

Sept. 17, 1935.

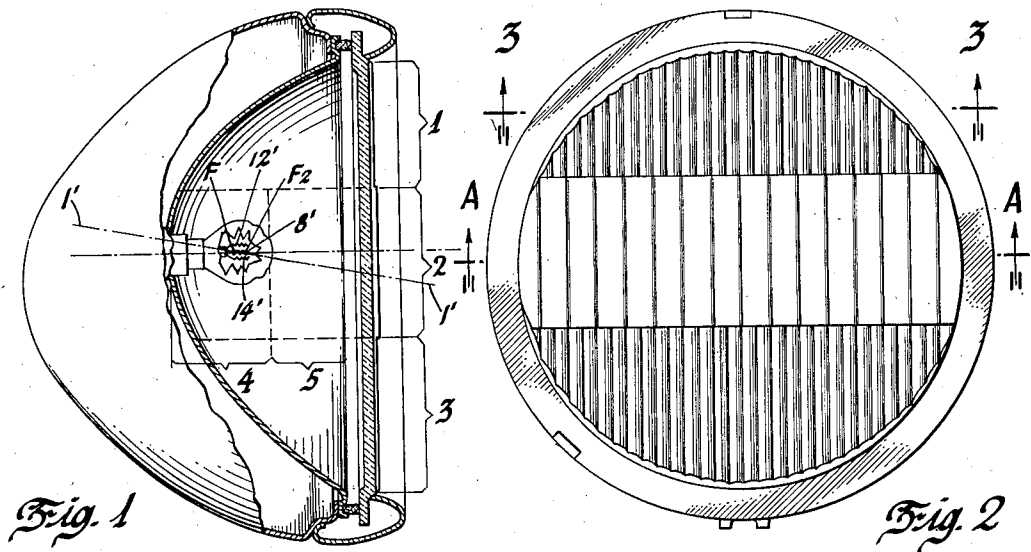
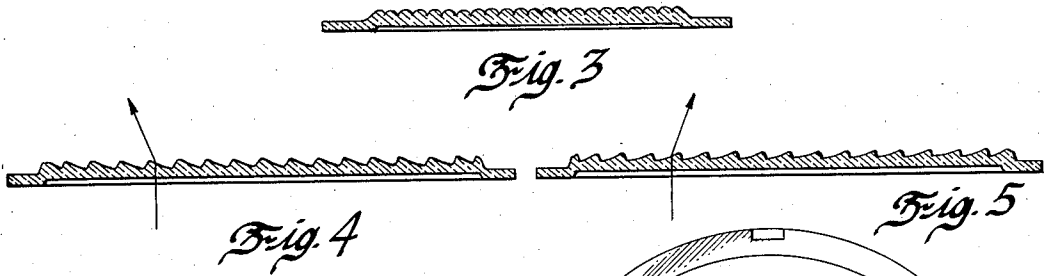
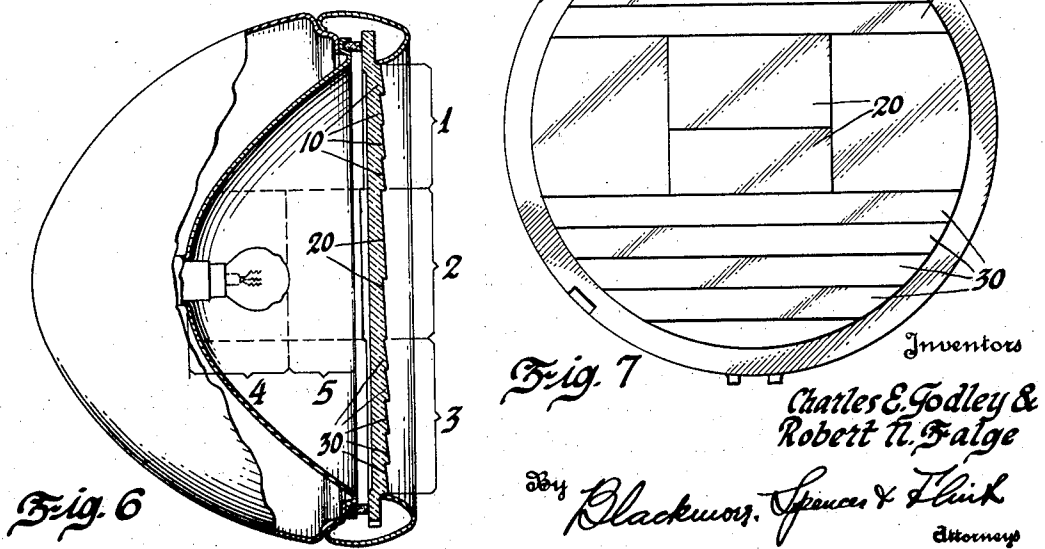
R. N. FALGE ET AL

