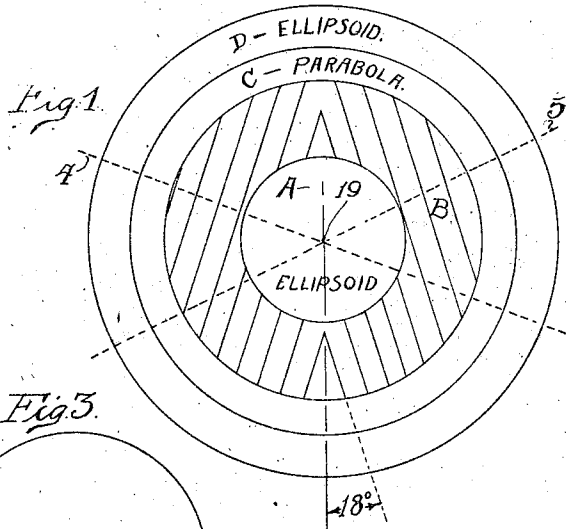
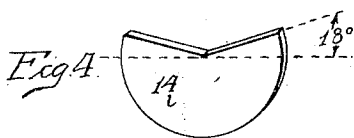
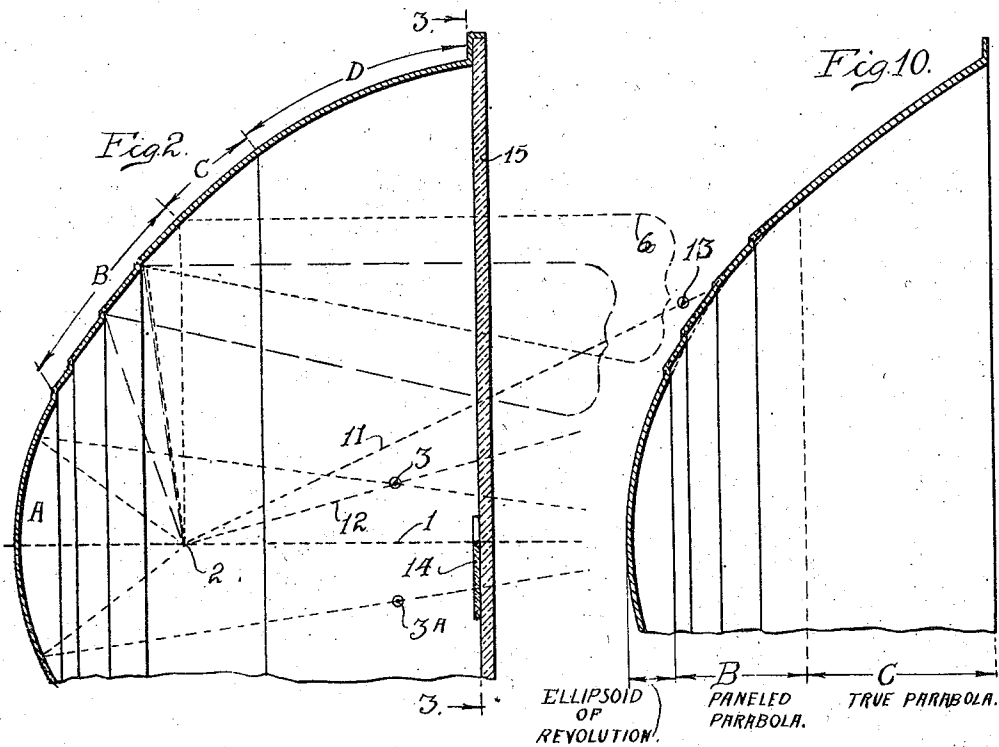
1,610,124

