

March 10, 1936.

C. A. MICHEL ET AL

2,033,387

REFLECTOR

Filed March 21, 1934

2 Sheets-Sheet 1

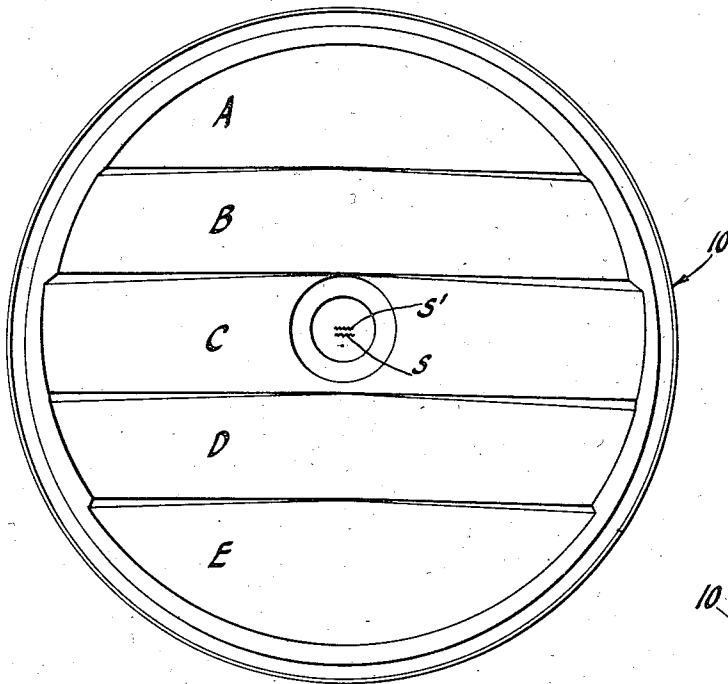


Fig. 1

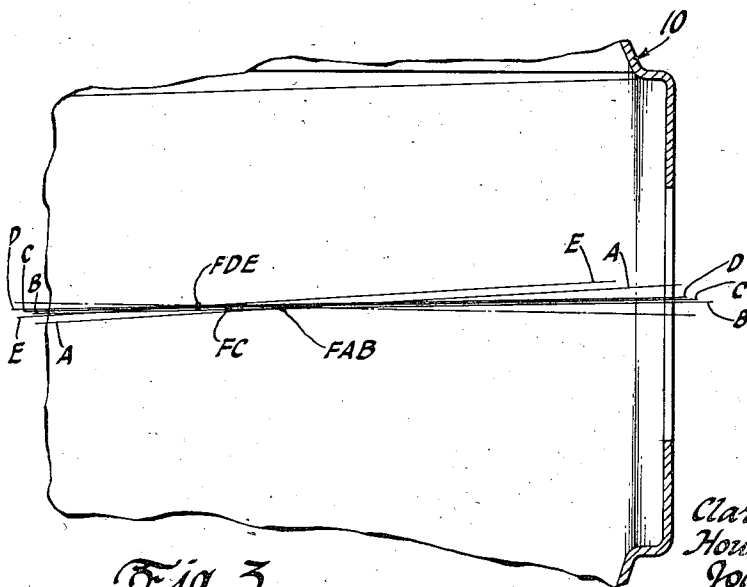


Fig. 3

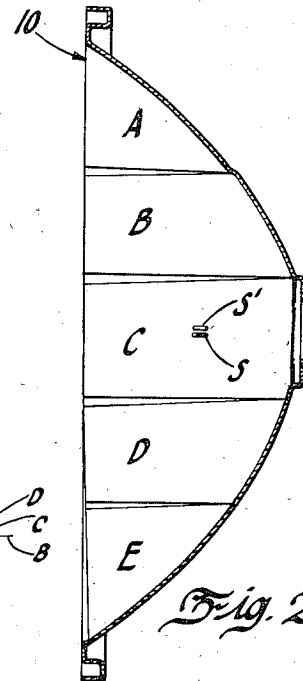


Fig. 2

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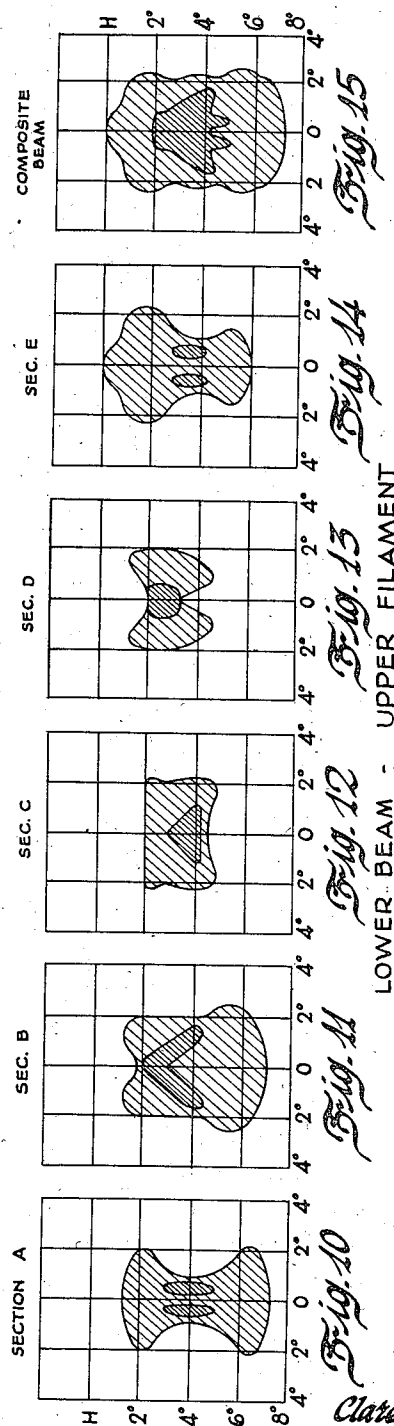
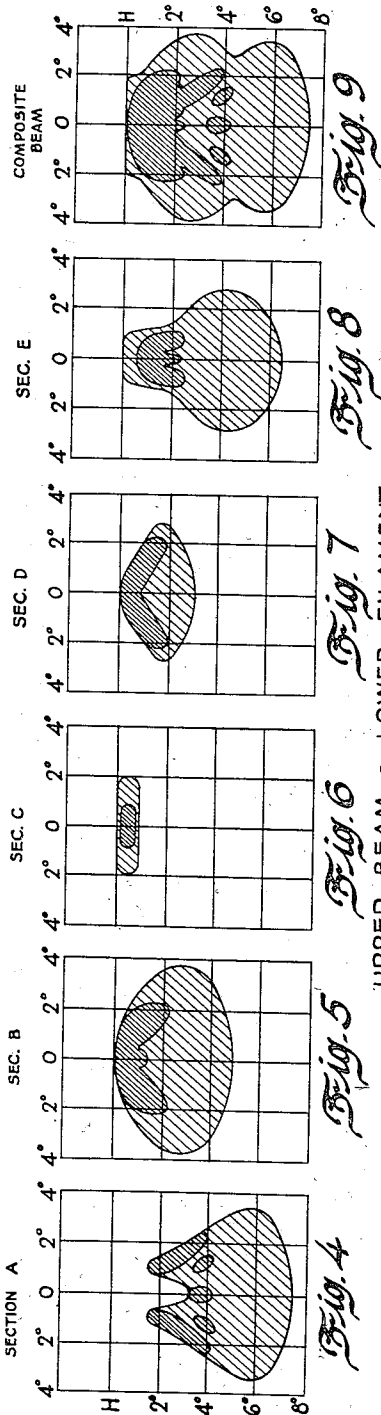
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UNITED STATES PATENT OFFICE

2,033,387

REFLECTOR

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ration of Delaware

Application March 21, 1934, Serial No. 716,574

6 Claims. (Cl. 240—41.36)

This invention has to do with reflectors for use in automobile head-lamps and is an improvement on the reflector disclosed and claimed in Michel Patent No. 1,594,544, granted August 3, 1926. The reflector there illustrated is an improvement on the one shown in Clark Patent No. 1,136,507, granted April 20, 1915. The Clark reflector is characterized by the fact that the focus of the upper half is behind the light source while the focus of the lower half is ahead of the light source. Each half projects a semi-circular beam but the two beams are superimposed and the top of the semi-circle of the beam from the upper half is customarily brought in line with the flat top of the beam from the lower half. The beam produced by the Michel reflector is of the same type except that light from the uppermost and lowermost portions is thrown toward the bottom of the beam.

While the beams from both the Clark and Michel reflectors are somewhat insensitive to inaccuracies in positioning of the filaments, this insensitivity is not as great as is desirable and often results in considerable reduction in intensity at the top of the beam where the greatest intensity is needed. Thus with the filament behind its proper position, the light from both halves of the reflector spreads out, tending to produce a reduction in intensity at the top center of the beam and also to raise the upper limit of the beam.

These objections are largely overcome by the improvement herein disclosed. This improvement consists in providing at the center of the Michel reflector a zone of parabolic contour having its axis substantially horizontal and its focus between the foci of the upper and lower sections. A considerable proportion of the light from the new zone comes from the sides of it and the conventional V-shaped filaments present to these sides the appearance of a single horizontal coil of wire. The corresponding images are, of course, flat and remain so even though the filaments be either forward or back of focus. Consequently the concentrated light made up of these small filament images remains at the top of the beam, the only effect of axial shift in the filament being to alter the horizontal angular relation of the reflected images, either bringing them closer together or moving them further apart.

