

June 9, 1942.

F. D. BLAUVELT

2,285,408

HEADLIGHT

Filed Feb. 9, 1940

2 Sheets-Sheet 1

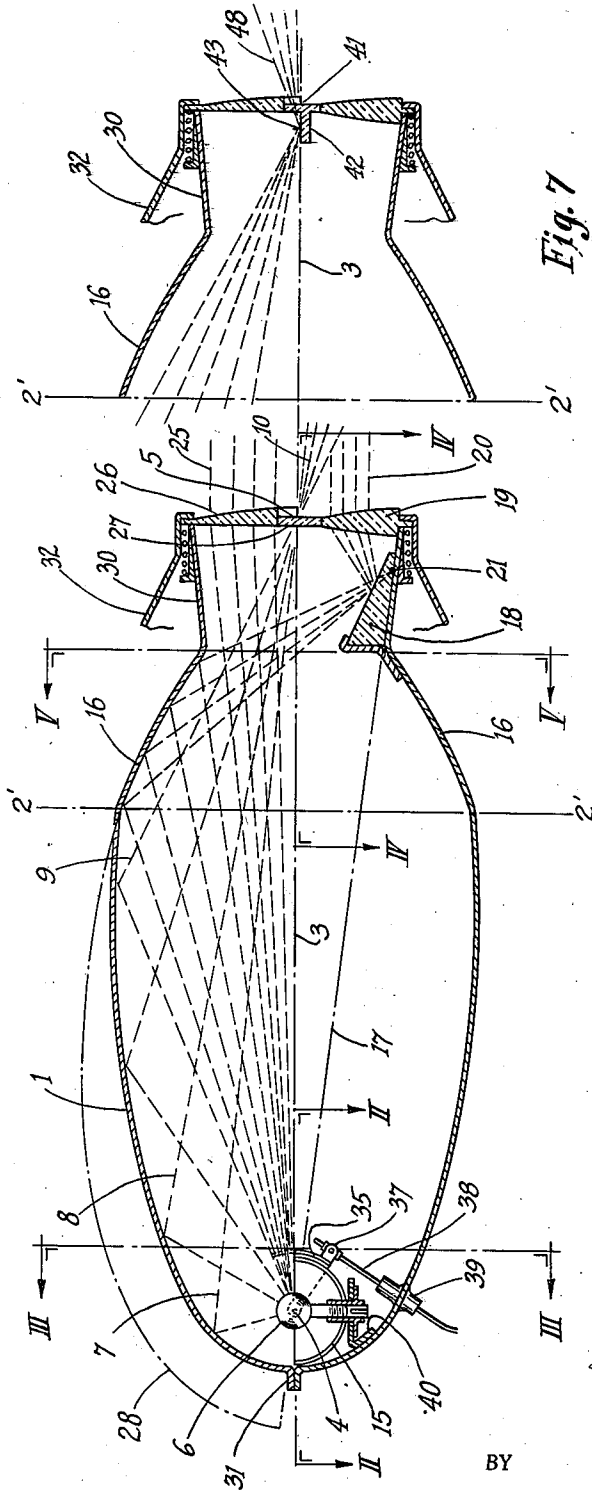


Fig. 7

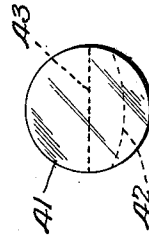


Fig. 8

Fig. 1

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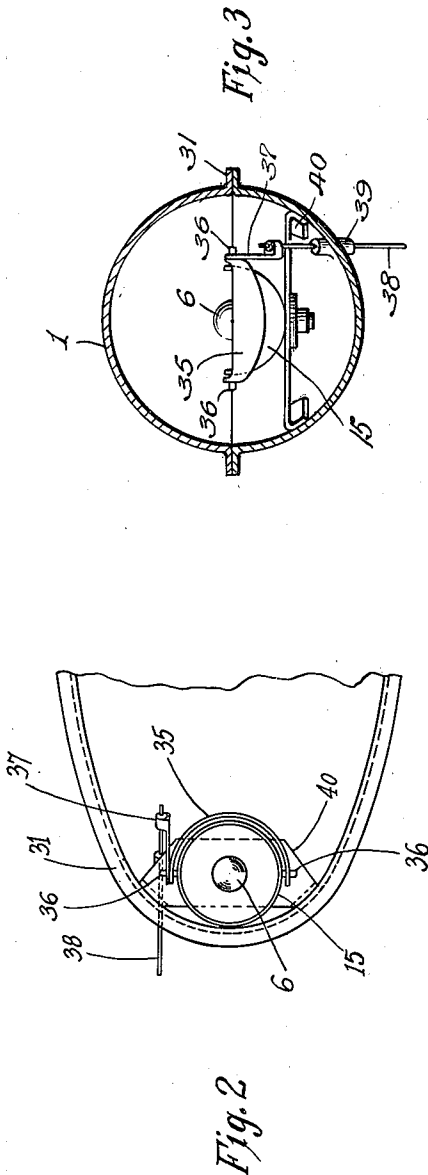
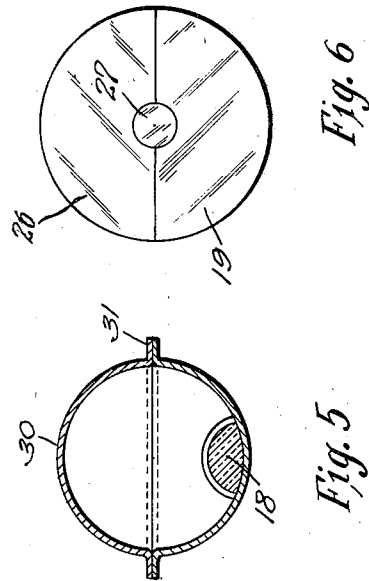
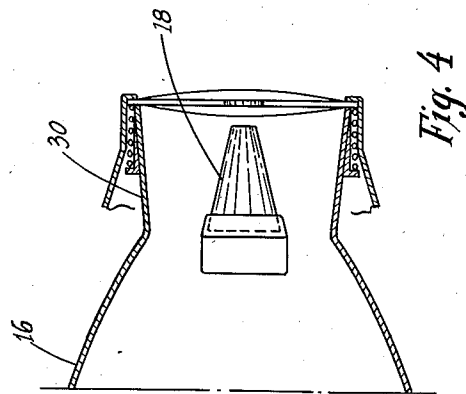
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2 Sheets-Sheet 2



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2,285,408

HEADLIGHT

Frederic D. Blauvelt, Upper Montclair, N. J.

Application February 9, 1940, Serial No. 318,105

4 Claims. (Cl. 240—41.3)

This invention relates to a new and useful improvement in head-lights. The head-light of my invention is especially suited to automobile use, although it may, of course, be employed in any other circumstances in which a similar illumination is required. The invention will be fully understood from the following description read in conjunction with the drawings in which—

Fig. 1 is a longitudinal vertical section through the head-light of my invention;

Fig. 2 is a part of the construction shown in Fig. 1 on the plane indicated by II—II;

Fig. 3 is a section through the construction shown in Fig. 1 on the plane indicated by III—III;

Fig. 4 is a section through the construction shown in Fig. 1 on the plane indicated by IV—IV;

Fig. 5 is a section through the construction shown in Fig. 1 on the plane indicated by V—V;

Fig. 6 is a front view of the lens shown in Fig. 1;

Fig. 7 is a longitudinal vertical section showing part of the construction shown in Fig. 1 and showing in addition a modified type of lens structure; and

Fig. 8 is an end view of a part of the construction shown in Fig. 7.

In the drawings 1 indicates the reflecting surface which is a continuous geometric function up to the plane indicated by 2—2. This reflecting surface 1 is an ellipsoid, i. e., a surface of revolution generated by an ellipse, having its axis on the line 3 and having on this axis a first focus at the point 4 and a second focus at the point 5. Since the surface 1 is an ellipsoid, it is aplanatic and any ray of light from the point 4 reflected from this surface will pass through the point 5. I take advantage of this fact by placing my light source 6, (in this case an incandescent bulb) at the point 4. While this bulb is, of course, not a true point source, the general direction of travel of the rays from this source as reflected by the surface 1 is indicated by the lines 7, 8, and 9. By following the extension of these lines as they pass beyond the head-light, it will be observed that they collectively form a beam, the general direction of which is downwardly or negative with respect to axis 3. A vertical section through this beam transverse to the showing in Fig. 1 is of fan-wise outline. When used in an automobile this beam, hereinafter identified by the numeral 10, provides clear and accurate illumination of the road surface.

