R. E. JONES.

LIGHT PROJECTING APPARATUS.

APPLICATION FILED DEC. 22, 1916.

1,235,484.

Patented July 31, 1917.

2 SHEETS—SHEET 1.

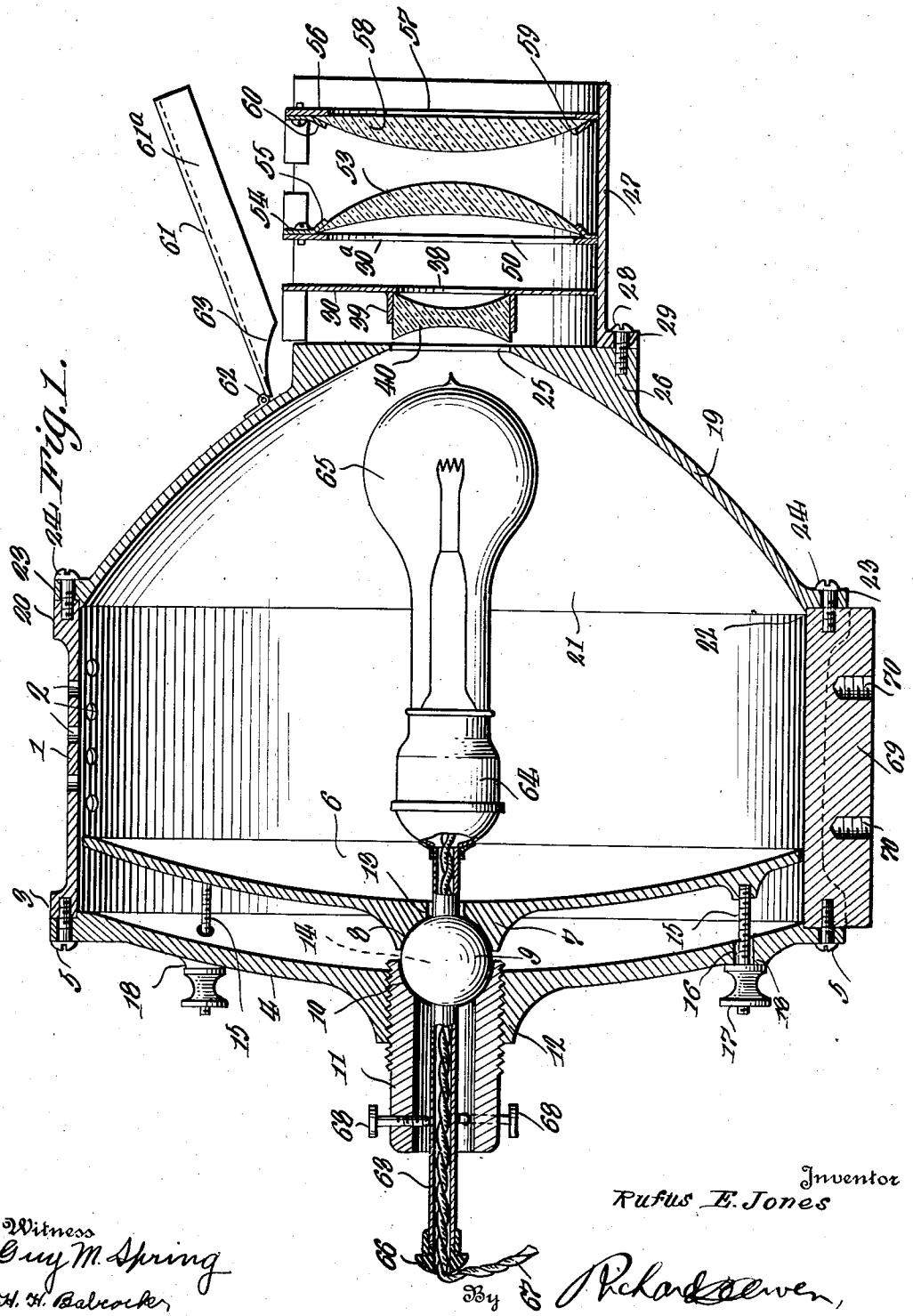

Fig. 1.

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Fig. 3.

