Oct. 15, 1935. C. A. B. HALVORSON 2,017,716

SODIUM LUMINAIR

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Fig. 1.

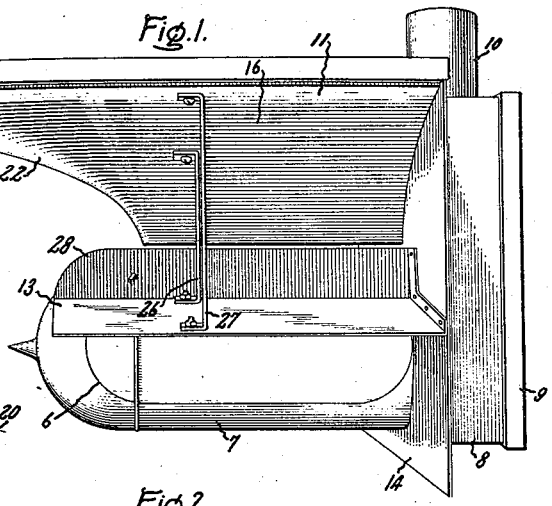

Fig. 4.

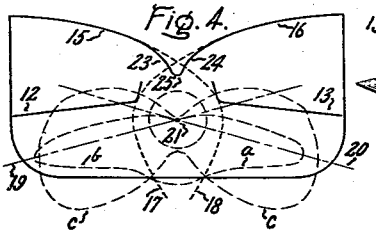

Fig. 2.

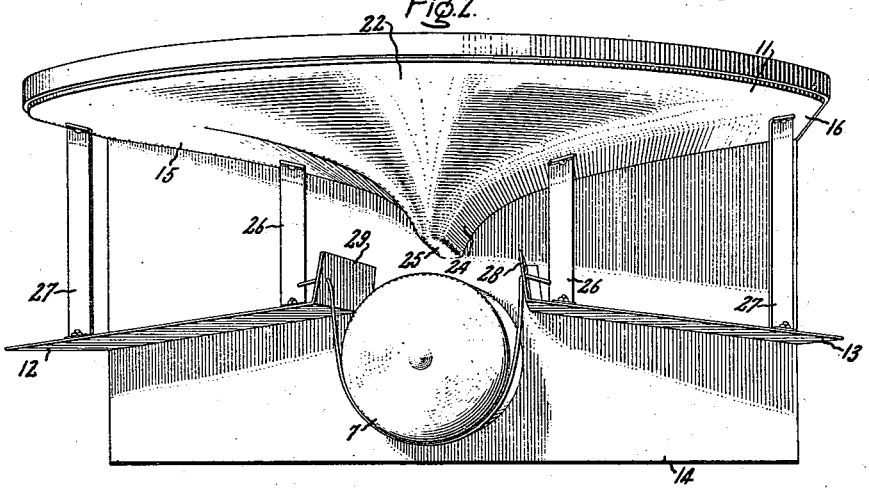

Fig. 5.

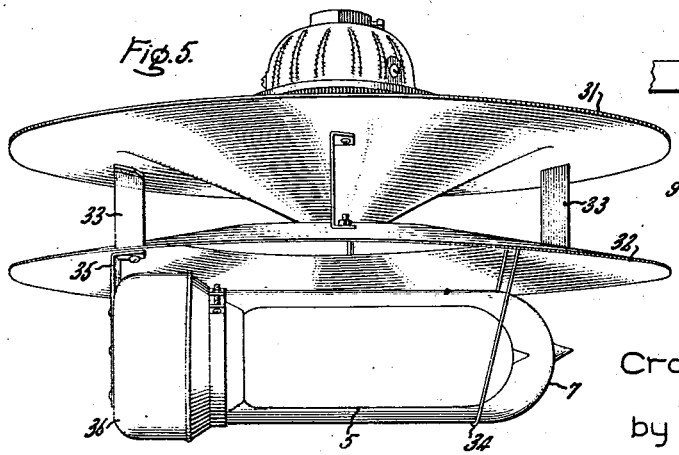

Fig. 3.

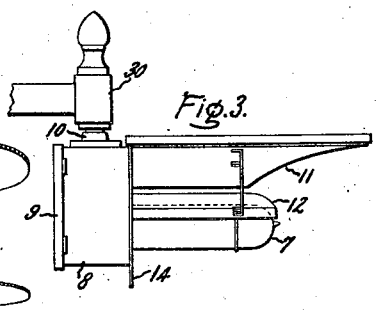

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Fig. 6.

