Jan. 26, 1937. R. WENDEL 2,068,781

REFLECTOR

Filed March 5, 1934 2 Sheets-Sheet 1

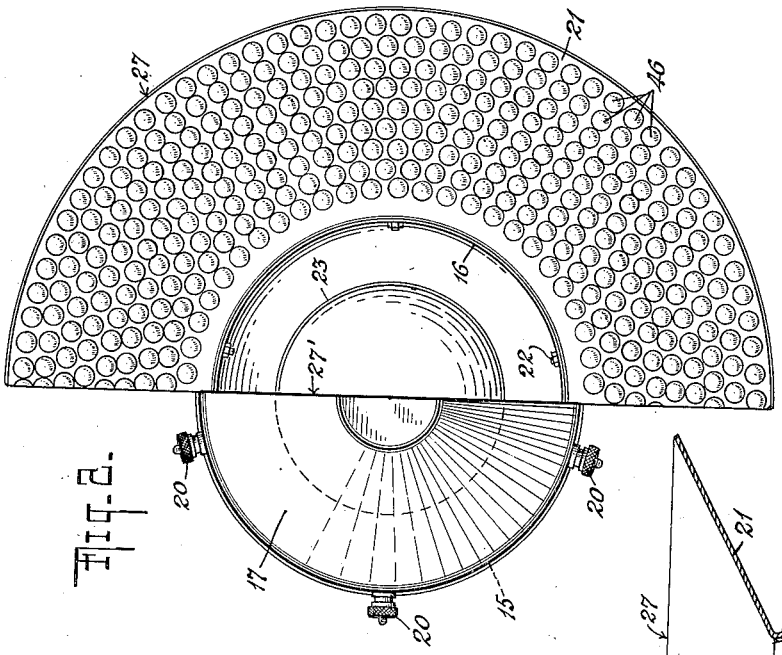

Fig. 2.

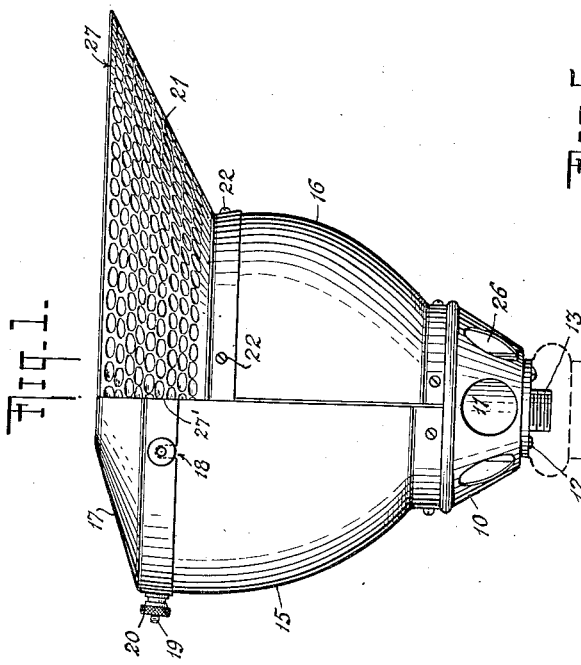

Fig. 1.

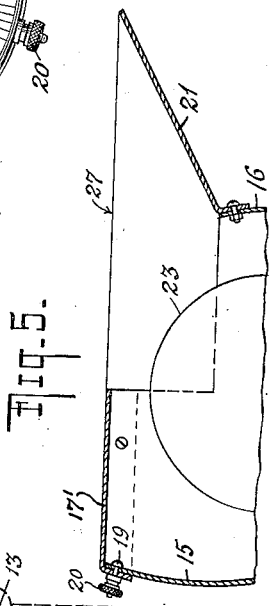

Fig. 5.

