No. 821,307. PATENTED MAY 22, 1906.

O. A. MYGATT.

DECORATIVE SHADE REFLECTOR FOR ARTIFICIAL LIGHTS.

APPLICATION FILED MAY 12, 1904.

3 SHEETS—SHEET 1.

FIG. 1.

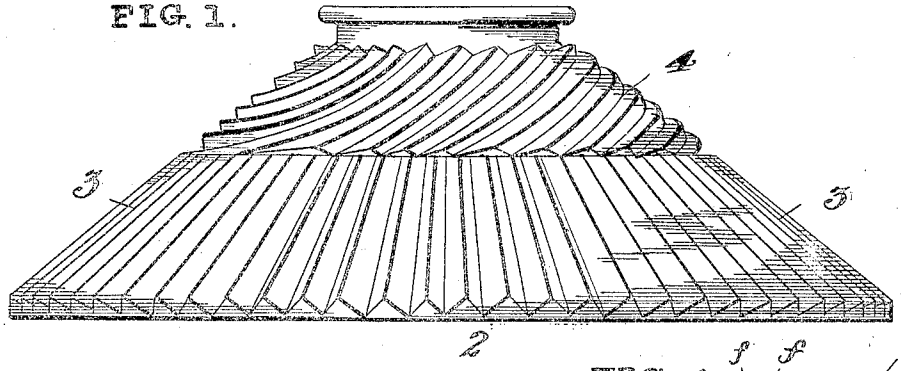


FIG. 4.

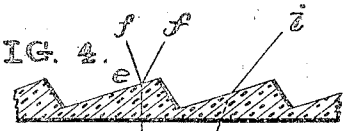
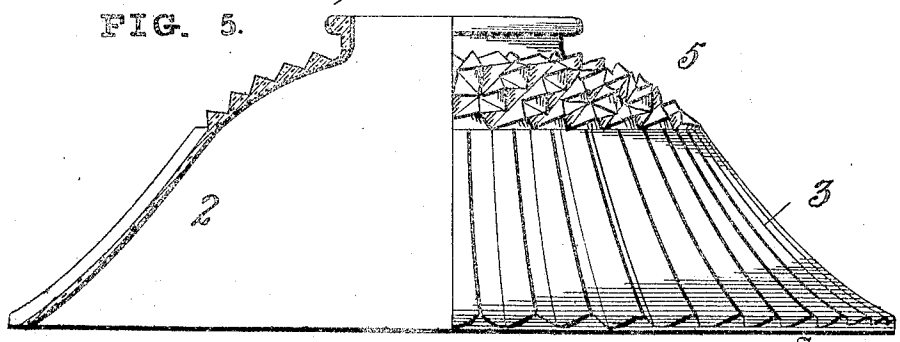


FIG. 3

FIG. 2.

FIG. 5.



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3 SHEETS—SHEET 2.

FIG. 6.

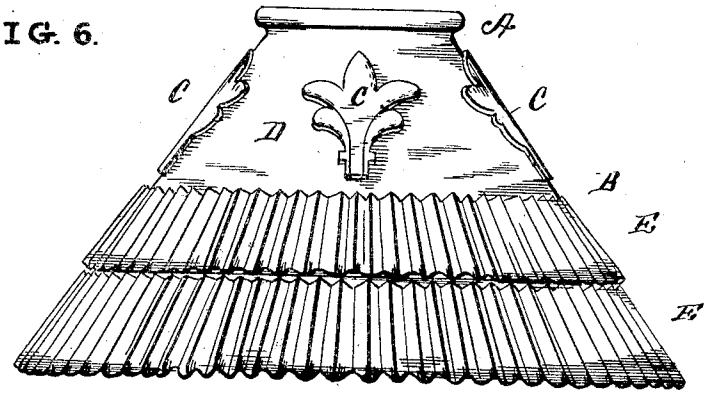


FIG. 7.

