O. A. MYGATT.

REFLECTOR FOR ARTIFICIAL LIGHTS.

APPLICATION FILED JULY 15, 1905.

1,043,787.

Patented Nov. 5, 1912

2 SHEETS—SHEET 1.

FIG. 1.

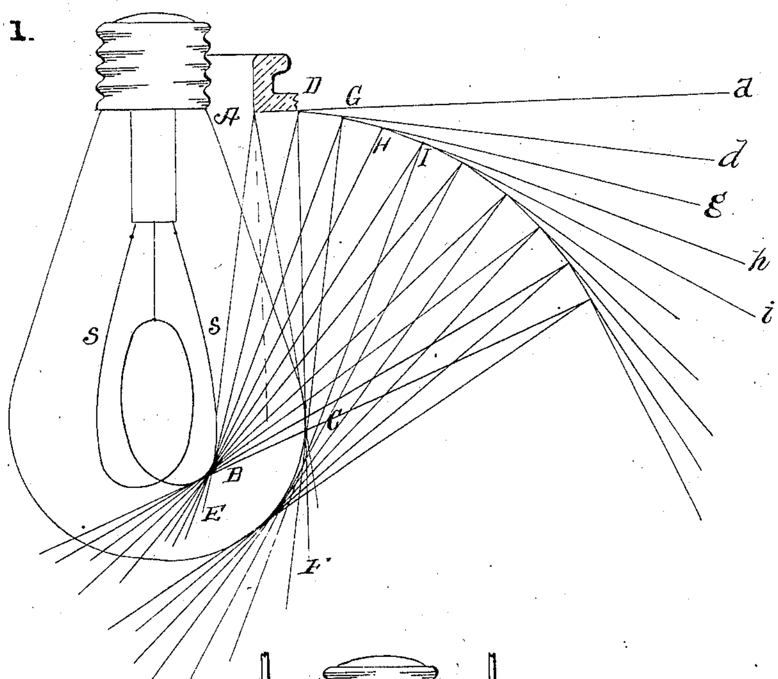

FIG. 2.

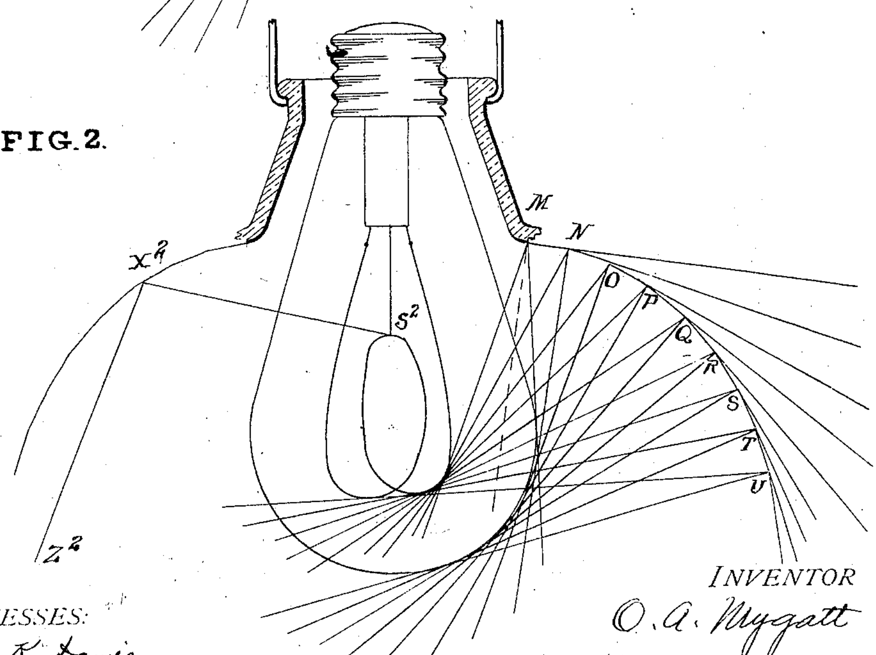

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FIG. 3. FIG. 5.