WITNESS

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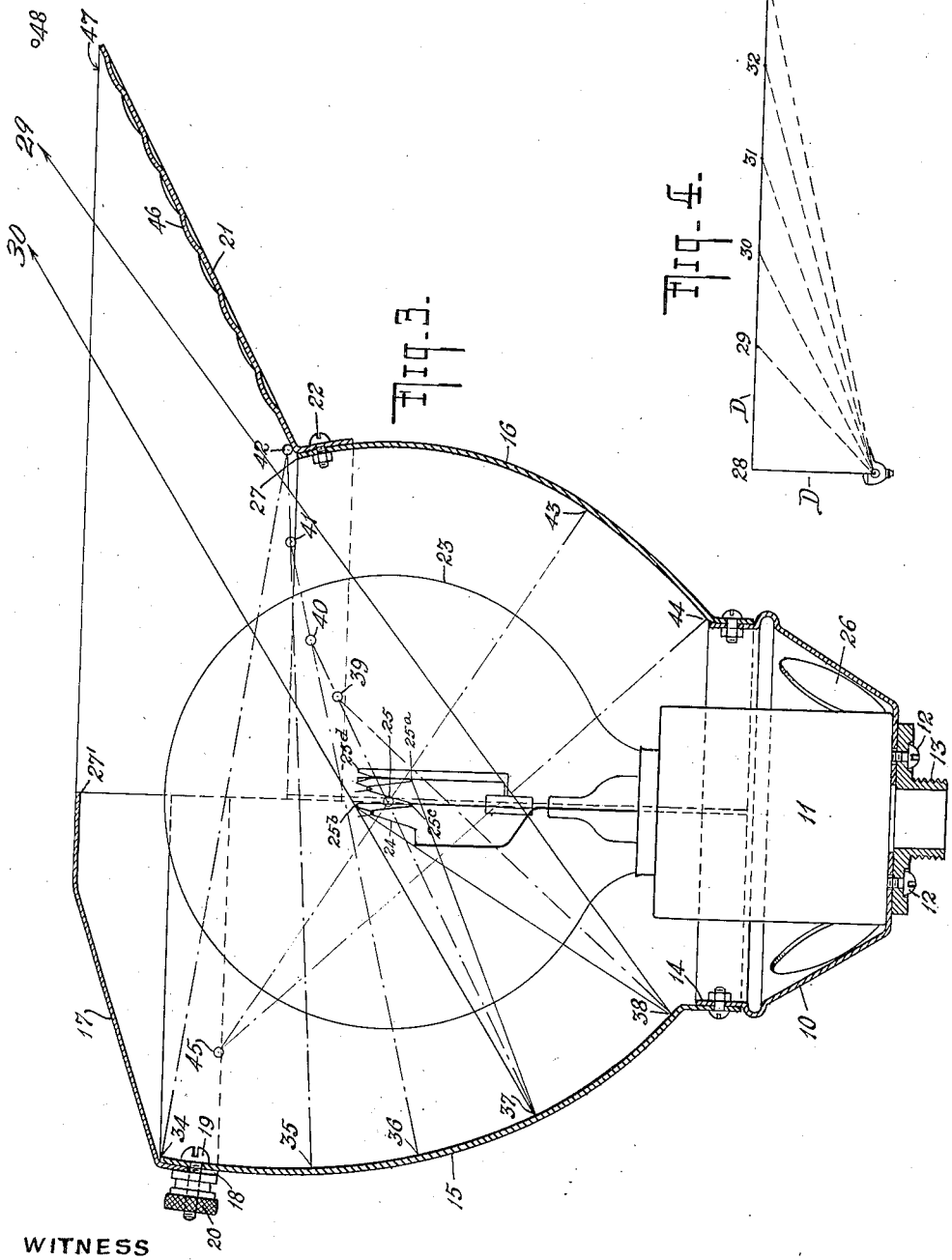

Fig. 3.

Fig. 4.

WITNESS

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UNITED STATES PATENT OFFICE

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REFLECTOR

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24 Claims. (Cl. 240—103)

The present invention relates to lamps and more particularly to a reflector structure for incandescent lamps whereby efficient and uniform lighting over a relatively large area is obtained.

It is the primary object of the present invention to provide a simple lamp and reflector construction which can be embodied in floor lamps, wall brackets, roadway illuminators, etc., for substantially uniformly illuminating a given area, the portion of the area remote from the lamp being only slightly less illuminated, but practically inappreciably so, than the area in the vicinity of the lamp, and the lighting being uniform and free of streaks, bands, images, etc. tending to disturb the uniform character of the illumination.

According to the present invention there is provided a lamp and reflector construction which operates so to distribute and project the light emanating from the filament of the electric lamp that a comparatively large area is substantially uniformly illuminated, there being a total absence of areas of intense illumination surrounded by areas of perceptively lower degree of illumination, the area to be illuminated, such as a ceiling, wall, floor, or ground, having a length which is several times the distance from the lamp to such ceiling, wall, etc.

In its preferred form, the reflector is so constructed that it reflects and distributes the light from an incandescent lamp over an angle of about 180°, that is, substantially wholly to one side of a plane passing through the longitudinal axis of the lamp, the intensity of the reflected beam increasing approximately in accordance with the law of inverse squares as the angle which the rays make with the surface being illuminated decreases, that is, as the areas struck by such rays become more and more remote from the lamp.

The reflector structure of my improved lamp in its simplest and preferred form is composed generally of two sections which for the sake of convenience may be called the ellipsoidal and the spherical sections, although, as explained more fully hereinbelow, the sections need not necessarily be true bodies of revolution. These two sections are arranged upon opposite sides of the lamp, the spherical section reflecting the light impinging thereon upon the ellipsoidal reflector. The latter, on the other hand, is shaped to reflect or project the light through an opening at the top of the reflector structure and onto the area to be illuminated. The ellipsoidal reflector may be supplemented by a conical reflector which aids in accomplishing the desired distribution of the light.