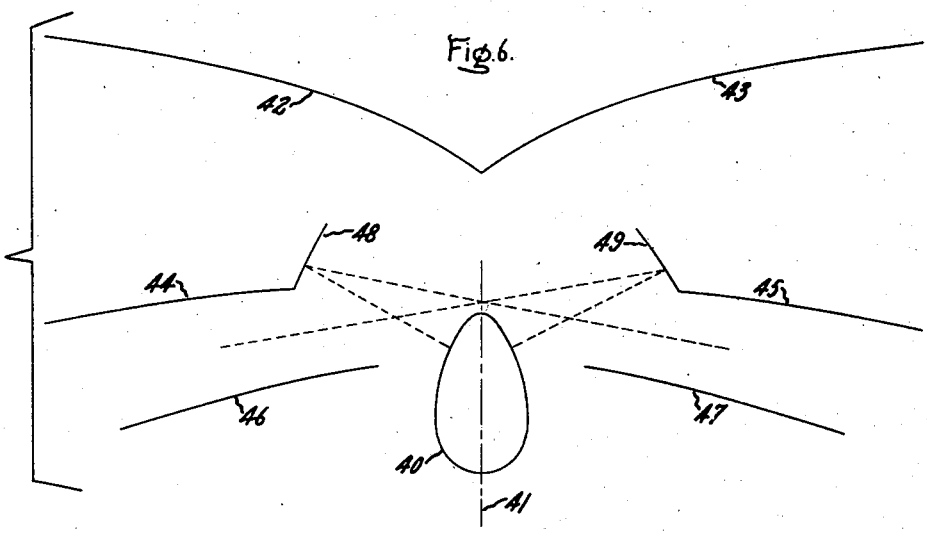


Fig. 7.

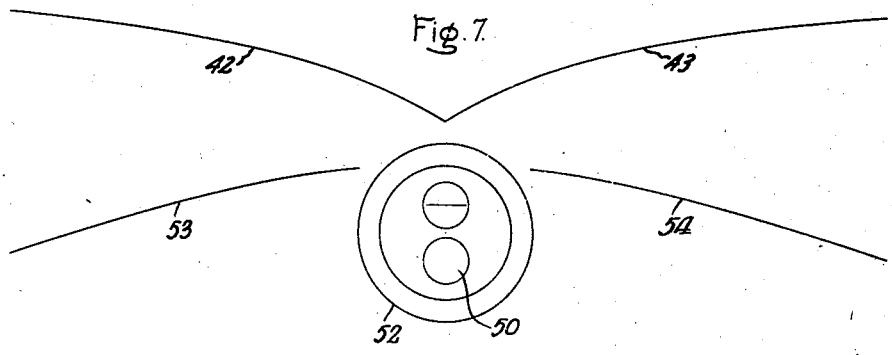
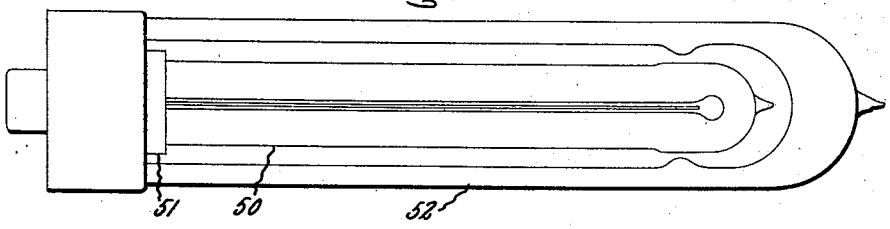


Fig. 8.



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UNITED STATES PATENT OFFICE

2,017,716

SODIUM LUMINAIR

Cromwell A. B. Halvorson, Lynn, Mass., assignor to General Electric Company, a corporation of New York

Application August 24, 1934, Serial No. 741,253

4 Claims. (Cl. 240—25)

My invention relates to highway lighting fixtures and more particularly to lighting fixtures using elongated light sources, such as, for example, sodium vapor discharge lamps.

It is an object of my present invention to provide a street-lighting unit for uniformly distributing the light from an elongated source of light over a predetermined area.

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 claims.

