Aug. 10, 1954

E. PASCUCCI

STREET LAMP

2,686,255

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Fig. 1

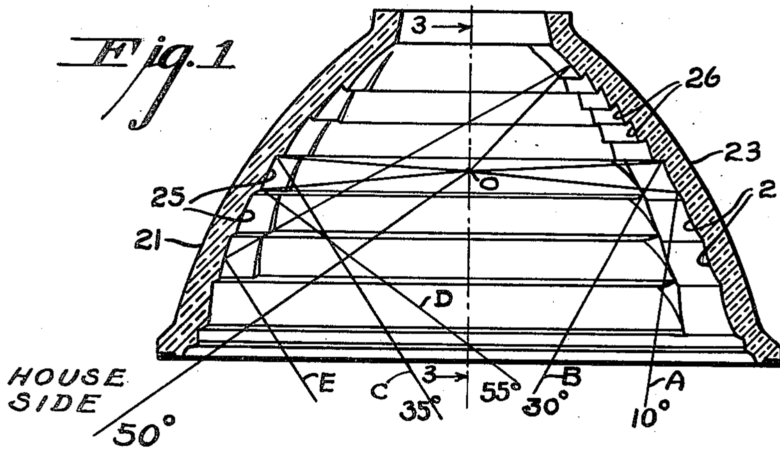



Fig. 2

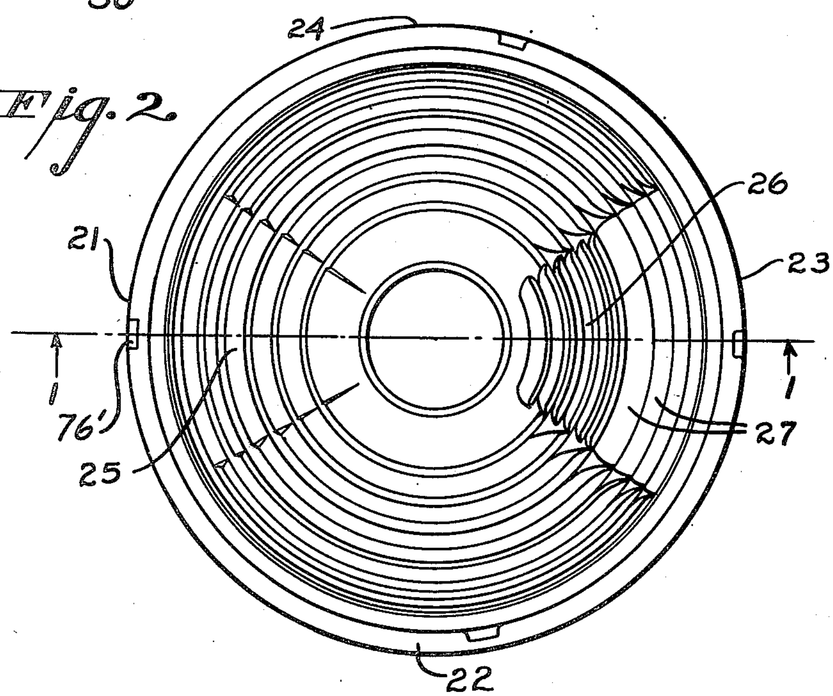
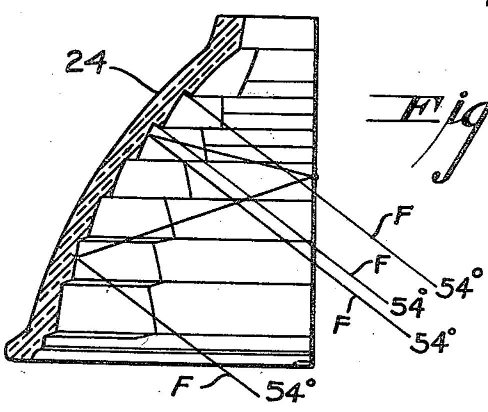



