W. H. O'BEIRNE.

REFLECTOR.

APPLICATION FILED SEPT. 23, 1909.

960,037.

Patented May 31, 1910.

Fig. 1.

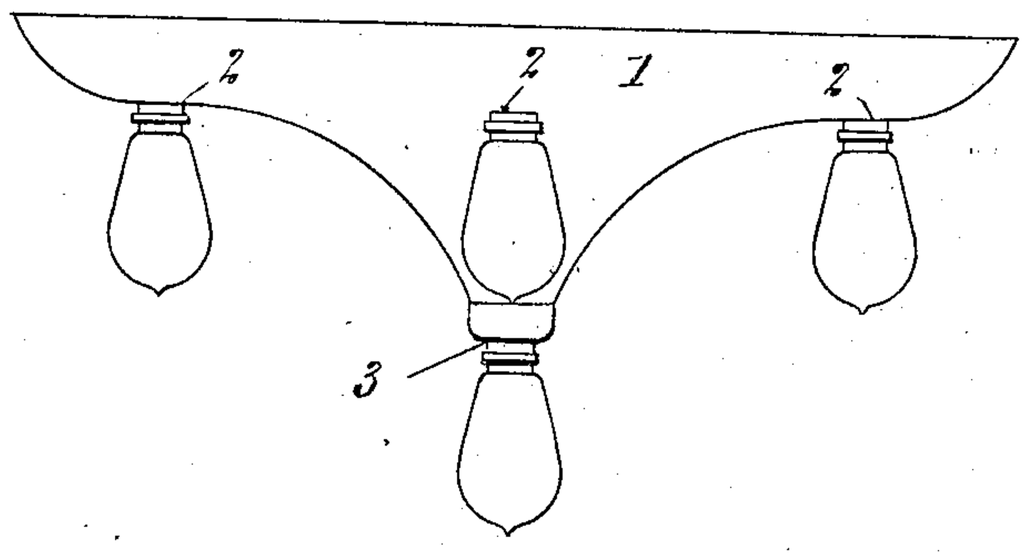


Fig. 2.