2,014,429

HEADLAMP

Filed Feb. 23, 1933

3 Sheets-Sheet 1



Inventors

Charles E. Godley &
Robert N. Falge

By Blackwelder, Spencer & Flint
Attorneys

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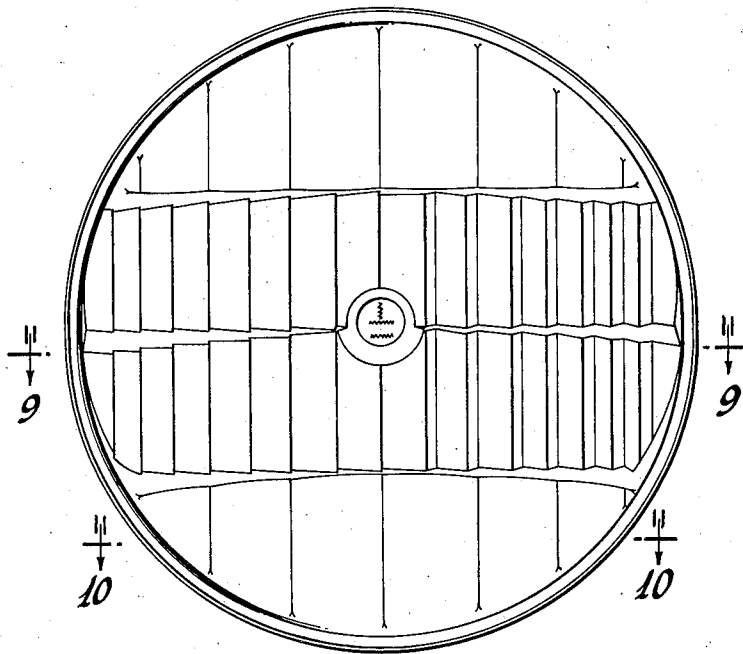


Fig. 8

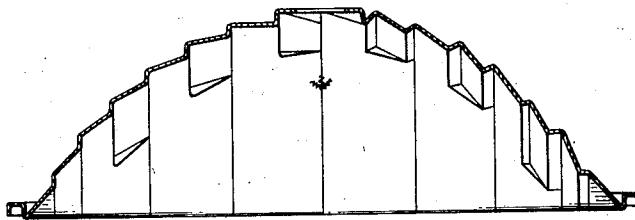


Fig. 9

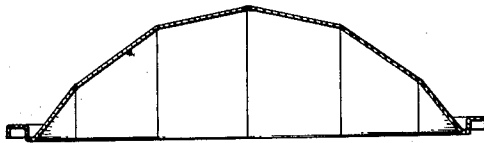


Fig. 10

Inventors
Charles E. Godley &
Robert N. Falge.

By *Blackman, Spencer & Link*
Attorneys

Sept. 17, 1935.