C. E. GODLEY

NO-GLARE HEADLIGHT

Filed June 30, 1924

2 Sheets-Sheet 1



Inventor:
Charles E. Godley
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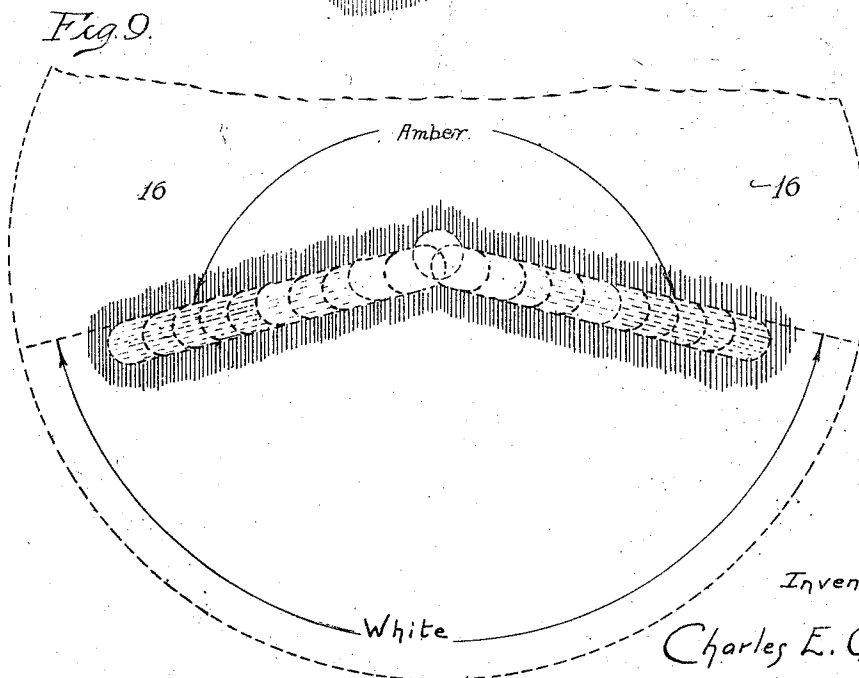
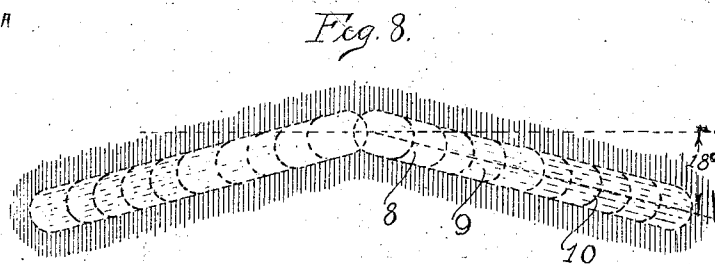
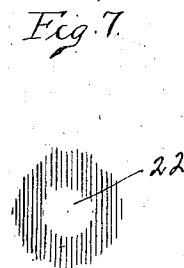
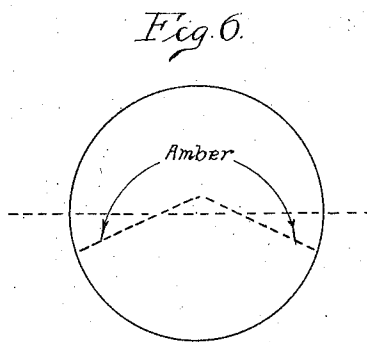
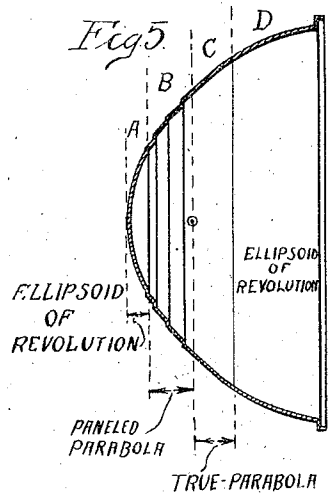
1,610,124

C. E. GODLEY

NO-GLARE HEADLIGHT

Filed June 30, 1924

2 Sheets-Sheet 2



Inventor:

Charles E. Godley
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Patented Dec. 7, 1926.

1,610,124

UNITED STATES PATENT OFFICE.

