Sept. 17, 1940. J. A. O'NEIL 2,214,861

LUMINAIRE

Filed Nov. 26, 1938 2 Sheets-Sheet 1

Fig. 1.

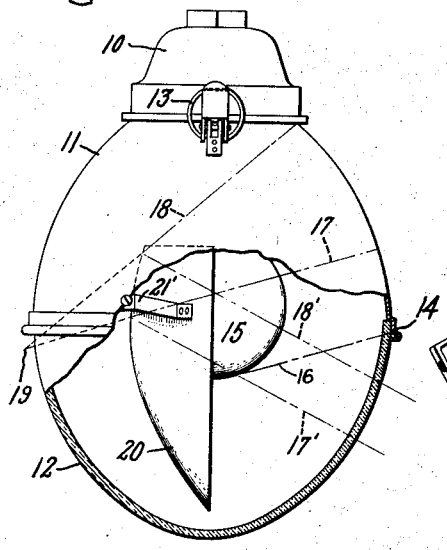

Fig. 2.

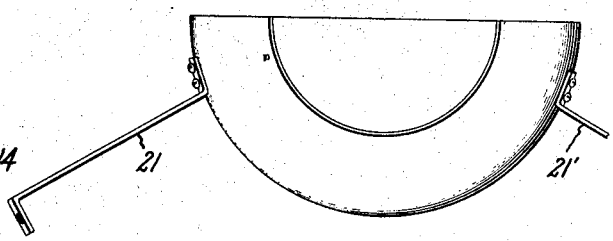

Fig. 3.

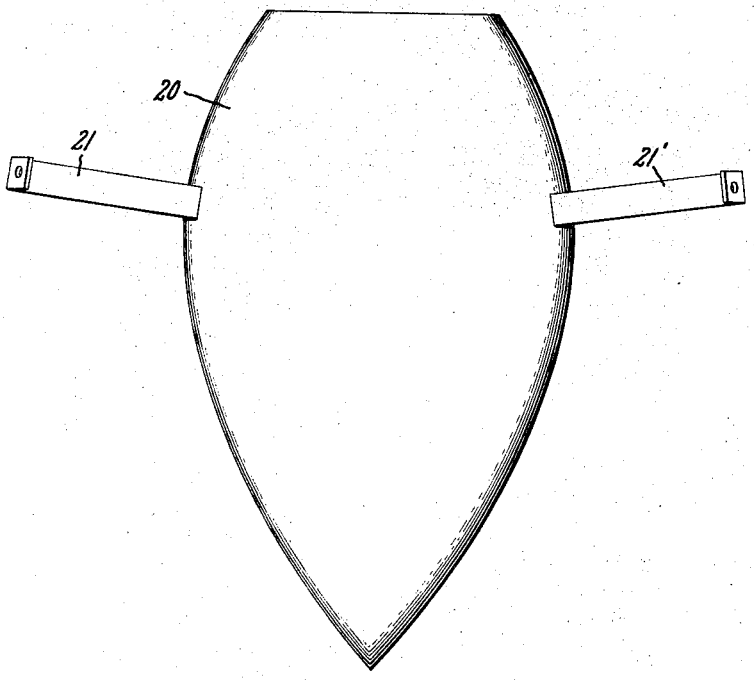

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Fig. 4.

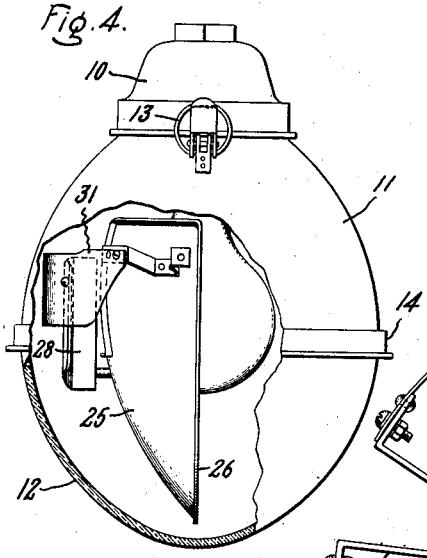


Fig. 5.