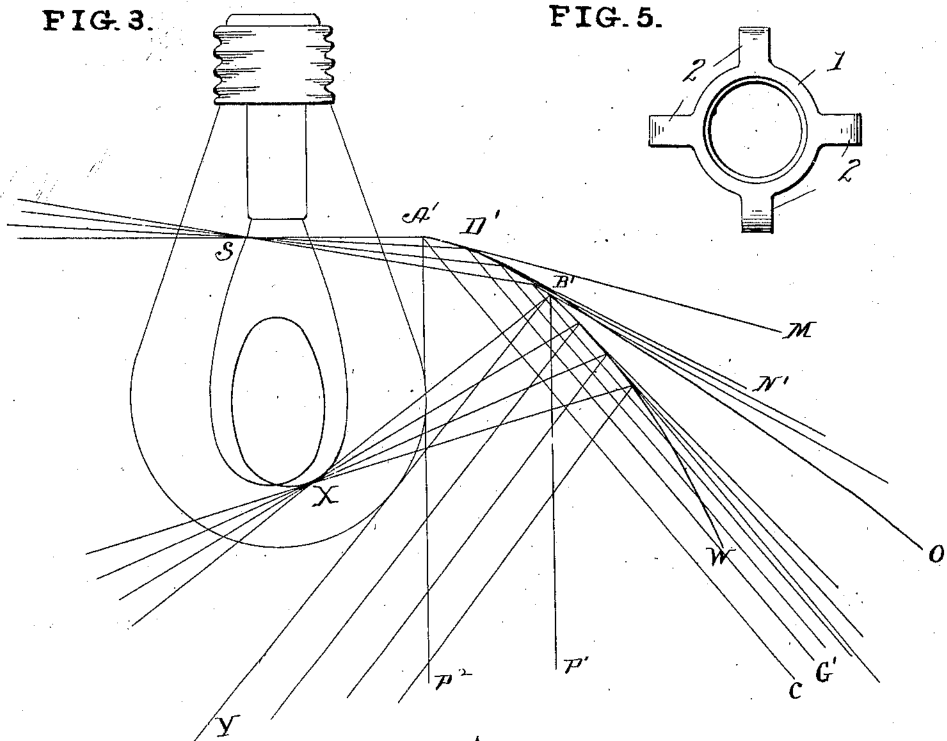
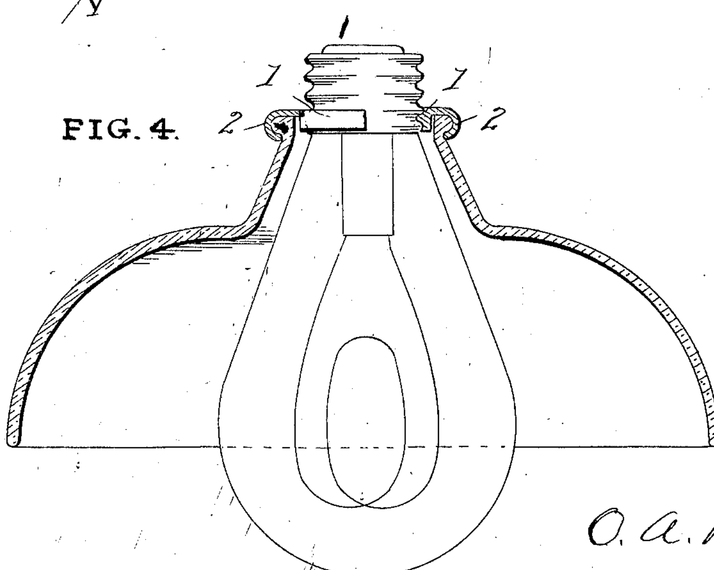


FIG. 4.



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UNITED STATES PATENT OFFICE.

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REFLECTOR FOR ARTIFICIAL LIGHTS.

1,043,787. Specification of Letters Patent. Patented Nov. 5, 1912.

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To all whom it may concern:

Be it known that I, Otis A. Mygatt, citizen of the United States, residing at New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Reflectors for Artificial Lights, of which the following is a specification, reference being had therein to the accompanying drawing.

My invention relates to the construction of reflectors for use with electric incandescent or other light sources and involves general principles of construction and certain combinations of parts adapted to produce definite results.

In designing my reflector, I take into consideration the size, shape and position of the luminous surface of the light source, the necessary mechanical accessories of such luminous surface, such as the glass bulb and metal base of an incandescent electric lamp, the holder by which the reflector is supported, the position of the luminous surface with reference to the reflector, and the contour of the reflecting surface.

While my reflector is particularly designed for use with incandescent electric lamps, it is adapted to other light sources.