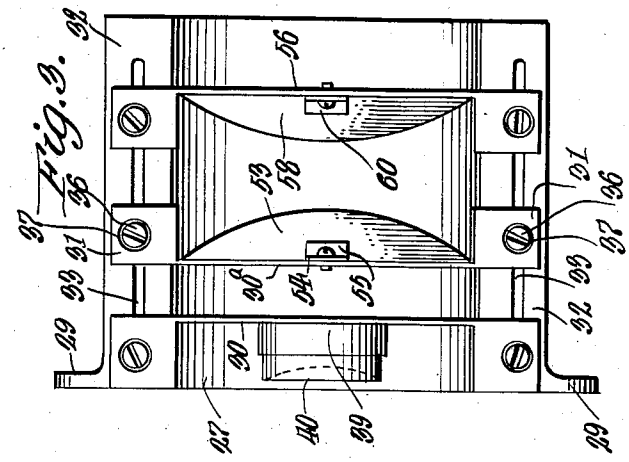
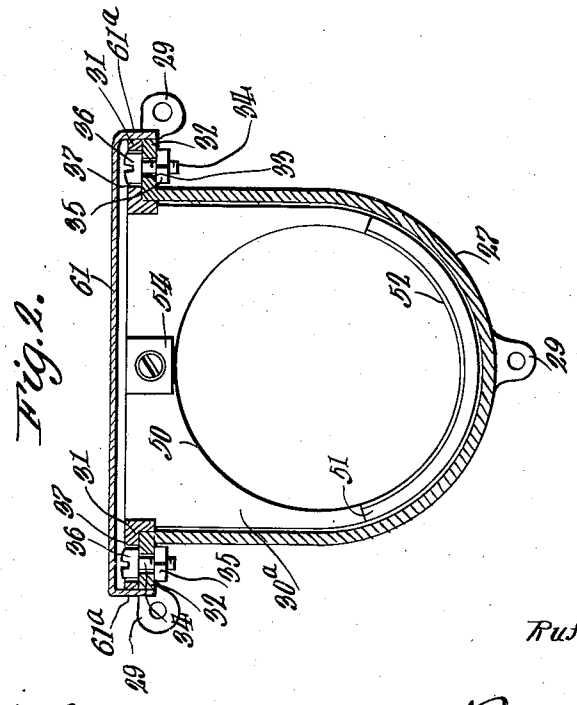


Fig. 2.



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UNITED STATES PATENT OFFICE.

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LIGHT-PROJECTING APPARATUS.

1,235,484. Specification of Letters Patent. Patented July 31, 1917.

Application filed December 22, 1916. Serial No. 138,441.

To all whom it may concern:

Be it known that I, RUFUS E. JONES, a citizen of the United States, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Light-Projecting Apparatus, of which the following is a specification.

This invention relates to light projecting apparatuses, and more particularly to a light projecting apparatus for use in connection with moving picture machines and the like.

One of the main objects of the invention is to provide an apparatus of the character stated which is well suited for using the ordinary tungsten high power electric light in place of the arc light now commonly used, thus effecting a material saving in current and eliminating the great heat incident to the use of an arc. A further object is to provide a projecting apparatus having means whereby the light rays may be collected and concentrated within a relatively small area being uniformly distributed over this area. A further object is to provide a projecting apparatus having a fixed parabolic reflector and an adjustable concave reflector which receives the light rays reflected from the parabolic reflector, the parabolic reflector being provided with a light opening at its apex and the concave reflector so shaped as to concentrate light rays and direct them through this opening. A still further object is to provide means for adjusting the concave reflector and the lamp whereby accurate concentration of the light rays may be obtained. Another object is to provide a lens supporting means having a plurality of spaced lenses removably mounted therein and means for adjusting these lenses toward and from each other. A still further object is to provide a plurality of lenses so relatively shaped and disposed as to first concentrate and then evenly distribute the light rays over a relatively small area. Further objects will appear from the detail description.

In the drawings:—

Figure 1 is a central vertical sectional view taken through a projecting apparatus constructed in accordance with my invention,

Fig. 2 is a vertical section taken through the lens supporting means,

Fig. 3 is a top plan view of the lens supporting means.