Fig. 3

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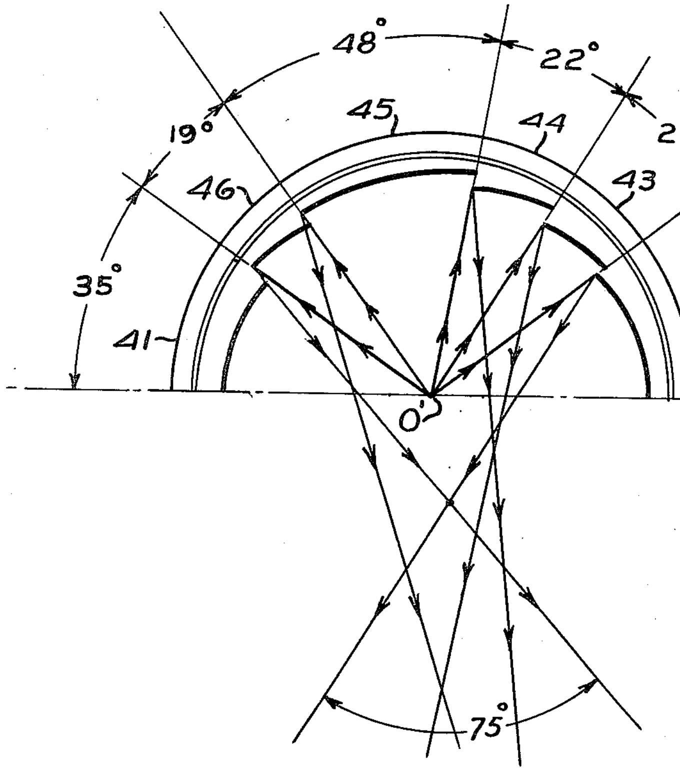