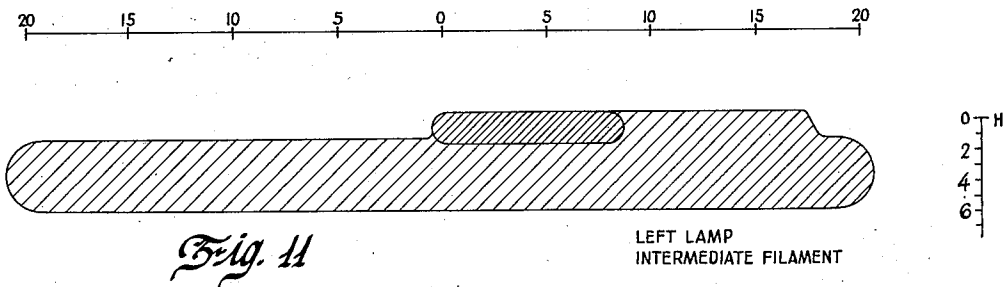
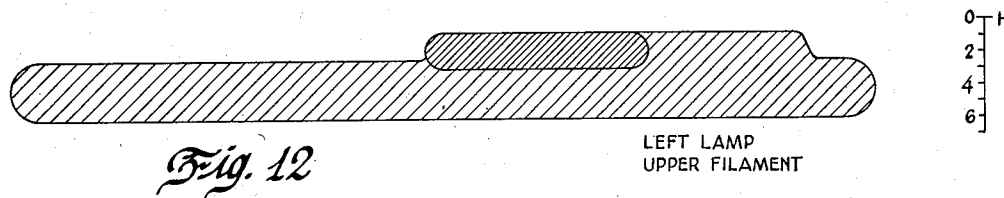
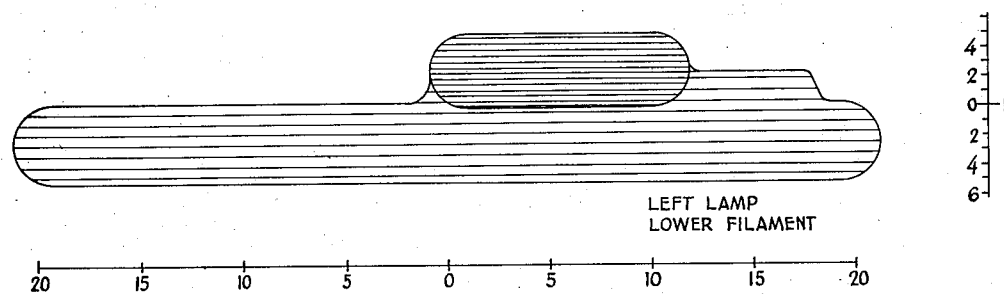
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3 Sheets-Sheet 3



Inventors
Charles E. Godley &
Robert N. Falge

By Blackmore, Spencer & Flint
Attorneys

UNITED STATES PATENT OFFICE

2,014,429

HEADLAMP

Robert N. Falge, Anderson, Ind., and Charles E. Godley, Ypsilanti, Mich., assignors, by mesne assignments, to General Motors Corporation, Detroit, Mich., a corporation of Delaware

Application February 23, 1933, Serial No. 658,058

6 Claims. (Cl. 240—41.25)

This is a continuation in part of our prior application Serial No. 539,518, filed May 23, 1931.

In that application we have set forth a system of illumination for use on automobiles in which each headlamp is capable of projecting a plurality of beams of different height. The higher beams are distinguished by the fact that their upper portions are unsymmetrical; that is, the light at the top of the beam is confined to one side of the road. By using at one side of the car a headlamp that projects a beam higher on one side of the road, and on the other side of the car a headlamp that projects a beam higher on the opposite side of the road, it is possible to produce a composite beam that is symmetrical, and similar to the present-day high beam. By depressing the beam from the headlamp that provides the light at the top of the left hand side of the beam, a composite beam pattern is obtained which is higher on the right hand side. The driver of an approaching car is consequently relieved of glare, while the high beam on the right hand side gives adequate illumination for passing. The present application has to do with the design of headlamp used in the system just described.

