March 19, 1929. S. F. ARBUCKLE ET AL 1,706,096

LAMP FOCUSING APPARATUS

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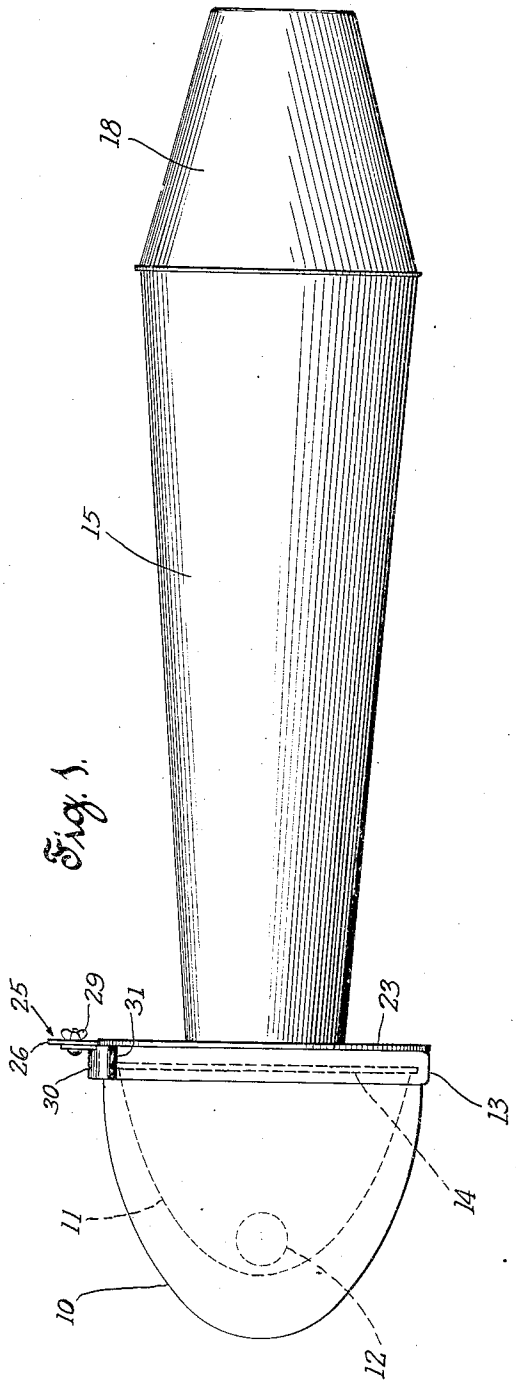


Fig. 1.

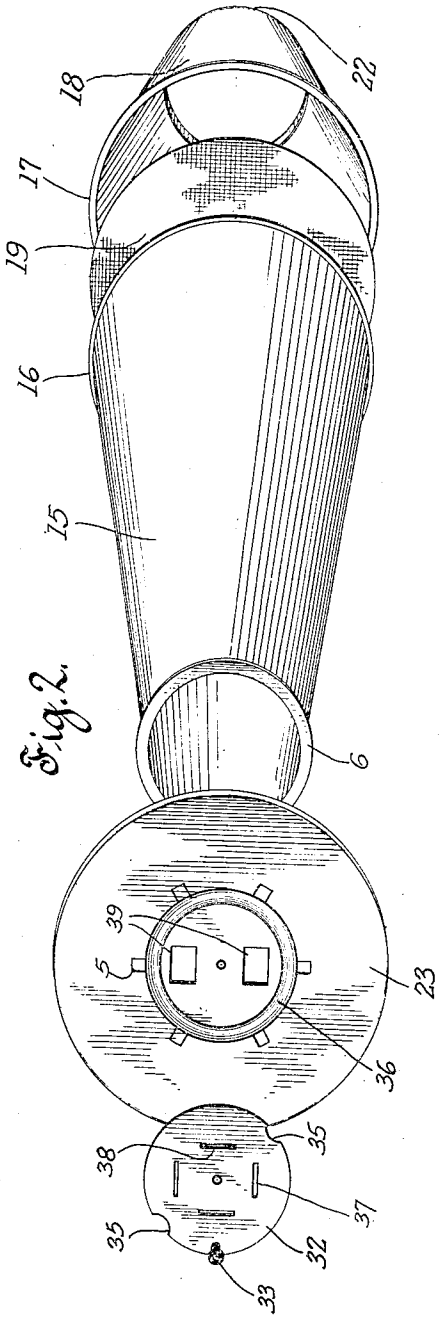


Fig. 2.