In the construction of the reflecting surface I may, if desired, modify the light distribution within the beam since in general an increase in the length of the minor axis of the ellipse as compared to the major axis tends to increase the concentration of the rays having the maximum downward or negative slope and conversely, a diminution in the length of the minor axis as

compared to the major axis results in an increased concentration of those rays within beam 10 having the least downward or negative slope. If the light source 6 were unshielded, there would in addition to beam 10 be a congruent beam having an upward or positive slope with respect to axis 3. Since the beam of upward slope is not required or desirable for automobile use, I surround my light source 6 with a suitable shield 15 so that only half of the reflecting surface 1 is within the field of illumination. This shield 15 is cup-shaped and is preferably hemispherical to maintain radial reflection of rays from the light source. The practical effect of this construction is to double the concentration of light incident to the reflecting surface 1. A disadvantage of all systems of illumination that rely upon a single beam is that objects a considerable distance in advance of the vehicle can only be illuminated by such an increase in the intensity of the beam as to cause glare. This is not only a limitation upon the maximum intensity that may be safely applied, but is in addition the cause of frequent accidents. I overcome this disadvantage by providing in addition a restricted beam or pencil of light projected in the form of substantially parallel rays from the head-light and since this beam is not used to directly illuminate the road surface, it need not be flaring or divergent. It does not, therefore, lose intensity rapidly and therefore need not be of high initial intensity. The construction by which this beam is formed will now be described. Referring to Fig. 1, 16 denotes a second surface that is also a continuous geometric function. The surface 16 is an ellipsoid, i. e., a surface of revolution generated by an ellipse having its axis on the line 17 and on this axis a first focus at the point 4 and a second focus at the point 21. Since this surface 16 is aplanatic, rays from the light source to this surface will be reflected to the point 21 and surrounding this point and surrounding axis 17 is interposed a suitable reflector 18 to redirect these rays, i. e., to reflect them to the lens 19. The reflector 18 is of conical form, the axis of the cone being coincident with axis 17 and is shown in top view in Fig. 4 and in end view in Fig. 5. The rays from surface 16 impinging upon reflector 18 will, of course, be reflected with the angle of reflection equal to the angle of incidence. With a conical reflector of the dimensions illustrated, the rays tend to spread out upon leaving the reflector. Preferably I convert these rays into rays composing the beam 20, which beam is substantially parallel to the axis 3 and for this purpose, I pass these rays through a suitable lens 19. A cross section through this lens appears in Fig. 1 and a top view of the same in Fig. 9. The precise form of lens employed is subject to modification within the skill of the lens

designer in response to changes in the ratio between the major and minor axis and resultant changes in the location of the focus 21. The lens 19 will in any case be adapted to convert the rays from the reflector 18 into a beam composed of rays substantially parallel to axis 3. By reference to Fig. 6, it will be noted that this lens occupies only the lower half of the area of the total lens, since it is only in the lower half that these rays are present.

If instead of reflector 18 of true conical form I employ a reflector of convex cross section I may so form the outline of this reflector that the rays reflected therefrom are less divergent than in the illustration in Fig. 1 and by appropriate selection of the form of the convex cross section of this reflector the rays may be reflected substantially parallel to one another and either parallel to axis 17 or, if desired, parallel to axis 3. In this case I may dispense with the lens 19 substituting therefor a plane glass for protection of the light interior.