CHARLES E. GODLEY, OF DETROIT, MICHIGAN, ASSIGNOR, BY MESNE ASSIGNMENTS,
TO C. M. HALL LAMP COMPANY, A CORPORATION OF MICHIGAN.

NO-GLARE HEADLIGHT.

Application filed June 30, 1924. Serial No. 723,202.

My invention relates to concentrating reflectors of the general class employed in automobile headlights, and in its general objects includes the providing of a simple and easily manufactured reflector construction whereby certain portions of the light of the lamp used with the reflector can effectively be distributed over definitely defined portions of the projected field and whereby the needed formations upon the reflector can be produced without interfering with the effective polishing thereof.

In another broad aspect, my invention provides a reflector construction adapted to project certain portions of the light in beams out of alinement with the axis of the reflector, and for this purpose provides a simple and easily manufactured construction which will readily permit any desired number of beams to be projected by different portions of the reflector, which will permit these beams to be tilted at varying angles with respect to the axis of the reflector, which will permit such beams to be varied as to the extent to which they spread the light, and which will permit these beams to overlap to any desired extent. It also aims to provide a reflector construction which will readily lend itself to the projecting of relatively diverging beams and to the intensifying of any desired portions of these beams.

Furthermore, my invention aims to provide a reflector construction particularly suitable for use in automobile headlights and adapted to project a beam of substantially inverted fan shape having an intensified upper portion and surmounted by auxiliary beam portions of less intensity and of non-glaring optical characteristics. It also aims to provide a head lamp of this class in which the glare-eliminating filter is so disposed that it intercepts only a relatively small portion of the light of the lamp and does not intercept any of the rays employed for the more intense light projection. Still further and also more detailed objects will appear from the following specification and from the accompanying drawings, in which

Fig. 1 is a front elevation of a headlight reflector embodying my invention.

Fig. 2 is a fragmentary horizontal section through a head lamp comprising the reflector of Fig. 1 in combination with a flat

glass lens carrying a suitable glare-reducing filter, taken along the line 19—5 of Fig. 1.

Fig. 3 is an elevation of the lens of the lamp with the filter attached to it, drawn on a reduced scale and taken from the inside of the lamp, or from the line 3—3 of Fig. 2.

Fig. 4 is an enlarged perspective view of the glare filter.

Fig. 5 is a section through the complete reflector, taken along the lines 4—19—5 of Fig. 1.

Fig. 6 is a view showing the field of light projected by the rear elliptical section of the reflector of Fig. 2.

Fig. 7 shows the circular field of light projected by the true parabolic portion of the reflector of Fig. 2 which is disposed immediately forward of the paneled portion.

Fig. 8 is a view showing the projection of light from the paneled portions of the reflector of Fig. 2.

Fig. 9 is a view showing the approximate general light distribution from the entire reflector and color filter combination of the headlamp of Fig. 2 when employed with a point source of light.

Fig. 10 is a fragmentary central section corresponding to Fig. 2 but showing a simplified type of reflector embodying my invention, namely one in which the forward elliptical portion is omitted.

Fig. 11 is a fragmentary horizontal section similar to a portion of Fig. 2, showing an alternative form of reflector in which the panel sections are tilted about their rear edges.

To meet the various requirements desirable in an automobile head lamp, it is important that a portion of the light of the lamp should be projected in a highly concentrated long distance beam axial of the lamp, and that this long distance beam should be supplemented by a beam of substantially inverted fan shape having relatively intense lighted portions diverging downwardly from the said concentrated driving beam portion. Also, that there should be a more widespread illumination of less intensity and that the glare-producing constituents of the less intense projected light should be greatly reduced.

Furthermore, it is desirable that the more concentrated portions of the beam should be projected by parts of the reflector which are not so close to the source of the light as

to reduce the size of the filament images and insure greater concentration, and that the portion of the reflector nearest to the source of light should be employed for a less concentrated light projection. It is also important that the axis of the reflector be maintained horizontal so as to produce a driving beam of long distance penetration, that the more intense light projection should not rise to any considerable extent above the axis of the lamp, and that the more elevated portions of the projected light be reduced as to their glare-producing factors. Furthermore, it is important that there should be a considerable projection of uncolored light upon the ground all the way from a point closely in front of the lamp up to points hundreds of feet ahead.

