(No Model.)

C. B. BOYLE.

LIGHT HOUSE ILLUMINATOR.

No. 308,871. Patented Dec. 9, 1884.

Fig. 1.

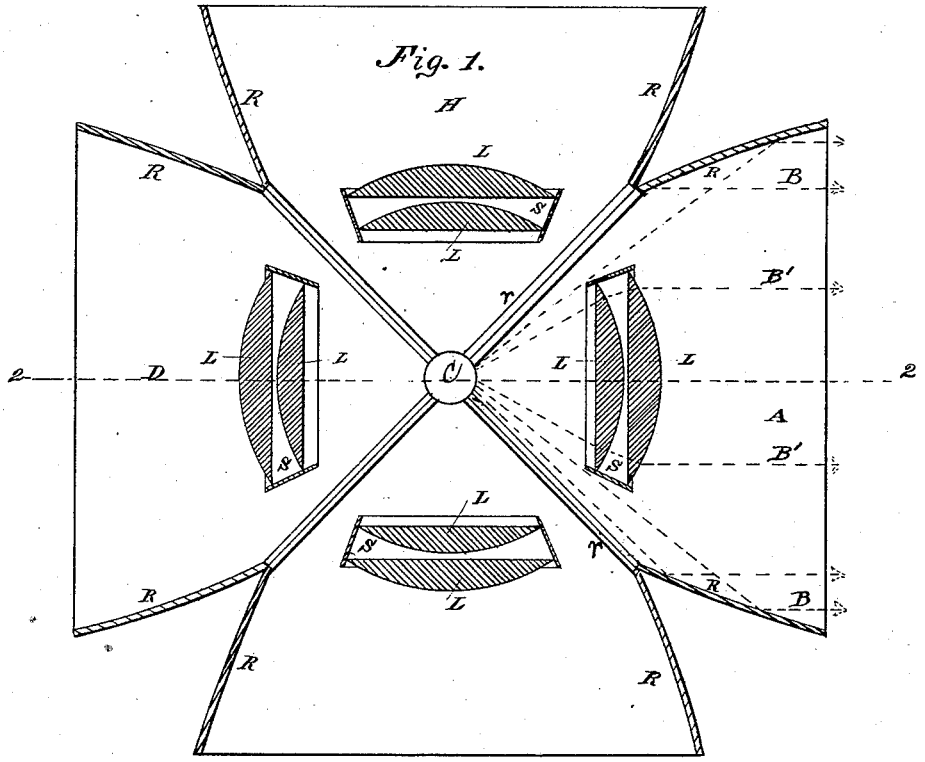
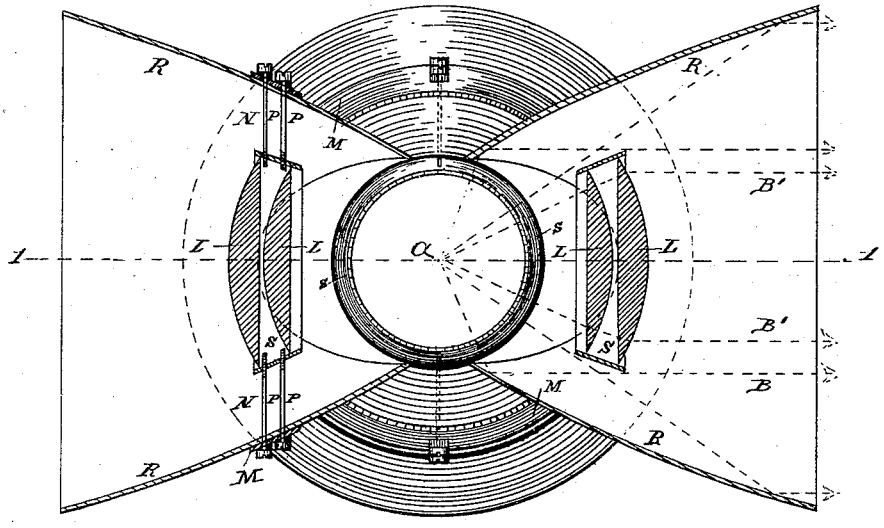


Fig. 2.



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UNITED STATES PATENT OFFICE.

CHARLES B. BOYLE, OF NEW YORK, N. Y.

LIGHT-HOUSE ILLUMINATOR.

SPECIFICATION forming part of Letters Patent No. 308,871, dated December 9, 1884.

Application filed January 17, 1882. Renewed August 23, 1883. (No model.)

To all whom it may concern:

Be it known that I, CHARLES B. BOYLE, a citizen of the United States, residing at New York, in the county and State of New York, have invented certain new and useful Improvements in Light-House Illuminators, of which the following is a specification.

The object of my invention is to concentrate the light radiated from a luminous center into parallel beams, for the purpose of giving to each beam the greatest degree of brilliancy attainable from the quantity of light evolved from the source.