In the design of my improved reflector structure, the area directly above the lamp (assuming that the lamp is to light a ceiling) may be assumed to be illuminated directly by the lamp. This area may be given a more or less arbitrary length representing a fraction of the total area to be illuminated, but such length will generally depend to some extent upon the size of the lamp, the size of the total area to be lighted and the distance of the lamp from such area, and can best be determined experimentally. The remaining area is illuminated by light projected by the ellipsoidal reflector, and the spherical reflector is preferably so constructed that it directs the light falling thereon upon those portions of the ellipsoidal reflector which direct the light upon the farthermost portions of the area to be illuminated. To this end, the spherical reflector is so designed that it reflects the light upon the upper portion of the ellipsoidal reflector, that is, upon the portion whose reflected light rays are least inclined to the area to be illuminated.

It has already been mentioned that the ellipsoidal reflector is not a true body of revolution, that is, it is not generated by revolving an ellipse about the axis passing through its two foci. A reflector representing the surface of such a body of revolution would, if struck by light emanating from the nearer focus, direct such light through the farther focus (which, theoretically, is a point) and thus produce a spot-light effect. The present construction is, however, intended to produce diffused illumination, and to this end the ellipsoidal reflector is so constructed that it directs the light not through a focal point, but theoretically through a curved, approximately 180° line passing through or near to the focal point. This may be accomplished by so constructing the reflector that, assuming that the lamp is positioned vertically, elliptical or nearly elliptical sections are cut by vertical planes passing through the nearer focus (at which the source of light is preferably positioned), the major axis of the ellipse being inclined to the horizontal, while circular sections are cut by horizontal planes, that is, by planes oblique to the major axis, instead of by planes normal to the major axis, as in an ellipsoid of revolution. In this way, the second or farther focus of the reflector theoretically takes the form of a circular line. However, since the source of light

(filament) is not a point but a number of lines covering a definite area, this focal line will in practice be represented by a section of a circular band or of an annulus or tones. By such construction the light from the ellipsoidal reflector is projected over a wide area which may be 180° in extent.

The invention will be further described with the aid of the accompanying drawings which show a preferred construction embodying the principles of the invention. In said drawings,

Fig. 1 is a view in elevation of a lamp constructed in accordance with the invention; Fig. 2 is a top plan view of the lamp shown in Fig. 1; Fig. 3 is an enlarged vertical section through the lamp; Fig. 4 shows diagrammatically the general method of determining the curvature of the light projector; and Fig. 5 shows a slightly modified construction.

My improved lamp comprises a base 10 upon which is mounted a socket 11 of any suitable or standard construction, the socket being attached to the base by means of screws 12 which also affix a fitting or nipple 13 to the base through which the electrical conductors are adapted to pass and by means of which the lamp may be mounted upon or suspended from any suitable support. The base 10 is provided with a vertical flange 14 to which are fixed the two reflector sections 15 and 16. To the reflector section 15 is attached a cover plate 17 which may be semi-circular in form as viewed in Fig. 2, the plate having a downwardly directed flange provided with open slots 18 which receive the stems of bolts 19 by which they are fixed to the section 15 by the nuts 20. The stems of the bolts may be milled down and the openings in the reflector section 15 may be of corresponding segmental shape so that the nuts may be turned without rotating the stems.

Attached to the upper edge of the reflector section 16 is an outwardly flaring conical reflector 21, which is approximately semi-circular in form, as viewed in plan in Fig. 2. The reflector 21 is fixed to the section 16 by bolts 22.

The socket member 11 is adapted to receive a lamp 23 of suitable construction, preferably one having a filament 24 of as small a size as possible consistent with the wattage desired, a floodlight type of lamp being satisfactory. The socket and reflectors may be suitably designed for certain standard types of lamps, so that the center 25 of the filament is at or corresponds with the center or focus of the curved surfaces of the reflector structure, as will be explained more fully below. The base of the lamp is provided with a number of apertures 26 for promoting circulation of air through the reflector structure and preventing over-heating.

The interior surfaces of the reflector sections 15, 16 and 21, which are shown as being made of sheet metal, are coated with a highly reflecting surface, such as nickel, silver, chromium, rhodium, etc., rhodium being preferred. The reflector sections may, however, also be made of glass or other suitable material and provided with a silver or other coating. The inner surface of the cover plate 17 need not be provided with a reflecting surface, although it may be designed to reflect at least part of the light falling thereon upon the projector 15.

In accordance with the present invention, the reflector sections 15, 16 and 21 are so constructed that the light is reflected laterally of the lamp, for example, to the right of the lamp and upwardly in the arrangement shown in Figs. 1 and 3; and the light densities are so proportioned and distributed that the beams directed toward points more remote from the lamp are made more intense, approximately in accordance with the law of inverse squares, so that the lamp illuminates a large area to one side thereof in a substantially uniform manner. To this end, the reflector sections are so constructed and arranged that the light beam is projected onto the area to be illuminated by only part of such sections, the projected beam being reinforced by the beams reflected from the other sections of the reflector structure in such a manner and to such an extent that areas remote from the lamp receive beams of greater intensity in approximately inverse square proportion to their distance from the lamp. The reflector 15, which may be designated as the projector, is also constructed so as to project a beam in fan-shaped fashion, that is, a beam extending through a considerable horizontal angle, up to 180°, so as to illuminate an area of considerable width.

