

Oct. 24, 1939.

E. A. HOWARD ET AL

2,177,217

VEHICLE HEAD LAMP

Filed March 23, 1937

2 Sheets-Sheet 1

Fig. 1.

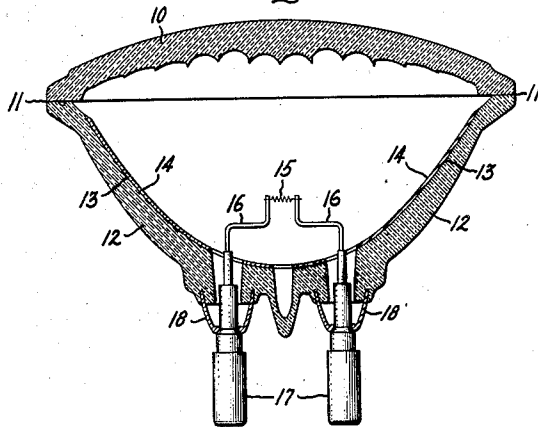


Fig. 2.

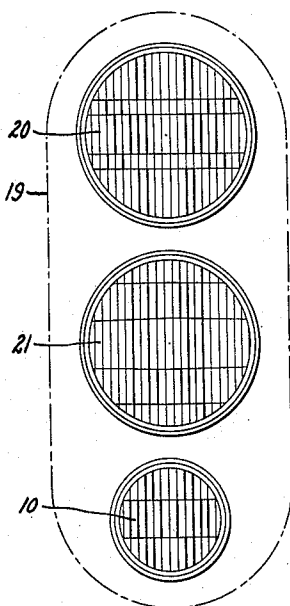
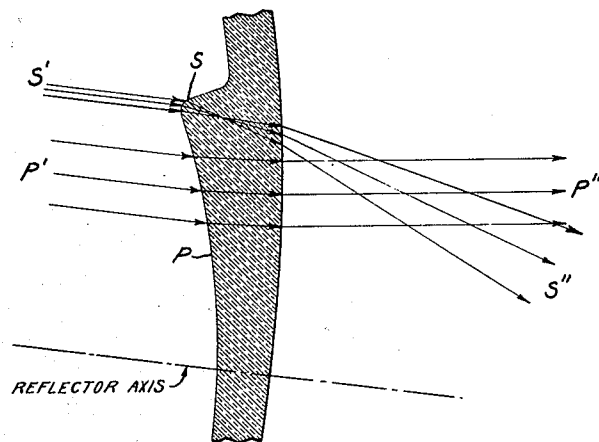


Fig. 3.