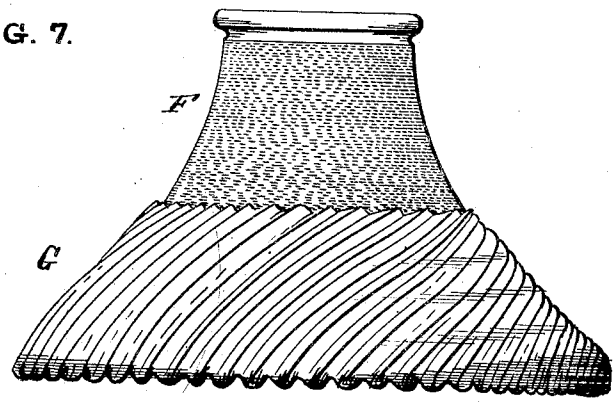
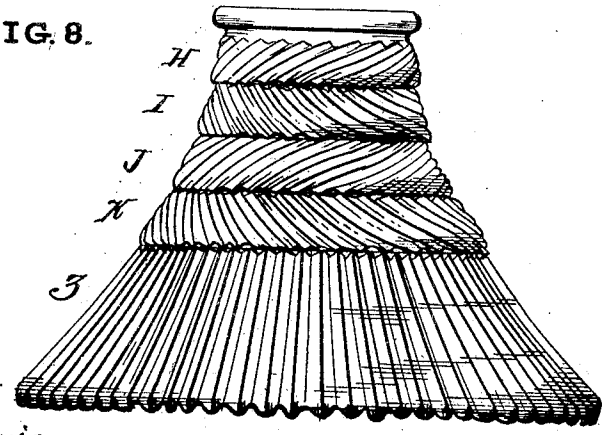


FIG. 8.



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3 SHEETS—SHEET 3.

FIG. 9.

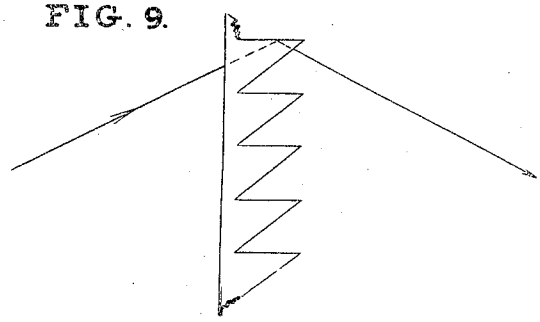


FIG. 10.

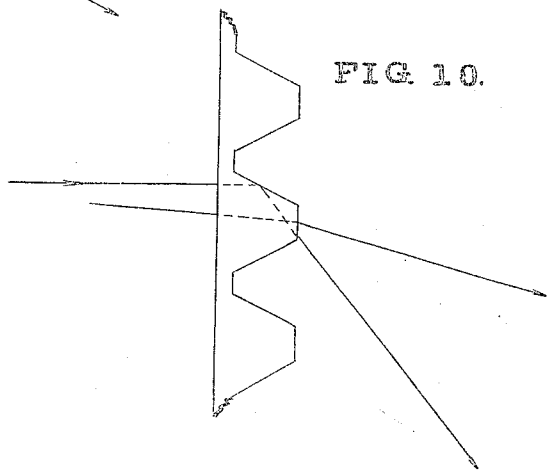


FIG. 11.

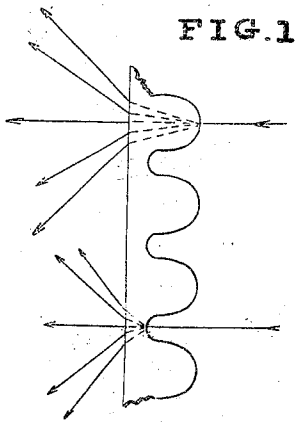
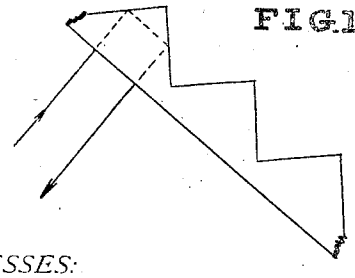


FIG. 12.

FIG. 13.



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UNITED STATES PATENT OFFICE

OTIS A. MYGATT, OF NEW YORK, N. Y.

DECORATIVE SHADE-REFLECTOR FOR ARTIFICIAL LIGHTS.

No. 821,307. Specification of Letters Patent. Patented May 22, 1906.

Application filed May 12, 1905. Serial No. 260,644.

To all whom it may concern:

Be it known that I, OTIS A. MYGATT, a 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 Decorative Shade-Reflectors for Artificial Lights, of which the following is a specification.

This invention relates to composite reflectors and decorative shades for artificial lights composed entirely of transparent glass.