In the form of the invention illustrated on the drawings, the reflector or projector section 15 is so constructed that all of the light impinging thereon is projected through the space between the edges 27 and 27', respectively, of the section 16 and cover plate 17. The light falling upon the section 16, on the other hand, is reflected upon the section 15 and by the latter is projected into the aforementioned space, the section 16 being preferably so designed that it reflects light onto those portions of the projector 15 which direct light toward the most remote portions of the area being illuminated. The projector 15 thus sends off a beam of sufficient width to sweep the whole area to be lighted, such as a ceiling, and of increasing intensity as the angle which the rays make with said area decreases.

In designing the lamp, or rather the reflector structure thereof, it is borne in mind that the lamp is to be made as small and compact as possible, taking into consideration the size of the incandescent lamp to be employed with the reflector. Thus, considerations of ventilation and prevention of over-heating of the reflector require that the reflector structure and also the top plate 17 be spaced a suitable distance from the lamp. In the case of a 250 watt lamp, the minimum distance from the lamp to the reflector may be about three-fourths of an inch to one inch, while for larger lamps the distance may be somewhat greater.

The reflector sections for the lamp may be designed in accordance with the invention in the following manner: Let it be assumed that the lamp is of the 1:4 type, that is, one in which the length of the area to be illuminated is four times the distance of the lamp filament from such area. This relationship is represented diagrammatically in Fig. 4. In this figure the line 28—29—30—31—32—33 represents the area to be lighted. It is arbitrarily assumed that a certain portion of the lighted area, say about one-fourth of such area, namely the fourth nearest to the lamp, is illuminated only by direct light from the lamp. This area is represented by the line 28—29 in Fig. 4. The reflector section 15 is then so designed that it projects the light toward the right of the point 29 (which actually is a line), so as to illuminate the area 29—33, and if desired also the top portion of the opposite wall and of the side walls. The line 29—33 is then divided into any convenient arbitrary number of sections, preferably equal for the sake of simplicity, and the

reflector 15 is then so designed that different portions thereof will direct the light upon the different parts of the area 29—33.

It may be mentioned at this point that the upper edge 34 of the reflector 15 is determined by the plate 17, or, roughly, by the uppermost point of the globe of the lamp 23. The lower effective edge 38 of the reflector is determined approximately from the character of the filament and the general construction of the lamp and also by the distance from the lamp required for adequate ventilation. The point 38 should also bear such a relationship to the upper edge 27 of the reflector 16 that substantially all of the projected light clears such edge.

The curvature of the several portions of the reflector 15 may, for the sake of simplicity, be made circular or spherical, and such curvature and the location and extent of such portions may be determined as follows: The point 34 is given an approximate location, with due regard to the height of the lamp and proper ventilation. The angle 34—25—38 is then divided into four parts, which may be and preferably are equal. Portion 37—38 (point 37 is not yet known) of the projector is designed so as to illuminate the area 29—30 (see Figs. 3 and 4). While Fig. 4 does not represent the working plan drawing for the specific reflector 15 shown in Fig. 3, the reference characters appearing in Fig. 4 will be used for convenience of explanation since Fig. 4 illustrates the principles along which the working plan for Fig. 3 will be drawn. Lines are then drawn from the point 29 to the point 38 and from the point 30 to the point 37 (whose position is assumed from the general shape of the lamp and is only approximate, although located on the lowest of the lines which divide the angle 34—25—38 into four equal parts), parallel respectively to the lines from the lamp center to the points 29 and 30 in Fig. 4. A line is then drawn from the point 25*a* of the filament, representing the lowest luminous point of the filament with reference to the line 29—37, to the point 37. The angle between the lines 30—37 and 25*a*—37 is then bisected as indicated by the line 37—39. A line is then drawn from the opposite point 25*b* of the filament, representing the highest illuminous point with reference to the line 29—38, to the point 38, and the angle 25*b*—38—29 is then bisected, as indicated by the line 38—39. The point of intersection 39 of the lines 37—39 and 38—39 then represents the center of a sphere passing through the points 37 and 38 and adapted to reflect the light from the filament to approximately the area 29—30.

In a similar fashion, the centers 40, 41 and 42 are determined for the sphere sections 37—36, 36—35 and 35—34, which reflect the light respectively to the areas 30—31, 31—32 and 32—33. The manner of determining the curvature of the spherical portions of the reflector 15 above described, wherein the actual dimensions of the filament are taken into consideration, will produce more or less definite beams directed wholly to the predetermined portions of the area 29—33. If desired, however, the filament can be regarded as concentrated at the point 25, the construction lines being then drawn from the point 25 to the limits of the several portions of the reflector 15 to determine the center points of the respective spherical sections; in such case, however, there will be some overlapping of the several beams due to the fact that the filament is not actually a point.

As the lines along which the adjacent sections of the reflector 15 meet will represent points of discontinuity in the surface 15, I prefer to make one surface lead gradually into the other and so produce a continuous smooth surface. Thus the points 37, 36, 35, and 34 may have to be shifted slightly to permit such continuity to be attained.