There is a further gain in useful light with this design in that it permits elimination of the large so-called transition zones joining the offset portions of the reflector on the horizontal

axis. Transition zones simply scatter light about without concentrating it on the road where it is most needed, and while they cannot be entirely avoided, their size is much reduced by the present construction.

The bulk of the new central zone is also sufficiently far removed from the center of the reflector so that the change in vertical aim of the beam resulting from inaccuracies in vertical position of the light source do not produce any greater variations than with the older designs. Naturally these advantages are obtained to some extent both in the case of the filament on the axis and the filament usually provided a short distance above the axis to produce the depressed beam.

Other modifications will be described in the course of the following specification in which:

Figure 1 is a front elevation of the improved reflector.

Figure 2 is a vertical section.

Figure 3 is an enlarged view of the center of Figure 2 showing in exaggerated fashion the foci and axes of the various sections of the reflector.

Figures 4 to 8 show the type of beams projected by the various sections of the reflector with the lower filament energized, while Figure 9 shows the corresponding composite beam.

Figures 10 to 14 show the beams projected by the different sections with the upper filament energized, while Figure 15 shows the corresponding composite beam.

The reflector indicated at 10 is made up of five transversely extending superimposed zones A, B, C, D, and E. Each of the zones is a portion of a surface of revolution and is preferably of parabolic contour, although, if preferred, ellipsoidal or hyperboloidal shapes closely approximating a paraboloid may be used.

Zone C has its axis C—C inclined downwardly $\frac{1}{2}^\circ$, and its focus is indicated at FC. Section B has its axis B—B inclined downwardly $\frac{1}{2}^\circ$, while section A has its axis A—A downwardly inclined to a greater extent, preferably on the order of $1\frac{1}{4}^\circ$. Sections A and B preferably have a common focus indicated at FAB, although if desired these foci may be slightly separated along the axis. However, this focus, or these foci, as the case may be, should be located to the rear of the focus FC of zone C.

Zone D has its axis D—D slightly downwardly inclined, preferably on the order of $\frac{1}{2}^\circ$, while section E has its axis E—E downwardly inclined to a greater extent, preferably on the order of $1\frac{1}{2}^\circ$. Sections D and E have a common focus as

shown at FDE, although if preferred these foci may be slightly separated in an axial direction. With either arrangement, the foci should be forward of the focus FC of the zone C.

5 The $\frac{1}{2}^\circ$ downward tilt is given to sections B, C and D in order to insure that the tops of the beams projected from these portions of the reflector shall come up to but not project above horizontal. The same end may of course be
10 accomplished by tilting either the headlamp or the reflector forwardly $\frac{1}{2}^\circ$ but this is often regarded as undesirable both from the standpoint of appearance and difficulty of adjustment of headlamps in service.

15 In Figures 1 and 2, we have illustrated diagrammatically the position of the light sources S and S' which may take the form of the conventional V-shaped filaments of an incandescent lamp, the filaments lying horizontal with their
20 apexes at the front, one filament being preferably .085" above the other. It will be noted that the lower filament lies along the axis of the central section C, and encompasses the various focal points within its length.

25 In Figures 4 to 8 are illustrated the beam patterns cast by the different reflector zones with the lower of focal filaments energized. These figures are self-explanatory. Attention is especially invited to the beam pattern cast by section C
30 which is of considerable intensity and of very narrow depth. This pattern it will be noticed comes to the top of the composite beam, and the effect of axial displacement of the light source is simply to increase or decrease the width of the
35 beam. In any event this light is of high intensity and is always at the top of the beam where it is most needed. On the contrary, the light from the other sections, such as B and D, may be spread into the lower part of the beam as a result
40 of axial displacement of the filament.

In Figure 9 is shown the corresponding composite beam pattern. In practice, of course, the light will be spread across the road by means of vertical flutes.

45 In Figures 10 to 14 we have shown the corresponding beam patterns projected from the same reflector sections with the upper filament S' energized, and with these it will be noted that much the same condition exists. The pattern from
50 section C is of less depth than that from the other sections and will always appear toward the top of the combined beam in spite of axial displacement of the light source.

While it will be noted that the corresponding
55 composite beam shown in Figure 15 indicates some light above the -2° line, this light is of relatively low intensity so that the beam from the upper filament is essentially a depressed beam.

This reflector is especially designed for use
60 with the lens disclosed in Figures 28 to 32 of the application of John L. Koubek, S. N. 679,296, filed July 7, 1933. The lens zones there illustrated are designed for use with the corresponding reflector zones of the present application. In general in modern headlamps it is customary to give
65 less spread to the light at the top of the beam so that this light may be concentrated down the center of the road. This is, of course, accomplished by using lighter flutes over the center of the reflector, and especially over the sides of the
70 center zone.

