C. FONTAYNE.

Magic-Lantern.

No. 167,090. Patented Aug. 24, 1875.

FIG. 1.

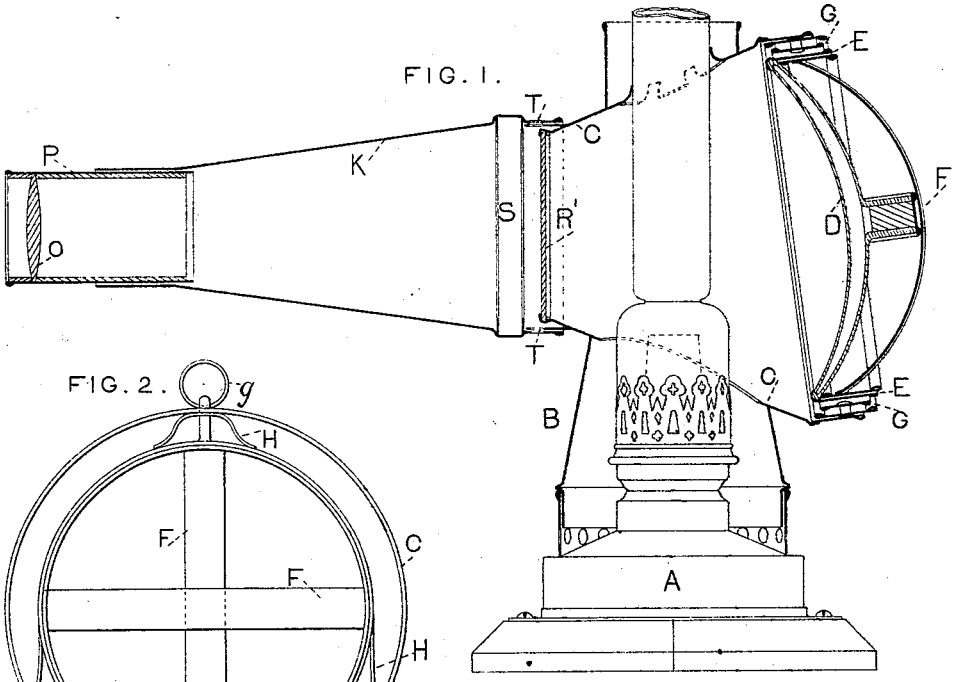
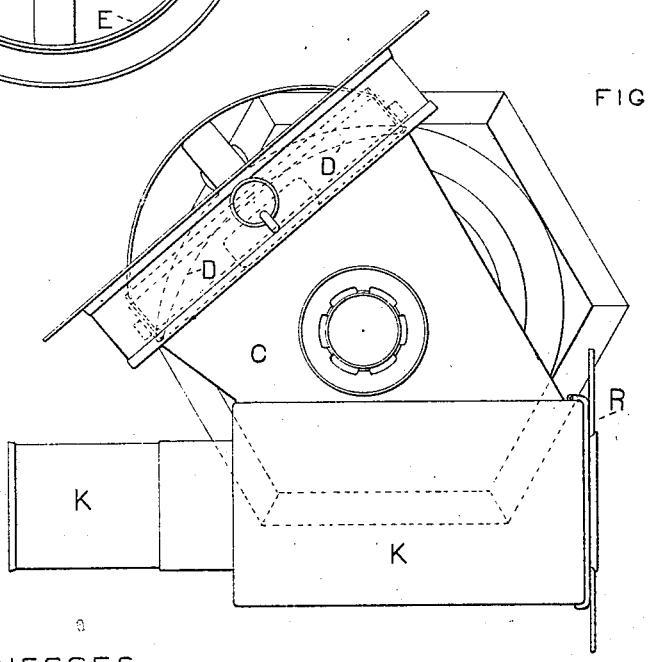


FIG. 2.

FIG. 3.



WITNESSES.

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IMPROVEMENT IN MAGIC LANTERNS.

Specification forming part of Letters Patent No. **167,090**, dated August 24, 1875; application filed July 9, 1875.