To meet all of these exacting requirements in an exceedingly simple and inexpensive construction, I desirably employ a concentrating reflector having at least three and preferably four distinct light projecting portions of relatively different formations. For this purpose, Figs. 1, 2 and 5 show a reflector having an annular intermediate portion C of a true parabolic shape formed by rotating a portion of a parabola whose axis is the axis 1 of the reflector and whose focus 2 is at the center of the source of light. This true parabolic section C desirably extends forward of the focus 2 and is here shown as having its rear edge in the same transverse plane of the reflector with the focus 2.

The extreme rear end portion A of the reflector is a portion of an ellipsoid of revolution generated by rotating about the axis 1 a portion of an ellipse which has its rear focus also at the source of light 2 and which has its axis inclined to the said axis. The forward focus 3 of the generating ellipse is desirably behind the mouth of the reflector, so that the forward foci of the resulting ellipsoid are disposed in a circle behind the said mouth and having its center on the said axis 1 of the reflector.

The part of the reflector between the portions A and C is also a general paraboloidal contour but has its determining parabolic shape deformed so as to afford two sets of panels respectively disposed at opposite sides of the vertical medial plane of the reflector, the determining shape being part of the same true paraboloid of which the portion C forms a part. The panels of each set extend parallel to each other at right angles to the direction along which the beam portions projected by that set of panels are to be widened, and have straight transverse sections in planes taken along the said direction. The panels of each set are also tilted out of chordal relation to the determining parabolic section taken along the plane in which the projected beam portion

is to be tilted, the tilting of each panel being desirably about one longitudinal edge thereof, so as to bodily tilt the beams respectively projected by these panels. This tilting for the said panels at each side of the vertical medial plane of the reflector is effected in a plane at right angles to the general direction in which the panels extend, or in the plane 4 for the left hand set of panels in Fig. 1 and in the plane 5 for the right hand set of panels. Each panel is desirably tilted about its forward edge, leaving this forward edge in the true determining parabolic surface while the rear panel edge is disposed laterally outward of that surface, thereby causing each panel to project its beam across the medial vertical plane of the reflector. A similar general effect might be obtained by tilting each panel about its rear edge as shown in Fig. 11, but the stop portions between the consecutive panels would then face the source of light, thereby producing objectionable glaring streaks in the projected light.

With the panels thus tilted into substantially tangential relation to the determining true parabolic surface, each panel owing to its flat transverse section will project a forwardly widening beam of light having its medial plane tilted with respect to the medial vertical plane 1 of the reflector, as shown at 6 for the forwardmost panel in Fig. 2. Consequently, the widened beam projected by the panels at each side of the reflector will cross the vertical medial plane and project a field of light at the other side of that plane, and since the panels extend in directions inclined to the vertical medial plane, the fields projected by them will be elongated along axes correspondingly tilted with respect to the horizontal plane. For example, with the panels inclined at 18° from the vertical medial plane as shown in Fig. 1, the projected fields will be inclined at this same angle with respect to the horizontal plane, as shown in Fig. 8.

With each panel, the extent to which the projected beam is widened will depend on the width of the panel, while the amount of angular displacement from the vertical medial plane will depend on the extent to which the panel is tilted out of chordal relation to the determining parabolic surface. Consequently by suitably proportioning both this tilting and the width of the panels, I can cause the resulting projected field portions to overlap to any desired extent. This is highly desirable in the case of an automobile headlight reflector, as the plural projected field portions 8, 9 and 10 of Fig. 8 can then be produced with their upper ends (or the ends nearest to the medial vertical plane of the reflector) overlapping, thereby causing the composite inclined beam part at each side of the projected field to gradually

decrease in density as it recedes from the vertical medial plane. This is indicated for example in Fig. 8 which shows the two outwardly diverging beam parts projected respectively by the sets of panels at opposite sides of the reflector when this reflector has its panels so formed that these inclined beam parts slightly overlap at their upper ends, and these overlapping portions are also overlapped by the concentrated beam projected by the parabolic reflector portion C, thereby theoretically producing a composite intensified light projection as shown in the middle portion of Fig. 9. In practice, owing to the size of the light giving filament, these intensely lighted portions will overlap even to a greater extent so as to produce a raised driving beam portion of high intensity.

