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C. E. GODLEY

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FOCUS CHECKING DEVICE

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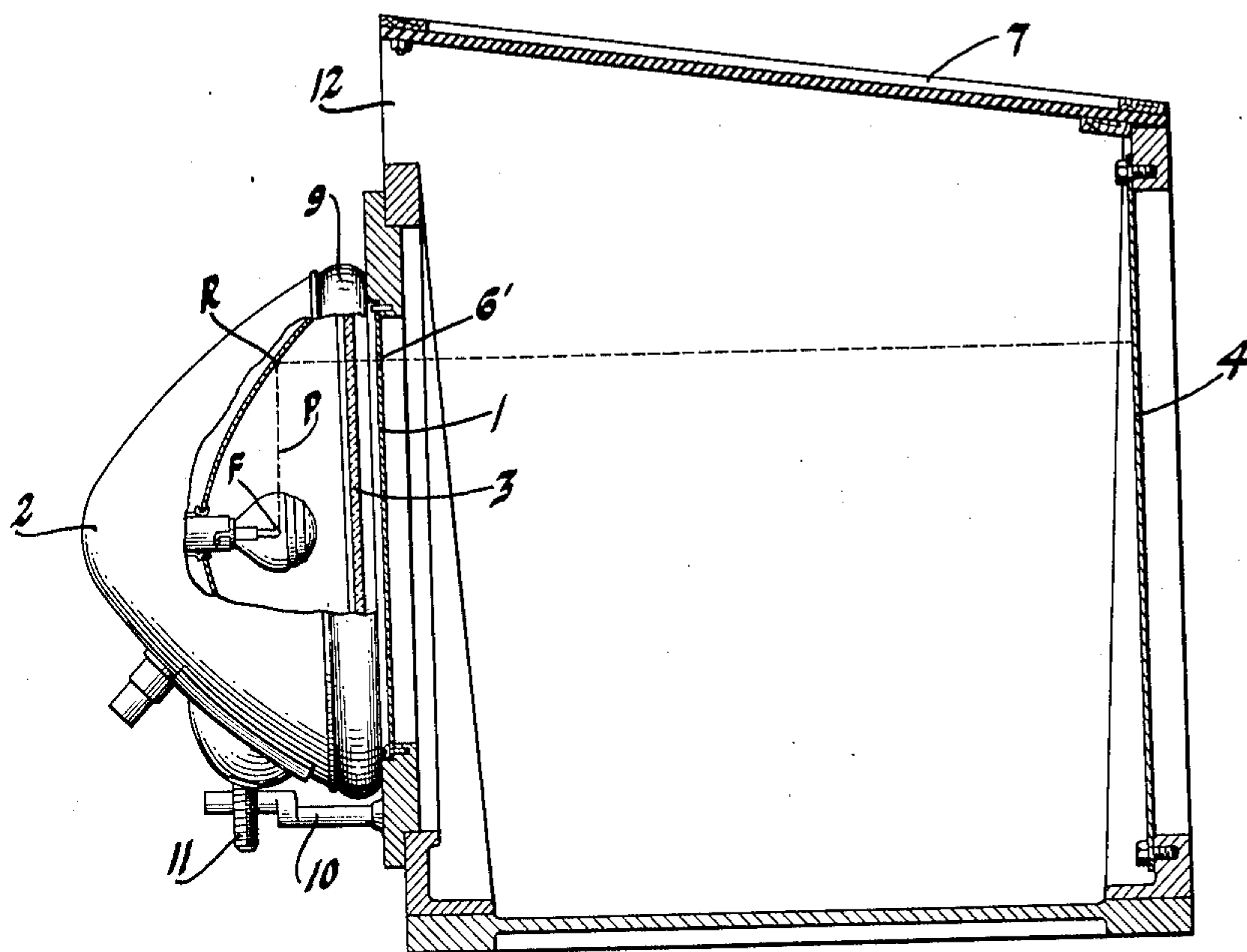