The design may be embodied either in the reflector, the lens, or in a combination of reflector and lens. We have illustrated all three forms. A characteristic feature of the invention consists in so forming the reflector, lens, or both, that the areas that provide light at the top of the beam are formed to throw light to one side of the road, while the remaining areas are formed to spread the light more or less across the width of the road as desired to give good general illumination. In the case of headlamps capable of providing beams of different height in accordance with present practice, it is the intermediate zone of the lamp that provides the top light, and hence it is this region that is shaped to throw light to one side of the road. This may be done by either providing the lens with half flutes, or with side bending prisms and full flutes which are optically the same thing, or by bending the corresponding portion of the reflector so as to throw the light to one side. This is most conveniently done by properly fluting the reflector.

In the accompanying drawings:

Figure 1 is a vertical section through our improved headlamp embodying a special reflector for producing a drop in the beam.

Figure 2 is a front view of the lens employed in the lamp of Figure 1.

Figure 3 is a section on line 3—3 of Figure 2.

Figure 4 is a section on line A—A of Figure 2,

showing the arrangement of flutes over the corresponding portion of the lens in the case of the right headlamp, while Figure 5 is a section taken on the same line showing the arrangement of flutes in the case of the left headlamp.

Figure 6 is a vertical section through a modified form of our headlamp.

Figure 7 is a front view of the lens shown in Figure 6.

Figure 8 is a front view of a special reflector which may be used instead of the lens and reflector combinations previously described.

Figure 9 is a section on line 9—9 of Figure 8.

Figure 10 is a section on line 10—10 of Figure 8.

Figures 11, 12 and 13 show the beam patterns produced by the left headlamp made according to our invention.

A headlamp consists essentially of a light source and light directing means which may consist either of a reflector alone, or of a combination of reflector and lens. In addition, headlamps have been developed in which light is directed by the lens alone, but such designs have so far not found wide application in automobile headlights.

In Figures 1 to 5 we have disclosed a headlamp in which the light is directed by means of a special reflector, and a special lens; in Figures 6 and 7 we have shown a headlamp in which light is directed by a plain parabolic reflector and a special lens, and in Figures 8 to 10 we have shown a special reflector which directs the light where desired without the use of a lens. Each of the light directing devices shown in Figures 1, 6 and 8 is divided into three transversely extending superimposed zones or areas, the upper and lower zones of which are constructed to depress light downwardly. In each form of the invention the top zone is numbered 1, the intermediate zone is numbered 2, and the lower zone is numbered 3. In Figures 1 and 8 the light from zones 1 and 3 is bent downwardly by tilting the corresponding portions of the reflector as indicated by the tilted axis 1'—1'. In Figure 6 the same result is achieved by using down-bending prisms 10 on the upper zone 1, and down-bending prisms 30 on the lower zone 3.

To secure insensitivity to variations of the light sources from their proper positions vertically, the intermediate zone 2 is given special treatment to throw the light from the center portion 4 toward the bottom of the beam so that the top of the beam is formed by the light coming from the sides of the intermediate zone which are numbered 5. In the forms of our invention shown in Figures 1 and 8 this is accomplished by axially offsetting

the upper and lower halves of the reflector, thus the upper half will have its focus at F, while the lower half will have its focus at F². If preferred a similar result may be obtained by tilting the center of the intermediate zone downwardly with respect to the sides as disclosed in the prior patent to Brown, 1,822,839, granted September 8, 1931. It will be understood that the phrase "substantially parabolic reflector" as used in the claims includes reflectors having the modifications just described as well as plain parabolic reflectors. In the form of our invention shown in Figure 6, this result is accomplished by providing the center of the lens with down-bending prisms 20, which, however, are of less bending power than the prisms 10 or 30. If desired, the sides of the central zone may be equipped with lighter down-bending prisms in accordance with present practice.