It will be apparent from the above that the upper portions of the reflector 15 direct the beams toward illuminated areas more and more remote from the lamp. If desired, the rays reflected by the highest portion of the projector may be made to run parallel to or very nearly parallel to the ceiling, so as to illuminate the upper portions of the walls. In order to strengthen the beams emanating from successively higher sections of the reflector 15, I design the reflector 16 in such a manner that it reinforces the beams projected by such upper portions of the reflector 15. To this end, the upper portion of the reflector 16 is designed to reflect light falling thereupon onto, say, approximately the upper half of the reflector 15. The upper portion of the reflector 16 may, however, be designed to illuminate any desired portion of the reflector 15.

It will be assumed that the reflector 16 is to direct its rays upon the upper portions of the projector 15. The upper edge 27 of the reflector 16 is so determined, as already indicated above, that the ray coming from a point on the filament making the largest angle with the line 38—39 just clears such edge. This edge is also located a sufficient distance from the lamp to insure proper ventilation. An arc is then drawn through the edge 27 (represented in Fig. 3 as a point) with the center 25 of the filament as its center. The lower edge 43 of this arc is so determined that the rays impinging thereon from the limits 25*c* to 25*d* of the filament are reflected to approximately the point 34 on the reflector 15. Thus the point 43 may be so located that a ray of light from the center of the filament is reflected to the edge 34 of reflector 15. If the arc were extended below the point 43, the light striking the extended portion would be reflected above the edge 34 and would be thrown upon the cover 17 and so would practically all be lost. The point 43 is most easily found by extending the line 34—25 until it strikes the surface 16.

The lower portion 43—44 of the reflector 16 is made of larger radius, i. e. is somewhat flattened in order to direct the rays falling thereon upon the upper portion of the projector 15. The lower point 44 is determined approximately by the required distance from the lamp for the purpose of ventilation and by the general construction of the base of the lamp. To determine the center of the arc 43—44, a line is drawn from the uppermost point 25*d* of the filament (from which a ray makes the largest angle with the surface 16 at the point 44) to the point 44, and a line is drawn from approximately the point 34 to the point 44. The angle 25*d*—44—34 is then bisected, yielding the line 44—45. In a similar fashion the line 43—45 is determined by bisecting the angle between the line 25*c*—43 and the line from 43 to a point which may be slightly above the point 34 on the projector 15. At the point of intersection 45 of these bisector lines is located the desired center 45 of the spherical surface 43—44 of arc reflector 16.

It will thus be seen that light directed by the lamp upon the section 27—43 of the reflector 16 will be directed upon the upper portion, and if desired more than half, of the reflector 15, while

the beam projected by the uppermost portion of the projector 15, which beam is directed to the farthermost areas to be illuminated, is further reinforced by light reflected from the portion 43—44 of the reflector 16. In this way the beam projected by the reflector 15 increases in intensity as it is directed further and further away from the lamp 23.

In order to spread the beam through a horizontal angle of approximately 180°, the projector 15 is given such a curvature that the rays are directed in fan-shaped fashion therefrom. This may be accomplished by making the projector 15 circular in horizontal cross-section, as will be clear from the plan view in Fig. 2, from which it will be noted that the curvature of the reflector 15 is concentric with the filament of the lamp; in other words, the locus of the centers of the circular arcs cut on the reflector 15 by horizontal planes lies approximately in the vertical axial line passing through the filament.

The conical portion 21 assists in hiding the upper portion of the lamp 23 from view and also prevents any stray rays from being directed downwardly. Its upper edge 47 is preferably in line with the upper surface of the plate 17. The surface of the conical section 21 is preferably made irregular, though still reflecting, by embossing or stamping the same as indicated at 46. In this way, the image of the filament is diffused and no irregular and bright streaks are reflected upon the area being illuminated. The inclination of the section 21 is preferably such that it will not be struck by light projected by the lower portion of the projector 15.

I have found from a study of the shape of the reflector 15 in a number of lamps of different types and sizes designed by me in accordance with the embodiment of the invention illustrated, that the curvature of such reflector approximates so closely the surface of an ellipsoid that it can be made in the form of such curve without appreciable loss of efficiency but with considerable gain in facility of manufacture. One focus of the ellipse is at the center of the lamp filament, while the other focus is at a point 48 at or slightly above the extreme outer edge 47 of the conical section 21. If the filament were actually a point, the second focus could be located substantially at the edge 47. However in view of the fact that the filament is of considerable size, the second focus is not only located some distance above the point 47, but is not in the form of a point, having in vertical transverse section an area of considerable dimensions. Substantially all of the light reflected by the reflector 15, if the latter is made in the form of an ellipsoid, will pass through this second focal region 48. The ellipsoid is not, however, an ellipsoid of revolution. Whereas in an ellipsoid of revolution it is the sections in a plane perpendicular to the major axis that are circles, in the surface according to the form of the invention illustrated, the sections oblique to the major axis are circular. It will be noted that the major axis 25—48 is inclined to the horizontal, while horizontal sections (which are oblique to the major axis) through the projector are circular. In an ellipsoid of revolution the light emanating from one focus would, theoretically at least, all pass through the other focus, that is, through a point. It is the object of my improved construction, however, to cause the light to spread over a wide area. By making the projector non-elliptical in horizontal section, the light from the projector 15 is caused to converge upon a line and not upon a point, the line being of approximately the same nature as the horizontal section of the projector; that is, if such section is circular, the focal line will be circular. The locus of the centers of the circles or rather circular arcs cut on the surface 15 by horizontal planes, as already indicated above, is a vertical line passing through the lamp filament, the light from 15 passing through this line or adjacent to it and then through the curved focal line 48. This construction produces a 180° spread of beam.

