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LUMINAIRE

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Fig. 1.

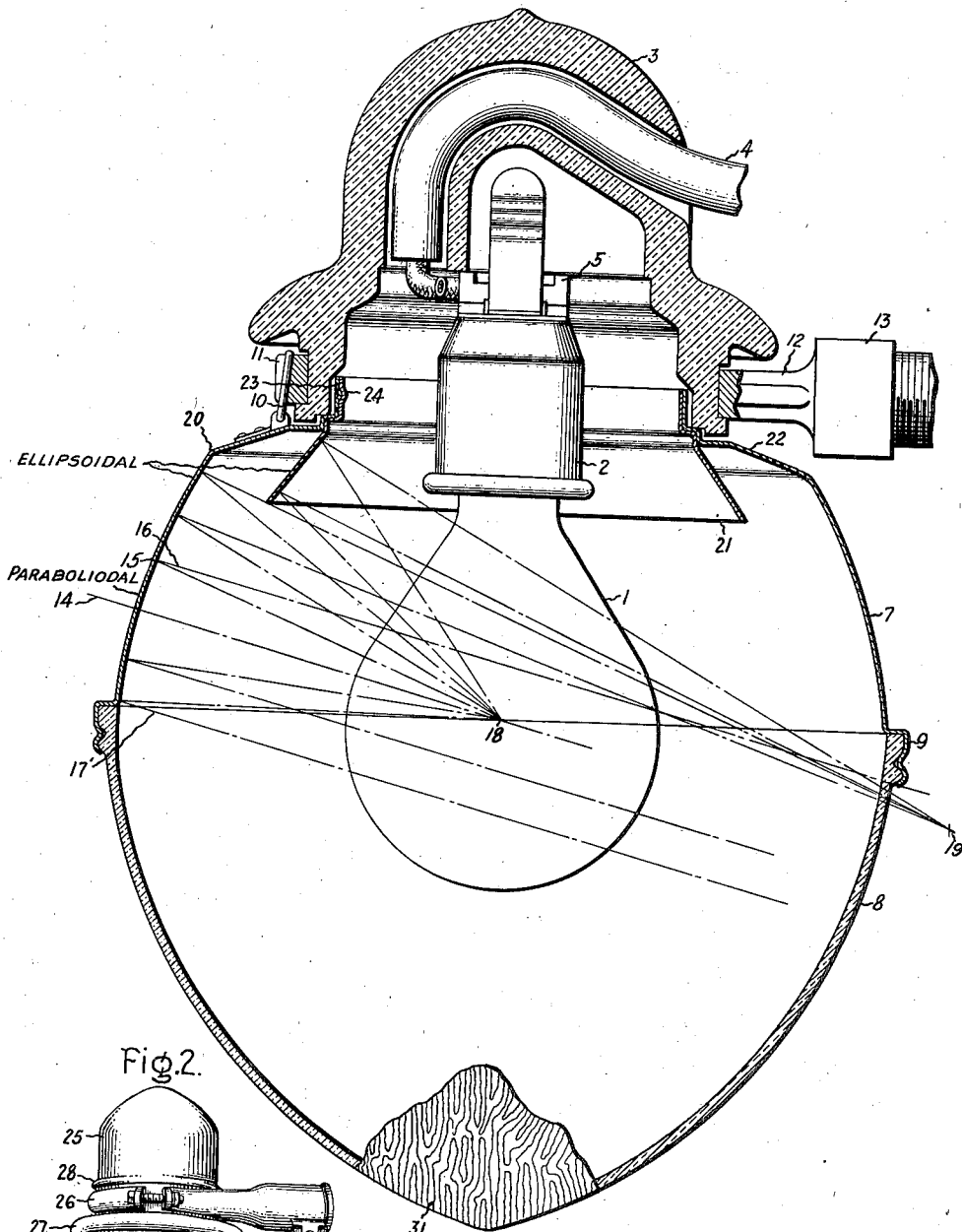
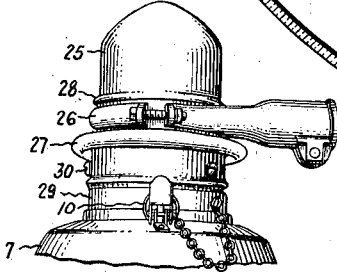


Fig. 2.