The light source we employ is an incandescent lamp, and while there may be considerable variation in the design of filaments, we prefer to employ filaments of conventional V-shape, one numbered 8' between the foci of the reflector, another, numbered 12', approximately $\frac{1}{8}$ " above the focus, and a third, numbered 14', approximately $\frac{1}{8}$ " below the focus. However, the only essential thing is that there be light sources in the reflector spaced vertically from each other with or without lateral displacement. The only effect of lateral displacement is to give a slight sidewise shift to the beam as disclosed in the prior patent to Sumner E. Brown No. 1,792,806.

The construction so far described will provide three symmetrical beams, the highest beam being projected from the filament 14', the next highest from the filament 8', and the lowest from the filament 12'. The beams produced from the last two filaments will correspond with the present day high beam and low beam, respectively, while the beam produced by the lowest filament 14' will provide a beam higher than any now permitted in most States, but one which gives excellent illumination for driving over rolling and hilly roads.

To provide a beam with an asymmetrical top we have formed the reflector or the lens so as to direct the light from the intermediate zone toward one side of the road. This may be accomplished by properly shaping the corresponding part of the lens as illustrated in Figures 4 and 5. In Figure 4 we have illustrated fractional flutes designed to throw light toward the left side of the road. As explained in our prior application, half flutes consist essentially of side-bending prisms provided with full flutes to spread the light in the amount desired. The right hand headlamp will preferably be provided with half flutes as shown in Figure 4 to direct light to the left of the road, while the left headlamp will be provided with half flutes as shown in Figure 5 to direct light to the right of the road. If desired, the half flutes may be designed for lateral insensitivity as described in our first filed application; that is, in the case of the left hand headlamp the left boundary of the asymmetrical portion of the beams may be provided by rays from the extreme side portions of the reflector, these portions being less sensitive to lateral displacement of the light source. The flutes over these portions of the reflector are designed with little or no prismatic action at their left extremities. The prismatic action at the left side of the half flutes increases as the vertical center line of the lamp is approached. As a consequence, going from the side of the lamp to the center line, the left-most ray

of each successive flute is thrown a little more to the right, providing a tolerance so that even if the filament is .060" out of position, still no ray will pass to the left of the vertical center line of the lamp.

The lamp shown in Figures 6 and 7 will be provided over the intermediate zone with half flutes of the design shown in the previous figures.

The same result is accomplished in the case of the reflector shown in Figure 8 by the provision of half flutes formed in the intermediate section of the reflector itself as illustrated in Figure 9.

The light from the top and bottom sections 1 and 3 is spread across the width of the roadway by the use of full flutes either on the lens as shown in Figures 2 and 3, or on the reflector as shown in Figures 8 and 10.

Obviously, if preferred, hybrid types may be employed, for example, full flutes may be used on the intermediate section of the reflector in combination with side-bending prisms on the lens, or the reverse arrangement may be used, that is, the intermediate section of the reflector may be turned to throw light to one side of the road, and the light may be spread by the provision of full flutes on the lens. Other obvious combinations will occur to those skilled in the art.

The beam patterns produced by the left headlamp of each of the forms of the invention illustrated are shown in Figures 11 to 13, these patterns being appropriately labeled so that no further description is necessary. The beam patterns of the right lamps will be of the same design except that the asymmetrical portion will be on the opposite side of the road—in other words as if one were looking at the pattern through the paper.

Many modifications of our invention will be obvious. For example, so long as the bulk of the rays of each section are directed in the manner described, an occasional area in the intermediate zone may be provided with a full flute or flutes, or an occasional area in the top and bottom zone may be provided with a half flute or flutes without sensibly altering the optical result, for such expedients are now and then necessary to smooth up the beam.

The degree of spread of the light from any of the sections may be varied as desired, and for some purposes it may be that little or no spread will be needed. Various designs and arrangements of filaments may be employed to alter the depth or shift of the beams. However, we have described what we believe to be a superior arrangement.