While the combination of the beam parts as shown in Fig. 9 readily produces a highly desirable light projection for the distant points, it will not ordinarily be adequate for illuminating the portions of the road and road sides nearer to the vehicle. Consequently, I provide my reflector with at least one section formed for projecting light at angles diverging considerably from the axis of the reflector. For this purpose I desirably form the rear end A of the reflector as part of an ellipsoid of revolution as heretofore described. With the rear end A thus formed, rays of light will be reflected by it through annularly arranged foci, such as 3 and 3^A to form a beam which converges outside the reflector and then spreads out in a conical form.

Since the upwardly directed portions of this beam will reach the eyes of approaching drivers or pedestrians and since the proximity of this rear portion A to the source of light makes this beam quite intense, these upwardly directed portions would produce a highly undesirable glare. To eliminate this glare I provide a glare filter 14, desirably in the form of a thin plane of glass or other translucent material of a light amber or so called "railroad yellow" tint, which filter may be fastened to the back of the clear glass lens 15 as shown in Figs. 2 and 3. This filter desirably is in the shape of a sector having an inclosed angle of 180 degrees plus the angle at which the two sets of panels in the reflector section C diverge from each other. When such a glass glare filter 14 is cemented to the rear face of the plain glass lens 15 with the recess portion of the filter facing upwardly and symmetrically disposed with respect to a horizontal plane, and with the notch in the recess at the axis 1 of the reflector, the glare filter will intercept the upwardly directed rays from the rear elliptical portion A, thereby causing this portion to project an amber tint over the field portion 16 as shown in Fig. 9. By thus eliminating the glare producing factor from the

light which is projected above the horizontal by the rear section A, I enable my headlight to afford sufficient illumination above the more intense beam parts so as to make distant approaching vehicles, signs, buildings and other land marks clearly visible without blinding any approaching drivers.

At the same time, rays reflected by the upper half of the rear end A will almost all pass above the glare filter, thus affording uncolored light for illuminating the roadway, ditches and lower roadside portions. Owing to the concentration of this conical beam, it will only be effective at points considerably ahead of the lamp, hence I preferably also provide another reflector section for affording a general illumination nearer to the lamp. For this purpose I desirably add a forward section D also forming part of an ellipsoid of revolution generated by rotating a portion of an ellipse about the axis 1 of the lamp. In this case, the generating ellipse has its rear focus 2 at the source of light and its forward focus 13 laterally displaced from the said axis 1 of the lamp and at the same side of the axis 1 with the focus 3 but considerably forward of the latter and desirably forward of the lens 15 as shown in Fig. 2. The thus generated ellipsoid has its rear focus at the point 2 on the axis of the lamp (or at the source of light), and has its foci disposed in a circle about the axis 1, the point 13 being one of these foci. With the reflector portion D thus formed, light will be projected by it at angles diverging more from the axis of the reflector than the light projected by the rear portion A, thereby lighting both the nearer road portions and the nearer road sides, vehicles and the like. Since this reflector portion D is at a considerable distance from the source of light, the intensity of the projected rays is not nearly as great as the rays projected by the rear portion A, so that it is not necessary to have any of the rays reflected by this forward portion D to pass through a glare filter. Consequently, I can accomplish the general purposes of my invention by employing a quite small glare filter such as that shown in Fig. 3, and having only a small portion of the light pass through this glare filter.