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Fig. 3.

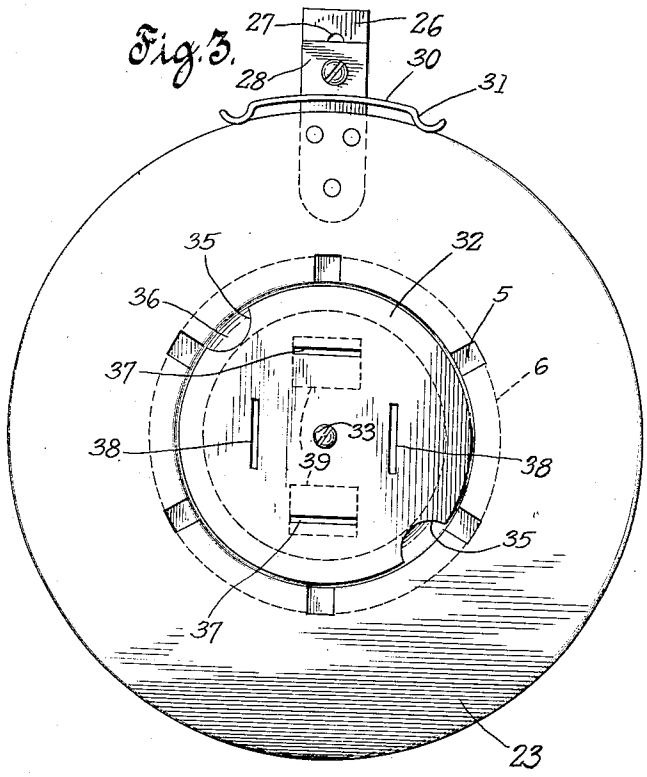


Fig. 4.

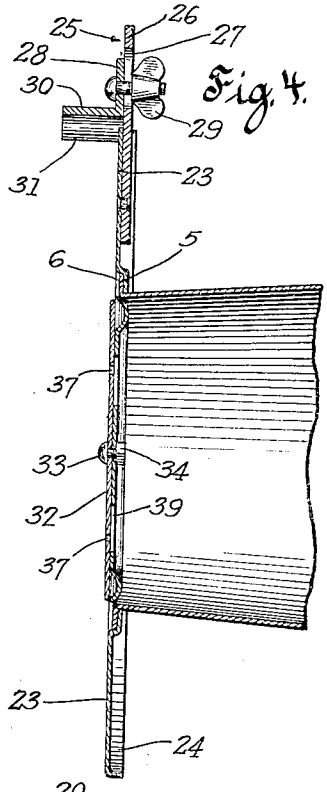


Fig. 5.

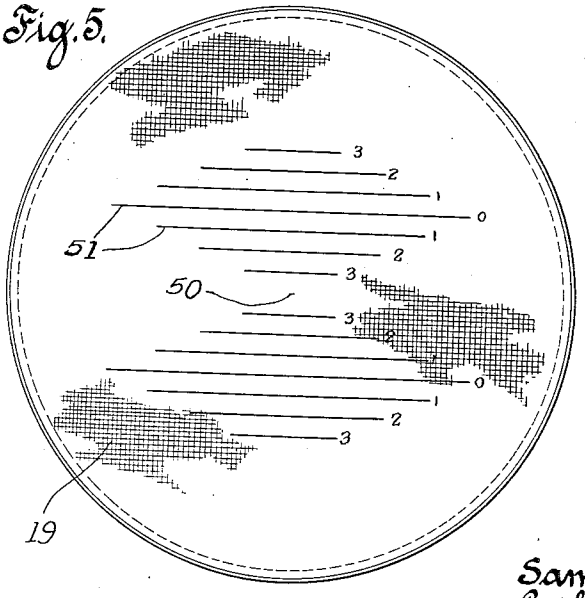
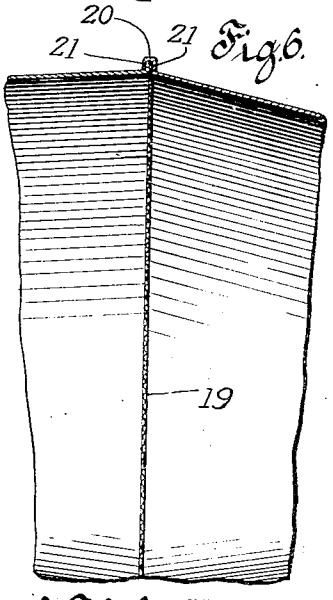