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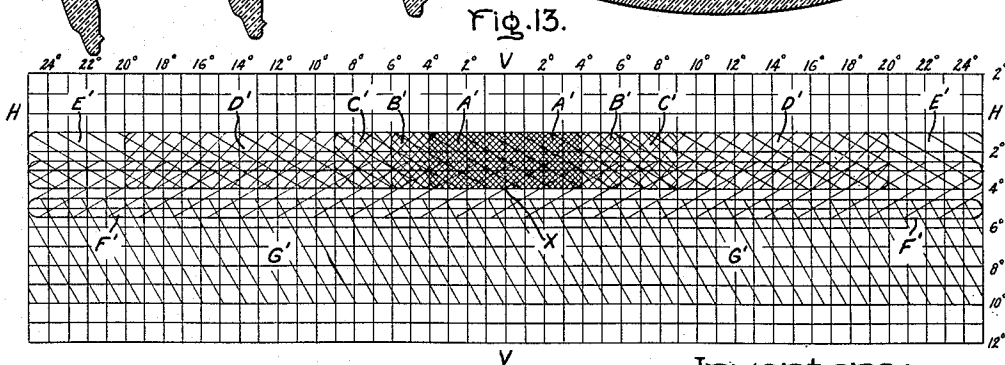
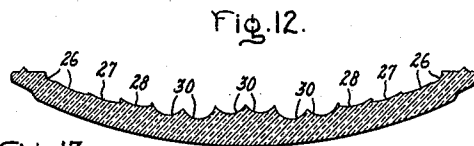
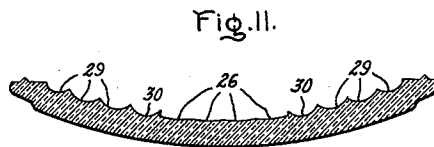
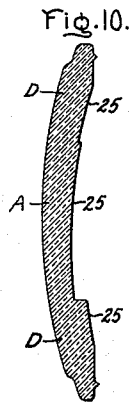
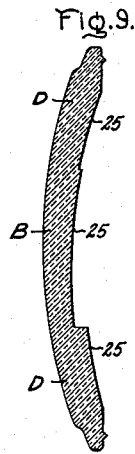
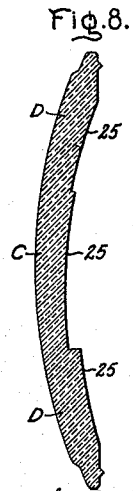
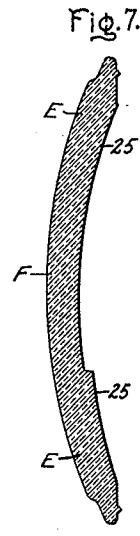
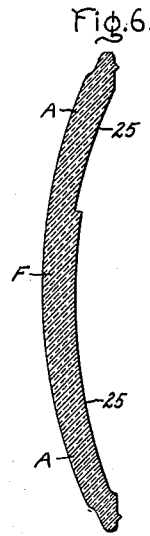
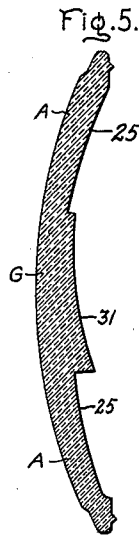
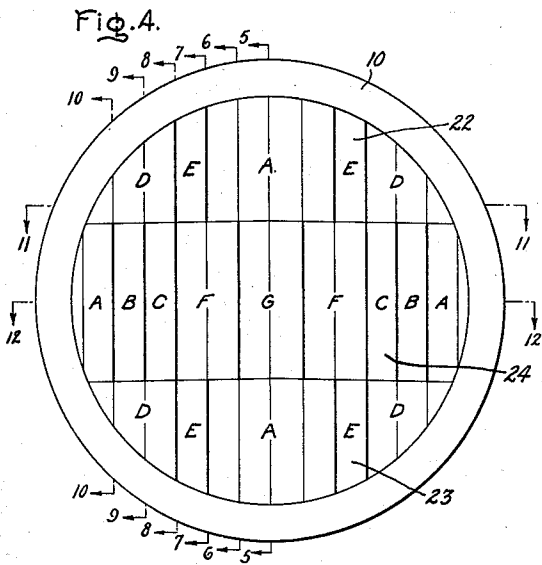
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VEHICLE HEAD LAMP

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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

2,177,217

VEHICLE HEAD LAMP

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Application March 23, 1937, Serial No. 132,532

2 Claims. (Cl. 240-41.4)

Our invention relates to vehicle headlights, and more particularly to light directing elements or lenses therefor. Specifically, our invention pertains to a design of lens adapted to produce a city driving beam projected entirely below the horizontal and in which the high intensity portion is spread out and graded off in intensity at each side thereof.

Our design of lens has been developed in conjunction with, and is particularly applicable to vehicle headlights of the reflector lamp type such as is described and claimed in co-pending application Serial No. 68,713, Daniel K. Wright, filed March 13, 1936. In lamps of this type a filament or other concentrated light source is accurately positioned at the focal point of the parabolic reflector portion of the lamp, thereby resulting in the projection of a powerful and efficient beam of light. When such a lamp is used to project only one type of beam, such as a city driving, country driving or country meeting beam, the lens with which such lamp is equipped can be so designed as to produce the most efficient beam of the single type desired.