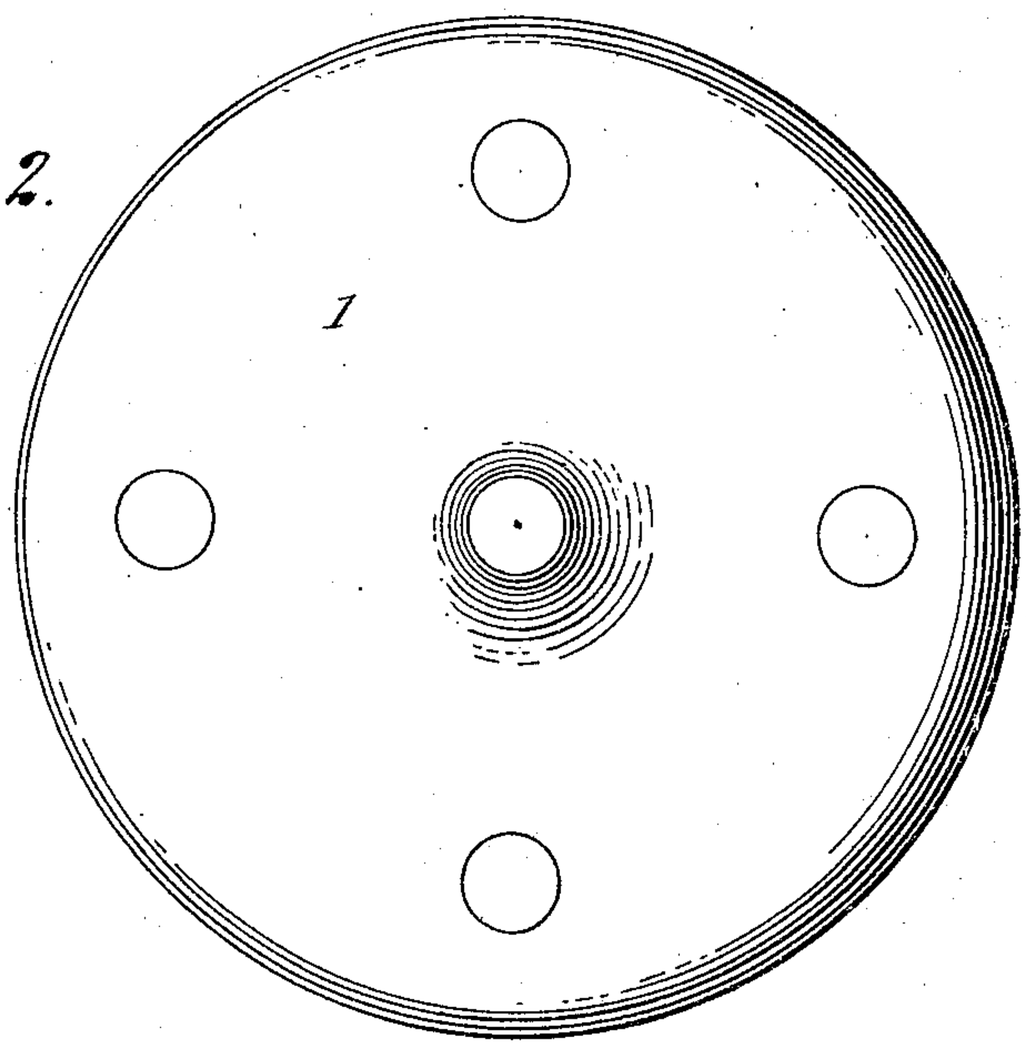
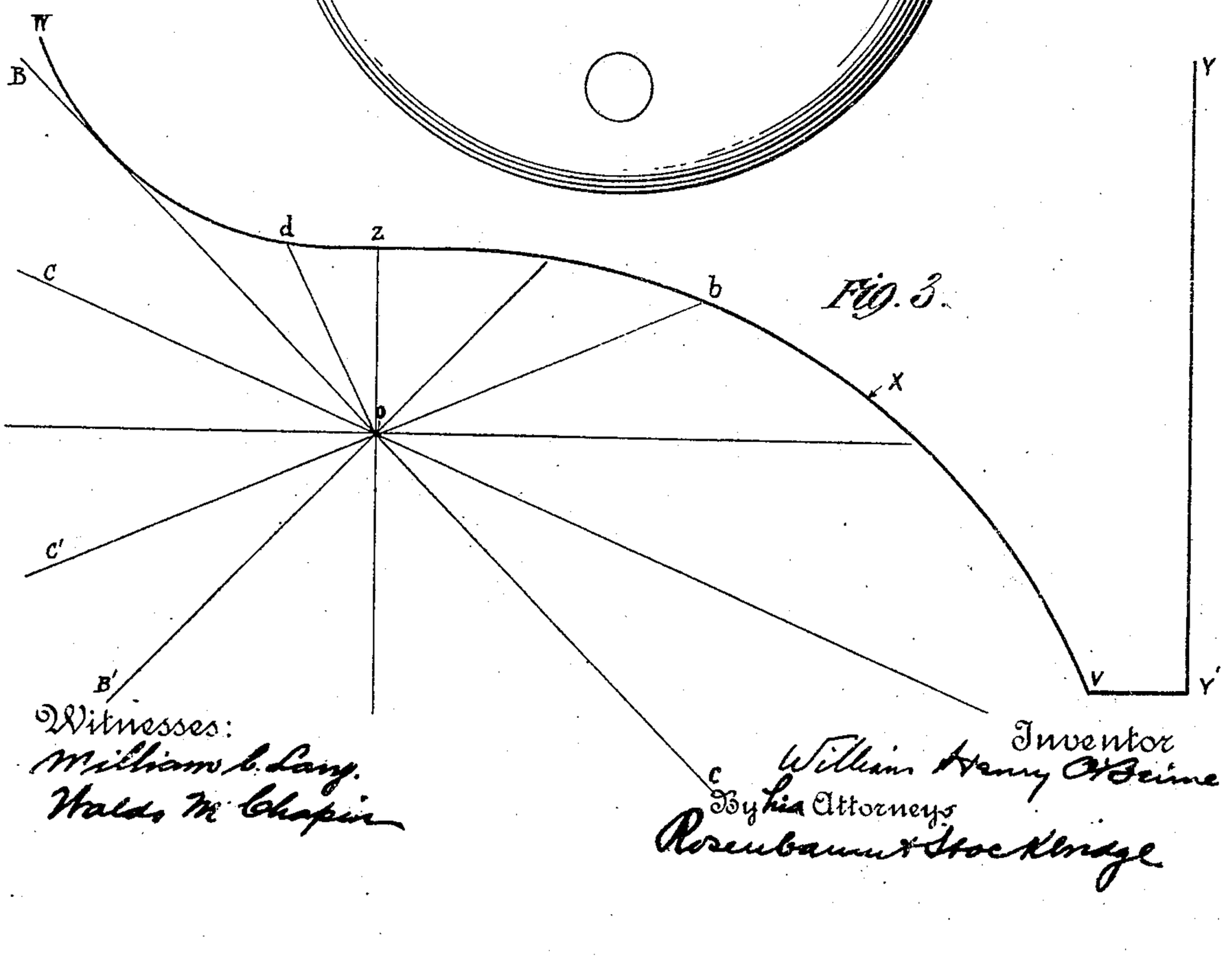


