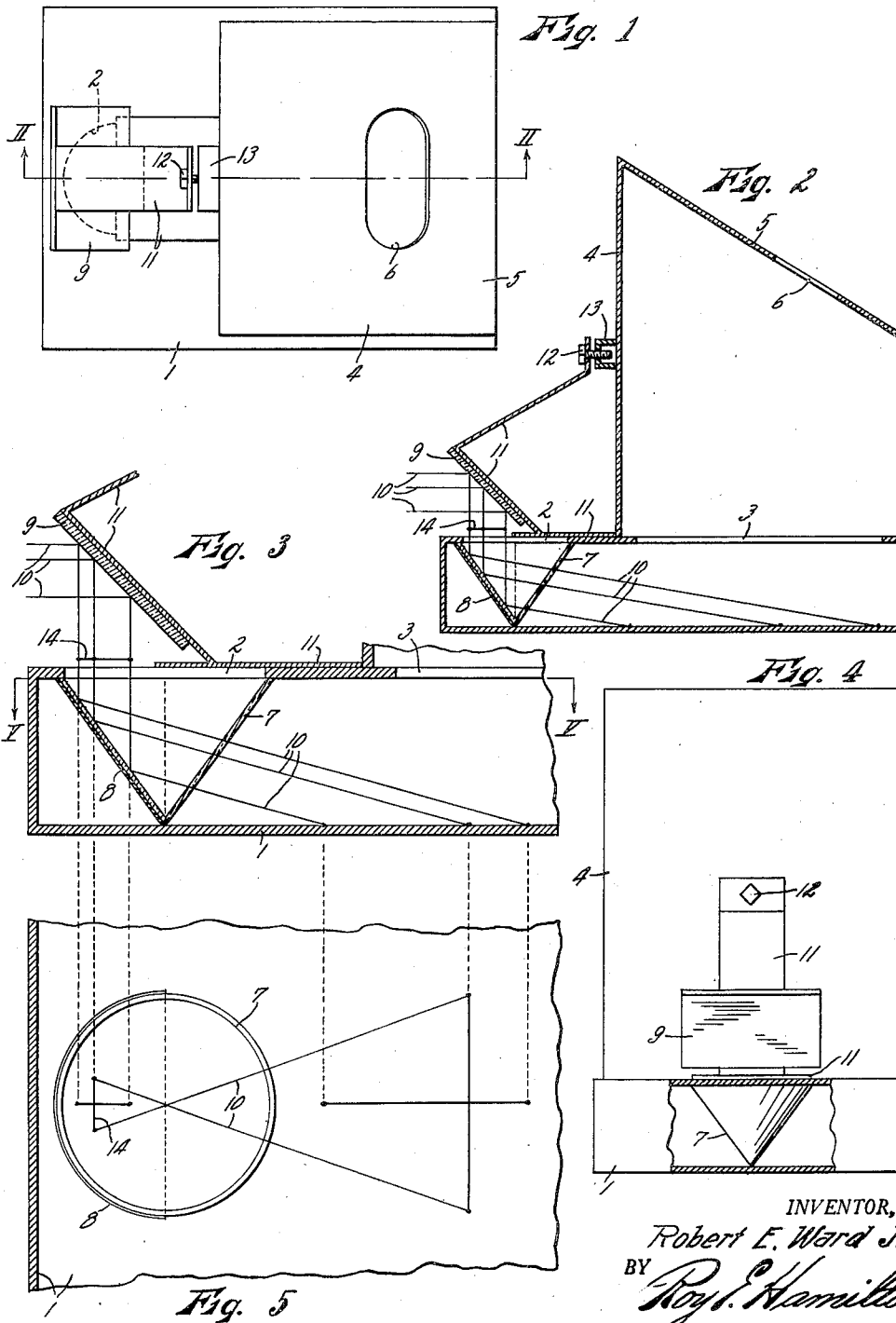


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R. E. WARD, JR
 APPARATUS HAVING CONICAL REFLECTOR
 FOR PROJECTING MAGNIFIED IMAGES
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APPARATUS HAVING CONICAL REFLECTOR
FOR PROJECTING MAGNIFIED IMAGES

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3 Claims. (Cl. 88—39)

1 My invention relates to improvements in an apparatus for magnifying the image of an object.

One of the objects of my invention is the provision of a novel apparatus for magnifying the projected image of an object, consisting in projecting the image onto the inner reflecting surface of a portion of an envelope of a cone having an angle of less than ninety degrees, and reflecting the projected image from said surface onto a flat surface in the plane of the apex of the cone and perpendicular to the axis thereof.

A further object of my invention is the provision of a novel apparatus which is simple, cheap to make, which is easily operated by an unskilled person, which is strong, durable, not likely to get out of order, and which is efficient in operation.

The novel features of my invention are hereinafter fully described and claimed.

In the accompanying drawing which illustrates the preferred embodiment of my improved apparatus,

Fig. 1 is a plan view of my improved apparatus.