In the accompanying drawings, Fig. 1 illustrates a side view of the preferred form of my unit; Fig. 2 illustrates a front view; Fig. 3 is another side view illustrating a part of the mounting bracket; Fig. 4 is a diagrammatic view illustrating the development of the reflectors of the unit and the approximate light distribution thereof; Fig. 5 is a modification illustrating a combination of the elongated light source with circular reflectors; Figs. 6 and 7 illustrate modifications in which the elongated light source is modified so that the vertical axis is greater than the horizontal axis of a cross section taken at right angles to its main axis, and Fig. 8 is a view of an elongated lamp.

The lighting unit illustrated in Figs. 1 to 4 comprises a lamp 6 which is preferably a sodium vapor discharge lamp surrounded by an evacuated flask 7 for conserving the heat of the lamp and maintaining its operating temperature. The lamp is mounted horizontally having its base and contacts enclosed in a casing 8. A cover 9 is provided at the back of this casing to provide access to the terminals of the lamp. A pipe fitting 10 on top of the casing 8 provides means for supporting the entire unit.

The light emanating from lamp 6 is distributed by a set of reflectors 11, 12, 13 and 14. The reflector 11 is mounted directly above the lamp and comprises two parabolic cylindrical surfaces 15 and 16. The surfaces 15 and 16 are developed as illustrated in Fig. 4. They are respectively portions of the parabolic cylinders 17 and 18 whose axial planes 19 and 20 are at about 15° to the horizontal and intersect each other and the axis 21 of the lamp 6. The surfaces 15 and 16 are terminated at the back end of the lamp by the vertically arranged flat reflector 14 and are joined at the front end by a paraboloidal surface 22. As shown in the diagram, Fig. 4, the surfaces 15 and 16 are not cut off at their intersection but are joined by longitudinal cylindrical surfaces 23 and 24 which blend into the surfaces 15 and 16 and join in a ridge 25 directly above the lamp 5. The surfaces 23 and 24 are so arranged that the light directly above the lamp itself is directed away from the lamp instead of back into the lamp.

The reflectors 12 and 13 are arranged substantially parallel to and slightly above the axial planes 19 and 20. They are, in the present embodiment of my invention, shown as flat reflectors but may be curved to obtain different distribution of light. They are suspended from the reflector 11 by straps 26 and 27 at the forward end and are joined to the reflector 14 at the rear. They are further provided with extensions 28 and 29. These extensions are at a slight angle to the vertical and provide a cut off for light tending to project above the reflector 11. The light impinging upon these extensions 28 and 29 is reflected against the surfaces 23 and 24 and is thereby projected along the road surface.

The reflector 14 throws the light forward so that when the unit is mounted at the side of the road with the axis of the lamp transverse thereto, the light will be thrown forward across the road. The light ditribution of the lamp is shown by curves *a*, *b* and *c* in Fig. 4. Curve "*a*" is the photometric curve taken in a plane vertical to the axis of the lamp. Curve "*b*" is also taken in a vertical plane, but this plane is taken at a 15° angle forward of the lamp. It will be noted that the light is thrown farther in this plane than in the preceding curve "*a*". Curve "*c*" is taken in the axial planes 19 and 20 of the parabolic cylinders.

Fig. 3 illustrates a view of the lamp from the side opposite to the one shown in Fig. 1 and in addition shows a portion of the supporting bracket 30.

In Fig. 5 I have illustrated a modification of my lighting unit. This unit is a combination of a circular reflector with an elongated light source. The light distribution of this unit is not as well confined as that of the unit shown in Figs. 1, 2 and 3. The advantage of this unit is that its cost of manufacture is small compared to that of the first unit. It includes a reflector 31, comprising a paraboloid, and a truncated cone reflector 32 suspended therefrom by straps 33. A lamp 5 and its evacuated flask 7 are suspended from the cone reflector by straps 34 and 35. The strap 34 supports the forward end of the lamp and strap 35 supports a casing 36 within which the contacts to the lamp and the contact end of the lamp and

flask are supported. The relation of the cone reflector 32 to the reflector 31 is approximately the same as in the previously described unit. The light rays impinging on the reflector 31 are reflected outwardly at a slight angle to the horizontal. The cone reflector has an inner diameter which cuts off the light that would pass beyond the edge of reflector 31 and deflects this light downwardly upon the road. The center of the reflector 31 also deviates from a true parabola so as to disperse the light projected immediately upwardly from the lamp.