Fig. 6.



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UNITED STATES PATENT OFFICE.

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LAMP FOCUSING APPARATUS.

Application filed January 28, 1924. Serial No. 688,946.

This invention relates generally to focusing apparatus for lamps and more specifically to focusing apparatus for headlamps of automobiles and other automotive vehicles.

In general, the invention consists in certain improvements in the appartus for focusing headlights described and claimed in the co-pending application, Serial Number 555,276, filed by Samuel F. Arbuckle one of the two joint applicants of this application wherein apparatus is utilized, consisting of an elongated tubular member having a closed end plate at one end with two adjacent holes formed therein, an observation aperture at the other end, and an image screen within the chamber. This device is fastened to the headlight reflector from which the lens has been removed and the condition of focus determined by the observer through inspection of the images of the lamp filament formed on the screen. The present invention comprehends improved means for attaching the apparatus to the headlamp casing; the utilization of improvements in the end plate which will not necessitate the removal of the headlamp lens and make possible a much clearer determination of the center of the filament images; which permit ready and easy adjustment of the apparatus for headlamps of different makes and dimensions; and other features referred to hereinafter.

Various important objects are comprehended within the invention as outlined above.

An important object is the provision of means whereby the focusing apparatus may readily be attached to lamp casings of variable curvatures and dimensions. Another object is the employment of means whereby the apparatus may conveniently and easily be centered upon the headlamp with the axis of the apparatus coinciding with the axis of the lamp reflector. Another important object is the utilization of structure in lamp focusing apparatus which is operable independently of the presence or absence of a refracting lens in the line of light travel. It is an object also to provide means whereby the light apertures of the apparatus may be varied in accordance with the make or dimensions of the lamp. A highly important object also is contemplated in the specific formation of the light apertures, whereby a laterally extended image, the axis of which is readily determinable, is formed on the screen within the apparatus.

Additional objects relating to the specific construction, mode of manufacture and function of the apparatus will be readily apparent from consideration of the description of one embodiment of the invention herein disclosed and illustrated in the accompanying drawings.

Referring to the drawings:

Fig. 1 is a side elevation of the focusing device in position upon the automobile headlight casing;

Fig. 2 is an exploded view of the focusing device, showing the essential elements thereof;

Fig. 3 is a front elevation of the end plate, showing the adjustable aperture disc and two-point support;

Fig. 4 is a side view of the vertical section of the end plate;

Fig. 5 is a view of the image screen as viewed from the observation end of the focusing apparatus; and

Fig. 6 is a view showing a mode of attachment between the image tube and sight tube of the focusing apparatus.

The apparatus of the present invention and of the invention disclosed in my co-pending application, Serial Number 555,276, above referred to, provides means whereby with a dark chamber and a screen enclosed therein, determination of whether or not the lamp, within a headlamp of an automobile, for example, is in proper focus therein relative to the reflector of the headlamp. The principle of operation involved is that where light is emitted from a point at the focus of a parabolic reflector and transmitted as parallel rays through an aperture to a screen, it will form on the screen a sharp image of the source of light. If the light source is other than a point, the image will conform to the dimensions of the light source, as a heated filament, for example. Should the light source be displaced from the parabolic focus transversely, the sharp image will disappear and the light transferred will be diffused. Accordingly, if a screen is provided which is marked in accordance to a regular plan as by a series of parallel or concentric lines and by prede-

termination the proper center of the image fixed, the operator may adjust the lamp or determine to what degree the lamp is off-center.

