

J. T. BEECHLYN.
ARC LAMP GLOBE.
APPLICATION FILED AUG. 13, 1910

Patented Aug. 6, 1912.
2 SHEETS—SHEET 1.

1,034,955.

Fig. 1.

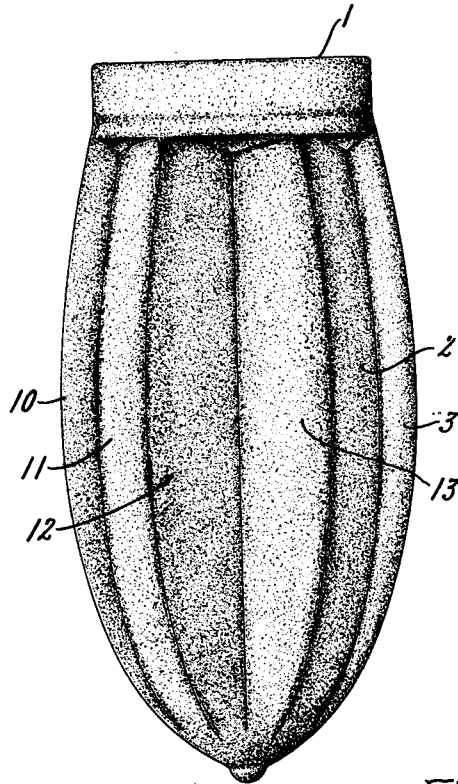


Fig. 2.

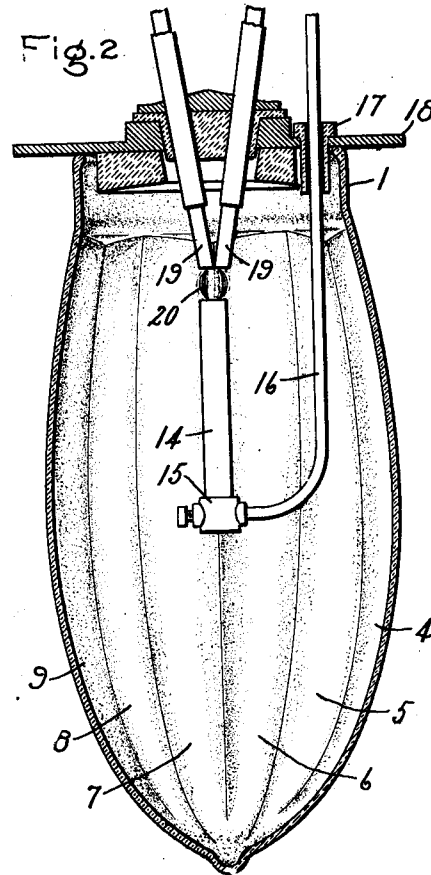
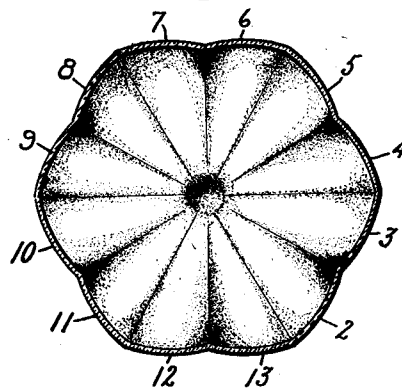


Fig. 3.



Witnesses:

J. Ellis Elen
Allen O. Ford

Inventor:

John T. Beechlyn,

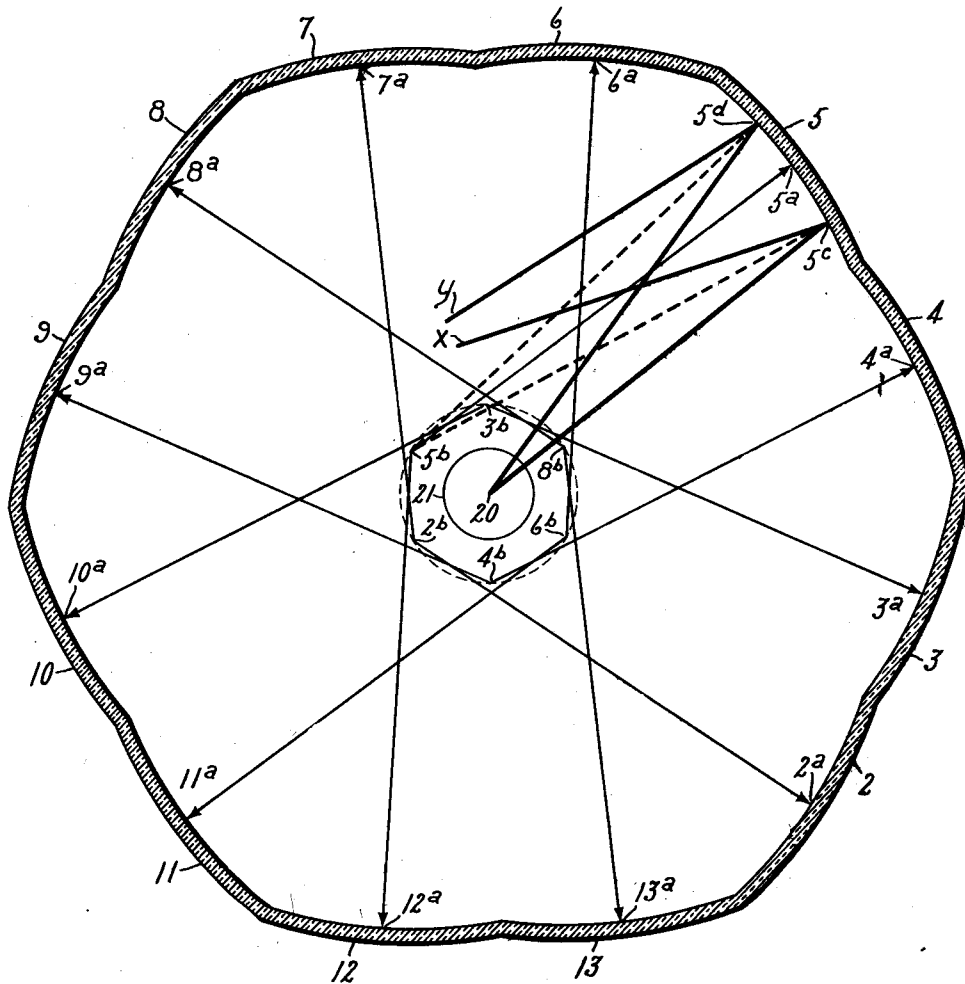
by *Wm. D. Davis*
His Attorney.