The object of the invention is to produce in a single structure of glass a reflector which shall be highly efficient by reason of prismatic construction of that part of the device which is best adapted for reflection, and also to utilize a part of the surface which cannot be of great utility as a reflector for the purpose of illuminating areas or surfaces outside the reflector, and for producing decorative and ornamental effects in the way of illumination.

Figure 1 is a side elevation of a decorative reflector involving the principles of my invention. Fig. 2 is a partial elevation and partial section of a reflector as applied to an incandescent electric lamp, showing also the direction of certain rays of light. Fig. 3 is a broken horizontal section through some of the prisms 3 in Fig. 1; and Fig. 4 is a horizontal section through some of the prisms 4, Fig. 1. Fig. 5 is a partial section and partial elevation of a modified construction. Fig. 6 is a side elevation of still another modification. Figs. 7 and 8 are modifications of still other species of the invention. Figs. 9 to 13 are diagrams illustrating the direction of certain light-rays through certain forms of prisms and flutings which are applicable to certain parts of the decorative reflector according to the principles of my invention.

In order that my meaning and description may be clear, I will here define some of the terms which I shall hereinafter employ in this specification. By "prism" I refer to an angular piece of transparent glass, usually having one angle and two plane faces which merge into the body of the reflector, (see Figs. 3, 4, 9, and 13,) but which may have a greater number of angles and plane faces. (See Fig. 10.) Such a prism may be short, as a facet or pyramid, or may be continued at length in a circumferential, vertical, (radial,) or spiral direction, with reference to the body of the reflector. By "flutings" I refer to projections from the face of the glass having curved outlines or surfaces. The fluting may merge on curved lines, as in Fig. 11, or may merge in angles, as shown at Fig. 12. By a "simple" prism I refer to a prism outlined by one angle and two plane surfaces in its projection from the reflector-body. One at least of the plane surfaces is calculated with reference to a definite object in directing light-rays. Simple prisms are illustrated in Fig. 9. By "compound" prism I refer to a prism having more than one angle and two plane surfaces in the part projecting from the reflector-body. (See Fig. 10.) Such prisms are carefully described in patent to Blondel *et al.*, (assigned to me,) No. 593,348, November 9, 1897. By "double-reflecting" or "total-reflecting" prisms I refer to prisms having one angle and two plane faces arranged so that a ray of light from within the reflector passing through the thickness of the glass strikes the inner face of one of the inclined surfaces of the prism and is reflected through or across the body of the prism to the second inclined face, where it is again reflected and emerges from the inside of the reflector. As a matter of fact I find that prisms constructed of pressed glass do not reflect all the light, and I hesitate to employ the term "totally-reflecting prism," although such term is common in text-books on the subject. A study of Figs. 9 and 10 shows that in the prisms termed "simple" and "compound" a light ray enters the glass from one side and is reflected or refracted, or both reflected and refracted, but emerges from the other side of the glass. A study of Figs. 3 and 13 shows that where double-reflecting prisms are employed, no matter how arranged on the body of the reflector, a light-ray entering the glass from the interior will not emerge (in material quantity) from the opposite face of the glass, but will be returned to the interior thereof, provided the plane faces of the prisms are so placed with reference to each other that the rays strike the plane faces of the prisms at about an angle of forty-five degrees. In other words, with simple or with compound prisms arranged on a glass shade the light will pass through the shade. With double or total reflecting prisms the light will emerge from the glass at the side which it enters. By a "diffusing-prism" or a "fluting" I refer to such an outline of prism or fluting as does not deflect, reflect, or refract any considerable proportion of light-rays in any one par-

ticular direction, but such as is calculated to break up, diffuse, or spray out light-rays in many directions. By a "distributing-prism" I mean either a simple or a compound prism having one or more surfaces definitely calculated with a definite light distribution in view. That is to say, a distributing-prism is calculated to direct a considerable proportion of the light-rays emerging from the prism in certain predetermined directions, whether by reflection only or by refraction only, or by both reflecting and refracting these light-rays.