In order to produce the highest efficiency, it is necessary to prevent as far as possible the reflected rays from passing through or encountering any object after leaving the reflecting surface. With reflectors used at the present time a considerable portion of the reflected rays pass backwardly through the bulb of the lamp. If the lamp bulb is frosted or ground on its surface, as is very frequently the case, and which is a very desirable condition by reason of the softening of the glare of the bare filament which is thus produced, the direction of the reflected light into and through the bulb becomes a source of considerable loss by absorption. The absorbed light being converted into heat, thereby raises the temperature of the bulb and acts in a deleterious manner upon the filament of the lamp, reducing the length of time during which it will properly perform its function. The general purpose of a reflector is to intercept the rays which would naturally proceed in an upward direction and direct them by reflection into the region below the position of the light source; and for specific purposes of illumination it is desirable to distribute the reflected rays in some definite manner. For example, it is frequently desirable to produce an approximately uniform illumination over a horizontal plane beneath the reflector. To accomplish this it is necessary that the intensity of the light vary with the cube of the cosine of the angle from the perpendicular, in accordance with the well known laws of light.

Figure 1 is an elevation of a lamp of common construction, and diagram illustrating the calculation of angles and curves required to produce a reflector according to the present invention. Fig. 2 is an elevation of a lamp, and a shade reflector applied thereto, with diagram of some light rays. Fig. 3 is an elevation of an incandescent lamp, and diagram of curve of reflector, and of reflected rays, as hereinafter explained. Fig. 4 is an elevation of a lamp, a section of a reflector, and a partial section and partial elevation of a reflector holder. Fig. 5 is a plan of a reflector holder.

My invention includes methods of constructing or forming reflectors which shall accomplish these several objects before stated more advantageously than has formerly been done.

In determining the contour of a reflector for accomplishing any definite result, I first determine the form which, while intercepting any desired portion of the total light radiation, and reflecting the same in a downward direction, shall not cause any of the reflected light to pass backwardly through the lamp bulb or other essential accessory used in connection with the light source. The method of determining this curve is shown in Fig. 1, in which an incandescent electric lamp is taken as the source of light. The point A is taken in a position nearest the point of attachment of the reflector to the fixture supporting the lamp. From this point a line A B is drawn to the lower extremity of the luminous surface S; (in this case the filament of the lamp); the line A B represents the incident ray making the smallest angle with the reflecting surface at the given point. The problem is then to determine the position of a reflecting surface at this point which shall reflect this ray of light in a direction which shall not reënter the lamp bulb. A tangent A C is therefore drawn to the bulb from the point A. The line A C therefore represents the ray A B after reflection. The reflecting surface at the point A must therefore be perpendicular to the bisectrix of the angle B A C. A a is a line so drawn. The point D, taken at any convenient short distance from A on the line A a, is taken as the second point of calculation, and the incident ray from the lower extremity of the luminous surface D E, is drawn as before, and the perpendicular to the bisectrix of the angle E D F drawn. This line, D d, forms the reflecting surface at this point. The point G on the line D d is taken in a similar manner, and the line H h determined by the same method. This process of calculation is continued until any number of points in the contour of the surface is determined. The lines A D, D G, H I, and so on, are these separate lines of calculation, or trial lines, and these lines are tangents to the required curve. A curve line inscribed within these trial lines so that all the trial lines are tangents to different points on said curve, will give the contour of the reflecting surface sought. The trial lines may be as numerous as desirable, and the reflecting surface may be extended to intercept any desired portion of the radiation. Such a curve also represents the smallest figure which the reflector can have without reflecting a portion of the rays through the bulb of the lamp, assuming that the curvature begins at the collar or point of support of the reflector as usually constructed. I have devised a method, however, by which I accomplish the same result with a reflector of very much smaller diameter at the open end, which is a very desirable object to attain, particularly with reflectors made of prismatic glass, as it reduces their weight and cost of manufacture very materially. This improved method of construction consists in starting the reflecting surface at a point approximately horizontal with the upper extremity of the luminous surface; in the case of an incandescent lamp, such point being horizontal with the points of attachment of the filament with the lead-in wires. The curve of the reflector is then determined in the manner previously described, and as shown in Fig. 1, M, N, O, P, etc., the difference in the size required for the two reflectors will be seen to be very marked. A reflector thus made according to my improved method has a much smaller diameter than a reflector of similar curve commonly made, and therefore requires far less material for construction, and imposes a proportionately smaller weight upon the supporting fixture.