J. T. BEECHLYN.
 ARC LAMP GLOBE.
 APPLICATION FILED AUG. 13, 1910.

Patented Aug. 6, 1912.
 2 SHEETS—SHEET 2.

1,034,955.

Fig. 4.



Witnesses:

J. Ellis Allen
Helen Ford

Inventor:

John T. Beechlyn,

by *Wm. H. Davis*
 His Attorney.

UNITED STATES PATENT OFFICE.

JOHN T. BEECHLYN, OF LYNN, MASSACHUSETTS, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK

ARC-LAMP GLOBE.

1,034,955.

Specification of Letters Patent.

Patented Aug. 6, 1912.

Application filed August 13, 1910. Serial No. 577,034.

To all whom it may concern:

Be it known that I, JOHN T. BEECHLYN, a subject of the King of Denmark, residing at Lynn, county of Essex, State of Massachusetts, have invented certain new and useful Improvements in Arc-Lamp Globes, of which the following is a specification.

My invention relates to inclosing globes for electric arc lamps.

In the ordinary arc lamp the inner surface of the arc-inclosing globe is a simple surface of revolution about a vertical axis which passes through the arc maintained between the electrodes. The light rays proceeding from the arc or from the crater of the positive electrode, or from both, impinge upon the globe and partly pass through the same at the points of incidence and are partly reflected. These reflected rays, if they were not intercepted by the electrodes, would again strike the inner globe surface and would there again partly pass through and partly be reflected; and this process would be repeated theoretically *ad infinitum*, so that eventually all the light emitted at the arc would pass through the globe. But in most arc lamps the electrodes are in vertical alinement coincident with the axis of revolution of the globe surface, or there is at least one electrode, the lower one, located coincident with that axis, and the rays proceeding from the arc are in the ordinary globes reflected mostly downwardly and always inwardly toward the axis of revolution of the globe surface; they are therefore in great measure intercepted by the lower electrode and are thus lost.

It is the object of my invention to increase the efficiency of arc lamps by so forming the arc-inclosing globe that most of the reflected light will be directed laterally past the electrodes.

The invention is illustrated in the accompanying drawings, in which—

Figure 1 is a front elevation of the globe; Fig. 2 is a vertical section of the globe showing the electrodes in elevation; Fig. 3 is a cross-section of the globe; and Fig. 4 is a cross-section of the globe with a diagram illustrating the reflection of light from the inner surface of the globe.

The profile of the globe here shown somewhat approaches the form of an ellipse, but this is not essential, since almost any other

general outline will serve the purpose of my invention.

The globe 1, instead of being formed as a surface of revolution about a single vertical axis, is formed of a number of contiguous surfaces 2, 3, 4, . . . 13, each representing a segment of a surface of revolution about its own and generally, but not necessarily, different, vertical axis, that does not pass through the arc but is parallel to the axis of the lower vertical electrode 14. Consequently, any ray of light proceeding from the arc that strikes any one of these surfaces, will be reflected in a plane defined by the incident ray and the radius of curvature of the particular surface, drawn to the point of incidence from a point in its axis of revolution, that is to say, the ray will be reflected laterally past the vertical electrode, and will not be intercepted by the same. This will more fully appear farther on.

A part of a lamp structure only is indicated in the drawing, because my invention is not dependent upon any particular structure of the mechanism. The lower, vertical electrode 14, is in a holder 15, supported by a rod 16, which passes through a guide or bushing 17 in the globe cover 18. The upper electrode is here shown, by way of example, as composed of two converging rods 19, and the arc 20, is established between the electrodes in any ordinary or improved manner, by any suitable mechanism, which is not here shown, because unnecessary for an understanding of the invention.