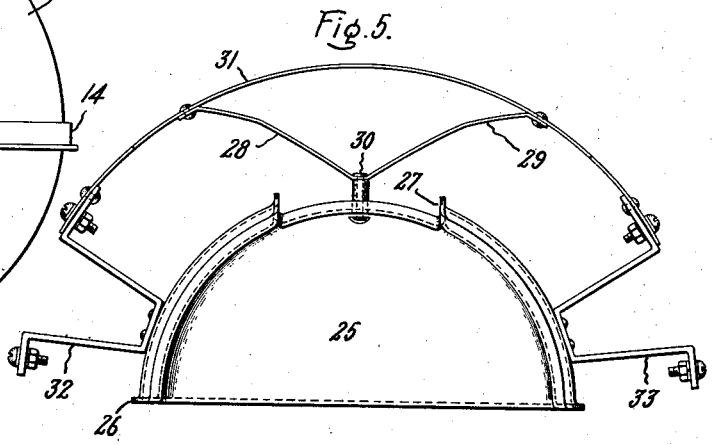
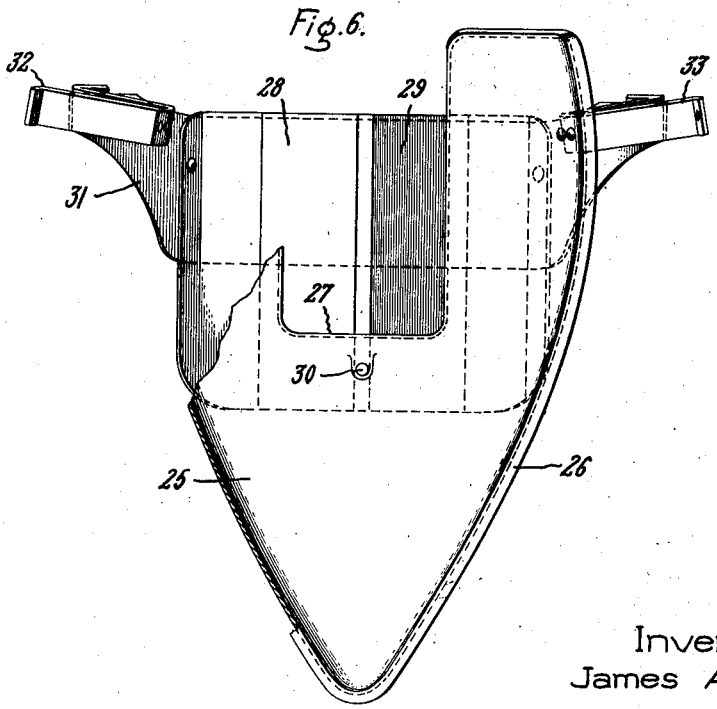


Fig. 6.



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2,214,861

UNITED STATES PATENT OFFICE

2,214,861

LUMINAIRE

James A. O'Neil, Lynn, Mass., assignor to General Electric Company, a corporation of New York

Application November 26, 1938, Serial No. 242,519

1 Claim. (Cl. 240—25)

My invention relates to luminaires and more particularly to an improved combination of reflector and deflector for highway lighting luminaires.

One object of my invention is to provide an asymmetric distribution of light from a normally symmetric luminaire.

For a better understanding of my invention together with other and further objects thereof, reference is had to the following description taken in connection with the accompanying drawings, and its scope will be pointed out in the appended claim.

In the accompanying drawings, Fig. 1 is a side elevation, partly in section, of a luminaire built in accordance with my invention; Fig. 2 is a plan elevation of a deflector used in the luminaire of Fig. 1; Fig. 3 is a back elevation of this deflector; Fig. 4 is a side elevation of a luminaire, partly in section, provided with a modified deflector; Fig. 5 is a plan elevation of the modified deflector; and Fig. 6 is a front elevation thereof.