Fig. 9a

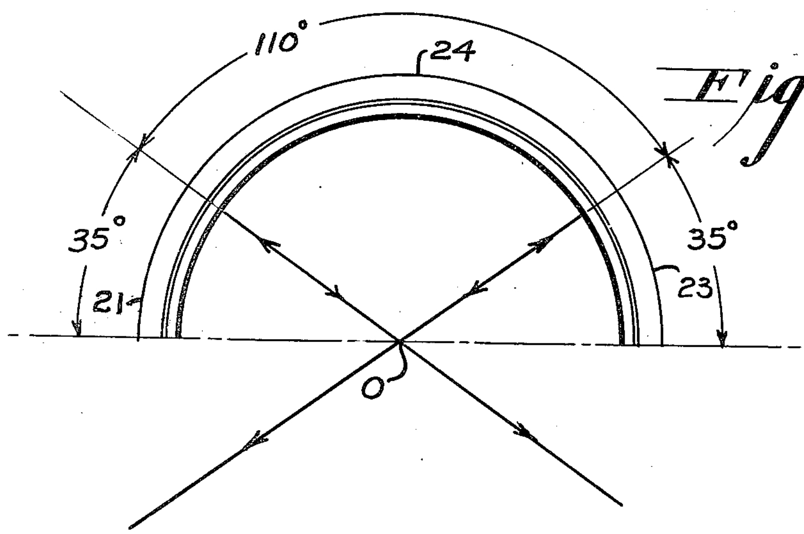


Fig. 3a

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Fig. 4

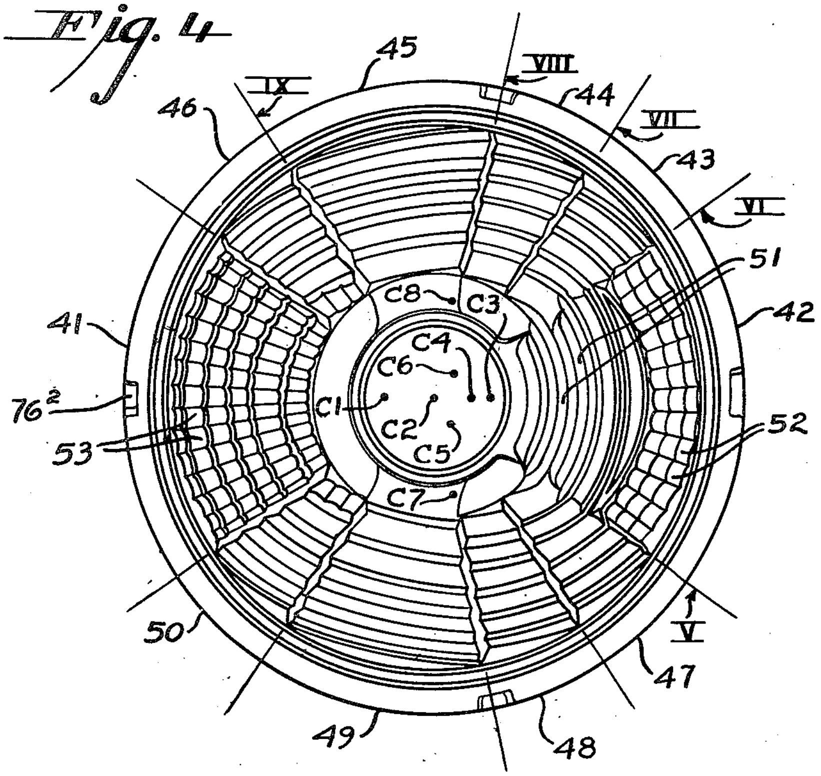


Fig. 5

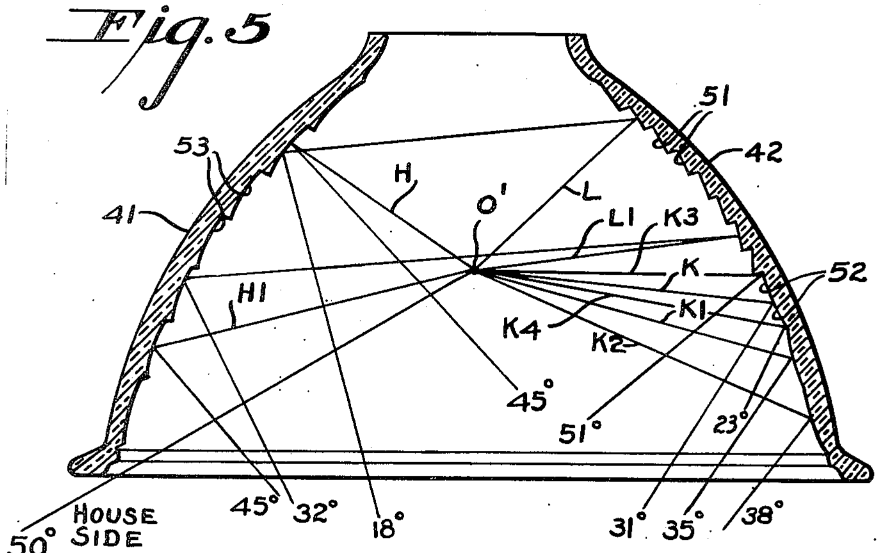


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Fig. 6

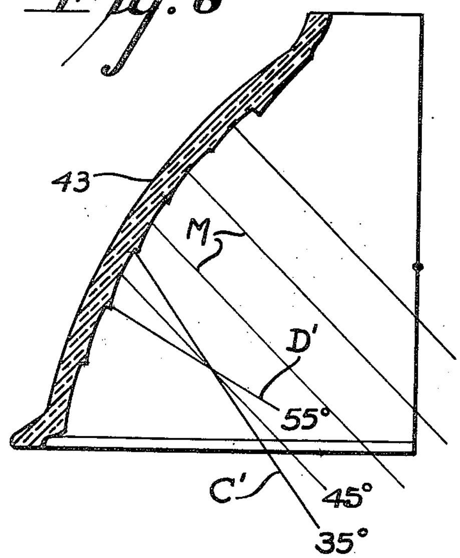


Fig. 7