Fig. 2 is a vertical section on the plane of the line II—II of Fig. 1, showing rays of light employed for projecting and reflecting the image to be magnified.

Fig. 3 is a vertical sectional view enlarged of a portion of the apparatus shown in Figs. 1 and 2, but employing a portion of the envelope of a cone of slightly less angle reducing the magnification.

Fig. 4 is a front elevation, partly broken away, of the apparatus, shown in Figs. 1 and 2.

Fig. 5 is a fragmentary section taken on line V—V of Fig. 3, with dotted projection lines extending to corresponding parts in Fig. 3.

Similar reference characters designate similar parts in the different views.

My improved apparatus comprises the following described parts. 1 designates a rectangular flat box having closed sides, ends and bottom, and a top having through it two openings 2 and 3, one in front of the other, the rear opening 3 being the larger.

Over and covering the rear opening 3 is a rectangular cabinlike housing 4 having a slanting roof 5 provided with an oblong peep hole or opening 6 the rear opening 3 being encircled by the housing 4.

In the box 1 encircling the front opening 2 is the thin envelope 7 of a cone having an angle less than a right angle. The envelope 7 is of transparent material, such as mica, or sheet plastic material. The apex of the envelope 7

2 rests on the flat upper side of the bottom of the box 1. The inner side of the front half of the circumference of the envelope 7 is made a reflecting surface, as by silvering the outer side, as indicated by the semi-portion 8, Figs. 2 and 3, or by coating the inner side of the front half with reflecting material, as polished silver, not shown.

Over the front opening 2 is disposed a rectangular mirror 9 which slants upwardly and forwardly at an angle of forty five degrees. It may be supported by any suitable means, so as to reflect horizontal rays of light 10 perpendicularly downwardly against the inner reflecting side of the envelope 7, which in turn reflects the rays downwardly and rearwardly through the transparent rear half of the envelope 7 onto the upper flat side of the bottom of the box 1 below the rear opening 3, as shown in Figs. 2 and 3 with magnification in all directions without distortion.

20 Secured to the upper side of the mirror 9 is a flexible plate 11, which may be of card board, and which is fastened to the upper side of the box 1. A portion of the plate 11 extends upwardly and rearwardly from the mirror 9, and has fastened to its upper end portion an adjusting screw 12, Figs. 1, 2 and 4, which has threaded engagement with a clip 13 fastened to the front side of the housing 4. By adjusting the screw 12, the mirror 9 may be adjusted to its proper operating angle.

30 Assuming that the thing to be magnified is a cross 14, Fig. 2, it is disposed below the mirror 9, so that its image is reflected by the rays 10 onto the upper inner side of the front half of the envelope 7, from which it is reflected downwardly through the transparent rear side of the envelope onto the upper flat side of the bottom of the box 1, and below the rear opening 3. The angle of the envelope 7, Fig. 2, is such that the image will be magnified about six times.

40 Referring to Fig. 3, the envelope 7 is of an angle less than ninety degrees but slightly smaller than the angle of the envelope 7 of Fig. 2, so that the image of the cross 14, reflected against the reflecting inner side of the envelope 7 of Fig. 3, is reflected by the envelope on the bottom of the box 1 with a magnification of but about four times, and is reversed, as shown in Fig. 3, in the lower portion thereof.

45 Thus it will be noted that by increasing the angle of the reflecting envelope 7, but less than ninety degrees, the magnification of an image projected therefrom will be increased.

50 Many modifications of my invention, within the

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scope of the appended claims, may be made without departing from the spirit of my invention.

What I claim is:

1. In an apparatus of the kind described, in combination, a portion of the envelope of a cone of an angle of less than ninety degrees, said portion having means for reflecting rays of light projected against its inner side, means supporting said portion against a flat surface in the plane of the apex of the cone and perpendicular to the axis thereof, and means for projecting the image of an object onto said inner side from which said image is reflected magnified in all directions without distortion onto said flat surface.

2. In an apparatus of the kind described, in combination, a portion of an envelope of a cone having an angle of less than ninety degrees, said portion having means for reflecting rays of light projected against its inner side, a container in which said portion is located having in it a flat surface in the plane of the apex of the cone and perpendicular to the axis thereof, said container having an opening in register with the inner side of said portion, and means for projecting the image of an object through said opening onto said inner side of said portion from which said image is reflected magnified in all directions without distortion onto said flat surface.

3. In an apparatus of the kind described, in combination, a box having a bottom with an upper flat surface, and having a top with two openings therethrough, a portion of an envelope of a cone of an angle less than ninety degrees,

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said portion having means for reflecting rays of light projected against its inner side, said inner side being in register with one of said openings, the apex of said cone being in the plane of said flat surface and the axis of the cone perpendicular to said flat surface, and means for projecting the image of an object through the last named opening onto said inner side of said portion from which said image is reflected magnified in all directions without distortion onto said flat surface below the other of said openings.

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