In my Design Patents Nos. 32,685 and 32,686, of May 22, 1900, I describe and illustrate very effective forms of prismatic glass reflectors. By large experience in the manufacture of such reflectors and of other species I have learned that in very many of the shapes of reflectors employed by modern usage the upper portion of a prismatic glass reflector is not very effective for the purpose of projecting light-rays from the open mouth of the reflector. This inefficient surface approximates in many forms of reflectors one-half (the upper half) of the height of the reflector; but as reflectors are generally of conical, semispherical, or of variations of such forms the upper half has of course much less than half the area of the entire reflector. As will be seen in Fig. 2, the lamp itself is an obstacle in the way of reflection from the upper part of the shade-reflector. This is generally true with nearly all varieties of artificial lights, electric or otherwise. In incandescent lights the upper part of the filament is least effective for illuminating purposes, but has some value.

In using the terms "upper" and "lower" I use them in a relative sense only. In Fig. 2 the shade-reflector and lamp are shown in a common relation; but this may be varied, and the position both of the lamp or light and of the reflector will depend on circumstances, as is usual with lamps and reflectors.

In my present invention I largely dispense with the reflective action of the central or upper portion of the prismatic shade-reflector and adapt that portion of the body which heretofore acted with small efficiency as a reflector to the purposes of decoration, ornamentation, and the distribution and diffusion of light passing through the body of the device, which thus becomes not merely a reflector of light.

I find by experiment that the most effective arrangement of prisms for the purpose of reflecting light from the open mouth of a reflector of common form is what I term a "vertical" arrangement of prisms on the upper surface of the reflector, (or in a very flat reflector this would be called a "radial" arrangement.) Such an arrangement is shown in the lower portions of Figs. 1, 2, 5, 6, and 8, the prisms to be most effective being of the form shown in Figs. 3 and 13. The prisms 3 are arranged with their axes extending in what I generally term a "vertical" direction. (Such term is not strictly accurate, nor would the term "radial" be strictly accurate; but in connection with the drawings these terms will probably be understood, being the best terms with which I am familiar.) As will be seen, such prisms in order to preserve the desired reflective angle must increase in width and height as they approach the periphery of the reflector. As the angle of incidence and the angle of reflection must be equal, the line *a b b c*, Fig. 3, indicates the direction of a light-ray when reflected twice, the light-ray returning in a line parallel with its line of radiation. This direction, due to the form of the prism, is, however, somewhat modified by the form of the body of the reflector, as indicated by lines *a b c*, Fig. 2. Where the light-ray does not encounter the plane face of the prism at an angle of forty-five degrees, it may still be partially reflected in a somewhat different direction, as at *a b' b' c*, Fig. 3.

When prisms are arranged spirally on the outer surface of a reflector of common form, the reflective angle varies by reason of this arrangement, and one side of the prism presents a comparatively flattened surface to the light-rays radiating from within the reflector, as indicated in exaggerated form in Fig. 4. In such case a light-ray may be broken up and diffused, as at *d e f f* in Figs. 2 and 4, or it may be refracted, as at *h i*, Fig. 4.

Where a shade-reflector is divided into zones, the upper zone being covered with spiral prisms and the lower with radial prisms, it is apparent that the light distribution, both inside and outside the reflector, is different from what it would be were the same character of prisms retained throughout the device. The same is true where other light-directing bodies are employed in lieu of prisms. Thus by changing the character of the external light-directing bodies on the reflector in different belts or zones the effective distribution of light may be varied without changing the form of the body.

I have hereinbefore explained that the upper portion of the prismatic reflector is not very efficient for reflective purposes. In the present invention I devote this portion of the body to other purposes, using the lower portion of the reflector (for something like one-half the height or three-fourths of the area) for purposes of reflection. In Fig. 1 the upper portion of the reflector has prisms arranged spirally about its body, which arrangement is considered decorative and is also quite effective in diffusing light-rays from this portion of the body, the rays largely passing through the glass. The outward appearance of the reflector (when over a light) viewed from one side or from above is that of an illuminated body having bright and less

bright spiral lines arranged about the upper portion, while the lower portion shows but little illumination. The upper portion, therefore, of a shade or reflector constructed in general as shown in Figs. 1, 2, and 5 is a light-diffusing surface, the spirally-arranged prisms 4 or the pyramids 5 acting to diffuse light in substantially all radial directions outward from the reflector. The body 1 is preferably smooth on the interior, and the reflecting-surface is substantially covered by double-reflecting prisms 3. Where the body is bent inward toward its periphery, as at 2, Fig. 2, the concentration of reflected light in front of the open mouth of the reflector is greater than where a reverse curve is employed, as in Fig. 5.