Fig. 1

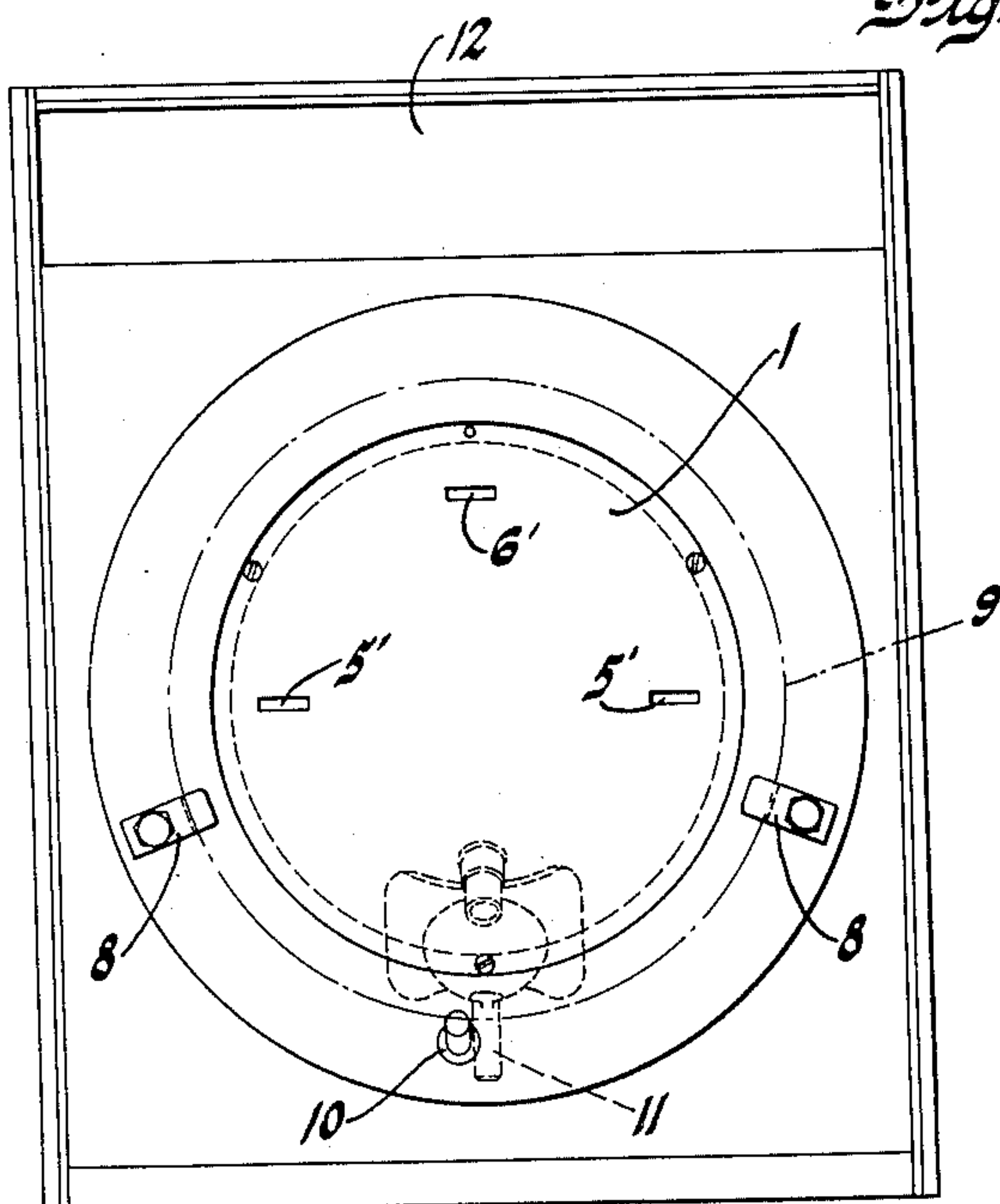


Fig. 2

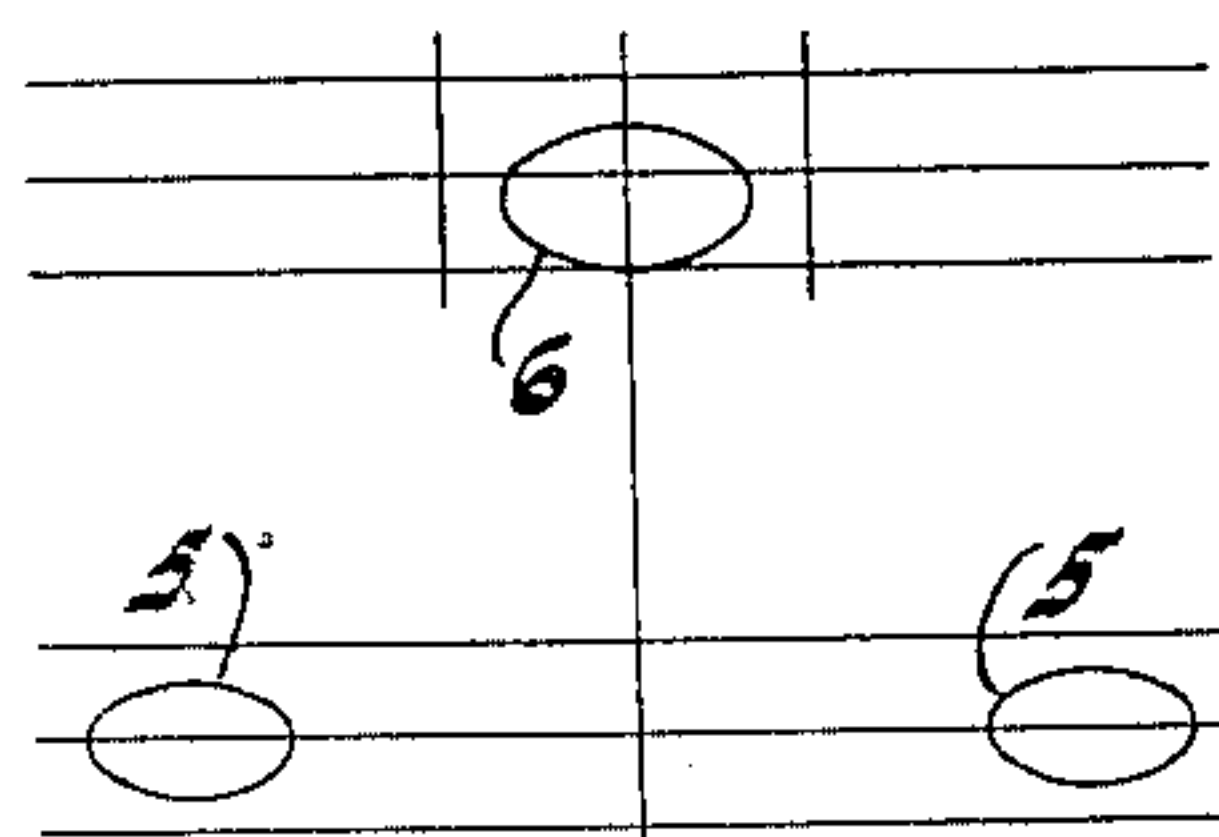


Fig. 3