The casing of the projector is formed with a cylindrical body or ring 1 having a plurality of perforations 2 for ventilation purposes. This ring is provided at its rear edge with a peripheral flange 3. A concaved back plate 4 is secured to the back of ring 3 by means of screws 5 passed through the same and threaded into suitable bores in flange 3. To effect a light tight closure between this plate and the ring 1, the plate is provided with a peripheral rabbet or recess which receives the edge of the ring, as shown in Fig. 1 of the drawings. A concaved reflector 6 is mounted within the casing in front of the back plate 4. This reflector may have a reflecting surface formed from highly polished silver plate, or a glass mirror of usual construction may be utilized, if desired. In the construction shown the inner face of the reflector 6 is given a very high polish to form the reflecting surface. Reflector 6 is provided with a central rearwardly extending boss 7. This boss has an approximately hemispherical socket 8 which receives the inner half of a bearing ball 9 the outer portion of which is mounted in a similar socket 10 formed in the inner end of a sleeve 11 threaded through a boss 12 formed on the outer face of back plate 4, at the center thereof. The reflector 6 is provided with a central bore 13 which communicates with the socket 8 and is in axial alinement with a smaller diametrical bore 14 extending through the ball 9. The reflector 6 is further provided, on its outer face, with a plurality of bosses in each of which is secured a threaded screw stem 15. In practice I prefer to use three or more of these screw stems positioned concentric with bore 13 and spaced equidistant, when three stems are used being spaced 120° apart. These stems extend through bores 16 through the back plate 4, these bores being of somewhat greater diameter than the screw stems. A thumb nut 17 is threaded on the outer portion of each screw stem and bears against a boss 18 integral with the back plate. By means of the thumb nuts 17 and screw stems 15, the reflector 6 may be adjusted or rocked about the ball 9 so as to vary its angle slightly relative to the axis of the casing thus permitting accurate adjustment of the reflector so as to concentrate the greatest

possible number of light rays at the desired point. Also, by threading the sleeve 11 into or out of the boss 12, and threading thumb nuts 17 onto or off of the screw stems 15, the reflector 6 may be adjusted axially with the same object in view.

A cover plate 19 is secured to the front flange 20 of ring 1. This cover plate is of approximately parabolic shape, the inner face thereof being highly polished to produce a parabolic reflector 21. This cover plate is provided with an integral inwardly extending peripheral shoulder 22, and a peripheral securing flange 23 through which are inserted the securing screws 24. The shoulder 22 serves to effect a light tight closure between the ring 1 and the cover plate and also serves to secure the parabolic reflector 21 in accurate adjustment in the casing.

The cover plate 19 is provided, at its apex, with a circular light opening 25. An integral boss 26 is formed on the outer face of the cover plate concentric with the light opening 25. A U-shaped lens supporting frame 27 is secured to this boss by means of securing screws 28 inserted through lugs 29 formed at the inner end of the frame and threaded into suitable bores in boss 26. This frame supports a plurality of lenses for concentrating and evenly distributing the light rays which are directed through the opening 25 by means of the concaved reflector 6.

A lens holding plate 30 of approximately semi-elliptical shape is mounted in the frame 27. A second lens holding plate 30^a is mounted in the frame in front of plate 30. This plate is provided, at each corner with an outwardly directed rectangular ear 31 which fits snugly over and about an outwardly directed longitudinally extending flange 32 formed at the upper edge of each arm of frame 27 integral therewith. Flange 32 is provided with a longitudinally extending slot 33. This slot receives an adjusting screw which is passed through the same, a securing nut 35 being threaded on the screw beneath the flange. Screw 34 is provided with a button head 36 which fits snugly within a bore 37 extending through the horizontal flange of ear 31. By this means, the lens holding plate 30^a is demountably secured in the lens frame 27 and may be quickly and easily removed, when necessary, by lifting the plate sufficiently to disengage the ears 31 from the heads 36 of the screws 34. The screws 34 and nuts 35 threaded thereon provide means for gripping the flanges 32 of frame 27 whereby the lens holding plate may be quickly and easily adjusted longitudinally of the frame.