It will be apparent that the focal "line" referred to above is not a unidimensional line in the strict geometrical sense, but in view of the fact that the filament has extension in three dimensions, is roughly in the nature of a section of a torus and is to be understood in such sense.

From the above it will be evident that it is important that the center of the filament be located at a definite point determined by the design of the lamp. This may be accomplished by designing the socket 11 for certain standard lamps having standard uniform construction, prefocussed lamps and prefocussing sockets being preferably used.

As the reflectors 15 and 16 are of different curvatures, they will not meet along a common line. If desired, the reflectors can be distorted at the joints into a common junction line, or they can be left in non-registering condition.

The reflectors can be designed for any suitable length of area to be illuminated and for any desired distance of the lamp from such area. For best results, the length of the area to be lighted should not be less than three times nor more than ten times the vertical distance of the filament from such area.

Instead of being circular, the horizontal sections of the projector 15 can be parabolic, assuming that the lamp is in the position shown in Fig. 3. In such case, the projected beam would not extend through 180° but would be composed of parallel rays, the width of the beam corresponding approximately to the width of the projector.

The reflector 15 may be extended up to a point located at the maximum level of the plate 17 as indicated in Fig. 5. In this way the efficiency of the lamp is somewhat improved and a larger portion of the beams is directed along a more nearly horizontal line so as to illuminate to a greater degree the upper portion of the opposite wall and also the side walls.

It will be understood that while in the above description I have assumed the lamp to be arranged to illuminate the ceiling of a room, my improved reflector can be employed with equal advantage for lighting side walls, floors, etc.

In use, the reflector is mounted within a bowl or other suitable structure, which may be ornamental in nature, especially if the reflector is to be used in a floor lamp or wall bracket, the lamp being preferably arranged at such a level that the line 47—27' runs horizontally above eye level when the lamp is used to light a ceiling, or below eye level when the reflector is turned downward to light a floor or road; the arrangement being, however, such that in the operative position of the lamp the reflecting surface of the reflector 15 will not be visible, so that the source of the light will not readily be perceived. In this way very interesting lighting effects can be obtained.

For greater simplicity in the design of the reflector 15, the filament may be assumed to be concentrated at the point 25 instead of being considered as a body of appreciable dimensions. In

such case there will be overlapping of the beams from the several parts of the reflector 15, but in many cases this will not interfere to any considerable extent with the efficiency of the lamp. In the embodiment illustrated in the drawings, I have treated the filament as having extension, which corresponds to actual conditions.

I claim:

1. In a lamp structure, the combination of two reflector sections adapted to be arranged upon opposite sides of a lamp, one of said reflector sections constructed to reflect light falling thereon upon the opposite reflector section, and said opposite reflector section constructed to focus the light falling thereon and also the light reflected by the first mentioned section, upon a linear focal region located at or above the upper edge of the first mentioned reflector section and approximately coextensive therewith, whereby a wide beam of light is projected by the second mentioned reflector section and means for concealing the reflecting surface of the opposite reflector section from view in the operative positions of the lamp structure, the lamp structure affording substantially unobstructed passage for the light beam directly from said opposite reflector section to the area to be illuminated.

2. In a lamp assembly, the combination of a socket member adapted to receive an incandescent lamp, a reflector structure comprising two reflector sections arranged upon opposite sides of the lamp, one of said sections being curved to reflect light upon the opposite section, and said opposite section representing a portion of the surface of an ellipsoid having one focus at the filament of the lamp, and its second focus so positioned that the light projected by such opposite section clears the upper edge of the first section, said ellipsoidal section not being an ellipsoid of revolution, the shape of said section in planes oblique to the major axis being such that light reflected by said section is directed toward a linear focal region forming the said second focus and passes in a wide band to the area to be illuminated, and means for shielding the last mentioned reflector section to hide the reflecting surface from view.

3. In a lamp assembly, the combination of a socket member adapted to receive an incandescent lamp, and a reflector structure comprising two reflector sections arranged upon opposite sides of the lamp, one of said sections constructed to reflect light upon the opposite section, and said opposite section representing the surface of an ellipsoid having one focus at the filament of the lamp, and its second focus so positioned that the light projected by such section clears the upper edge of the first section, the said opposite section yielding sections of such nature in planes perpendicular to the longitudinal axis of the lamp assembly that the second focus of the said second opposite section is extended theoretically into a line, so that a wide beam is projected into space by said second reflector section.