Referring to the drawings in detail, Fig. 1 discloses a luminaire comprising a cap 10, a reflector 11 and a globe 12. The reflector 11 is attached to the cap 10 by latches 13 and the globe 12 is attached to the reflector 11 by a flange 14, on the edge of the reflector 11, which is rolled over a corresponding flange on the edge of the globe 12. The reflector 11 is of sheet metal and is preferably in the form of a conoid, the profile curvature of this conoid being a combination of a parabola and ellipse. The reflector herein described is used merely by way of example. My invention may be applied to any conoidal reflector projecting a comparatively wide beam.

The reflector being circular in horizontal cross section, projects a symmetrical beam from a light source located on its focal axis. In the particular illustration, the angular spread of this beam is approximately 160°, the center of the light source being above the edge of the reflector so that a line drawn from the edge to the source is 10° below horizontal. The light source is an incandescent lamp 15 supported in the cap 10, and projecting downwardly so that the filament is in the focal point of the reflector. It is practically impossible to obtain the highest candle power at the virtual cutoff, or at the edge of the light beam in luminaires of this type, and in the present luminaire this region of maximum candle power is approximately 72° from the vertical, or 8° inside the edge of the beam.

When luminaires of the above-described type are installed on city streets or on highways, they are suspended from horizontal arms attached to poles which are located along the edge of the street or highway. Since it is impractical to have these horizontal arms of great length, the luminaires are nearer to one side of the street than to the other, and since the light distribution is symmetrical, the light is projected through the windows of houses along the edge of the street. This is objectionable, and hence it is desirable to provide some means to prevent this projection of light into adjacent houses and to redirect it onto the street surface where it is needed. In accordance with my invention, this redirection of light is accomplished both by a novel deflector and by its novel combination with the symmetrical reflector of a luminaire.

In Fig. 1 I have indicated by lines 16, 17 and 18 the approximate distribution of light from the lamp 15 by the reflector 11 in any axial plane. This distribution is, of course, symmetrical about the axis of the reflector. These lines indicate that a parallel beam is projected, by the parabolic section of the reflector surface, between the lines 16 and 17 directly across the unit and below the edge of the reflector on the opposite side, and a second wedge-shaped beam is projected from the upper, or elliptical, section of the reflector between the lines 17 and 18, this beam having a focal region at 19 beyond which it again spreads and adds to the light flux of the parallel beam. In order to redirect this light onto the street surface, and thereby protect the homes near each one of these luminaires, a novel shaped deflector 20 is mounted by brackets 21 and 21' within the reflector 11 and the globe 12. This deflector is made of sheet metal, preferably aluminum, having its surface treated to retain a maximum efficiency reflecting surface and is given a profile curvature of a parabola whose focus is on the reflector axis and in the center of the light source 15. This curve is revolved about its focus and the axis of the reflector 11 over an arc of approximately 180°. The axis of this parabola profile curve is 18° to the horizontal, whereby the light impinging upon this deflector is reflected in the direction of the maximum candle power of the beam projected by the reflector. This is illustrated by the reflection of ray 17 in the direction of ray 17'. The semi-conoidal surface thus formed projects light into the region of the highest candle power of the beam. It is within the scope of my invention, however, to project this deflected light evenly throughout the beam, or in any other desired proportion, by using a curvature similar to the profile curve of the reflector, or any

other suitable curve, in generating the deflector surface.