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# UNITED STATES PATENT OFFICE

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## LUMINAIRE

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4 Claims. (Cl. 240—25)

My invention relates to luminaires, and more particularly to street-lighting luminaires.

One object of my invention is to provide an improved reflector whereby a substantially uniform distribution of light may be obtained 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 drawing, and its scope will be pointed out in the appended claims.

In the accompanying drawing, Fig. 1 is a vertical cross-section view of a luminaire equipped with my improved reflector, and Fig. 2 is a partial view of a modified luminaire also equipped with my improved reflector.

In the luminaire of Fig. 1, a light source 1, such as an incandescent filament lamp, for example, is the light source and is supported in a socket 2, which in turn is mounted in a porcelain cap 3. A conductor 4 conducts current to the terminals of the socket 2 through a receptacle 5. The light source is enclosed by a housing comprising a sheet metal reflector 7 and a glass globe 8. The reflector is provided at its lower end with a flange 9 which is preferably spun over the edge of the globe 8 for the purpose of providing a dust-proof joint between the reflector and globe. The housing is attached to the cap by means of latches comprising rings 10 engaging lugs 11 on a metal collar 12 surrounding the cap 3 near its lower edge. This collar 12 is provided with a cap 13 by means of which it may be attached to any convenient pipe and thereby support the entire unit.

In luminaires of the type disclosed, the reflector is designed to collect substantially all light projected by the source above the horizontal and to reflect it towards the surface over which it is suspended. The difficulty has been to distribute the reflected light in such manner that when the reflected light is combined with the direct light from the source, a uniform intensity is obtained over the entire area. In view of the high intensity of the direct light, directly below the luminaire, it becomes necessary to project practically all the reflected light to the edge of the illuminated area. This has been impossible with the conventional continuous surfaced reflectors having the conventional curvatures and dimensions. The main reason for this limitation is that only a comparatively narrow section of the reflector surface could be used to reflect light at the angles nearest to horizontal. The light re-

lected from the sections of the reflector nearer to the zenith are reflected at such low angles that the light strikes the surface near the luminaire where it raises the light intensity above the desired value, or it strikes the opposite edge of the reflector thereby being confined within the reflector. In accordance with my invention the surface of the reflector is given a curvature such as to project the maximum of light to the edge of the beam and a supplementary surface con-focal with the continuous surface is provided to project additional light towards the edge of the beam.

The reflector in the illustrated luminaire is a surface of revolution comprising a paraboloidal surface having its axis tilted to the horizontal by about 15°. The axis of this section of the reflector is indicated by a line 14. The section extends between flange 9 and a line indicated by point 15 in the drawing. This reflector section projects a parallel beam bounded by the lines 16 and 17. Line 16 represents the upper edge of this beam and indicates that it passes under the opposite edge of the reflector. The resulting beam from this section of the reflector surface is a conoid with its apex at the center 18 of the light source 1.

It is evident that if the paraboloidal surface were continued above the indicated line 15, the light above that line would be cut off by the opposite edge of the reflector. A greater proportion of the upwardly projected light, therefore, cannot be projected by a paraboloidal section without changing the angle of the axis 14 or increasing the diameter of the reflector. A partial solution of this problem is obtained by continuing the surface of the reflector as an ellipsoid having its conjugate foci at the center 18 of the light source and at a point 19 which is below the edge of flange 9 and outside of the glass globe 8. This surface extends from the edge 15 of the paraboloidal section up to a line 20. This surface is extended as far as possible upwardly toward the zenith without projecting light against the flange 9. The light from this reflector section is concentrated at the locus of foci 19 and is then added to the light projected by the paraboloidal section. The surfaces so far described still leave a large portion of the upwardly projected light unreflected. A continuation of the ellipsoidal surface would partially take care of this problem, but that would result in an increase of the length of the luminaire, or would necessitate an increase in diameter. This is undesirable.