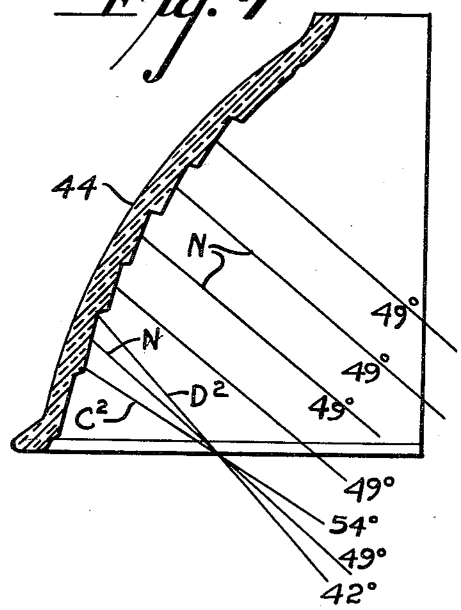


Fig. 8

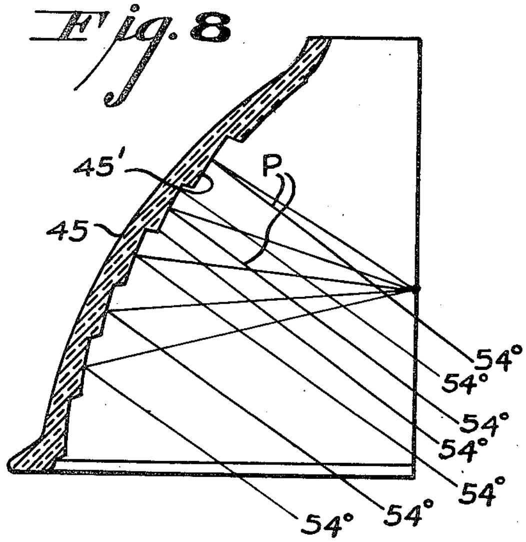


Fig. 9

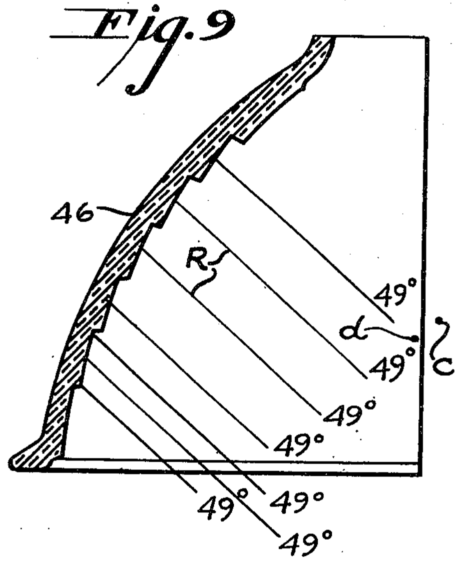


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Fig. 10

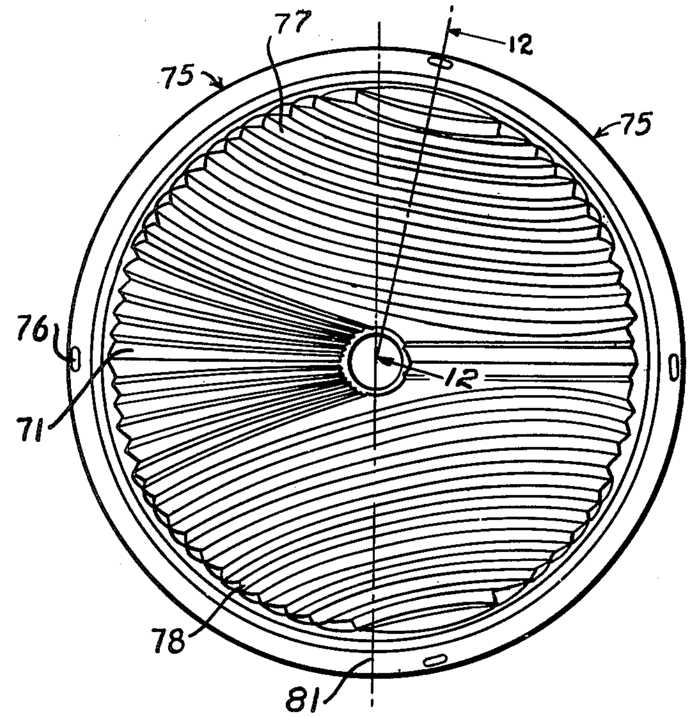



Fig. 11

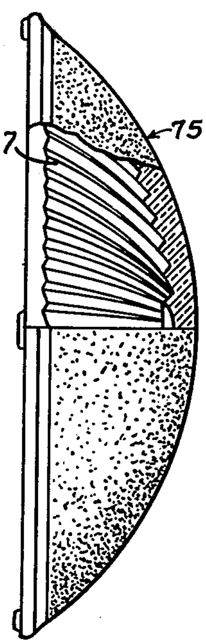
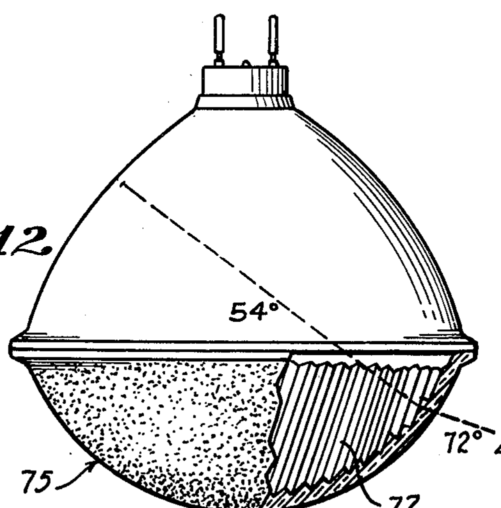