In Figs. 6 and 7 I have diagrammatically illustrated a combination of reflectors and light source wherein due to the shape of the light source a desired light distribution is obtained with considerably smaller reflectors than is possible with the light source illustrated in Figs. 1 to 4. Electric discharge lamps are considerably larger than arc or incandescent lamps and a comparatively large lighting fixture is necessary to obtain the desired light distribution. In the modifications of Figs. 6 and 7, I obtain a reduction in the size of the fixture by changing the shape of the lamp so that the transverse cross section thereof will be elongated in a vertical direction. In this manner the total light flux of the round lamp may be retained, less light is projected by the lamp directly below the suspended light fixture, considerably more light is available for redistribution by reflectors and the reflectors can be made considerably narrower.

Fig. 6 discloses diagrammatically an arrangement of reflectors in combination with a lamp whose cross section at right angles to its axis is elliptical and the major axis of this section is vertical to the ground when the unit is suspended. Referring to this diagram the lamp 40 is indicated as having an egg-shaped cross section, the major axis 41 of which is perpendicular. I prefer to distribute the cross section of the lamp in such manner that the vertical or major axis of the cross section is 1½ times to twice that of the minor axis. In this manner I am enabled to reduce the size of the entire unit and yet obtain a better light distribution than with the circular cross section unit illustrated in Figs. 1 to 4. For distributing the light of this lamp 40, I provide a pair of cylindrical parabolic reflectors 42 and 43 whose line of intersection is directly above the lamp 40 and also reflectors 44, 45, 46 and 47.

The reflectors 44 and 45 are parabolic cylinders arranged below the reflectors 42 and 43, respectively, and are provided with extensions 48 and 49. These extensions are angularly arranged with respect to the reflectors 44 and 45 so as to reflect light which would otherwise pass beyond the edge of the reflectors 42 and 43. The angle of these extensions is so adjusted that the light reflected by extension 48 passes below the reflector 45 and the light reflected by extension 49 passes below reflector 44. Additional reflectors 46 and 47 are mounted below reflectors 44 and 45, respectively. They are arranged on either side of the lamp bulb and distribute the light of the lamp immediately below the lighting unit. They may be either flat or parabolic.

In Fig. 7 I have illustrated diagrammatically a lighting unit using the lamp illustrated in Fig. 8. This lamp comprises a tubular discharge lamp 50 having a relatively small diameter tube folded into a U shape and provided with a base 51 and heat retaining jacket 52. The light of this lamp is distributed by reflectors 42, 43, 53 and 54. Reflectors 42 and 43 are above described and reflectors 53 and 54 are similar to 46 and 47. Both of these modifications provide a greater amount of their available light for distribution by the reflectors than is possible with the round lamp shown in Figs. 1 to 4. At the same time the size of reflectors can be reduced since the initial distribution of the light flux by the lamp is horizontal to a great extent. This, therefore, constitutes a more practical unit both for manufacture and for maintenance.

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

1. In a street lighting fixture, the combination of an elongated lamp, a pair of reflecting surfaces arranged to distribute light from said lamp on a roadway in opposite directions having their line of intersection parallel to the said lamp, a pair of reflectors suspended from said joined reflectors and arranged parallel to said lamp on the two sides thereof, and a plane reflector arranged at one end of said lamp and perpendicular thereto.

2. In a street lighting fixture, the combination of an elongated lamp, a pair of parabolic cylinder reflectors having their axial planes parallel to the axis of said lamp arranged above said lamp to distribute the light from said lamp along a roadway in opposite directions, a paraboloidal surface of revolution joining said reflectors at one end and a pair of plane reflectors arranged on opposite sides of said lamp and intermediate the upper and lower edges thereof, said plane reflectors being arranged parallel to the axial planes of said parabolic cylinders.

3. In a street lighting fixture, the combination of a gaseous discharge lamp, a pair of parabolic cylindrical surfaces arranged above said lamp with their line of intersection parallel to said lamp, a surface of revolution joining said surfaces at one end, and a plane reflector arranged vertically to said parabolic surfaces at the opposite end extending from said surfaces to the lower edge of said lamp.

4. In a street lighting fixture, the combination of a gaseous discharge lamp mounted horizontally and transversely of a roadway, a pair of parabolic cylinder surfaces arranged to reflect upwardly projected light from said lamp, laterally and in opposite directions along said roadway and having a line of intersection parallel to said lamp, a parabolic surface of revolution joining said reflectors at one end and a vertical reflector arranged at the opposite end of said reflectors, said vertical reflector extending from the edges of said parabolic reflectors to the said lamp.

CROMWELL A. B. HALVORSON.