The reflector here described may likewise be used with a lens of the design disclosed in the application of John L. Koubek, S. N. 676,821, filed
75 June 21, 1933. In case the reflector is used with

flat lenses instead of the spherical lenses disclosed in the above applications, it will, of course, be unnecessary to use the special lens treatment disclosed in said applications, each zone of the reflector then being provided with simple symmetrical spreading flutes to give the desired light distribution.

We claim:

1. A reflector comprising a plurality of transversely extending superimposed zones, each of
10 said zones being formed by the revolution of a curve of substantially parabolic contour, the meeting edges of all of said zones lying in substantially parallel horizontal planes, said zones including a central zone having a forwardly extending axis and extending substantially equal
15 distances above and below said axis, upper zones having their foci to the rear of the focus of the central zone, lower zones having their foci forward of the focus of the central zone, the uppermost and lowermost zones having their axes
20 downwardly inclined with respect to the axes of the other zones, the portions of the uppermost and lowermost zones nearest the apex of the reflector lying adjacent the intersections with the
25 reflector of perpendiculars drawn through said foci.

2. A reflector comprising a plurality of transversely extending superimposed zones, each of
30 said zones being formed by the revolution of a curve of substantially parabolic contour, the meeting edges of all of said zones lying in substantially parallel horizontal planes, said zones including a central zone having a forwardly extending axis and extending substantially equal
35 distances above and below said axis, upper zones having their foci to the rear of the focus of the central zone, lower zones having their foci forward of the focus of the central zone, the uppermost and lowermost zones having their axes
40 downwardly inclined with respect to the axes of the other zones, the portions of the uppermost and lowermost zones nearest the apex of the reflector lying adjacent the intersections with the
45 reflector of perpendiculars drawn through said foci, the axes of said other zones being downwardly inclined by an angle less than the angle of inclination of the uppermost and lowermost zones.

3. The combination of a reflector comprising a plurality of transversely extending superimposed
50 zones, each of said zones being formed by the revolution of a curve of substantially parabolic contour, the meeting edges of all of said zones lying in substantially parallel horizontal planes, said zones including a central zone having a forwardly extending axis and extending substantially
55 equal distances above and below said axis, upper zones having their foci to the rear of the focus of the central zone, lower zones having their foci forward of the focus of the central zone, the uppermost and lowermost zones having their axes
60 downwardly inclined with respect to the axes of the other zones, the portions of the uppermost and lowermost zones nearest the apex of the reflector lying adjacent the intersections with the
65 reflector of perpendiculars drawn through said foci, and a concentrated light source encompassing said foci and having its major dimension in a substantially horizontal plane.

4. The combination of a reflector comprising a plurality of transversely extending superimposed
75 zones, each of said zones being formed by the revolution of a curve of substantially parabolic

contour, the meeting edges of all of said zones lying in substantially parallel horizontal planes, said zones including a central zone having a forwardly extending axis and extending substantially equal distances above and below said axis, upper zones having a common focus to the rear of the focus of the central zone, lower zones having a common focus forward of the focus of the central zone, the uppermost and lowermost zones having their axes downwardly inclined with respect to the axes of the other zones, the portions of the uppermost and lowermost zones nearest the apex of the reflector lying adjacent the intersections with the reflector of perpendiculars drawn through said foci, a concentrating light source encompassing said foci and having its major dimension in a substantially horizontal plane and a second light source above the first named light source for producing a lower beam.

5. A reflector comprising a plurality of transversely extending superimposed zones, each of said zones being formed by the revolution of a curve of substantially parabolic contour, the meeting edges of all of said zones lying in substantially parallel horizontal planes, said zones including a central zone having a forwardly extending axis and extending substantially equal distances above and below said axis, upper zones having a common focus to the rear of the focus of the central zone, lower zones having a common focus forward of the focus of the central zone, the uppermost of the upper zones and the lowermost of the lower zones having their axes

downwardly inclined with respect to the axes of the other zones, the portions of the uppermost and lowermost zones nearest the apex of the reflector lying adjacent the intersections with the reflector of perpendiculars drawn through the said foci.

6. A reflector comprising a plurality of transversely extending superimposed zones, each of said zones being formed by the revolution of a curve of substantially parabolic contour, the meeting edges of all of said zones lying in substantially parallel horizontal planes, said zones including a central zone having a forwardly extending axis and extending substantially equal distances above and below said axis, upper zones having a common focus to the rear of the focus of the central zone, lower zones having a common focus forward of the focus of the central zone, the uppermost of the upper zones and the lowermost of the lower zones having their axes downwardly inclined with respect to the axes of the other zones, the portions of the uppermost and lowermost zones nearest the apex of the reflector lying adjacent the intersections with the reflector of perpendiculars drawn through the said foci, the axes of said other zones being downwardly inclined by an angle less than the angle of inclination of the uppermost and lowermost zones.

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