Fig. 12

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Patented Aug. 10, 1954 2,686,255

# UNITED STATES PATENT OFFICE

2,686,255

## STREET LAMP

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Application June 22, 1950, Serial No. 169,747

14 Claims. (Cl. 240—103)

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The present invention relates to controlled beam lamps for street-lighting use. In usual controlled-beam street-lighting practice a suitable lamp is carried by a street-lighting fixture including a reflector and a refracting lens and/or globe assembly designed to direct the light in the desired pattern and intensity.

One object of the present invention is the provision of a controlled-beam street lamp or luminaire of the sealed-beam type. A lamp of this type, while more expensive to manufacture than a conventional lamp, has many advantages thereover. For example, a sealed-beam unit requires no additional globe or reflector so that the expense of these is avoided. The sealed-beam lamp is very light in weight compared to a conventional street lamp assembly, so that less expensive support equipment is required. Since the lamp and its reflector and lens are integral, with the reflector hermetically sealed therein, the need for periodically cleaning the reflector is avoided. Also, the sealed-beam unit can be much smaller than conventionally used globes, so that it makes a more difficult target and thus breakage by air rifle shot and stones is materially reduced. When breakage or burning-out of the filament does occur, replacement of the lamp inherently includes provision of a new reflector. Thus top efficiency is always assured. The invention is herein shown and described as applied to a luminaire providing asymmetrical light distribution, but is equally applicable to a luminaire providing symmetrical light distribution.

In the accompanying drawings

Fig. 1 is a sectional view of a reflector embodying the invention taken on line 1—1 of Fig. 2.

Fig. 2 is a bottom plan view of the reflector.

Fig. 3 is a sectional elevation taken on line 3—3 of Fig. 1.

Fig. 3*a* is a diagrammatic indication of the horizontal light distribution obtained with the reflector of Fig. 1.

Fig. 4 is a bottom plan view of an alternative form of reflector embodying the invention.

Figs. 5 to 9 are views showing, in section, the internal surface configurations of the portions of the reflector seen when looking in the direction indicated in Fig. 4 by the arrows designated V–IX respectively.

Fig. 9*a* is a diagrammatic indication of the horizontal light distribution obtained with the reflector of Fig. 4.

Fig. 10 is a top plan view of a refractor lens or reflector cover glass embodying the invention.

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Fig. 11 is a side elevational view of the lens with a part thereof shown in section.

Fig. 12 shows a luminaire embodying the invention, partly in section, taken on line 12—12 of Fig. 10.

In the forms of reflector shown, the light source O or O′ is indicated as being so located that the reflector has a cut-off angle at 50° as indicated in Figs. 1 and 5; certain of its reflecting surfaces are basically parabolic to produce reflected rays, such as F (Fig. 3) or P and R (Figs. 8 and 9) parallel to one another, while certain others of its reflecting surfaces are designed to produce either a vertical light convergence as indicated by rays C and D (Fig. 1), or rays L, L1 (Fig. 5), C′, D′ (Fig. 6) and $C^2$, $D^2$ (Fig. 7) or a vertical light divergence, as indicated by rays A and B (Fig. 1), or K—K4 (Fig. 5).

As will be understood, vertical control of the rays reflected from the annular horizontal reflecting prisms such as 26 and 51 is obtained by proper selection of the angle with the vertical of the planes of their reflecting surfaces. Similarly, vertical control of the rays reflected from the annular horizontal reflecting convex flutes such as 27 and the annular horizontal reflecting concave flutes such as 25 is obtained by suitable selection of the vertical curvature of their reflecting surfaces. The locations of the centers from which such vertical curved surfaces are struck, of course, are determined by the vertical light distribution desired in each case. Similarly, the lengths of their radii of curvature determine the angular relation of the rays from each surface with respect to each other. The locations of such centers, as will be well understood, determine the general direction of all the rays reflected from the respective surfaces. With the arrangements illustrated, a zone of light more than 58° above the horizontal plane through the light source and a 25° zone below the same is intercepted so that a very substantial portion of the lumen output of the source is redirected. The reflector may be metal, but it is preferably composed of glass which can be more readily given an inner surface of the desired varied configuration.