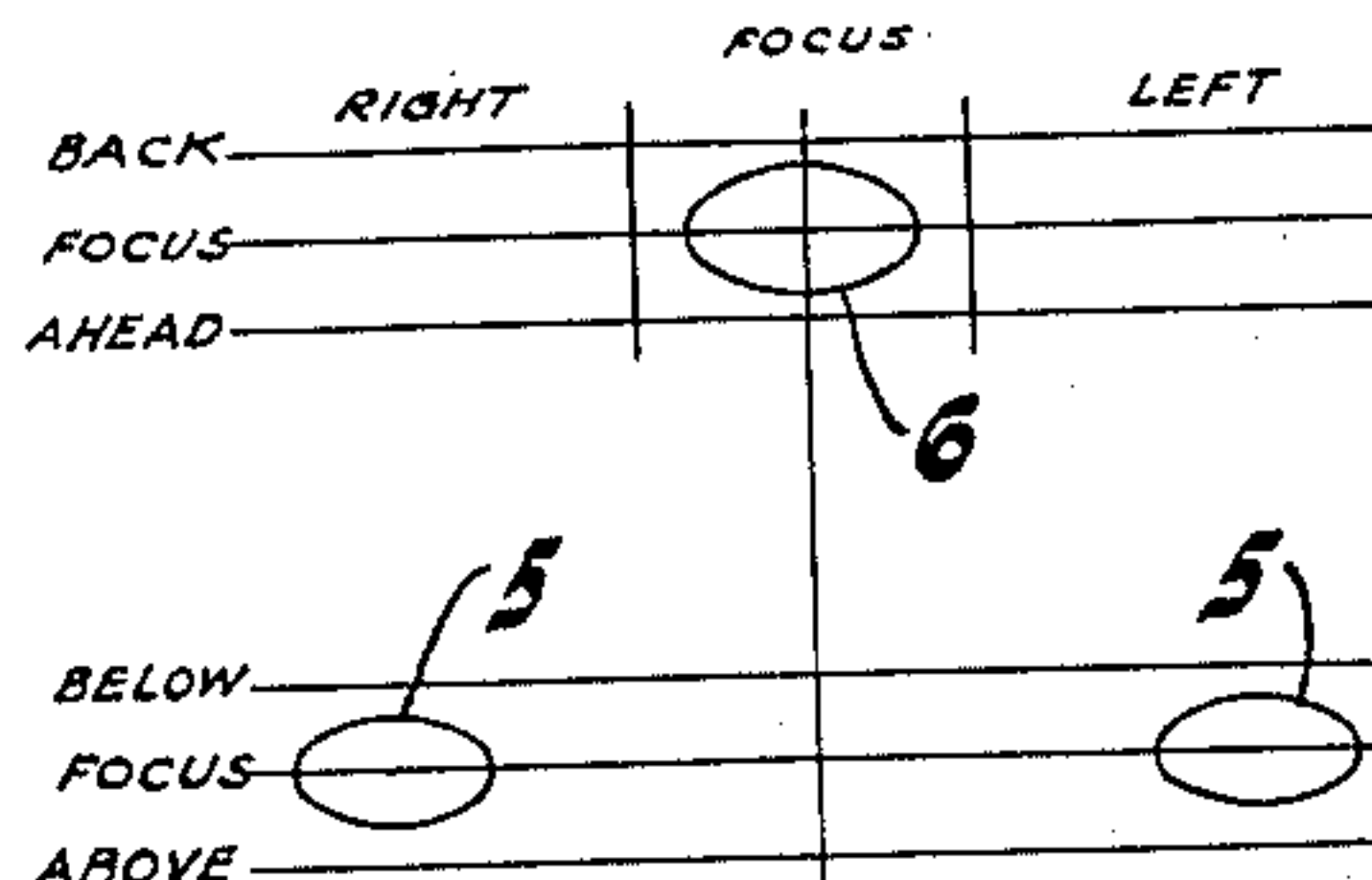


Fig. 4

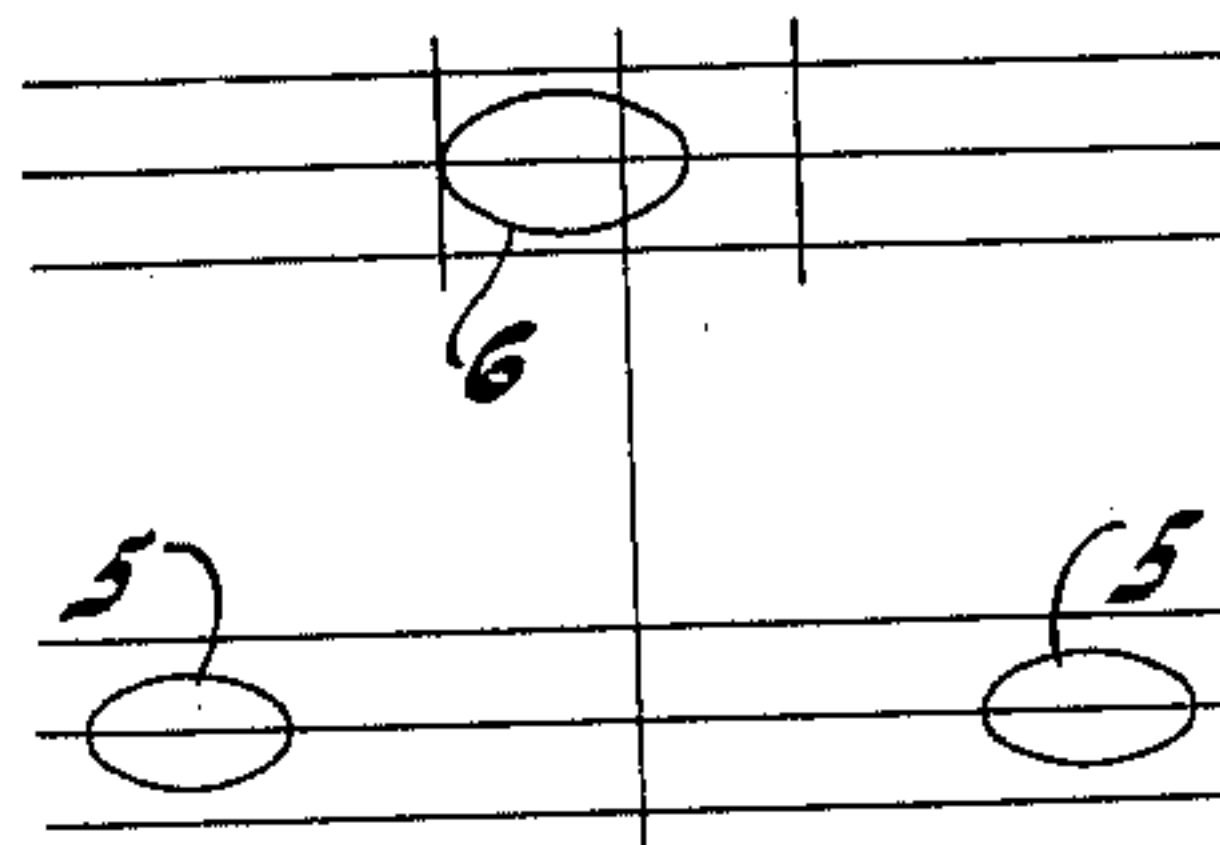


Fig. 5

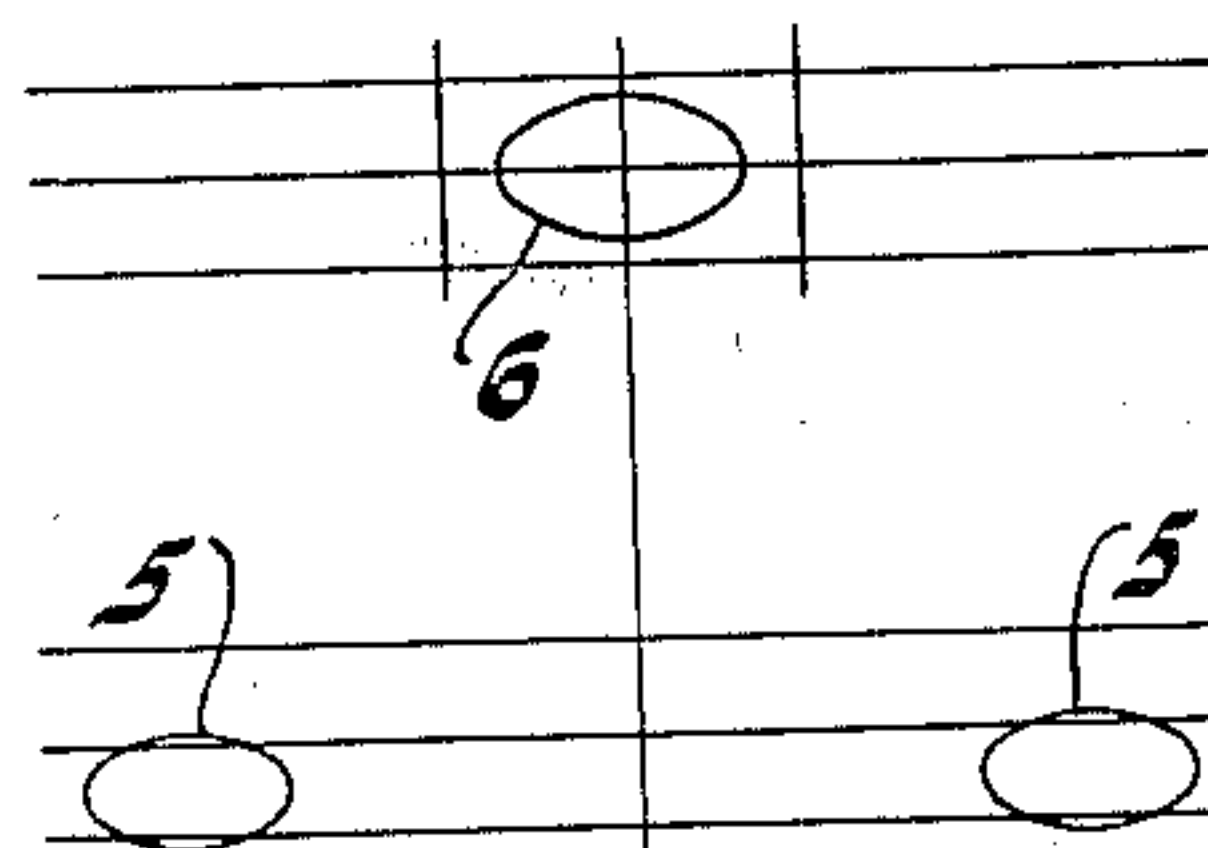


Fig. 6

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UNITED STATES PATENT OFFICE

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FOCUS CHECKING DEVICE

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4 Claims. (Cl. 88—14)