Plate 30 is mounted in the frame 27 in the same manner as plate 30^a. Plate 30 is provided, at its center, with a circular opening 38 and an inwardly extending lens holding collar 39 concentric therewith. A double concaved lens 40 is mounted in collar 39 closely adjacent to, and in axial alinement with, the light opening 25. Lens holding plate 30^a is provided with a circular lens opening 50. An arcuate lens securing strip 51 is secured to the plate adjacent the lower end thereof concentric with the lens opening 50. This strip has an upwardly and outwardly directed lens holding flange 52 which extends in front of the lower portion of the lens opening. This strip receives the lower peripheral portion of an outwardly directed concavo-convex lens 53 mounted in front of the lens opening 50, this lens being secured in position by a clip 54 secured at the top of plate 30^a, at the center thereof, having an angularly disposed flange 55 adapted to engage over the edge of the lens. By this means the lens 53 is secured tightly on the lens holding plate 30^a in proper position and may be quickly and easily demounted or removed from this plate when desired. A lens holding plate 56 is mounted in the frame 27 adjacent the outer end thereof similarly to the mounting of plate 30^a. Plate 56 is provided with a lens opening 57 over which is secured an inwardly directed plano-convex lens 58 detachably secured on the plate by the securing strip 59 and clip 60. A sheet metal cover 61 is hingedly secured to cover plate 19 above the boss 26, as at 62. This cover is of rectangular cross section and is adapted, when in lowered position, to fit snugly over the top of lens frame 27 so as to effect a light tight closure therewith. Each side flange 61^a is cut out at its inner end, as at 63, so as to accommodate the securing lugs 29 formed at the inner ends of the flanges 32 of the frame. By raising this cover easy access to the lenses for adjustment, cleaning, or replacing, is obtained.

A lamp-socket tube 63 is inserted through the bore 14 of ball 9. This tube extends inward somewhat beyond the inner face of deflector 6 and is provided, on its inner end, with an electric lamp socket 64. An electric lamp 65 is mounted in the socket 64 and provides the source of light for the apparatus. This lamp may be of any suitable type but is, preferably, a tungsten filament lamp the bulb being filled with nitrogen to produce an intense light. A thimble 66 of insulating material is secured on the outer end of the tube 63, which extends through and beyond sleeve 11. This thimble surrounds the cord or cable 67 by means of which the socket 64 is connected to the opposite sides of any suitable source of electrical energy. The tube 63 is of considerably less diameter than sleeve 11, and is secured in the sleeve by means of set screws 68 threaded through the sleeve and engaging the tube. Any suitable number of these set screws may be used, but in practice I prefer to use three

set screws spaced 120° apart about the sleeve. Set screws 68 serve to hold the tube 62 in axial adjustment and may also be used to rock the tube so as to adjust it an angle to the axis of the casing, and consequently the lamp 65, this rocking adjustment being permitted by the ball 9 through which tube 63 is inserted. By this means, the angle of adjustment of the lamp 65, as well as its distance away from the reflector 6, may be quickly and easily adjusted or varied so as to concentrate and direct the greatest number of light rays through the light opening 25. This adjustment of the lamp, in conjunction with the adjustment of the reflector 6 previously described, renders it possible to quickly and easily adjust the apparatus so as to insure accuracy of operation and a maximum of efficiency.

The parabolic reflector 21 acts to direct the light rays from lamp 65 rearward on to the concave reflector 6, these rays being directed along paths parallel with the axis of the casing. The reflector 6 is so shaped that these light rays, which are parallel with the axis of the casing, are reflected at such an angle as to be directed through the light opening 25. The light rays which are thus concentrated and flow through the opening 25 fall upon the inner face of the double concave lens 40. This lens, which is a divergent lens, acts to spread these light rays which then fall upon the inner concaved face of the concavo-convex lens 53. The lens 53 causes the light rays to assume paths approximately parallel with the axis of the lens. The light rays then fall upon the convex face of the plano-convex lens 58. This lens acts to turn or deflect the light rays slightly inward, thus causing convergence of the light rays and serving to concentrate the same within a relatively small area. By first spreading the light rays in the manner described, by means of the lens 40, then collecting them by means of lens 53, and concentrating them by means of the lens 58, a uniform distribution of light is obtained which is well adapted for use in connection with moving picture machines and similar apparatuses.

The ring 1 is provided, at its under side, with an integral block 69. This block is provided with threaded bores 70 to receive securing screws for securing the apparatus to the slide of a table used in conjunction with a moving picture machine, in the usual manner. By this means, the projecting apparatus may be moved toward or away from the picture machine as circumstances may demand.