Fig. 3.



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UNITED STATES PATENT OFFICE.

WILLIAM HENRY O'BEIRNE, OF PAULS VALLEY, OKLAHOMA, ASSIGNOR, BY MESNE ASSIGNMENTS, TO EDWARD J. O'BEIRNE AND COMPANY, OF ELGIN, ILLINOIS, A FIRM.

REFLECTOR.

960,037. Specification of Letters Patent. Patented May 31, 1910.

Application filed September 23, 1909. Serial No. 519,152.

To all whom it may concern:

Be it known that I, WILLIAM H. O'BEIRNE, a citizen of the United States, residing at Pauls Valley, in the county of Garvin and State of Oklahoma, have invented certain new and useful Improvements in Reflectors, of which the following is a full, clear, and exact description.

This invention relates to reflectors for tungsten and similar high candle power lamps, particularly of the type having a plurality of vertically arranged filaments. With lamps of this class the illumination is so intense that the near presence of the lamps, for example in drop lights, desk lights, etc., is not only unnecessary, but is actually objectionable, either from the standpoint of comfort or optical requirements. Accordingly, installations employing tungsten lamps provide them in the ceiling, seeking to obtain a diffused illumination throughout the room or apartment rather than a radiant illumination from a light source directly upon the book or work of the room occupant. As is well known, however, ceiling illumination requires very perfect diffusion in order to get properly satisfactory results, this being attained in some cases by banks of lights behind an opalescent window, or by the use of "holophane" globes, and in other ways.

By the present invention I aim to secure a diffusion which is sufficiently perfect for any ordinary purposes by the use of a simple reflector having a white vitreous surface like porcelain and a shape adapted to give as perfect a diffusion as is mathematically possible with the use of a simple reflector.

With this object in view my invention consists in the features of construction and combination as hereinafter set forth and claimed.

In the drawings: Figure 1 is a side elevation of a reflector embodying the principles of my invention. Fig. 2 is a bottom plan view, and Fig. 3 is a diagrammatic view showing certain mathematical principles involved in the reflecting action.

Before taking up the features of construction, it will be of assistance to consider some of the theoretical considerations involved. A tungsten lamp suspended vertically, as is the normal use of these lamps, emits light in all directions, the illumination being most intense in the horizontal plane of the lamp. From this plane the illumination grows less intense at increasingly divergent angles, generally speaking, proportionate to the cosine of the angle. On this basis, assuming the illumination in a horizontal plane to be denoted by unity, the illumination on the lines O—B and O—B′ 45 degrees away from the horizontal plane, would be represented by the numeral .7071. On the lines O—C and O—C′ on 22½ degree angles with the horizontal plane, the illumination would be represented by the numeral .9238. The problem therefor is to obtain uniform illumination in all directions, the illumination preferably emanating from an infinite number of points distributed over a considerable area.