To this end the peculiarity of my present invention consists in mitering or otherwise fastening together two or more paraboloid reflectors, and posing concentrically within each a condenser made up of two lenses, of such width and degree of refracting power and so situated as to interrupt and refract into parallel light all rays which would otherwise pass in divergent directions beyond the mouth of the reflector and so be dissipated and lost. The lamp, being situated in the focus of both refractors and reflectors, has the whole volume of its light changed, by their united action, into two or more shafts of parallel rays. I so construct the instrument that it divides the light into any number of beams, which may in light-house engineering be considered necessary for a certain locality or purpose. When so constructed as to deliver more than a single shaft of light, the instrument is made to revolve horizontally about its center—*i. e.*, the point of light—thereby sweeping about the horizon the shafts of light it projects in a manner analogous to the revolving Fresnel lens, now known as a "flash-light." When intense brilliancy or far-reaching penetrating power of light is more desirable than numerous shafts, the instrument is so constructed as to divide all the light into two volumes, into which the whole illuminating power of the lamp is concentrated. The two condensing-lenses of each reflector are mounted in a single ring or "cell," which is so supported from the reflectors by screw-rods as to be capable of adjustment in a plane at right angles to the axis of the reflector. I am thus enabled to shift the lenses as required, to get them to exact concentric position within the reflectors. The outer lens is made of greater diameter than the inner, and the supporting-cell is flared outwardly, so as to prevent interruption of the rays of light. Circular bands are placed around the reflectors for strengthening the same at the points through which the supporting-rods of the lens-cells are passed.

In order that my invention may be more fully understood, I will proceed to describe it with reference to the accompanying drawings, in which—

Figure 1 is a horizontal sectional view, on the line 1 1, Fig. 2, of a light-house illuminator embodying my invention, having four paraboloid reflectors. Fig. 2 is a vertical sectional view of the same on the line 2 2, Fig. 1.

R R R R are four paraboloid reflectors having sufficient of their rear portion cut away to enable them to be mitered or otherwise joined together, as shown at *r r*, so as to have their foci at a common point, C. At this point the illuminating-flame is placed. The reflectors R R are brightened, as by silver or nickel plate on their interior surfaces in customary manner, and are made of such a curvature as that all rays from the flame at C striking the curved surface will be reflected therefrom in lines parallel or at any desired degree of divergence, according to the degree of deviation of the parabolic curve. The curve of the reflectors here shown is intended to be of such a degree as will reflect the light in parallel lines, as illustrated by the dotted lines B. It will be seen that such reflectors, while they will concentrate into a single shaft all rays which strike the reflector, there will be, unless other arrangements be added, a large body of divergent rays which pass beyond the edge of the reflector, and, as they do not add to the brilliancy of the main beam of light, are wasted. To gather, therefore, these divergent rays and direct them into parallelism, I place at such a point within each of the reflectors as to intercept all rays within a cone having the flame as an apex and the mouth of the reflector as a base, two lenses, L L, preferably plano-convex, as shown, held within a brass ring or cell, S, which is supported from the reflector by screw-rods P P. The rods P screw into the cell S at their inner ends, the arrangement being such as to per-

mit adjustment of the cell and lenses to concentric position within the reflector by turning the said rods.

M M are bands encircling the reflectors at the point of passage of the rods P to lend greater strength. It will now be seen that all rays which would not strike the sides of the reflectors will pass through the lenses L L, and be thereby refracted into parallelism, the resulting shaft of light issuing from the mouth of the reflector being entirely made up of parallel rays, as indicated by dotted lines B B'. The greatest diameter of the cells S is equal to that of the back opening of the reflectors, thus avoiding on the one hand the interruption of any rays which, on striking the rear part of the reflector, are being thrown directly forward, and, on the other hand, the permission of escape of any divergent rays from the mouth of the reflector. The angle of the sides of the cell is equal to the refracting angle of the inner lens, so that all rays of light passing through said lens being brought into parallelism with the cell-wall will avoid impinging against the same. In actual practice the inner lens is placed, as shown, a trifle beyond the cone described, between the mathematical center of light and the edge of the reflector, this being rendered necessary by the size of the illuminating-flame.

The combination of two lenses, as shown, is a necessity of this invention for the reason that a single lens to have the necessary refracting power would have to be double convex, and a large portion of the radiated light impinging upon the inner convex surface of such a lens, at angles greater than that of total reflection, would not pass through the lens, but, being reflected therefrom, would be scattered and lost. Such a single lens, which is common to all prior similar devices, being inoperative for my purpose of bringing the whole volume of light into parallelism, is not herein claimed.

In my application No. 104,553, filed August 23, 1883, for improvement in combined reflectors and refracting-lenses, I have shown and claimed the application of the herein-described system of double lenses to a paraboloid reflector cut away at the rear and having a hemispherical cap covering the opening thus formed, and consequently do not claim such an arrangement in the present application.

Having thus described my invention, the following is what I claim as new therein and desire to secure by Letters Patent:

1. In combination with two or more paraboloid reflectors, mitered or otherwise joined together so as to have a common focus, a plurality of condensing-lenses so arranged within each reflector as to intercept and refract all light not falling on the reflectors, substantially as set forth.

2. In combination with reflectors R and lenses L, so arranged within the reflectors as to intercept all rays not falling thereon, the cells S, of an extreme diameter equal to that of the openings in the reflectors, and whose sides are deflected at an angle equal to the refracting angle of the inner of said lenses, for the purpose set forth.

3. The combination of reflectors R, lenses L, cells S, and screw-rods P, arranged to support said cells S, and adapted to adjust the same at will, for the purpose set forth.

4. The combination of reflectors R, lenses L, and supporting devices S P, with bands M, encircling and strengthening the reflectors, as set forth.

CHAS. B. BOYLE.

Witnesses:
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