In order to take care of a shift of the light source along the axis of the reflector away from the focal plane, two adjacent apertures, one on either side of the reflector, may be utilized, it being evident that should the light source be out of the focal plane, the images formed on the screen will be shifted away from points parallel to the apertures, thus giving evidence of improper focusing.

Referring particularly to Figs. 1 and 2, there is illustrated an automobile headlamp casing 10, in which in dotted outline is shown the parabolic reflector 11, and a lamp bulb 12. The reflector is secured within the casing in conventional manner, there being shown a rim 13, enclosing the outer edges of the casing and serving to bind the lens 14 and the reflector to the casing.

The focusing device consists of an elongated, truncated cone 15, forming the image tube, which, at its base 16, is secured to the base 17 of a second truncated cone 18, forming the sight tube. The bases 16 and 17 of the conical members 15 and 18 are outwardly flanged and are adapted to receive therein-between the outer edge of the image screen 19, the whole being bound together by a ring 20 having inwardly directed flange members 21 adapted to be clamped against the surfaces of the flanges 16 and 17.

The screen 19 may be formed of any suitable material, such as oil paper, cloth or ground glass which is sufficiently translucent to permit vision of the images of the light source through the side aperture 22, formed at the small end of the sight tube 18. On the screen 19, above and below the horizontal, diametrical line 50, passing through the center of the screen, are drawn a plurality of lines 51 (Fig. 5), the same being preferably displaced and increasing in length symmetrically to a given point indicated by the line *o* above which in the upper portion of the screen, and below which in the lower portion thereof, the lines decrease in length. As indicated in Fig. 5 of the drawing, these lines are preferably numbered 3, 2, 1, 0, 1, 2, 3, both above and below the center 50 in order to facilitate the determination of the median point of the images formed and permit the formation of simple directions for the operator in the use of the apparatus.

The image tube 15 is so formed that its small end is about half as large as the larger end, and the small end is adapted to be positioned adjacent the headlamp so that light rays passing therethrough will not be reflected directly upon the light screen from the tube interior. As illustrated, the small end of the tube 15 covers only the central portion of the headlamp.

To the small end of the image tube 15, an apertured end plate 23 is attached as by means of the outstruck tongues 5 of the plate 23, engaged and compressed with the annular flange 6 formed at the end of the casing.

In order to give the plate rigidity, the other edge is turned to form a flange 24. The end plate 23 is adapted to be supported from the rim 13 of the headlamp by means of a bracket 25. This bracket consists of a strap 26 having a slot 27 cut therein, a plate 28 removably bolted to the strap by means of a wing nut 29, and a transverse support member 30 integral with the plate 28 and having at each end upturned, reversely curved end contacts 31 designed to bear upon the rim 13 of the headlamp casing. For purposes of adjustment, the strap 26 adjacent the wing nut may be marked with graduation lines.

At the center of the end plate 23 there is mounted for pivotal rotation the disc 32 by means of a central screw 33, the nut 34 thereof being fixed to the interior face of the end plate. The disc 32 is formed with two oppositely positioned sectors 35 cut in the edge of the same by means of which a hand grip may be obtained to rotate the same, this manipulation being aided by means of an annular groove 36 formed in the end plate 23 beneath the edge of the disc 32. There are four slots cut in the disc 32 in pairs of two, each oppositely placed relative to the disc pivot, such pairs being indicated by the numerals 37 and 38 and adapted to register with a given pair of slots in the disc is a pair of horizontal slots 39 in the end plate 23, these slots being on the vertical line through the disc axis and parallel to each other, the width of the same being materially greater than the width of the disc slots 37, as shown for example in Fig. 3. The purpose of this difference in width is to permit a slight variation in distances between the various pairs of slots which are utilized in focusing the lamp, for it is evident that slots which are appropriate for use in connection with one make of headlamp or lens may not be usable in connection with another set, thus requiring disc slots which are positioned either closer together or farther apart, the increased width of the slots 39 accommodating this variation.