A city driving beam should preferably comprise a widened high intensity portion, together with a widespread graduated intensity portion for illuminating the entire width of the street and objects at the sides thereof. Said beam should be free from glare and preferably disposed entirely below the horizontal so as not to temporarily blind pedestrians or approaching drivers.

One object of our invention is the provision of a headlight lens which will produce an efficient city driving beam fulfilling the above-mentioned requirements. A further object of our invention is the provision of a headlight lens which, when mounted on a headlight the reflector axis of which is directed several degrees below the horizontal plane passing through the focal point of the reflector, will direct a high intensity beam and a widespread graduated intensity beam substantially above the reflector axis but entirely below said horizontal plane.

Another object of our invention is the provision of a headlight lens which, when mounted on a headlight the reflector axis of which is directed as above stated, will produce a city driving beam characterized by a sharp light cut-off above the horizontal plane passing through the reflector focal point.

A further object is the design of a headlight lens which utilizes the rays of light passing through only the top, bottom and side areas

thereof for the production of the high intensity portion of the beam.

A still further object of our invention is the provision of a headlight lens having a plurality of upward bending prisms formed thereon for the purpose of bending the rays of light passing therethrough upward to thereby minimize the sources of glare in the lens itself by the elimination of refractory faces and corners thereon constituting secondary upward bending prisms.

Another object is the provision of a downwardly bending prism at the central portion of a headlight lens for the purpose of depressing the rays of light passing therethrough to thereby illuminate that portion of the highway immediately in front of the vehicle, and also to prevent the possible projection of glare rays likely to be projected through such center area by inaccurately disposed filaments.

Still another object is the provision of divers vertically extending, horizontal light spreading flutes so situated on the lens and so graded in degree of spread as will provide the desired amount of horizontal spread for the various beam portions making up the composite city driving beam.

Other objects and advantages of our invention will be apparent from the following description of an embodiment thereof and the accompanying drawings, in which:

Fig. 1 is a horizontal sectional view of a reflector lamp of the type disclosed in the previously mentioned co-pending application Serial No. 68,713, equipped with a lens made in accordance with our invention; Fig. 2 is a diagrammatic view showing the manner in which a reflector lamp equipped with our city driving lens may be mounted in a holder, together with other similar lamps, for projecting city driving, country driving, country meeting or other types of beams; Fig. 3 is an enlarged view of one of the vertical upward bending prisms formed on the rear surface of our lens, showing the manner in which the rays of light striking the various portions of the same are refracted thereby; Fig. 4 is a front elevation of a city driving lens comprising our invention; Figs. 5, 6, 7, 8, 9 and 10 are vertical sectional views taken on the lines 5-5, 6-6, 7-7, 8-8, 9-9 and 10-10 respectively of Fig. 4; Figs. 11 and 12 are horizontal sectional views taken on the lines 11-11 and 12-12 respectively of Fig. 4; and Fig. 13 is a view showing the beam pattern produced by our city driving lens when mounted on a reflector lamp of the type shown in Fig. 1, the reflector

axis of which is directed approximately 4 degrees below the horizontal plane passing through the reflector focal point.

Referring to the drawings, there is shown in Fig. 1 a reflector lamp comprising a lens 10, made in accordance with our invention, sealed at 11 to a preformed reflector portion 12 in the manner described in the previously referred to co-pending application. The said reflector portion 12 is made of pressed glass, the interior surface 13 of which is preferably of paraboloidal shape and covered with a coating 14 constituting a reflecting surface. A concentrated light source comprising a horizontally disposed bar filament 15, similar to that disclosed in U. S. Patent No. 2,012,806, Brown et al., is mounted within the lamp by lead wires 16, terminal members 17, and metal cups 18, and is accurately positioned at the focal point of the reflector surface 14. The greater accuracy with which the pressed glass paraboloidal interior surface 13 can be formed over the conventional stamped metal reflectors, together with the accurate disposition of the concentrated light source 15 at the focal point of the reflector surface 14, results in the projection of a powerful and efficient beam of light.