Instead of doing all of the downward bending in the reflector or lens part may be done in the reflector and part in the lens. The same is true in the case of the sidewise bending or spreading of the light. If preferred, convex flutes may be employed instead of concave flutes and in such event the same principle of design would be employed to render them insensitive to variations in lateral position. It is likewise obvious that instead of using a number of filaments one light source may be shifted to the various positions in the reflector.

While we have illustrated a construction in which the left lamp provides the light at the top right hand side of the beam and the right lamp provides the light at the top left hand side of the beam, it is not essential that the beams from the two lamps be thus criss-crossed. If preferred the right lamp may provide the light at the top of the beam on its side of the road, and the left

lamp may provide the light at the top of the beam on its side of the road. However, it is important that the lamp which provides light at the top right hand side of the beam shall not direct light in any quantity into the top left side of the high beam, otherwise an asymmetric beam will not be obtained when the beam from the other lamp is dropped. In the case of the lamp which projects light to form the upper left hand portion of the high beam, it is only essential that all of the rays going into that portion of the beam shall be dropped upon going to the lower beam.

We claim:

1. A lens for use in depressible beam headlighting systems for automobiles provided with three transversely extending superimposed zones, the central zone being provided with unsymmetrical flutes, for directing light to one side of the road in the form of a laterally elongated beam, while the top and bottom zones are provided with flutes for projecting light across the width of the road.

2. A headlamp comprising light projecting means including a substantially parabolic reflector and a glass closure, means providing a source of light adjacent the focal region of the reflector, said light projecting means being subdivided into upper, intermediate and lower transversely extending superimposed zones, said intermediate zone being provided with means for directing substantially all of the light to one side of the road in the form of a laterally elongated beam, one of the zones other than the intermediate zone being provided with means for directing light across the full width of the road, said upper and lower zones being formed to direct the rays falling upon them beneath the rays from the intermediate zone.

3. A headlamp comprising light projecting means including a substantially parabolic reflector and a glass closure, means providing a source of light adjacent the focal region of the reflector, said light projecting means being subdivided into upper, intermediate and lower transversely extending superimposed zones, said intermediate zone being provided with means for directing substantially all of the light to one side of the road in the form of a laterally elongated beam while the upper and lower zones are provided with means for directing light across the full width of the road, said upper and lower zones being formed to direct the rays falling upon them beneath the rays from the intermediate zone.

4. A headlamp comprising light projecting

means including a substantially parabolic reflector and a glass closure, means providing a source of light adjacent the focal region of the reflector or at a point above the focal region, said light projecting means being subdivided into upper, intermediate and lower transversely extending superimposed zones, the rays of light from said upper and lower zones being but slightly affected by shifting from one source to the other while the rays of light from said intermediate zone are shifted sharply downwardly upon energizing the upper source, said intermediate zone being provided with means for spreading substantially all of the light to one side of the road in the form of a laterally elongated beam, one of the zones other than the intermediate zone being provided with means for spreading light across the full width of the road, said upper and lower zones being formed to direct the rays falling upon them beneath the top of the beam produced when the lower source is energized, whereby, upon changing to the upper source, an effective lowering of the top of the high side of the beam is secured.

5. A headlamp comprising light projecting means including a substantially parabolic reflector and a glass closure, means providing a source of light adjacent the focal region of the reflector or at a point above the focal region, said light projecting means being subdivided into upper, intermediate and lower transversely extending superimposed zones, the rays of light from said upper and lower zones being but slightly affected by shifting from one source to the other while the rays of light from said intermediate zone are shifted sharply downwardly upon energizing the upper source, the intermediate zone being provided with means for directing substantially all of the light to one side of the road in the form of a laterally elongated beam while the upper and lower zones are provided with means for directing light across the full width of the road, said upper and lower zones being formed to direct the rays falling upon them beneath the top of the beam produced when the lower source is energized, whereby, upon changing to the upper source, an effective lowering of the top of the high side of the beam is secured.

6. A lens as defined in claim 1 having the last named zones provided with down-bending prisms.

ROBERT N. FALGE.
CHARLES E. GODLEY.