4. In a lamp assembly, the combination of a base, a socket mounted upon said base and adapted to receive an incandescent electric lamp, and a reflector structure mounted upon said base and surrounding the said lamp, said structure comprising two reflector sections positioned upon opposite sides of the lamp, one of said sections constructed to reflect at least part of the light falling thereon upon the opposite reflector section, said opposite reflector section having a surface whose section in a plane passing through the longitudinal axis of the lamp assembly is an ellipse having one focus at the lamp filament and its second focus at a point so positioned that substantially all of the light projected by the said opposite reflector section clears the upper edge of the first mentioned section, said second reflector surface presenting non-elliptical sections in planes perpendicular to the longitudinal axis of the lamp, so that the locus of the second foci of said opposite reflector section is represented by a line of considerable extent, whereby a wide beam is projected by the lamp upon an area to be illuminated.

5. The construction set forth in claim 4, wherein the second reflector section is constructed to reflect light beyond an arbitrarily dimensioned area directly above the lamp, said area being illuminated directly by said lamp.

6. The combination set forth in claim 4, including a conical reflector extending from the upper edge of the first named reflector section and flaring outwardly toward the area to be illuminated.

7. The combination set forth in claim 4, including a conical reflector extending from the upper edge of the first named reflector section and flaring outwardly toward the area to be illuminated, the surface of said conical reflector being irregular to diffuse the light impinging thereon.

8. The combination set forth in claim 4, including a conical reflector extending from the upper edge of the first named reflector section and flaring outwardly toward the area to be illuminated, the line representing the theoretical locus of the second foci of the said opposite reflector section being positioned a short distance above the outer edge of said conical section.

9. The combination as set forth in claim 4, including a cover arranged to shield part of the upper surface of the lamp.

10. The combination as set forth in claim 4, including a cover arranged to shield part of the upper surface of the lamp, said reflector structure including a conical section flaring outwardly from the upper edge of the first mentioned reflector section, the outer edge of said conical section being approximately in line with the upper surface of the cover.

11. The combination as set forth in claim 4, including a cover arranged to shield approximately one half of the upper portion of the lamp, said reflector structure including a conical section flaring outwardly from the upper edge of the first mentioned reflector section, the outer edge of said conical section being approximately in line with the upper surface of the cover, and the line representing the locus of the second foci of the said opposite reflector section being positioned slightly above the outer edge of the conical reflector.

12. In a lamp assembly, the combination of a base, a socket mounted on said base and adapted to receive an incandescent lamp, a reflector structure for said lamp comprising two sections arranged upon opposite sides of the lamp, one of said sections being curved to reflect the light falling thereon upon the second section, and the opposite section being constructed to project the light beyond an area directly above the lamp in the form of a wide beam which is condensed by such section along a linear region representing the locus of the foci of successive vertical sections of the second mentioned reflector.

13. The combination as set forth in claim 12, wherein the first named reflector section is constructed and arranged to direct the light upon the upper portion of the said opposite reflector section which projects the light to the farthest areas to be illuminated.

14. The combination as set forth in claim 12, wherein the first named reflector section is composed of two portions, one of which reflects light upon the upper portion of the second reflector section and the second portion of which reflects light upon the uppermost portion of the said opposite section, so that the beam projected by the said second reflector section increases in intensity as it is directed toward areas more and more removed from the lamp.

15. In a lamp structure, the combination of two reflector sections arranged upon opposite sides of a lamp, one of said reflector sections being curved to reflect light falling thereon upon the opposite reflector section, and said opposite reflector section being curved to project the light falling thereon and also the light reflected by the first mentioned section in a broad beam upon an area to be illuminated, the socket of said lamp being positioned between those ends of the reflector sections which are opposite the place of emergence of the projected beam, the ends of said sections remote from the base of the lamp being spaced to enable direct light from the lamp to illuminate the nearest portion of the area to be illuminated, the lamp structure affording substantially unobstructed passage for such direct light to said nearest portion of the area to be illuminated, and shielding means for concealing the reflecting surface of the said opposite reflector section from the direction toward which the light is projected.

16. In a lamp structure, the combination of two reflector sections arranged upon opposite sides of a lamp, one of said reflector sections being curved to reflect light falling thereon upon the opposite reflector section, and said opposite reflector section being curved to project the light falling thereon and also the light reflected by the first mentioned section in a broad beam upon an area to be illuminated, the socket of said lamp being positioned between those ends of the reflector sections which are opposite the place of emergence of the projected beam, the ends of said sections remote from the base of the lamp being spaced to enable direct light from the lamp to illuminate the nearest portion of the area to be illuminated, the lamp structure affording substantially unobstructed passage for such direct light to said nearest portion of the area to be illuminated, said opposite reflector section being so curved as to direct substantially all the light falling thereon to parts more remote than said nearest portion, and shielding means for concealing the reflecting surface of the said opposite reflector section from the direction toward which the light is projected.