When such a lamp is utilized for the projection of a single type of beam only, such as a city driving beam, the lens can be so designed as to produce the proper distribution of the light rays for such beam alone. Fig. 2 illustrates diagrammatically one manner in which a plurality of reflector lamps of the type described above, each equipped with a different lens designed to produce a different type of beam, may be mounted in a holder 19. Lens 10 is a city driving lens made in accordance with our invention, while lens 20 is adapted to produce a country driving beam, and lens 21 an asymmetric or country meeting beam. The lenses 20 and 21 may be of the type shown and claimed in our applications Serial Nos. 132,530 and 132,531 of even date. Although we have shown all three lamps mounted in a single holder, they may, if desired, be separately mounted, or grouped in a variety of ways. Thus, the country meeting lamps may be mounted on or in the front fenders of an automobile to better indicate the width of the car to approaching drivers, while the country and city driving lamps may be grouped together nearer the center of the car.

The lens 10 constituting our invention comprises a plurality of substantially horizontal sections, (Fig. 4) consisting of a top section 22, a bottom section 23, and a center section 24. The top and bottom sections 22, 23 each comprise a central area A, side areas D, and intermediate areas E. The center section 24 comprises a central area G, end areas A, primary intermediate areas F, secondary intermediate areas C, and tertiary intermediate areas B. Each of said sections 22, 23 and 24 has a plurality of vertically extending light spreading flutes formed on the rear surface of the lens, certain of which are of a different degree of spread. In addition, certain portions of said sections have upwardly bending prisms, preferably of 3 degrees, formed on the rear surface of the lens, while the central portion or area G of the center section 24 is formed with a downwardly bending prism on the rear surface of the lens.

In the manufacture of lenses formed with prisms thereon, the ends or extremities of such prisms must be provided with a slight amount of

draft to permit removal of the lens from the mold. The bases of the prisms always have rounded corners which constitute small secondary lenses which direct the rays of light striking the same in a direction opposite to that of the rays refracted by the prism itself.

It has been customary heretofore in the design of lenses for the production of non-glaring beams to provide the same with downward bending prisms for the purpose of directing the rays of light passing therethrough downward, and in such manner maintaining the entire beam below the horizontal. However, the previously described corners refract the rays of light striking them upwardly and above the horizontal. Thus these corners constitute sources of light in the lens itself which create a considerable amount of glare. By providing our city driving lens 10 with upward bending prisms, instead of downwardly bending prisms, we eliminate such sources of light and resulting glare in the lens itself.

Referring to Fig. 3, showing an enlarged view of one of the upwardly bending vertical prisms p formed on the rear surface of our lens, the projected rays of light p' striking the prism itself are refracted upwardly, as at p'' , while the projected rays of light s' which strike the prism base corner s are directed downwardly, as at s'' . By simply aiming the reflector axis downward the proper amount, the upwardly directed rays p'' refracted by the upwardly bending prisms p can be made to project horizontally or slightly downward, so that the beam is maintained below the horizontal. As shown in the beam pattern (Fig. 13) of our city driving lens 10, we preferably locate the aiming point x of the reflector approximately 4 degrees below the horizontal plane H—H passing through the reflector focal point.