To all whom it may concern:

Be it known that I, CHARLES FONTAYNE, of the city, county, and State of New York, have invented certain Improvements in Magic Lanterns, of which the following is a specification:

This invention pertains to certain improvements in the magic lantern, by which its cost of construction is greatly diminished, while its powers at the same cost are greatly increased; and the invention consists in the combination of a movable reflector with a magnifying-lens in such manner that the axis of the support of said reflector forms such an angle with the axis of the lens as to prevent the projection of the image of the burner on the screen, as will hereinafter be more fully described.

Figure 1 is a side elevation of the lamp and a longitudinal section of the lantern. Fig. 2 is a rear end view to show one method of supporting the rear reflector. Fig. 3 is a plan to show a modified form of the lantern when adapted for exhibiting opaque pictures.

At A is represented a common form of oil-lamp, the base of which may serve as a base for the entire lantern, as shown in Fig. 1. Surrounding said lamp, and upon its base, is mounted the conical support of the lantern, as at B, and said support is tubular, and serves as a guide for the air to the lamp, as well as a base for the lantern. Upon said base or support B is mounted the body of the lantern proper, as at C, and this is preferably made in the form shown in Fig. 1, though it may be greatly varied, as will appear hereafter. Said body is the frustum of a cone, and upon the base thereof is mounted the chief reflector D, which is a large concave reflector, that may be made of any material desired; but the well-known glass reflectors with a silver coating answers the purpose, and is probably the cheapest for the purpose at present known. Said reflector is mounted upon a ring or hoop of metal, as at E, which surrounds its edge, and it may be stayed and held in said ring by straps of metal, as at F, extending from the ring E across and over the back of the reflector, as shown in the drawings.

As it is essential that the reflector shall be capable of adjustment in various directions, the metal ring which supports it is mounted on pivots within a second ring, as at G, Fig. 1, which is held within a band of metal surrounding the base of the cone C, and said ring G is mounted on pivots at right angles to the first, so that the reflector is capable of any movement, as the mariner's compass. But another method of mounting the reflector is shown at Fig. 2, and as it answers every purpose, and is made cheaper, is the preferred method, and it consists in mounting the ring E within the cone C by suspending it upon a loop or pin, as at *g*, which projects through the base of the cone C, and is suspended by a pin or split ring, as shown in Fig. 2, which holds the reflector suspended within the base of the cone C, and then to adjust it at the proper angles and hold it small springs, as at H, are attached upon the outer portion of the ring E, and they serve to produce sufficient friction between the ring E and the inner band that surrounds the base of the cone as to hold the reflector at any required adjustment. Upon the small end of the cone C is mounted the tube, as at K, for holding the picture and the magnifying-lens—that is, if the pictures be transparent, or made for the light to pass through them, in which case the tube is constructed as shown at Fig. 1; but if the pictures are opaque then the front tube is placed at an angle upon the side of the cone C, as shown at Fig. 3, and the picture is placed in the base of the tube K, and receives its illumination from the reflector D upon its face, instead of through it, as in Fig. 1. The principal of illumination is, however, the same in both. Now, I have discovered that by making the interior surface of the cone C a bright reflecting-surface, and placing the source of light within it, and then mount a large reflector within its base at such an angle that its axis will form an angle to the axis of the magnifying-lens, or by tilting it to such a degree as not to project the image of the lamp-burner upon the screen, that the combination of the two reflecting-surfaces will give a most powerful illumination of the pictures without the use of a condensing-lens, or any other corresponding to it, and that by such a simple combination a very cheap lantern can be produced that will give as good

results as instruments costing from five to ten times as much. To determine the proper angle of the cone C it depends upon the size of the picture, and if it is transparent then it will be mounted in a tube, as at Fig. 1, where a slit it made through the tube, and as close as possible to the end of the cone C, for it must be borne in mind that the nearer the picture is to the source of the light the better it will be, as less of it is absorbed in its passage, as is now the case in the use of a condensing-lens.

The size of the pictures being determined, then the next thing is to choose the concave reflector D, which should be as large as possible to collect all the rays that can be transmitted to the picture, and the size of said reflector is only limited by its proximity or relationship to the light, and the concavity of the reflector itself, and it shall be placed as near to the light as possible, merely allowing sufficient space for adjustment to focus with the picture and the magnifying-lens.