In Fig. 4, the principle of construction of the arc globe as well as the reflections from the same is diagrammatically indicated. A cross-section of the globe is here shown, the same as in Fig. 3, but upon a larger scale, and we may assume that the cross-section is through the middle of the globe. In the cross-section here shown, by way of example, the length of the radius of curvature of each of the segments 2, 3, 4, etc., is the same; thus, the radius of curvature of segment 2, is represented by the lines $2^a 2^b$; the radius of curvature of segment 3, is represented by $3^a 3^b$; the radius of curvature of segment 4, is represented by $4^a 4^b$; the radius of curvature of segment 5, is represented by $5^a 5^b$; the radius of curvature of segment 6, is represented by $6^a 6^b$; the radius of curvature of segment 7, is

represented by $7^a 2^b$; the radius of curvature of segment 8, is represented by $8^a 8^b$; that of segment 9, by $9^a 4^b$, etc., and all these radii are of the same length. If the cross-section of the globe were taken above or below the middle of the globe, the radii of curvature of the different segments would be shorter, but still all of the same length. The point 2^b thus becomes the horizontal projection of all the inner ends of all the radii of curvature of all the cross-sections of the segmental surfaces of revolution 2 and 7, i. e., it represents the horizontal projection of the axis of revolution of the segmental surfaces 2 and 7. Similarly, the point 3^b is the horizontal projection of the axis of revolution of the segmental surfaces 3 and 10, and so forth, and the line which connects all these points $2^b, 3^b, 4^b$, etc., is the horizontal projection of a surface that is the geometrical locus of all the axes of revolution of all the surfaces of which the globe is composed. In the example here shown, in which the segments are arranged symmetrically around a common axis, the line $2^b 3^b 4^b 5^b 6^b 8^b$, is a circle, as indicated in dotted lines, which means that the locus of the axes of curvature of the segments, no matter how many segments there may be, is a circular cylinder; but this is not essential, since the invention is not dependent upon a symmetrical arrangement of the segments. With a different arrangement of the segments, the locus of their axes of revolution might be an elliptical cylinder, or a prism, or, in fact, may have any configuration, since it is by no means necessary that the axes of revolution be all parallel to the axis of the electrodes.

In Fig. 4, the inner circle 21 may represent the size and location of the lower electrode, and the center of this circle may represent the arc 20 established between the electrodes, which is here, for the sake of simplicity, considered as a point.

A ray of light proceeding from the arc and striking any of the segmental surfaces of the globe, say the ray $20-5^a$, will be reflected in the plane defined by that ray and by the radius of curvature $5^b 5^c$, drawn to the point of incidence, in the direction $5^c x$, well past the vertical electrode, and generally downwardly. This ray will, therefore, not be intercepted by the electrode and will not be lost. The same thing is true of any other ray that proceeds from the arc and strikes the segment 5, as for instance the ray $20-5^a$, which will be reflected in the plane defined by the ray itself and by the radius of curvature $5^b 5^c$, drawn to the point of incidence, in the direction $5^c y$, well past the vertical electrode. It will now be clear, that the same is true of all rays that proceed

from the arc and strike any of the segmental surfaces of the globe at any point between the edges where these segments meet. The rays, however, which, proceeding from the arc reach the globe at the lines of junction of two contiguous segments, will generally be reflected toward the axis of the vertical electrode and will thus be lost; but these rays are only an infinitesimal portion of the rays emitted by the arc, and it may therefore be said that practically no light is lost by interception by the electrodes.

In the specimen of globe here illustrated I have shown twelve segmental surfaces, all of the same size and so grouped as to present to the arc concave surfaces, meeting alternately at direct and reëntering angles; but the invention is obviously not restricted to such arrangement, since the number of segments is arbitrary and the successive segments may have different widths and may join each other at all sorts of angles; a symmetrical arrangement, such as shown, is however generally preferable.

It is evident that my invention is not confined to a globe which is entirely composed of segmental surfaces of revolution about axes that are eccentric to the axis of the lower electrode, or to the main axis of the globe as a whole, since it is quite practicable to have a portion or portions of the inclosing globe made with a surface of revolution about an axis coincident with that of the vertical electrode. It is also clear that the axes of revolution of the segments may be at infinite distances, which means that the segments would, in cross-section, be represented by straight lines.

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

1. In an electric arc-lamp having a lower vertical electrode, an arc-inclosing globe of light-transmitting material formed with reflecting surfaces of revolution about axes that are eccentric to the axis of the lower electrode, each radius of curvature of each surface being in a vertical plane extending laterally past the lower electrode.

2. In an electric arc-lamp having a lower vertical electrode, an arc-inclosing globe of light-transmitting material, formed with a continuous series of contiguous segments of reflecting surfaces of revolution about axes that are eccentric to the vertical electrode, each radius of curvature of each surface being in a vertical plane extending laterally past the lower electrode.

In witness whereof, I have hereunto set my hand this eleventh day of August, 1910.

JOHN T. BEECHILYN.

Witnesses:

FRANK G. HATTIE,
CHARLES A. BARNARD.