X, denotes a reflecting surface such as porcelain having the power of distributing or diffusing to a greater or less extent, the light reflected against any point thereof. This reflecting surface has the form of a surface of revolution on an axis Y—Y′, the generating element being a reversed curve of substantially the outline shown. It will be observed that the curve is substantially tangent to a horizontal plane at the point Z somewhat more than two-thirds the way from the axis Y—Y′ to the outer periphery W. From this point the curve approximately follows the arcs of two circles, described with a vertical line through Z as a center and approximately tangent to vertical lines through the points V and W, or more exactly, tangent to lines a slight distance beyond or outside the points V and W.

O denotes the center of illumination of a tungsten lamp, and which is located on the vertical axis Z. This center of illumination is a few inches below the point Z corresponding to the dimensions of a tungsten lamp. Under these circumstances, the light will be diffused in a very even way. The zone of the reflector between V and *b*, will be illuminated by rays of maximum intensity, and the strongest effect of this illumination would be a diffusion downward and outward. This illumination is supplemented by that between the points V and *c*, which is emanated directly from the lamp without reflection from any surface. The zone of the reflector between the points *b* and *d* emanates light almost directly down-

ward, the amount of this illumination being greatest at points half way between the tungsten lamps disposed around the deflector. In addition to the foregoing, the surface *d w* emanates diffused light directly outward, and this is supplemented by all the direct illumination between the lines B and B′.

The above analysis shows that diffusion in every direction, and from a wide area is provided for, and that those parts of the reflector which receive the least intense illumination by reason of the angle of light emanation, as first considered, are by reason of their nearness to the light source substantially compensated therefor, so that the reflected light is substantially uniform from all points and in all directions. The uniformity arises therefore both from the true reflecting and the diffusing properties of the porcelain.

A more exact analysis of the action than the foregoing does not seem necessary and is difficult because of the fact that a vitreous surface like porcelain, is partly diffusing and partly a true reflecting surface. Furthermore the result of the practical construction is to give a better illumination than is obtained with any reflector known to me. Whether therefore the theoretical considerations which I have outlined are exactly correct or not in every detail, or whether certain other theoretical consideration enter the action with which I am not familiar, the actual facts are that the reflector gives what I regard as very superior results.

A practical construction is illustrated in Fig. 1 and comprises a sheet metal disk 1 spun or formed into the shape above indicated and enameled with white enamel or vitreous porcelain. The reflector has holes 2 at four points, each corresponding to the axis Z above described, and located 90° apart around the reflector. In the center there is a large hole 3 in which a fifth tungsten lamp is placed depending considerably below the others. This lamp forms a central diffusion point for the light which acts to supplement the distributed diffusion points above described.

What I claim, is:—

1. A reflector for tungsten and analogous lamps, having a light diffusing surface of a form that would be generated by rotating a reversed curve about an axis in its own plane, said reversed curve having a portion substantially tangent to a plane normal to the axis of rotation somewhat more than two-thirds the distance out from the axis to the periphery, said surface flaring generally outward and relatively abruptly upward from its central lowermost edge and being most nearly vertical at said edge and at its periphery.

2. A reflector for tungsten and analogous lamps, having a light diffusing surface of a form that would be generated by rotating a reversed curve about an axis in its own plane, said reversed curve having a portion substantially tangent to a plane normal to the axis of rotation somewhat more than two-thirds the distance out from the axis to the periphery, said curve having substantially the arc of a circle in each direction from said point, the arc on one side being of large curvature substantially tangent to the axis of rotation, and the arc on the other side being of small curvature substantially tangent to a vertical line through the circumference of the reflector.

3. A reflector for tungsten and analogous lamps, having a light diffusing surface of a form that would be generated by rotating a reversed curve about an axis in its own plane, said surface flaring generally outward and relatively abruptly upward from its central lowermost edge and being most nearly vertical at said edge and at its periphery, said surface being adapted to diffuse light both laterally and downwardly therearound.

In witness whereof, I subscribe my signature, in the presence of two witnesses.

WILLIAM HENRY O'BEIRNE.

Witnesses:

JNO. P. MCCONAHEY,

A. K. SUGGS.