The light passing out the reflector mouth is intercepted by a spherical light-refracting cover glass (Figs. 10–12) provided on its inner surface with a fan-shaped group of refracting prismatic ribs 71 which intercept and diffuse the reflected rays and the direct rays and provided with groups of refracting prisms 77 and 78 which elevate the reflected rays at the center of the main beams in a vertical plane from about 54° to about 72° along line 12—12 as indicated in Fig. 12. Moving away from this line, however, around toward the street side and the house side, respectively, less and less elevation is obtained and more and more lateral redirection is obtained. At 78° from line 12—12 toward the street side, maximum horizontal redirection is obtained without elevation. Similarly, at 102° from such line toward the house side similar light redirection prevails.

The reflector of Figs. 1–3 has its inner surface divided into four sectors 21–24. Sectors 21 and 23 are arranged opposite one another, as are sectors 22 and 24. Sector 21 has annular horizontal reflecting concave flutes 25 designed to intercept light issuing from source O toward the house side, and to redirect such light in a vertical converging pattern as by rays C, D and E (Fig. 1) out through the mouth of the reflector onto the street and the sidewalk area across the street.

Sector 23 has annular horizontal reflecting prisms 26 and also annular horizontal reflecting convex flutes 27. Prisms 26 are adapted to reflect light from source O within the reflector onto the flutes 25, as indicated by ray E, which in turn reflect such rays out through the reflector mouth. Flutes 27 are, on the other hand, adapted to reflect intercepted light rays, such as A and B, in a vertically diverging pattern directly out through the reflector mouth. The flutes 27 are adapted to spread and redirect intercepted light over the sidewalk area of the house side of the street nearest the lamp. Light rays A to E issuing from sectors 21 and 23 are shown in Fig. 1 as issuing from the reflector mouth at from approximately 10° to 55° from the vertical.

Each of the remaining oppositely disposed sectors 22 and 24 is provided with annular horizontal reflecting prisms, the reflecting surface of each of which has a substantially parabolic profile with the focus on the light source and with the axis downwardly sloping, which prisms are adapted to reflect light rays, such as rays F (Fig. 3) directly out through the reflector mouth in opposite directions substantially lengthwise of the street. The rays F issuing from sector 24, and similar rays (not shown) from sector 22, in the opposite direction are preferably approximately 54° from the vertical.

The horizontal distribution of the light reflected from this reflector is shown in Fig. 3*a*, only half of the reflector being shown for convenience. It will be appreciated, of course, that, while such distribution is symmetrical, it is rendered asymmetrical when the cover glass 75 is combined with the reflector. As indicated in Figs. 2 and 3*a*, sectors 22 and 24 each extend through more than 90°. While sectors 21 and 23 are each shown to be equal in extent, one may be made larger than the other and may even exceed 90° if the desired horizontal light distribution pattern so requires.

The reflector of Fig. 4 has its inner surface divided into oppositely disposed house side and street side sectors 41 and 42, with the sectors therebetween divided into stepped subsectors 43–46 and corresponding subsectors 47–50 for directing and distributing light in opposite directions lengthwise of the street.

In this alternative form of reflector, sector 42 (Figs. 4 and 5) has annular horizontal reflecting prisms 51, and in addition has annular horizontal reflecting convex flutes on which are superposed vertical reflecting convex flutes 52. The sector 41 is composed of annular horizontal reflecting concave flutes upon which are superposed vertical reflecting convex flutes 53. These horizontal reflecting concave flutes are adapted to reflect light rays, such as H and H1, from source O′ out through the reflector mouth along substantially parallel paths approximately 45° from the vertical, and to reflect rays, such as L and L1, intercepted from source O′ by prisms 51, out through the reflector mouth over a range of approximately 18°–32° from the vertical.