This application is concerned with an improved focus checking device, such as may be employed to determine the exact focal position of the light bulb in a reflector of an automobile headlight.

5 The object of my invention is to design an apparatus for this purpose which is simple in structure and operation, and by the use of which the deviation of the light filament from the focal point in the reflector in any direction may be quickly and accurately determined. The apparatus is constructed to indicate visibly any deviation in horizontal and/or vertical planes, and the arrangement is such that it may be determined at a glance in exactly which direction or
10 directions the filament is offset.

Such a device would have two primary applications, one, for the purpose of inspecting headlights before installation to determine if the filament is displaced farther from the focal point than permitted by standards, particularly in fixed focus headlights; and the other, for the purpose of determining any necessary adjustment in the position of the filament in adjustable focus headlights, either before or after installation. Relative to this latter use, the device is so constructed that it may be employed in service stations, or the like, occupying a minimum of space, and of such simple character that it affords a means of determining accurate adjustment when used by the
20 average layman. Such features and advantages, as well as others, will be readily apparent from the description of my improved device hereafter to be disclosed in detail.

Referring to the drawing forming a part
35 hereof:

Figure 1 is a longitudinal vertical section, partly in elevation, of a practical embodiment of my invention.

Figure 2 is an end view of Figure 1, showing a
40 headlight in dot and dash lines.

Figures 3 to 6, inclusive, are diagrammatical views of the screen showing various instances of filament variations.

Generally, the device consists of a means to determine the location of the filament by projecting images therefrom on a screen. More particularly, this is accomplished by placing a shield 1 provided with relatively small openings over the open end of the headlight body 2 and/or lens 3, through which images 5 and 6 of the filament or light source are projected on a screen 4 provided with suitable scales for determining the deviation of the filament from the focal point, and with reference to the position of which it may be determined whether the deviation is of such extent
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from set standards that the headlight should be rejected, or with reference to which the bulb may be properly adjusted in an adjustable focus headlight until it occupies the exact focal point or the relative position desired or required by State lighting laws.

The use of a shield with openings and a screen for projected images is, of itself, not claimed to be novel. I have improved such arrangements, as heretofore employed, however, by the particular location of the openings in the shield and the cooperating scales or graduations on the screen on which images from the filament are projected. These openings and screen scales are so arranged that deviations of the filament from the focal point in any direction may be readily distinguished without conflict with possible deviation in some other direction at the same time, both of which will be clearly indicated in their proper directions without requiring manipulation of either the headlight or screen.

The principal feature of my invention consists in positioning the openings in the shield so that they are substantially in line with the intersection of the focal plane P with the reflector or paraboloid R, as indicated by dotted lines in Figure 1, said dotted lines being continued to show the path of the projected ray through one of the openings when the light bulb is properly positioned with its filament F at the focal point of the reflector. The focal plane may be defined as a vertical plane passing through the focal point of the reflector and perpendicular to the longitudinal reflector axis, and the openings in the shield are so positioned within the term "in line with" that a line passed through the center of any one opening and meeting the reflector at the intersection of the focal plane therewith is at right angles to said focal plane and therefore, parallel to the reflector axis.

In the embodiment illustrated herein, I provide three such openings or slots in the shield 1. Two of these openings, designated at 5', are in the same horizontal plane one on each side of the center of the shield and in line horizontally with the intersection of the focal plane with the reflector or paraboloid. The third opening 6' is positioned on the vertical axis above the center and is in line with the intersection of the focal plane with the reflector or paraboloid near the top of the reflector. I do not desire to be limited to this particular number of openings or exact relative positioning thereof which are disclosed as being one application of my invention which
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has been proved very satisfactory in actual practice thereof.