Due to the curvature and the method of generating the surfaces of the deflector, it tapers towards each end from a center section. In accordance with another phase of my invention, this deflector surface is mounted within the symmetrical reflector, so that its maximum width is at a point slightly below the edge of the reflector, and is permitted to taper to a point below the reflector. It is permitted to extend above this maximum width section into the reflector, being cut off horizontally in a plane above the reflector edge, this plane being high enough to prevent the projection of any light beyond this deflector from any section of the reflector. The deflector is spaced from the surface of the luminaire so that a certain amount of light flux will be directed to the reflector and globe from whose surfaces it will be redirected onto the back of the deflector so as to eliminate the totally black spot within the luminaire resulting from the presence of this deflector in the globe. The upper horizontal edge of the deflector 20 is placed within the reflector so that it intersects the line 18 which marks the upper edge of the reflector beam projected toward the house side of the luminaire, thereby cutting off a sector of the light beam projected in that direction and reflecting it in the direction of line 18' which approximately coincides with the deflector axis. The lower end of the deflector terminates in an apex on the axis of the reflector so that the sector of the beam that is redirected is actually wedge shaped, being 180° at the edge of the reflector beam and tapering off to zero at the axis of the reflector. The result of this is that the beam is deflected at its upper edge, where it is most objectionable, over a sector of 180°. At the lower angles an increasingly greater portion of the light is allowed to spill, or project, toward the house side of the street. This light, however, being directed at lower angles, does not reach the houses near the luminaire. The edge of the deflector cuts off the beam so that it ends approximately along the edge of the street. Some of this light is also reflected by the globe onto the back surface of the deflector, thereby eliminating the shadow which this deflector would otherwise throw onto the globe and thereby mar the appearance of the luminaire.

In Figs. 4, 5 and 6, I have illustrated a modified deflector in the same unit as is illustrated in Fig. 1. The deflector 25 in this modification is generally of the same semi-conoidal shape as that illustrated in Figs. 1, 2 and 3. It is reinforced, along its edge, by a flange 26 and is provided with an opening 27. This opening is centrally located and substantially divides the deflector into two sections above its center. The light projecting through this opening is redirected by cylindrical deflectors 28 and 29. These two deflectors are formed from a single sheet of metal having their central common edge attached to the deflector by a rivet 30. Their respective surfaces are parabolic, being generated by a straight line which is moved parallel to the axis of the reflector. They are supported at their outer ends by a third deflector 31. The cylindrical deflectors 28 and 29 project the light coming through the opening in the first deflector at approximately right angles to the opening in two opposite directions. Some of this light also reaches the back surface of the deflector 25, thereby more efficiently hiding its presence within the luminaire. A greater portion of this light is projected, as above stated, at right angles to the opening, and when the luminaire is properly installed, this light is projected parallel to the axis of the highway and along the edge thereof. The third cylindrical deflector 31 acts as a support for the cylindrical deflectors 28 and 29 and also reflects some of the stray light flux projected toward it. This last deflector is circular and any light reaching its inner surface is projected to the back surface of the deflector 25. This complete assembly of deflectors is mounted within the reflector 11 by brackets 32 and 33 in such manner that the relationship of the deflector 25 to the reflector 11 remains the same as the relationship between the reflector 11 and the deflector 20, i. e., the axis of the semi-conoidal deflector coincides with the axis of the reflector, the edges thereof are in a plane with the reflector axis and the axis of the deflector curve intersects the focal point of the reflector.

The above-described reflector and deflector combination comprises a simple inexpensive structure for obtaining an asymmetrical distribution of light flux from a symmetrical luminaire. It is impractical from a manufacturing standpoint to modify the reflectors of the luminaires so as to obtain the desired asymmetrical light distribution for each installation. With my improved deflectors, however, and their improved combination with the symmetrical reflector, the desired asymmetrical distribution is obtained economically and without altering the normal appearance of the luminaire.

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

In a luminaire having a light source a conoidal reflector intercepting substantially 200° of the light flux projected from said source and being arranged to project a beam which is symmetrical about the axis of said light source, the combination of a deflector, said deflector comprising a conoidal surface having an arcuate length of approximately 180° about the axis of said reflector and extending above and below the edge of said reflector, said deflector terminating in an apex below said reflector, an opening in said deflector extending from the upper end of said deflector to a predetermined point below the edge of said reflector and cylindrical deflecting surfaces spaced from said first deflector arranged to intercept the light projected through said opening and to redistribute said light in opposite directions along an edge of the combined beam projected by said luminaire.

JAMES A. O'NEIL.