The horizontal reflecting convex flutes are adapted to intercept light rays, such as K—K4, from such source and to redirect the reflected light out through the reflector mouth, but along paths which range from approximately 23°–51° from the vertical. The across-the-street light pattern obtained by use of a reflector with sectors 41 and 42 is superior to that obtained with a reflector having sectors such as 21 and 23, but the production of sectors such as 41 and 42 is more costly and may not be justified in all instances.

The subsectors 43, 44, 45, and 46, and the similar oppositely disposed subsectors 47, 48, 49, and 50, are employed in reflecting light lengthwise of the street, but are designed to do a better job than done by sectors 24 and 22 of Fig. 2. The base lines of the annular horizontal concave flutes of sector 41 (Fig. 5) and the annular horizontal parabolic prisms of subsectors 46 and 50 are struck from a center C1. The horizontal prisms 51 of the sector 42 are struck from the reflector center C2. The base lines of the horizontal convex flutes of sector 42 are struck from the center C3. The base lines of the annular horizontal concave flutes of subsectors 43 and 47 are struck from center C4. The base lines of the annular horizontal concave flutes of subsectors 44 and 48 are similarly struck from centers C5 and C6, respectively, whereas the annular horizontal parabolic prisms of subsectors 45 and 49 are struck from centers C7 and C8, respectively. The subdivision of the sectors of the reflector employed in directing light lengthwise of the street into subsectors and then striking the several subsectors from different centers rather than all from the reflector axis C2, as in the case of the reflector of Fig. 1, is more costly but makes possible a better control of the horizontal distribution of reflected light lengthwise of the street, as indicated in the horizontal light distribution pattern shown in Fig. 9*a*, and therefore in certain instances justifies the added cost involved. Fig. 9*a* shows the effect of the location of such centers in widening or narrowing the horizontal light distribution from the several subsectors. The vertical distribution of the reflected rays from the respective subsectors is shown in Figs. 6 to 9. As indicated in Fig. 6, the reflected rays M, C′ and D′ issuing from subsector 43 are spread over a range of approximately 20°, namely 35°–55° from the vertical.

As indicated in Fig. 7, the reflected rays $D^2$, N, and $C^2$ issuing from subsector 44 range or spread 12°, namely 42°–54° from the vertical.

As illustrated in Fig. 8, the rays P, intercepted and reflected by subsector 45, pass out through the reflector mouth in parallel paths at approximately 54° from the vertical.

As indicated in Fig. 9, the rays R reflected by subsector 46 are at approximately 49° from the vertical.

As will be understood, the light rays issuing from subsectors 47–50 (Fig. 4) are at the same number of degrees from the vertical as are the rays from corresponding subsectors 43–46.

As will be further understood, while angle values given are for a point source, these will naturally vary, dependent on the filament size and shape.

The prismatic refractor or cover-glass (Figs. 10, 11, and 12), generally designated 75, is adapted for use with either of the described reflectors and is provided with bosses such as 76 adapted to enter indentations, such as 76′ in the reflector of Figs. 1–3 or $76^2$ in the reflector of Figs. 4–9 when the cover-glass is properly arranged over the mouth of one of such reflectors.

As previously stated, the refractor or cover-glass 75 is spherical so that all ribs formed on its surface are likewise spherical and are simply struck from centers giving them their desired light-controlling characteristics. Since the forms of luminaires illustrated are for asymmetrical distribution, the luminaire to be mounted to one side of the center of the street, the prisms 77 and 78 are struck from centers to one side of the median line 81.

I claim:

1. A downwardly and outwardly diverging reflector of circular cross section having a normally vertical axis and being adapted to receive a light source at a point along such axis above its mouth, the inner surface of such reflector being divided into two pairs of oppositely disposed sectors, the sectors of one such pair extending through more than 90° each and the sectors of the other pair each extending between the sectors of said first pair; one of said sectors of said other pair having a series of annular horizontal reflecting prisms remote from the mouth of the reflector and a series of annular horizontal reflecting convex flutes adjacent the mouth of the reflector, said horizontal prisms reflecting light intercepted from said light source onto the other sector of such pair, said horizontal convex flutes reflecting light intercepted from said light source in a vertically diverging pattern out through the mouth of the reflector, the other of said sectors of said other pair having a series of annular horizontal reflecting concave flutes, said horizontal concave flutes reflecting light both reflected from said first sector and intercepted from said light source in a vertically converging pattern out through the mouth of the reflector; each of said sectors of more than 90° having a series of annular horizontal reflecting prisms, the reflecting surface of each of which has a substantially parabolic profile with the focus on the light source and with the axis downwardly sloping, said horizontal parabolic prisms reflecting light intercepted from said light source out through the reflector mouth.