In combination with the shield so formed, the screen 4 is placed adjacent thereto to receive the 5 images projected thereon through the designated openings. This screen is preferably suitably scaled or graduated by providing thereon two horizontally arranged main lines in vertically spaced relation, the upper line positioned in horizontal 10 alinement with the upper opening and the lower line in horizontal alinement with the two side openings, and a vertically arranged main line in vertical alinement with the upper opening which line may be extended downwardly across 15 the lower horizontal line though this is not required as will be explained hereafter. On each side of each of these main lines is preferably arranged a parallel secondary or limit line. For convenience these main and limit lines may be 20 suitably designated to indicate the directions of deviation of the filament from the focal point, as illustrated in Figure 3 and described hereinafter.

Whereas it is stated hereabove that the horizontally arranged main lines on the screen are to 25 be positioned in horizontal alinement with the respective openings in the shield, this relative location thereof would be accurate only in the event that there is no lens between the reflector and shield, or if the lens is in place that it is not provided with horizontal prisms or other light 30 deflecting arrangements which would be opposite the openings in the shield. In the use of the device with a headlight provided with a lens having horizontal prisms or the like, the horizontally arranged main lines would not be positioned in 35 horizontal alinement with the shield openings because of the effect of such prisms on the path of the rays passing through the respective openings, and therefore, to assure the utmost accuracy in 40 adjusting or checking the filament location in various types of headlights it would be advisable to provide several screens with each scaled or graduated for use with a particular type of reflector and lens assembly. In some instances, as will appear 45 hereafter, the use of a screen with a different location of the scales or graduations to compensate for the effect of lens prisms may be obviated by the provision of a bottom opening in the shield.

With the above arrangement, it follows that if 50 the filament is properly positioned at the focal point, the image 6 projected through the upper opening 6' in the shield will appear on the screen at the intersection of the upper horizontal main line with the vertical main line, and the images 5 55 projected through the side openings 5' will appear on the lower horizontal main line as is shown in Figure 3. For convenience therefore, these main lines may be designated as "Focus" lines. On various deviations of the filament from the focal 60 point, the effect on the positions of the three images projected on the screen with reference to the so-called focus lines would be as follows, by reason of the location of the openings in the shield substantially in line with the intersection of the 65 focal plane with the paraboloid, noting that to avoid undue repetition, the proper designation of the lines on the screen appears only on Figure 3:

1. As shown in Figure 4, a sidewise deviation or 70 lateral horizontal deviation in the focal plane would not affect the position of the side images 5 but would change the upper image 6 to the right or left of the vertical focus line which displacement would be in the opposite direction to that of 75 the filament with respect to the focal point. For

convenience, therefore, the right and left vertical limit lines may be designated, respectively, "Left" and "Right".

2. As shown in Figure 5, a vertical deviation 80 in the focal plane would not affect the position of the upper image 6 but would change the side images 5 to above or below the lower horizontal focus line which displacement would be in the opposite direction to that of the filament with respect to the focal point. For convenience, 85 therefore, the limit lines above and below the lower horizontal focus line may be designated respectively, "Below" and "Above".

3. As shown in Figure 6, an axial deviation outside the focal plane, or, in other words, a deviation 90 ahead or back of the focal point would cause a change of both upper and side images, which would, however, in either instance be a variation at right angles to the changes set forth above, as caused by sidewise and vertical deviations. 95 namely, the side images 5 which change vertically on vertical deviations, would change horizontally, moving either farther apart or nearer together, on axial deviations. The upper image 6 which changes horizontally on sidewise deviations, 100 would change vertically to above or below the upper horizontal focus line on axial deviations, which displacement would be above said focus line if the axial deviation is back of the focus point, and would be below said focus line if the 105 axial deviation is ahead of the focus point. For convenience, therefore, the limit lines above and below the upper horizontal focus line may be designated, respectively, "Back" and "Ahead". Ordinarily, only the upper image 6 would be used 110 in determining axial deviation since it would be difficult to determine accurately the amount of this deviation by a movement of the side images 5 toward or away from each other especially when the device is applied to a headlight provided with a lens having vertical flutes or other 115 means for spreading the light laterally.