The high intensity portion of a city driving beam should be relatively narrow in vertical extent and insensitive to displacement of the light source from the reflector focal point. To obtain such characteristics the light rays making up such beam portion must, of necessity, be taken from those portions of the reflector projecting the smallest images of the filament or light source, which images are more easily controlled than the larger ones. When a concentrated light source consisting of a helical filament is disposed horizontally and at right angles to the axis of the reflector, such as is indicated at 15 in Fig. 1, the smallest images thereof will be projected by those portions of the reflector furthest from the focal point. These small images are projected through those portions of the lens immediately adjacent the periphery thereof. It is for this reason that the rays of light passing through the areas A (Fig. 4) of the lens 10, comprising the central portion of the top and bottom sections 22 and 23 respectively, and the extreme outer or side portions of the center section 24, are utilized to make up the high intensity portion of the composite city driving beam.

As indicated in Figs. 5, 6 and 10, each area A is provided with an upwardly bending vertical prism 25, preferably of 3 degrees, formed on the rear surface of the lens. To spread out the high intensity portion of the beam to a small extent, each area A is further provided with a plurality of vertically extending light spreading flutes 26, (Figs. 11 and 12) preferably of 8 degree spread, also formed on the rear surface of the lens. The high intensity beam produced by the areas A, and indicated at A' in the beam pattern, (Fig. 13) is disposed symmetrically about a vertical line

V—V, which lies in the vertical plane passing through the reflector focal point parallel to the longitudinal axis of the vehicle, but is directed substantially entirely above the reflector axis or aiming point x by the upwardly bending prisms 25 formed on the lens within the areas A. However, by aiming the reflector axis downward the proper amount below the H line, as indicated at x , the high intensity beam portion A' is so directed as to lie entirely below the H line, thereby preventing such beam portion from striking the eyes of pedestrians or approaching drivers. Thus when the aiming point x is located 4 degrees below the H line, the top surface of the beam portion A' will lie approximately 1 degree below such line.

The widespread graduated intensity portion of our city driving beam indicated at B', C', D' and E' in Fig. 13, should be directed so that the top surface thereof is likewise maintained approximately one degree below the H line in order to insure against any rays of light projecting above such line into the eyes of pedestrians or approaching drivers, which latter condition might ordinarily result from either inaccurately disposed filaments or longitudinal rocking motions of the vehicle. We have found that one degree is sufficient to prevent projection of any rays, included in the portions A', B', C', D' and E' above the H line in practically all instances of inaccurately disposed filaments or longitudinal rocking motion. To accomplish the above object for our invention it is therefore quite important that the top surfaces of the widespread graduated intensity portions B', C', D' and E' be positively maintained at the above stated level of one degree below the H line. Consequently, the areas B, C, D and E of the lens are utilized to produce such portions of the composite beam for the reason that the images projected therethrough are the next in smallness of size and ease of control to those projected through the areas A.

Referring to Fig. 12, each of the tertiary intermediate areas B of the lens center section 24 comprises a single vertically extending horizontal light spreading flute 27, preferably of 12 degree spread, while each of the secondary intermediate areas C comprises a single similarly disposed light spreading flute 28, preferably of 18 degree spread. The end areas D of the top and bottom sections 22, 23 each comprise a plurality of vertically disposed horizontal light spreading flutes 29 (Fig. 11) preferably of 40 degree spread, while each of the intermediate areas E comprises a single similarly disposed flute 30, preferably of 50 degree spread. Like the areas A, each of the areas B, C, D and E is formed with upward bending prisms 25, preferably of the same degree as that of the areas A, i. e. 3 degrees. As is apparent from the beam pattern illustrated in Fig. 13, the beam portions B', C', D' and E', produced by the areas B, C, D and E respectively, are disposed symmetrically about the vertical line V, but, due to the upward bending prisms 25, are directed above the reflector axis or aiming point x the same amount as the high intensity portion A' so as to coincide therewith. The increasing degree of spread of the flutes included within the areas B, C, D and E produces a widespread plate or band of light gradually decreasing in intensity toward the sides.