2. A reuector as defined in claim 1, in which each sector of said other pair of sectors extends through less than 90°.

3. A reflector as defined in claim 2, in which the two sectors of said other pair of sectors are equal in extent.

4. A reflector as defined in claim 1, in which the annular horizontal parabolic prisms extend throughout each sector of said sectors of more than 90°.

5. A reflector as defined in claim 1, in which vertical reflecting convex flutes are superposed on the annular horizontal convex flutes of the first sector of said other pair of sectors.

6. A reflector as defined in claim 1, in which the vertical axis of the annular horizontal convex flutes is closer to said first sector of said other pair of sectors than the vertical axis of the reflector, the light reflected from said horizontal convex flutes being thereby given a wider horizontal spread.

7. A reflector as defined in claim 1, in which vertical reflecting convex flutes are superposed upon the annular horizontal concave flutes of the second sector of said other pair of sectors.

8. A reflector as defined in claim 1, in which the vertical axis of the annular horizontal concave flutes is closer to said second sector of said other pair of sectors than the vertical axis of the reflector, the light reflected from said horizontal concave flutes being thereby given a wider horizontal spread.

9. A reflector as defined in claim 1, in which vertical reflecting convex flutes are superposed respectively on the annular horizontal convex flutes of the first sector and on the annular horizontal concave flutes of the second sector of said other pair of sectors, the vertical axes of said horizontal convex flutes and said horizontal concave flutes being respectively closer to their respective sectors than the vertical axis of the reflector, the light respectively reflected from said horizontal convex flutes and said horizontal concave flutes being thereby given a wider horizontal spread.

10. A reflector as defined in claim 1, in which the vertical axis of the annular horizontal parabolic prisms is more remote from each sector of more than 90° than the vertical axis of the reflector, the light reflected by said horizontal parabolic prisms being thereby given a narrower horizontal spread.

11. A reflector as defined in claim 1, in which vertical reflecting convex flutes are superposed respectively on the annular horizontal convex flutes of the first sector and on the annular horizontal concave flutes of the second sector of said other pair of sectors, the vertical axes of said horizontal convex flutes and said horizontal concave flutes being respectively closer to their respective sectors than the vertical axis of the reflector, the light respectively reflected from said horizontal convex flutes and said horizontal concave flutes being thereby given a wider horizontal spread, and in which the vertical axis of the annular horizontal parabolic prisms is more remote from each sector of more than 90° than the vertical axis of the reflector, the light reflected by said horizontal parabolic prisms being thereby given a narrower horizontal spread.

12. A reflector as defined in claim 11 in which the sectors of said other pair of sectors each extend through less than 90° and are equal.

13. A reflector as defined in claim 12, in which the series of annular horizontal parabolic prisms in each sector of more than 90° is separated from the second sector of said other pair of sectors by a series of annular horizontal reflecting prisms, the reflecting surface of each of which has a substantially parabolic profile with the focus on the light source and with the axis downwardly sloping, said latter horizontal parabolic prisms also reflecting light intercepted from said light source out through the reflector mouth, the vertical axis of said latter horizontal parabolic prisms being closer thereto than the vertical axis of the reflector, the light reflected by such prisms being thereby given a wider horizontal spread.

14. A reflector as defined in claim 13, in which the first series of annular horizontal parabolic prisms in each sector more than 90° is separated

from the first sector of said other pair of sectors by two series of annular horizontal reflecting concave flutes, each of said series of horizontal concave flutes reflecting light intercepted from said light source in a vertical converging pattern out through the mouth of the reflector, the vertical axis of the series of such horizontal concave flutes adjacent said horizontal parabolic prisms being further therefrom than the vertical axis of the reflector, the light reflected from such flutes being thereby given a narrower horizontal spread, and the vertical axis of said other series of horizontal concave flutes being closer thereto than the axis of the reflector, the light reflected by such flutes being thereby given a wider horizontal spread.




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