However, while Fig. 9 shows the distant light distribution as it theoretically would be obtained with a point source of light, it will be obvious that this will be modified somewhat by the considerable size of the source of light actually employed, so that the projected beam portions will correspondingly overlap and blend into one another.

Furthermore, while I have pictured and described a highly desirable embodiment of my invention and one employing a desirable angular displacement of the panel portions, I do not wish to be limited to these or other

details of the construction and arrangement thus disclosed. Obviously, these might be varied in many ways without departing either from the spirit of my invention or from the appended claims. For example, Fig. 10 shows a simplified form of my reflector in which the true parabolic portion C is somewhat extended forwardly and in which the ellipsoidal portion D of Figs. 2 and 5 is omitted.

I claim as my invention:

1. A lamp comprising a source of light, and a concentrating reflector housing the same, the reflector having a portion formed for reflecting light from the said source in a beam of circular section and having an annular portion concentric with the aforesaid portion and comprising two sections respectively formed for reflecting light from the said source in two beams each of which has a greater cross-sectional width than height, the last named two beams having the longer axes of their cross-sections oblique to each other.

2. For use with a source of light, a concentrating reflector having a generally parabolic part whose focus is at the source of light, the said part being deformed into two sets of panels respectively at opposite sides of a medial plane of the reflector, the panels of each set extending parallel to each other and having their edges oppositely inclined to the said plane from the edges of the panels of the other set, all panels of either set having flat transverse sections tilted in the same direction with respect to adjacent portions of the true parabolic curve so as to tilt the resulting beam portions in the same direction with respect to the said plane.

3. A reflector as per claim 2, in which the direction of the said tilting is respectively opposite for the two sets of panels so that the two sets tilt the resulting beam portions in respectively opposite directions with respect to the said plane.

4. For use with a source of light, a reflector having a portion of the general configuration of a paraboloid whose focus is at the source of light, the said reflector portion being deformed into panels extending at an acute angle to a medial plane of the reflector and having straight transverse sections, all of the panels at one side of the said plane having their transverse sections tilted in the same direction out of chordate relation to the true paraboloidal form of the said general configuration.

5. In a headlamp, a source of light and a reflector having the general configuration of a paraboloid whose focus is at the source of light, the reflector having portions thereof formed into two sets of parallel panels symmetrically disposed with respect to a medial vertical plane of the reflector; the panels of each set extending at an angle to the said

plane and having straight transverse sections causing them to widen the projected beam portions transversely of the direction in which the panels of the said set extend, and having their transverse sections tilted out of chordate relation to the said general paraboloid so as to tilt the projected widened beam portions out of symmetrical relation to the axis of the paraboloid.

6. The combination with a source of light, of a reflector housing the same, the reflector having two semi-annular parts thereof formed into panels arranged for projecting two flattened beams which beams have the longer axes of their cross-sections diverging obliquely from the axis of the reflector; the reflector having as another portion a surface of revolution formed for projecting a concentrated beam overlapping the adjacent edges of the said flattened beams, and having as a further part a surface of revolution formed for projecting another beam of circular cross-section coaxial with the said concentrated beam and housing the said flattened beams.

7. A headlamp comprising a source of light and a reflector housing the same; the reflector having two ellipsoid-of-revolution portions each having its rear focus at the source of light but having spaced forward foci, whereby the said portions project concentric beams adapted to light two road portions respectively disposed close to the lamp and at a considerable distance from the lamp; the reflector also having intermediate of the aforesaid portions a generally paraboloidal portion coaxial with the aforesaid portions and deformed into panels cooperating to project a composite beam of downwardly widening transverse section.

8. A headlamp as per claim 7, in which the reflector also has a parabolic portion formed for projecting a concentrated beam overlapping the upper edge of the said composite beam.