17. A lamp structure adapted to be positioned adjacent to the wall of a room and to project a wide beam of light upon the ceiling of the room, comprising, in combination, means for supporting a lamp, two reflector sections arranged upon opposite sides of the lamp, one of said reflector sections being curved to reflect substantially all of the light falling thereon upon the opposite reflector section, the upper ends of said sections being spaced to enable direct light from the lamp to illuminate the portion of the ceiling directly above the lamp, and said opposite reflector section being curved to project the light falling thereon and also the light reflected by the first mentioned section, upon the portion of the ceiling beyond said first mentioned portion, and a shield arranged to conceal the reflecting surface of the said opposite reflector section from view when the lamp is held at or slightly above the level of the eye.

18. A lamp structure adapted to be positioned adjacent to the wall of a room and to project a wide beam of light upon the ceiling of the room, comprising, in combination, means for supporting a lamp, two reflector sections arranged upon opposite sides of the lamp, one of said reflector sections being constructed to reflect substantially all of the light falling thereon upon the opposite reflector section, the upper ends of said sections being spaced to enable direct light from the lamp to illuminate the portion of the ceiling directly above the lamp, and said opposite reflector section being constructed to project the light falling thereon and also the light reflected by the first mentioned section upon the portion of the ceiling beyond said first mentioned portion, said reflector sections being so arranged that when they are supported above the level of the eye the reflecting surface of the opposite reflector section is concealed from view, the first reflector section being spherical in shape, the filament of the lamp being approximately at the focus of said section, and the said opposite reflector section being arranged to throw the light substantially entirely to one side of the lamp and being of ellipsoidal form, the nearer focus of said opposite section being approximately at said filament and the second focus being above the upper edge of the first mentioned reflector section.

19. A lamp structure comprising, in combination, two reflector sections, and a socket member for supporting a lamp therebetween, one of said reflector sections being curved to reflect light falling thereon upon the opposite reflector section, while the latter directs the light laterally above the upper edge of the first section upon the area to be illuminated, the lamp structure being open at the top (considered when the lamp is in position to illuminate a ceiling) to enable direct light from the lamp to illuminate the portion of the said area in the vicinity of the lamp, and the opposite reflector section being composed of a plurality of parts each curved to direct its incident light beyond the said area portion which is in the vicinity of the lamp, the parts of the said opposite reflector section from the bottom to the top thereof directing the light to successively more remote portions of the area to be illuminated, the first reflector section reflecting light upon the upper parts of the opposite section to reinforce the beams directed toward the more remote area.

20. A lamp structure adapted to be positioned adjacent to the wall of a room and to project a wide beam of light upon the ceiling of the room, comprising, in combination, means for supporting a lamp, two reflector sections arranged upon opposite sides of the lamp, one of said reflector sections being curved to reflect substantially all of the light falling thereon upon the opposite reflector section, the upper ends of said sections being spaced to enable direct light from the lamp to illuminate the portion of the ceiling adjacent to the lamp, the said opposite reflector section having a focussing curvature and hav-

ing its axis oblique to the ceiling so as to direct the light rays upwardly toward the ceiling beyond the said adjacent ceiling portion.

21. A lamp structure adapted to be positioned adjacent to the wall of a room and to project a wide beam of light upon the ceiling of the room, comprising, in combination, means for supporting a lamp, the lamp structure being open at the top to enable direct rays from the lamp to illuminate the portion of the ceiling in the vicinity of the lamp, a reflector at one side of the lamp and curved to focus the rays falling thereon at a region between the lamp and the ceiling so as to cause a diverging beam of light to be directed toward the more remote parts of the ceiling, the rays reflected from the uppermost portion of the reflector being directed to the remotest area to be illuminated, and means for shielding the lamp and reflector from view in the operative position of the lamp.

22. A lamp structure adapted to be positioned adjacent to the wall of a room and to project a wide beam of light laterally upon the ceiling of the room, comprising, in combination, means for supporting an incandescent lamp, two reflector sections arranged upon opposite sides of the lamp, one of said reflector sections constructed to reflect substantially all of the light falling thereon, upon the opposite reflector section, a shield extending from the said opposite reflector section and covering the adjacent portion of the lamp so as to prevent illumination of said wall, a second shield extending outwardly from the first reflector section and acting to conceal the source of light when the lamp is supported slightly above the level of the eye, the space between the two shields affording unobstructed passage for direct light from the lamp to the portion of the ceiling in the vicinity of the lamp, the second reflector section being curved to focus the light reflected thereby upon a region at the opposite side of the lamp and above the filament of the lamp so that a diverging beam is directed from said focal region to illuminate the more remote portions of the ceiling.

23. A lamp structure as set forth in claim 19, wherein the first reflector section is of spherical shape and has its center at approximately the filament of the lamp.

24. A lamp assembly as set forth in claim 3, wherein the reflector section which reflects light upon the opposite reflector section is spherical in shape and has its center approximately at the nearer focus of said opposite reflector section.

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