In Fig. 6 the outer surface from A to B of the shade-reflector has decorative or ornamental figures, forms, or bodies C C, generally in relief, on a ground D of clear glass. The clear glass will transmit the light-rays with little obstruction. The ornamental bodies or forms may be made light-diffusing by the adaptation of any style of fluting or otherwise; but these bodies will necessarily reflect some of the light-rays back into the reflector or there would be no contrast of appearance, which contrast is what produces the decorative effect. The lower or reflector part of the composite shade-reflector, Fig. 6, is substantially covered with double-reflecting prisms E E, arranged in series and of the character described and claimed in my application, Serial No. 199,721, filed March 24, 1904. Such construction of prisms is not specifically claimed herein.

In the modification shown in Fig. 7 the upper part of the shade-reflector at F is of frosted, etched, or varnished glass. This gives a light-diffusing, but only to a small extent a light-reflecting-surface. The lower portion G, which is the reflector proper, is externally covered with reflecting-prisms, arranged spirally, and therefore less efficient as reflecting-prisms than would be the prisms 3 3 or E E, but still having considerable reflective power, as the prisms are not flattened in the extent indicated in Fig. 4. Such an arrangement of prisms, which by their cross-section would be double-reflecting if arranged vertically, gives to part G a fairly efficient reflecting-surface, together with a considerable external diffusion of light and has a decorative appearance.

In Fig. 8 the upper portion of the shade-reflector is shown as covered with light-diffusing prisms, ribs, or flutings, arranged in series H I J K of reverse spirals. While such prisms if made on the forty-five-degree or best reflecting angle would have considerable reflecting power if arranged near the periphery of the reflector—as, for instance, at G, Fig. 7—they have but little reflecting capacity so near the center of the reflector and may be practically considered as light-diffusing prisms.

In my application, Serial No. 181,831, filed November 19, 1903, I describe and claim a reflector having its upper portion substantially covered with circumferential light directing or distributing prisms, and its lower body a reflector, substantially covered with reflecting-prisms, as in the present application. Such I do not claim herein, as the light-distributing feature is herein substituted by the decorative and light-diffusing features, hereinbefore described.

In my application, Serial No. 134,332, filed December 8, 1902, I describe and claim a shade-reflector having its lower body portion constructed as a reflector, as in the present application, and its upper or neck portion covered with circumferential light-diffusing prisms. In such application the display or decorative features of the present device are not embodied and the claims are limited to circumferential prisms. In such application light-diffusion is in part effected by the internal construction of the shade-reflector. In the present application I have assumed the inner face of the shade-reflector to be smooth, although such is not a necessary construction under all circumstances. My claims in the present application relate to the construction of the upper or outer surface of the shade-reflector.

From the foregoing it will be apparent that a shade-reflector constructed according to my invention of a single piece of glass can be made quite efficient to reflect a large proportion of light-rays received from within in a definite direction out of the open mouth of the reflector. In addition I utilize the light-rays which by reason of the form of the reflector, as usually made, or by reason of the location of the light within the reflector cannot be very efficiently reflected for the purposes of external illumination and decoration, and this purpose may be carried out in many ways within the scope of my claims.

The light-diffusing bodies on the upper part of the shade-reflector, whether ribs, prisms, flutings, facets, or other forms, perform the function of transmitting a large percentage of the light and do not reflect a very considerable quantity thereof back into the shade-reflector, but diffuse the light and present decorative appearances to the observer.

What I claim is—

1. A shade-reflector of glass, in form of a frustum having an open mouth, and having on its outer surface integral light-reflecting bodies adapted to reflect light-rays from within back into the reflector and out at the open mouth thereof, said bodies being of different reflective power in different belts or zones surrounding the reflector.

2. In a shade-reflector composed of glass in form of a frustum and having an open

mouth, a zone having external prisms arranged spirally and adapted to reflect light-rays back into the reflector and out at the open mouth, and another zone having prisms arranged radially and adapted to reflect light-rays back and out at the open mouth.

3. In a shade-reflector composed of a single piece of glass, in form of a frustum, and having an open mouth, a zone having external spirally-arranged prisms, and a second zone having reverse spiral prisms, all said prisms arranged to reflect some of the light-rays back into and out at the open mouth of the reflector.

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

OTIS A. MYGATT.

Witnesses:

ELISABETH MYGATT,

F. LANIER.