It is obvious that only one pair of slots may transmit light at one time, the slots 38 for instance in Fig. 3 being entir ly obstructed by the light impervious end plate 23. It is apparent also that should adjustment for the slots 38 be desired, it is necessary only to loosen the screw 33 sufficiently to loosen the disc when the same may be

rotated to bring these slots in register with the end plate slots 39 when the screw 33 may be again tightened. This plate, as illustrated clearly in Fig. 1, is of such a size as to cover the front of the headlamp against which it is adapted to be positioned.

Operation.

The operator, in making use of the focusing device as above described, places the same in juxtaposition with the headlamp with the support contacts 31 of the bracket resting upon the rim of the headlamp, the operator holding the end of the apparatus against the headlamp rim. It is evident that the two-point support tends to bring the axis of the apparatus into the vertical plane passing through the axis of the reflector and should the end plate be noticeably off-center vertically, the same may be adjusted by loosening the wing nut 29 of the bracket and shifting the bracket strap. With the light turned on, the operator then views the screen 19 of the apparatus through the observation hole 22 and notes the position of the double image formed on the screen. By reason of the presence of a lens in the headlamp instead of the angular V-shaped images of the filament, there will be formed on the screen elongated spots of light, each with its major axis horizontal, provided, of course, the lens is of the usual refracting type having a plurality of vertical refracting lens. These images are well defined and since the horizontal width of the same is large compared with the height, it is comparatively easy to determine the approximate median lines thereof and compare them with lines formed on the screen. The position of the image medians having been determined by comparison with data supplied by the manufacturers giving the correct position for the headlamp and lens being tested, the observer may readily determine whether or not the headlamp is in exact focus.

A large percentage of the lenses on the market are designed to give lateral diffusion of light and for this reason the same set of apertures may be used for a number of different makes of lamps or for lamps used on different makes of cars, but in such instances as where there is a divergence in the distance between images, such as would be accommodated by an additional pair of slots in the aperture disc 32, it is necessary merely to rotate the same a quarter turn in order to obtain the slots proper for that particular type of headlamp. Further, it is evident, that additional plates 32 may be provided which may be substituted for each other in order to secure a plate appropriate for the headlamp. This possibility of interchange of the aperture plates and the susceptibility to change of apertures of the plate itself, is highly advantageous in the adjustment of the varied makes of headlamps with their different lenses to proper focus. It is requisite only that the manufacturer, as a result of careful determination of distances for all the different types of headlamps, furnish the operator with charts or lists of data, disclosing the proper reading for the given type of headlamp by means of which the operator may obtain proper adjustment of his lamp.

As previously indicated, one of the noteworthy features of the invention is the development of the light image on the screen in the form of a horizontal elongated slot, the median horizontal line of which is readily determinable and comparable with the lines formed on the screen, thus permitting a precision of adjustment sufficiently accurate to meet the severest demands of State boards and officials. It is also noteworthy that the two-point support upon the headlamp permits instantaneous positioning of the apparatus so that its axis lies in a vertical plane passing through the axis of the reflector, there remaining only the necessity of adjusting the apparatus vertically by means of the wing nut 29. Further, the means provided whereby adaptation is made for all sizes and dimensions of headlamps and reflectors gives highest utility to the apparatus and adapts it for every ordinary use for the focusing of the headlamps,

It is, of course, apparent that while an embodiment of the invention has been described and illustrated which may in certain aspects be preferable, it is intended that such disclosure be illustrative rather than definitive, the scope of the invention being defined only in the claims as hereto appended.

Having thus described our invention, what is claimed is:

1. In a focusing apparatus for lamps, the combination with a headlamp having a reflector and a light source mounted therein, of a hollow tubular enclosed casing adapted to be positioned in front of said reflector, the axis of the casing lying parallel to that of the reflector; an end plate at the end of the casing adjacent the reflector, said plate having plural parallel slots formed therein; a translucent screen positioned in the other end of the casing; and means for observing the images of the light source on the screen.