9. A single-piece reflector including in axial alinement three sections; namely, a rear ellipsoidal section, an adjacent annular section of generally parabolic configuration but deformed out of true parabolic form to afford two sets of panels symmetrical with respect to the medial plane, each set of panels being parallel and the panels of the two sets diverging from each other downwardly, the determining parabola of the said annular section having its focus at the rear focus of the said ellipsoidal section; and a more forward annular parabolic section also having its focus at the rear focus of the said ellipsoidal section.

10. A single-piece reflector comprising four sections disposed in axial alinement; namely a rear ellipsoidal section and an annular ellipsoidal mouth section, both thereof having a common rear focus and each there-

of having a separate forward annular series of foci; and a pair of annular intermediate sections disposed between the said ellipsoidal sections; one of the intermediate sections being parabolic and having its focus at the common rear focus of the ellipsoidal sections; the other intermediate section being a deformed paraboloid, namely, a parabola having its focus at the said common rear focus and having its surface deformed into two sets of panels diverging downwardly from the vertical medial plane of the reflector.

11. A single-piece reflector comprising four sections disposed in axial alinement; namely a rear ellipsoidal section and an annular ellipsoidal mouth section both having a common rear focus; the said ellipsoids having forward annular foci disposed respectively within the reflector and forwardly of the mouth end of the reflector; and a pair of annular parabolic sections disposed between the said rear and mouth sections, one of the parabolic sections being formed into panels all having their longitudinal edges extending in the same general direction as a diametric plane of the reflector.

12. For use with a source of light, a reflector having a rear elliptical portion, a beam-widening paneled portion adjacent thereto and having the general configuration of a paraboloid whose focus is at the source of light, and a more forward annular parabolic portion of greater concentration than the said paneled portion and also having its focus at the source of light, the said three portions all having a common axis; the elliptical portion being generated by rotating about the said common axis a portion of an ellipse having its rear focus at the source of light and its forward focus between the said common axis and the generating ellipse portion.

13. In a headlight, a source of light, a concentrating reflector housing the same, a flat lens at the mouth of the reflector, and a sector-shaped color filter mounted on the lens with the center of the sector on the axis of the reflector and with its arcuate edge at its bottom, the radius of the sector being relatively small with respect to the radius of the lens; the reflector having ellipsoidal portions formed for projecting light entirely to lens portions radially outward of the color filter, and having parabolic portions formed for projecting light through lens portions including the portion carrying the color filter.

14. A headlight as per claim 5, in combination

with a lens disposed across the mouth of the reflector, and a color filter secured to the lens; the color filter being of a sector shape disposed with its arcuate edge downward and with its radial edges respectively at right angles to the directions in which the two sets of panels extend, so that the said radial edges will afford color cut-offs parallel to the directions in which beam portions are widened respectively by the panels of the two sets.

15. A lamp comprising a source of light, a reflector having in coaxial disposition a rear elliptical portion and a parabolic portion each having a focus at the source of light so that these portions will project coaxial beams; the reflector also having a portion of the general configuration of a paraboloid and comprising two semi-annular paneled portions formed respectively for projecting two flattened beams which have the major axes of their cross-sections diverging from the common axis of the two first named beams, the paneling of the said two semi-annular portions being arranged so that the fields projected by the said two beams overlap each other and are both overlapped by the field projected by the parabolic portion, the elliptical portion being formed so that the field projected by it overlaps all of the aforesaid fields.

16. A lamp as per claim 15, in which the intermediate reflector portion has the panel formations on its two halves differently disposed so that the said two halves project widened beam portions diverging from each other.

17. A lamp comprising a source of light, a reflector having in coaxial disposition a rear elliptical portion and a parabolic portion each having a focus at the source of light so that these portions will project coaxial beams; the reflector also having a portion of the general configuration of a paraboloid and comprising two paneled portions formed for projecting flattened beams and having the major axes of their cross-sections diverging from the common axis of the two first named beams and arranged for projecting fields overlapping each other and both overlapped by the field projected by the parabolic portion, the elliptical portion being formed so that the field projected by it overlaps all of the aforesaid fields.

Signed at Detroit, Michigan, June 20th, 1924.

CHARLES E. GODLEY.