In accordance with my invention, I terminate 55

the ellipsoidal surface, thereby creating in effect, a complex frustro-conoid and provide a second ellipsoidal reflector 21, confocal with the upper section of the main reflector, but having shorter focal lengths so that it may be placed nearer to the light source. In the drawing, this second reflector 21 is illustrated as being concentric with the main reflector 7 and having an average diameter which passes its reflecting surface from the main reflector surface toward the common axis. The main reflector is provided with a reducing flange 22, to which the rings 18 are fastened, and also a collar 23. The collar 23 is concentric with the main reflector and projects above the flange 22 into the lower end of cap 3. The second reflector 21 is provided with a collar 24 which projecting above the reflector, fits inside of the collar 23 and thereby supports this complementary reflector.

The reflector 21, as stated above, is ellipsoidal and is confocal with the main reflector surfaces. It extends into the main reflector between the surface of this reflector and the axis thereof so as to intercept a substantial portion of the light from the source projected between the upper edge 20 of the main reflector and the edge of socket 2. With this complementary reflector, I am, therefore, able to intercept, nearer to the source, and reflect into the beam reflected by the main reflector a substantial portion of the upwardly projected light at the greater angles, that is, light projected nearer to the vertical axis and I am able to do this without an increase in the size of the reflector.

In Fig. 2 I have illustrated a modification of the porcelain cap 3. In this modification the porcelain cap 25 is made larger so as to accommodate a supporting collar 26 above a rain shield 27. A beading 28 prevents the cap from slipping out of the collar. A metal adapter 29 is held into the lower end of the cap by screws 30 and the reflector 7 is attached to the adapter by ring latches 10, the same as in Fig. 1.

The glass globe 8 may be made of any suitable glass and shape. In Fig. 1 I have indicated diffusing prisms 31 on the outer surface of the globe. Any suitable prisms may be used for diffusing and refracting light on either the inner surface or the outer surface thereof.

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

1. In a street-lighting luminaire, the combination of a main reflector, a light source, and an auxiliary reflector, arranged within said main reflector to intercept light outside of the collecting angle of said main reflector and to reflect said light into the beam projected from said first reflector, said first reflector having a focal point at the center of the light source and a second focal point outside of said reflector, said auxiliary reflector having foci coinciding with said foci of said first reflector but having at least one of its corresponding focal lengths shorter than that of the first reflector.

2. In a luminaire, the combination of a frustro-conoidal reflector comprising a surface of revolution including a paraboloidal and ellipsoidal surface joined end to end, and a complementary reflector comprising an ellipsoidal section mounted within and concentric with said main reflector outside of the collecting angle of said first reflector and provided with a surface confocal with said first ellipsoidal section but having at least one shorter focal length than the corresponding focal length of said ellipsoidal section.

3. In a luminaire, the combination of a lamp, a socket therefor and a frustro-conoidal reflector comprising a surface containing an ellipsoidal and a paraboloidal section arranged to form a continuous surface, and a second reflector comprising an ellipsoidal flange concentric with said reflector, said flange being confocal with the said ellipsoidal section of said continuous surface and arranged to intercept an arc of the projected light extending from the upper edge of the main reflector and toward the axis of said main reflector and projected into the main beam below the edge of the lamp socket.

4. In a luminaire, the combination of a light source, a reflector comprising a surface of revolution having an axis projecting through said light source and including an elliptical section, the axis of said ellipse being at an angle to the axis of the surface of revolution and the conjugate foci of said section being respectively at the center of said light source and outside of said reflector, and an auxiliary reflector confocal with said section having at least one shorter focal length arranged to intercept light between the edge of said elliptical section and the axis of said surface of revolution.

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