Throughout the preceding description provision has been made for only a single opening on the vertical axis, designated as an upper opening. 120 I contemplate also, if found desirable, a similar opening at the bottom which would be positioned on the vertical axis substantially in line with the intersection of the focal plane with the reflector. Such additional opening would 125 be especially desirable when the device is applied to a headlight provided with a lens having in its upper portion prisms or horizontal flutes such as might render the upper opening and image projecting therefrom incorrect with respect to 130 the focus and limit lines on the screen. It has been found that the device may ordinarily be used without the removal of any common type of lens, provided, of course, that the openings in the shield are substantially in line with the intersection of the focal plane with the type of 135 reflector employed.

In practical application of the device, as is shown in Figures 1 and 2, the shield 1 and screen 4 are preferably mounted at opposite ends of a 140 suitable housing 7 so as to eliminate external sources of light in order that the images on the screen will be clearly and unmistakably defined. Such housing 7 is constructed with suitable means as hooks or lugs 8 engaging over the head- 145 light rim 9, and an offset arm 10 engaging the vertical headlight mounting stud 11, for positioning the same with respect to the headlight and suitable means to permit the operator thereof to view the screen and position of the images 150

thereon, such as, for instance, an opening or window 12 in an upwardly projected wall of the housing above the headlight when in operative position relative thereto.

5 The length of this housing such as would determine the distance between the shield and screen may be from one to three feet. I have found that about sixteen inch spacing is satisfactory, which would render the assembly very
10 compact and easily handled. By satisfactory it is meant that the change in the position of the images on deviations of the filament from the focal point is sufficiently great to enable an accurate adjustment to be made. A deviation of only
15 .060 of an inch, which is the usual permitted allowance, would cause a change of position of the respective image or images depending on the direction of this deviation, of approximately one inch with a sixteen inch spacing between the
20 shield and screen which would correspondingly increase with increased spacing to approximately three inches at three feet. Obviously, it would be desirable to so construct the relative dimensions of the housing and the scale on the screen
25 that the limit lines, heretofore described, would serve as an indication when the image or images project beyond these lines that the filament is located farther from the focal point than the standards permit.

30 From the foregoing description it will be readily apparent that an exceedingly accurate check and/or adjustment may be accomplished by the use of my improved device. As stated heretofore, I contemplate the use of a lower opening on the
35 vertical axis if desired according to the application of the device in practice. Furthermore, it is to be understood that the structure of the housing disclosed herein is primarily merely diagrammatic, and in practice many changes in the general form, dimensions and structure may be embodied therein such as in the type of positioning
40 means, which, by merely providing the hooks or lugs 8 above the center of the shield opening could be adapted to be supported on a headlamp casing installed on a vehicle, whereas in the embodiment illustrated herein, the housing and positioning means are adapted to support a detached
45 headlamp assembly.

Furthermore, whereas the screen is disclosed
50 as positioned vertically and parallel to the shield, it is contemplated that the screen may be inclined to the vertical with its lower edge closer to

the shield than its upper edge. This would necessitate a change in the location of the horizontal lines on the screen but has the advantages of providing for better visibility thereof through the window opening and for an increase in the depth
80 of the images projected on the screen.

The foregoing, among such other changes as may be apparent, are contemplated within the scope of my invention as defined by the appended
85 claims.

I claim:

1. In a focus checking device for use with a headlamp having a reflector and a light source therein, a substantially closed housing adapted to be positioned in front of said reflector, an apertured shield at the end of said housing adjacent the reflector, an opaque screen at the opposite end of said housing adapted to receive
90 images of the light source projected through the apertures in said shield, and an opening in said housing adjacent the reflector through which the position of said images on said screen may be viewed.
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2. The elements set forth in claim 1, in which said opening is positioned in a vertical end wall
100 of said housing opposite the screen end.

3. In a focus checking device, the combination with a headlamp provided with a rim and a supporting stud, of a housing provided with means engaging over said rim to position said housing
105 on said headlamp, and provided further with a means engaging said supporting stud to position said housing and headlamp circumferentially and prevent relative rotation in one direction.

4. In a focus checking device, an apertured
110 shield adapted to be placed adjacent a reflector containing a light source, one of the apertures in said shield being positioned on the vertical axis and another of the apertures being on the horizontal axis thereof, and a screen spaced from said
115 shield to receive images of the light source projected through said apertures, said screen being provided with scales on the image receiving portions thereof to indicate the relative extent and direction of any variation of said light source
120 from the focal point of the reflector, said scales being in part constituted by limiting lines within which the images appear if the position of the light source is within permissible standard tolerances.
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