What I claim is:—

1. In light projecting apparatuses, a casing, a forwardly directed axially adjustable concaved reflector mounted in said casing, an inwardly directed parabolic reflector mounted at the front of the casing, a lamp mounted intermediate said reflectors and adjustable axially of the casing, means for securing said lamp in adjustment, and light concentrating means mounted on the parabolic reflector at the apex thereof, said parabolic reflector being provided with a light opening at its apex.

2. In light projecting apparatuses, a cylindrical casing, a concaved axially adjustable reflector mounted in said casing, an inwardly directed parabolic reflector mounted at the front of the casing, a lamp intermediate said reflectors, and means exterior of the casing for adjusting the lamp axially.

3. In light projecting apparatuses, a casing, a forwardly directed concaved axially adjustable reflector rockably mounted in said casing, means exterior of the casing for adjusting said reflector axially and for securing it in rocked adjustment, an inwardly directed parabolic reflector mounted at the front of the casing and having a light opening at its apex, light concentrating means mounted on said reflector in alinement with said opening, and a lamp intermediate said reflectors.

4. In light projecting apparatuses, a casing, an inwardly directed parabolic reflector carried by said casing and having a light opening at its apex, a forwardly directed concaved reflector of uniform curvature mounted within the casing for angular adjustment relative to the axis of said casing, a light intermediate said reflectors, and a common means for supporting said concaved reflector and said light so as to permit independent angular adjustment thereof relative to the axis of the casing.

5. In light projecting apparatuses, a casing, a forwardly directed concaved reflector rockably mounted in said casing, a cover plate secured on said casing having its inner surface shaped to provide a parabolic reflecting means, said cover plate being provided with a light opening at its apex, and a lamp intermediate said reflectors.

6. In light projecting apparatuses, a cylindrical casing provided with a detachable back plate, a forwardly directed concaved reflector mounted in said casing provided with a central rearwardly extending boss, said boss having an approximately hemispherical socket and a central bore, a sleeve threaded through the back plate of the casing at the center thereof and provided in its inner end with an approximately hemispherical socket, a bearing ball mounted in the sockets of said boss and sleeve and provided with a diametrical bore of less diameter than the bore through said boss, a tube inserted through said boss and sleeve and fitting snugly into the bore of said ball, a plurality of set screws threaded through the sleeve and engaging said tube for securing the same in adjustment, means exterior of the

casing for adjusting said reflector axially about said ball, an inwardly directed parabolic reflector secured to the front of said casing and provided at its apex with a light opening, and light concentrating means mounted on the parabolic reflector in alinement with the said opening.

7. In light projecting apparatuses, a casing, a forwardly directed concaved reflector mounted in said casing, an inwardly directed parabolic reflector mounted in front of the casing and having a light opening at its apex, a double concaved lens mounted in front of said light opening, an outwardly directed concavo-convex lens mounted in advance thereof, and an inwardly directed plano-convex lens mounted in front of said concavo-convex lens, all of said lenses being mounted in axial alinement with each other and with said light opening.

8. In light projecting apparatuses, lens supporting means comprising a supporting frame of substantially U-shape in transverse cross section provided with a longitudinally extending outwardly directed flange at the upper edge of each arm, each of said flanges being longitudinally slotted, a lens holding plate mounted in said frame and provided with rectangular ears adapted to fit snugly over and about said flanges of the frame, each of said ears being provided with a bore in alinement with the slot of said flange, a headed securing screw inserted through said ear and flange, and a nut threaded on said screw beneath the flange, the head of said screw being of such size as to fit snugly into the bore of said ear whereby the lens holding plate is removably held in the frame and may be adjusted longitudinally of the same.

9. In lens holding means, a plate having a lens opening, a lens securing strip carried by said plate adjacent the lower end thereof adapted to receive and retain the edge portion of a lens, and means for releasably securing a lens in said strip in front of the lens opening, said plate being provided at each upper corner with an outwardly directed securing member for securing said plate in a lens holding frame.

In testimony whereof I affix my signature in presence of two witnesses.

RUFUS E. JONES.

Witnesses:
W. A. HAYWARD,
HUBERT STAHNKE.