In addition to that component of the total light that is reflected by the surfaces 1 and 16, there are some rays passing directly from the light source to the area occupied by the lens. These rays are also converted into a beam 25 composed of rays that are substantially parallel and for this reason the beam 25 also is not utilized to directly illuminate the road surface but forms a beam, the intensity of which does not rapidly diminish and which may, therefore, be utilized to indicate objects considerably in advance of the vehicle without causing objectionable glare. To bring these rays to substantial parallelism, I utilize the lens 26 which is a lens of positive focal length. As shown in Fig. 6 this lens occupies the upper half of the total area occupied by the lens. Both lenses 19 and 26 are preferably tinted to further eliminate any possibility of objectionable glare even to a person directly within the beam. For this purpose I find a light-blue tint suitable. Since the direction of the rays reflected from surface 1 is in general satisfactory, the central part of the area occupied by the lens may be a plain disc 27 of untinted glass.

The projected outline of the surface of revolution of which 16 is a part, is diagrammatically indicated by the dotted line 28.

In practice the shell of which the surfaces 1 and 16 are a part, together with the neck 30, is formed in two halves, i. e., an upper and a lower half. Since each half is identical with the other the surfaces may be formed by pressing from sheet metal using a single die and these two halves may then be joined by means of a small flange diagrammatically indicated by 31 in Fig. 1. The shell containing these surfaces may, of course, be surrounded by any suitable ornamental shell, part of which has been indicated by 32 in Fig. 1 and which ornamental shell also is a retainer ring for the lens structure.

It may for certain purposes be advisable at times to intercept the rays from the light source directly to the lens and to reflecting surface 16 and for this purpose I may provide a shield or visor 35 pivotally carried by the pins 36 on either side of the cup 15 so that the visor may, when desired, be pivotally moved upward to the position in which it intercepts rays from the light source direct to surface 16 and to the lens area including the axial rays. For this purpose the visor 35 is controlled by the arm 37 and the push

rod 38 passing through the sleeve 39 (Fig. 1). As shown in Figs. 1-3 inc. the cup-shaped reflector 15 is supported by the shelf 40 spot-welded to the shell.

While I have shown the structure with the upper half of the surface illuminated, this is not essential since I may, if desired, reverse the illumination directing it against the lower half of the surface provided only that I reverse the direction of the rays from the surface 1 at the point 5. In Fig. 7 I have shown the central disc 41 of the lens carrying a projection or shoulder 42 defining the surface 43 at a right angle to the surface of the disc. This surface 43 is silvered and, as shown in Fig. 7, reverses the direction of the rays impinging thereon to form the beam 48 of upward or positive slope with respect to the axis 3. It will of course be understood that if the lower half of the reflecting surface 1 is illuminated, the surface 43 will face downwardly instead of upwardly and the reversed beam 48 will have a downward or negative slope with respect to the axis.

The foregoing description is for purposes of illustration and not of limitation and it is therefore my intention that the invention be limited only to the appended claims or their equivalents in which I have endeavored to claim all inherent novelty.

I claim:

1. A headlight comprising a singly truncated ellipsoidal reflecting surface having an axis and on said axis a first and second focus, a light source substantially at said first focus, a cup-shaped reflector on one side of said axis and having its center substantially at said first focus, a doubly truncated, ellipsoidal reflecting surface contiguous to said singly truncated reflecting surface having an axis forwardly and downwardly inclined and on said axis a first focus coincident with the first mentioned first focus and a second focus independent of the first mentioned second focus and a reflector at said last mentioned second focus adapted to project forwardly rays reflected thereon from said doubly truncated ellipsoidal reflecting surface.

2. A headlight according to claim 1 comprising in addition a shield adapted to be removably inserted between said light source and said doubly truncated ellipsoidal reflecting surface.

3. A headlight comprising a singly truncated ellipsoidal reflecting surface having an axis and on said axis a first and second focus, a light source substantially at said first focus, a lens of positive focal length within the field of direct illumination from said light source and at said second focus and at a right angle to said axis, a cup-shaped reflector on one side of said axis and having its center substantially at said first focus, a doubly truncated ellipsoidal reflecting surface contiguous to said singly truncated reflecting surface having an axis forwardly and downwardly inclined and on said axis a first focus coincident with the first mentioned first focus and a second focus independent of the first mentioned second focus adapted to project forwardly rays reflected thereon from said doubly truncated ellipsoidal reflecting surface.

4. A headlight according to claim 3 comprising in addition a shield adapted to be removably inserted between said light source and said lens and said doubly truncated ellipsoidal surface.

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