These three elements having been determined upon, viz, size of picture, size of concave reflector, and possible distance from the burner to avoid injury from heat, and to permit adjustment, then the form and size of the cone are easily determined, as it is evident that its small end next to the picture must be the size to be illuminated, or practically the size of the picture, and the other end must be sufficiently large to admit the concave reflector within its base, as shown at Fig. 1, and its length must be as short as possible to prevent injuring the picture or the reflector by the heat from the lamp, and then the inside of said cone must be polished or silvered to produce a reflecting-surface that will catch all divergent rays of light in front of the burner or between it and the picture, and also all others that would otherwise be lost, and throw them into or converge them upon the surface of the large concave reflector, as at D, and by which they are thrown upon the picture without the use of any costly lens, either directly or indirectly.

The rest of the apparatus may now be easily understood, as the size and diameter of the front tube K depend upon the size of the magnifying-lens desired to be used, and the only thing to be determined as to the length of said tube is that the magnifying-lens, as at O, must be placed between the picture and the focus of the concave reflector D. When transparent pictures are used, the lens, as at O, may be mounted in a sliding tube, as at P, to assist in adjustment, as is now commonly done. If, however, opaque pictures are to be shown, then the front tube K must be placed, as shown in Fig. 3, at the side of the cone reflector C, and the picture must be mounted, as at R, at an angle of about forty-five degrees or less, if possible, to the plane of the mirror D, so that the illuminating-rays will be reflected from the picture through the magnifier instead of being transmitted.

It is evident, however, that the principle of illumination, which is the essence of my invention, is the same in both; and it is also evident that the lamp and the illuminating-cone C may be mounted in a box or case independent of each other, and yet so related to the light and the concave reflector and the picture, that my method of illumination without the use of a condensing-lens will be employed; but it is manifest that this construction, as represented, is less expensive.

It will be observed that the reflector D is placed in the base of the cone C at an inclination with its top toward the chimney of the lamp, and this is done in order to avoid reflecting the image of the burner upon the screen, and at the same time permit the light to be placed nearer to the concave mirror than the length of the radius of a sphere, of which the mirror would represent a segment.

This relationship of the mirror to the source of light constitutes a valuable discovery of itself, apart from the use of the cone C, as it is possible to bring the convergent rays of the large reflector D so near to the picture that an excellent illuminating-cone is obtained without being injured by the image of the burner or its chimney, or the flame itself, which is always the case when the illuminating-point is placed in a line coincident with the axis of the reflector and the lens, and thus it is possible to obtain good results by mounting the reflector, as already stated, at such an angle to the magnifying-lens as that the image of the burner will be thrown out of the illuminating-cone, and will not, therefore, appear upon the screen. Such an arrangement of the reflector also permits the use of a greater segment of a sphere than has heretofore been done, and, at the same time, permits the picture to be produced nearer to the source of light than is possible to do without a condenser, or without destroying the picture by the heat. In fact, I am not aware that any lantern can use a reflector of so large a surface, and having so short a radius, with the light between it and the picture, and thereby produce such a powerful illuminating-cone without a condensing-lens, which is the costliest element of such lanterns.

A plane of glass, as at R, is fastened in the small end of the cone C, to cut off the heat from the picture which is inserted at S, and between the two is a space left, or with holes, as at T, through which the air may pass to keep the picture or delicate specimens from being injured. Such improvements are also manifest in the exhibition of opaque pictures, as it will be seen that if a condensing-lens can be dispensed with, then the reflector D may be brought round to more nearly face the picture than is even shown at Fig. 3, and yet there will be nothing to obstruct the reflected rays, as would be the case were a condenser interposed. It is also evident that such a combination of the cone with the re-

flector and the burner is well adapted for all purposes of illumination where the rays of light are to be collected and converged forward, as in the head-light of locomotives, vessels at sea, &c.; and

I therefore claim—

1. In a magic lantern, the combination of a reflector with a magnifying-lens, when the axis of the support of said reflector forms such an angle with the axis of the lens as to prevent the projection of the image of the burner on the screen.

2. In combination with the reflector D and the cone C, the springs H for holding the reflector D in proper position when once adjusted, substantially as described.

3. The combination of the reflectors D and C, with the pivoted bearings between the two, substantially as described.

CHAS. FONTAYNE.

Attest:

E. B. GOODRICH,

BOYD ELIOT.