2. In a focusing apparatus for lamps, the combination with a headlamp having a reflector and a light source mounted therein, of a hollow tubular enclosed casing adapted to be positioned in front of said reflector, the axis of the casing lying parallel to that of the reflector; an end plate at the end of the casing adjacent the reflector, said plate having a pair of slots formed therein; a

translucent screen positioned in the other end of the casing; and means for observing the images of the light source on the screen.

3. In a focusing apparatus for lamps, the combination with a headlamp having a reflector and a light source mounted therein, of a hollow tubular enclosed casing adapted to be positioned in front of said reflector, the axis of the casing lying parallel to that of the reflector; an end plate at the end of the casing adjacent the reflector, said plate having two parallel slots formed therein; means adjacent said plate for varying the effective position of said slots; a translucent screen positioned in the other end of the casing; and means for observing the images of the light source on the screen.

4. In a focusing apparatus for lamps, the combination with a headlamp having a reflector and a light source mounted therein, of a hollow tubular enclosed casing adapted to be positioned in front of said reflector, the axis of the casing lying parallel to that of the reflector; an end plate at the end of the casing adjacent the reflector, said plate having two parallel slots formed therein; a rotatable disc positioned centrally of said plate and attached thereto, said disc having a plurality of pairs of parallel slots, whereby separate pairs of slots may be brought into registry with said plate slots; a translucent screen positioned in the other end of the casing; and means for observing the images of the light source on the screen.

5. In a focusing apparatus for a lamp, the combination with a lamp provided with a reflector, a light source, and a refracting lens, of a tubular dark chamber adapted to be positioned adjacent said reflector; an end plate fixed to one wall of the chamber having slotted apertures formed therein through which light rays are adapted to pass from the light source and reflector; means for supporting said end plate so that the central portion of the same coincides with the axis of the reflector; a translucent screen on the opposite wall of the chamber; and means for observing said screen.

6. In a device of the class described, the combination with a headlamp having a reflector and a lighting element mounted therein, of a hollow member adapted to be positioned in front of said reflector; an adjustable aperture plate at one side of said member; and a screen on the opposite side of said member, said screen being adapted to receive images of the lighting element through said apertures.

7. In a device of the class described, the combination with a headlamp having a reflector and a lighting element mounted therein, of a hollow member adapted to be positioned in front of said reflector; an adjustable aperture plate at one side of said member; a screen on the opposite side of said member on which the images of said lighting element are adapted to be formed; and means for shielding said screen from light external to that emitted through said apertures.

8. In a focusing device, the combination of a hollow tubular chamber; an opaque plate at one end of said chamber having parallel slots formed therein, said plate being adapted to be positioned adjacent a reflector containing a light source; a screen at the other end of the chamber; and means for facilitating observation of said screen.

9. In a focusing device, the combination of a hollow tubular chamber; an opaque plate at one end of said chamber having parallel slots formed therein, one on either side of the axis of said chamber, said plate being adapted to be positioned adjacent a reflector containing a light source; a screen at the other end of the chamber; and means for facilitating observation of said screen.

10. In a focusing device, the combination of a hollow tubular chamber; an opaque plate at one end of said chamber having parallel slots formed therein, said plate being adapted to be positioned adjacent a parabolic reflector containing a light source; a translucent screen at the other end of the chamber; and means for facilitating observation of said screen.

11. In a focusing device, the combination of a hollow, truncated, conical chamber; an opaque plate at the smaller end of said conical chamber having parallel slots formed therein, said plate being adapted to be positioned adjacent a reflector containing a light source; a screen at the other end of the chamber; and means for facilitating observation of said screen.

12. In a device of the class described, the combination of a tubular chamber adapted to be supported from a curved support; a slotted plate at one end of said chamber; a light translucent screen at the other end of the chamber; and means including a two-point bracket for suspending said chamber from the curved support.