It is evident that in order to accomplish its specific purpose in the most advantageous manner, a reflector must be held in a definite position relative to the luminous surface of the light source. The form of incandescent lamp, the socket by which the lamp is held when in use, and the holder for attaching the ordinary globe or shade, as commonly found in the market at the present time, are not adapted to hold a reflector of my improved design in the position required. It is therefore necessary either to provide a special metallic holder, or to extend the material of the reflector itself, in the form of a long annular neck, having a bead or collar, at the top, by which it may be attached to the metal holders now in use. This construction is particularly advantageous in the case of prismatic glass reflectors, as the neck can be formed with diffusing or directing prisms, in accordance with my previous Patents 763,688 and 763,689, of June 28, 1904. Having thus laid out the smallest possible shape of reflector which can be used without loss other than the necessary absorption of the reflecting surface, I proceed in a generally similar manner to determine the shape or contour required to produce other desired results.

In Fig. 3 is shown the method of calculating the reflector of the smallest dimensions which shall confine the reflected light within an angle of 40 degrees about the perpendicular. In this calculation I begin at a point on the reflector nearest the lamp, and approximately on a line with the points of attachment of the filament to the wires, as at A′. I next draw the ray from the upper extremity of the light source S, and the line A′ c at an angle of 40 degrees from the perpendicular P^2. The line A′ c then represents the ray A′ S after reflection. The reflecting surface must therefore be perpendicular to the bisectrix of the angle S A′ c. A′ M is such bisectrix. The point D′ on this line is taken as the starting point of another tangent to the desired curve, and the ray S D′ drawn, and also the reflected ray D′ G′ at the given angle of 40 degrees from the vertical, as before. A line D′ N′ is then drawn perpendicular to the bisectrix of the angles S D′ G′. It is evident that by continuing in this manner a curve may be determined which shall cause all of the reflected light to fall within the angle of 40 degrees, as desired. A curve so designed, however, as to cause the reflected light to fall on the same side of the perpendicular, would have a comparatively large diameter, as shown by the line A′ D′ O′. This I avoid without changing the distribution of the reflected light, in the following manner: Starting with the point A′, and developing the curve in the manner already described, I observe the point at which the reflected cone of light may be caused to fall on the opposite side of the perpendicular without reëntering, or passing through, the lamp bulb, as at B′. The point B′ is then the beginning of a reflecting surface which will cause the incident ray X B′ to be reflected in the direction B′ Y, making an angle of 40 degrees with the perpendicular P^2. From the point B′, I continue to develop the curve so that the reflected ray, making the smallest angle with the normal, shall fall at 40 degrees from, and on the opposite side of the perpendicular. This condition causes the curve to close in, thus reducing the diameter, as shown by the line B′ W. The complete outline, therefore, consists of two curves united at the point B′.

While reflectors of prismatic glass are peculiarly adapted for construction according to my present invention, I do not limit my claims to such reflectors, as it is quite apparent that bright metallic surfaces or mirrors may be used.

A convenient means for attaching a reflector to a lamp bulb is shown in Figs. 4 and 5. A metallic collar 1, having arms 2, 2, &c., which can be clasped around the collar of the reflector, is attached to the lower end of the neck of the lamp, close to the bulb. Lamps are commonly made with one or two more threads than are needed for inclosure in the socket, and the ring or collar 1 can be applied to this part of the lamp bulb. If necessary, an asbestos or rubber gasket may be applied for insulation, as is common.

The lines of reflection referred to above are those which come nearest to the lamp. As the angles of incidence and reflection are equal, it will readily be seen that such rays as S^2 Fig. 2, would be reflected in the direction S^2 X^2 Z^2 far outside of the lamp.

What I claim is:

1. The combination of a light source, a glass inclosure therefor, and a bowl shaped reflector whose reflecting surface in planes intersecting the axis of the reflector is a curve defined by an indefinite number of tangents each of which is perpendicular to the bisector of the angle defined by a ray emanating from the lower portion of the light source and reflected back in a line close to but outside the inclosure.

2. The combination of an artificial light source of relatively great length, a glass inclosure therefor, and a reflector approximately circular in planes perpendicular to its axis and having its axis substantially in line with the longest axis of the light source, the reflecting surface in planes intersecting the axis of the reflector being a curve defined by tangents each of which is perpendicular to the bisector of the angle formed by a light ray emanating from the lower portion of the light source and reflected back toward and outside the inclosure, the reflecting curve being also calculated to give a certain light distribution.

3. The combination of a light source, a glass inclosure therefor, and a bowl shaped prism glass reflector whose reflecting surface in planes intersecting the axis of the reflector is a curve defined by an indefinite number of tangents each of which is perpendicular to the bisector of the angle defined by a ray emanating from the lower portion of the light source and reflected back in a line close to but outside the inclosure.

In testimony whereof I affix my signature in presence of two witnesses.

OTIS A. MYGATT.

Witnesses:
PHILIP HUETWOHL,
ANNABELL McDOWELL.