Since the images projected through the remaining areas F and G of the lens are the largest and most difficult to control of any projected through the same, the rays of light passing through said areas F and G are utilized to pro-

duce the sideward and downward graduated intensity portions F' and G' of the composite city driving beam; or in other words, the illumination immediately in front of the vehicle. Each of the areas F and G comprises a pair of flutes 30 similar to the flutes 30 of the areas E. Area G being located at the center of the lens, where the images are the largest and most difficult to control, the same is further provided with a downward bending prism 31 in order to insure against the projection of upwardly directed glare rays which are likely to occur at such area from inaccurately positioned light sources. The prism 31 is preferably graded in intensity from 3 degrees at the top thereof to 10 degrees at the bottom. The beam portions F' and G' (Fig. 13) produced by the areas F and G are symmetrically disposed about the vertical line V. The portion F' is also symmetrically disposed about the horizontal line passing through the reflector axis x , but due to the downward bending prism 31, portion G' is disposed entirely below such horizontal line. Thus the portions F' and G' furnish the illumination immediately in front of the vehicle.

The following table lists the various areas into which our city driving lens 10 is divided, together with the corresponding degree of horizontal prism and horizontal light spread:

Area	Horizontal prism	Horizontal spread
		Degrees
A-----	3° up-----	8
B-----	3° up-----	12
C-----	3° up-----	18
D-----	3° up-----	40
E-----	3° up-----	50
F-----	None-----	50
G-----	Graded down 3° to 10°-----	50

The headlight lens described above is adapted to produce a highly efficient city driving beam. It is simple in construction and positive in operation, and when mounted in a headlight, and especially in one of the type described herein, an accurately positioned and powerful beam of light is projected down the street having a sharp light cut-off or decrease in intensity above a point one degree below the horizontal line H, and further characterized by the absence of glare normally resulting from inaccurately disposed light sources. Furthermore, our lens is distinguished by the absence of light sources and resulting glare in the lens itself, due to the use of upwardly bending prisms thereon.

It will be apparent to those skilled in the art that various changes may be made in the design of the lens as shown without departing from the spirit of the invention, such as altering the shapes of the sections and placing the flutes on the exterior or outer surface. Also, the light directing effect may be derived from a configured reflector instead of from a lens.

What we claim as new and desire to secure by Letters Patent of the United States is:

1. A lens for vehicle headlights divided into top, bottom and center sections extending horizontally across the width of the lens; said top and bottom sections containing vertically extending flutes, the flutes at the middle of said sections being of narrow light spread and the flutes at the sides thereof being of wide light spread, said top and bottom sections also containing horizontally extending upward bending prisms of small refracting power, said flutes and prisms being arranged to produce at the top of the

beam projected through said lens a laterally wide but vertically narrow band of light of high intensity at its middle; and said center section containing at each side only vertically extending flutes of comparatively narrow light spread and horizontally extending upward bending prisms of small refracting power arranged to produce a vertically narrow band of light superimposed on the mid portion of said first-mentioned band of light, said center section also containing at its middle vertically extending flutes of wide light spread and a downward bending prism arranged to produce a wide band of light below said first-mentioned band of light.

2. A lens for vehicle headlights divided into top, bottom and center sections extending horizontally across the width of the lens; said top and bottom sections containing vertically extending flutes, the flutes at the middle of said sections being of narrow light spread and the flutes at the sides thereof being of wide light spread, said top and bottom sections also containing horizontally extending upward bending

prisms of small refracting power, said flutes and prisms being arranged to produce at the top of the beam projected through said lens a laterally wide but vertically narrow band of light of high intensity at its middle; and said center section containing at each side only vertically extending flutes of comparatively narrow light spread and horizontally extending upward bending prisms of small refracting power arranged to produce a vertically narrow band of light superimposed on the mid portion of said first-mentioned band of light, said center section also containing at its middle vertically extending flutes of wide light spread and a downward bending prism arranged to produce a wide band of light below said first-mentioned band of light, said center section further containing at each side of said middle flutes wide spreading flutes arranged to produce a laterally wide but vertically narrow band of light slightly below the top of said first-mentioned band of light.

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