13. In a device of the class described, the combination with a lamp casing containing a parabolic reflector and a lamp at the focus of the reflector, of a tubular chamber; an apertured plate at one end of said chamber adjacent to and in front of said reflector; a light screen at the other end of said chamber; means for facilitating observation of the screen; and a support for said plate having two contact elements adapted to engage said casing and adapted to bring the axis of the tubular chamber into the vertical plane passing through the reflector axis.

14. In a device of the class described, the combination with a lamp casing containing a parabolic reflector and a lamp at the focus of the reflector, of a tubular chamber; an ad-

justable apertured plate at one end of said chamber adjacent to and in front of said reflector; a light screen at the other end of said chamber; means for facilitating observation of the screen; and means whereby adjustment of the device is secured relative to the reflector, said adjusting means including a bracket plate, a transverse plate fixed to the bracket and having terminal members adapted to contact with said reflector, and a nut and slot connection to said bracket.

15. In a light focusing apparatus, the combination with a casing including a parabolic reflector, a light source adapted to be positioned at the focus of the reflector, and a refracting lens, of means for indicating proper focus of said light source, said means comprising an opaque plate having a pair of parallel slots formed therein; means for supporting said plate on the casing so that said slots are equally displaced from the axis of the reflector; a tubular dark chamber attached at one end to the plate; a translucent screen attached to the opposite end of said chamber adapted to receive images of the light source thereupon; indicia on said screen whereby the state of focus of the light source within the reflector is determinable; and means for facilitating observation of said screen.

16. In a light focusing apparatus, the combination with a casing including a parabolic reflector, a light source adapted to be positioned at the focus of the reflector, and a refracting lens, of means for indicating proper focus of said light source, said means comprising a tubular dark chamber; means at one end of said chamber adapted to transmit substantially parallel flattened shafts of light from the light source; a screen at the other end of the chamber adapted to be illuminated by said light shaft; and means for supporting said chamber so that its axis lies in that of the reflector.

17. In a light focusing apparatus, the combination with a casing including a parabolic reflector, a light source adapted to be positioned at the focus of the reflector, and a refracting lens, of means for indicating proper focus of said light source, said means comprising a truncated, conical dark chamber; means at the smaller end of said chamber adapted to transmit substantially parallel flattened shafts of light from the light source; a screen at the other end of the chamber adapted to be illuminated by said light shafts; means for supporting said chamber so that its axis lies in that of the reflector; and means including a sight tube for inspecting said screen.

18. A shutter for light focusing apparatus, comprising an opaque end plate having a pair of parallel slots formed therein; a rotatable disc having parallel slots formed therein mounted on said plate, the axis of said disc lying between said plate slots; means for rotating the disc; and a screen spaced from said plate and adapted to intercept light projected through said slots from a source on the opposite side of said plate.

19. A shutter for light focusing apparatus, comprising an opaque end plate having a pair of parallel slots formed therein; a rotatable disc having parallel slots formed therein mounted on said plate, the axis of said disc lying between said plate slots; means for rotating the disc, said disc slots having a narrower width than the plate slots; and a screen spaced from said plate and adapted to intercept light projected through said slots from a source on the opposite side of said plate.

20. A shutter for light focusing apparatus, comprising an opaque end plate having a pair of parallel slots formed therein; a rotatable disc having parallel slots formed therein mounted on said plate, the axis of said disc lying between said plate slots; means for rotating the disc; an annular groove formed in the plate beneath the periphery of the disc whereby rotation of the disc is facilitated; and a screen spaced from said plate and adapted to intercept light projected through said slots from a source on the opposite side of said plate.

21. In a light focusing apparatus, a light screen therefor comprising a light translucent plate and a plurality of parallel indicia lines of varying lengths arranged in symmetrical groups and formed thereon below and above the horizontal diametric line of said screen.

22. In a light focusing apparatus, an adjustment plate having a plurality of slots formed therein; means for rotating said plate; and a screen spaced from said plate and adapted to intercept light projected through said slots by a light source on the opposite side of said plate.

In testimony whereof, we affix our signatures.

SAMUEL F. ARBUCKLE.
CARL P. BROCKWAY.