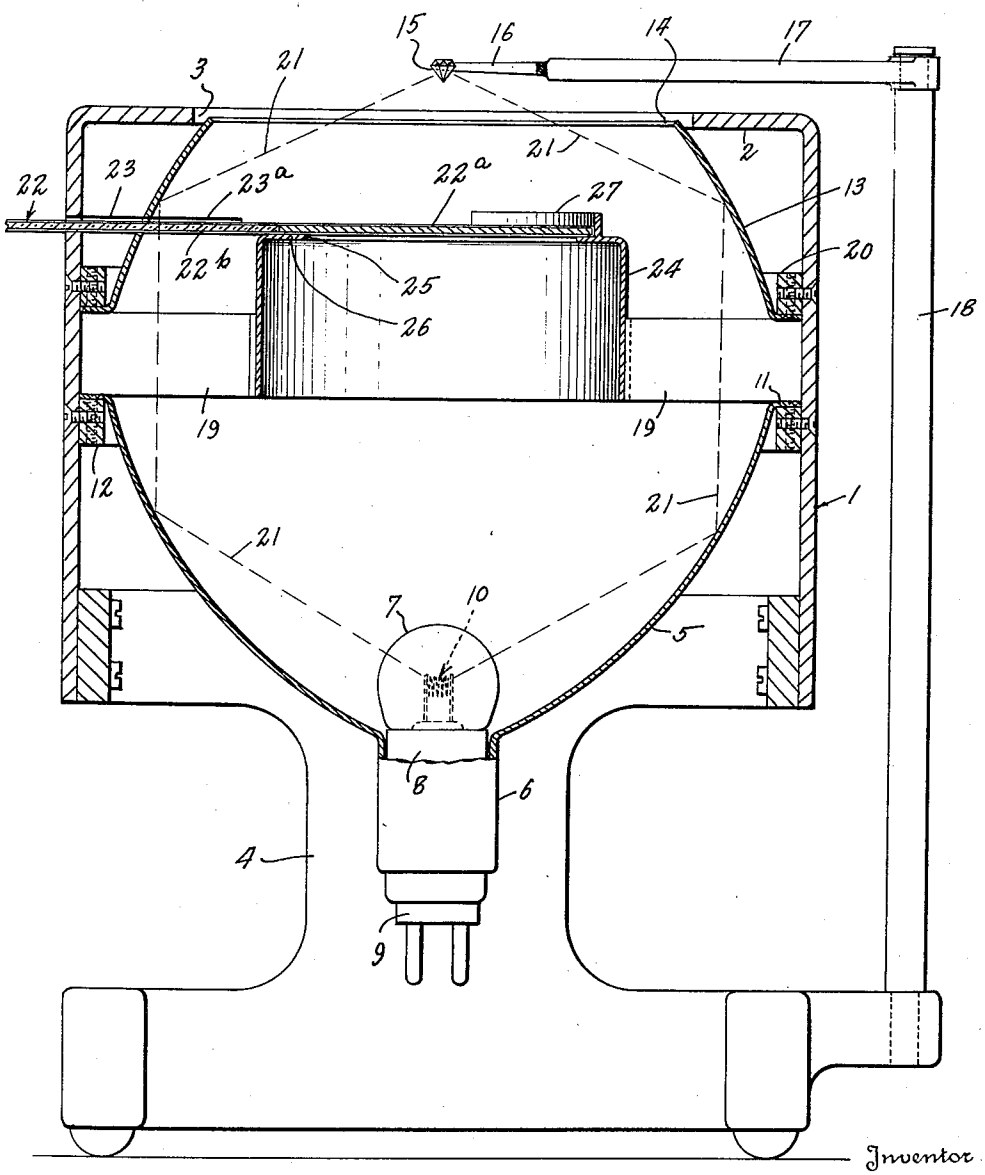
May 9, 1939. R. M. SHIPLEY, JR 2,157,437

DARK FIELD ILLUMINATOR

Filed Jan. 25, 1938

Fig. 1.



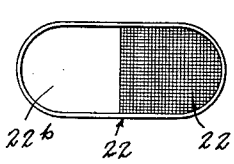
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Fig. 2.



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DARK FIELD ILLUMINATOR

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3 Claims. (Cl. 88—40)

This invention relates to instruments known as dark field illuminators. These instruments are used principally for observing the perfections, or imperfections in precious stones, and are constructed so that light is concentrated upon the gem from the sides with a dark field, or background against which the gem is examined.

The invention relates particularly to an instrument of this type employing a primary, or basal, reflector and a secondary, or upper, reflector, and in which the source of illumination, or lamp, is located at about the focus of the basal reflector. The upper reflector is in the form of an annular shell, the upper portion of which is removed; that is to say, the portion which would cover its focal point.

The general object of this invention is to provide a relation of the reflecting surfaces, which will operate to effect a high lateral illumination of the gem being examined, but which, at the same time, will reduce the glare effect upon the eye of the expert who is examining the gem, to a minimum.

Further objects of the invention will appear hereinafter.

The invention consists in the novel parts and combination of parts to be described hereinafter, all of which contribute to produce an efficient dark field illuminator.

A preferred embodiment of the invention is described in the following specification, while the broad scope of the invention is pointed out in the appended claims.

In the drawing, Fig. 1 is a vertical section through a dark field illuminator embodying my invention, the lamp socket being shown partially in elevation.

Fig. 2 is a plan of a slide employed with the device.

In practicing the invention, I provide a casing 1, preferably in the form of a cylindrical shell open below and having means such as an inturned flange 2 at its upper edge, so that an opening 3 of restricted diameter is formed at the upper side of the instrument. The lower portion of the casing 1 may be supported on a suitable stand 4. At the lower portion of the casing 1 I provide a primary reflector, or basal reflector 5, if the instrument is constructed on a vertical axis, and the base of the primary reflector is provided with a pocket 6 to support an illuminating device such as an electric lamp 7, which lamp can be screwed into a socket 8 received in the pocket 6, the current to the lamp being received through an electric cord attached to a suitable electric connection or coupling member 9. The primary reflector 5 is preferably a parabolic reflector, and the lamp 7 is located so that its filament will lie substantially at the focal point 10 of the reflector. The primary reflector 5 may be supported in the casing 1 in any suitable manner, for example, by providing a marginal flange 11 at the upper edge of the reflector that seats upon a ring or rest 12 attached to the inner face of the casing.

Above the primary reflector 5 I provide a secondary reflector 13, which is also preferably of parabolic form, but truncated, that is to say, the upper portion which would surround its focus, is cut away so that the reflector is annular and the upper end of this reflector presents a large opening 14, which is preferably located within the opening 3, the latter opening being of slightly larger diameter.

The gem, for example, the diamond 15 to be examined, is held at the focal point of the secondary reflector 13 in any suitable manner. In practice, the means for this purpose usually involves a suitable clamp 16 supported on an arm 17 that is supported at the side of the instrument on a suitable post 18 on which the arm 17 pivots. The secondary reflector 13 may be supported in any suitable manner within the casing 1, for example, by resting upon radial arms 19. These arms are in the form of plates, the inner ends of which are rigidly secured to the side walls of a circular box or rest 24, to be described more fully hereinafter. A follower ring 20 may be employed to hold the flange in position.

With this arrangement it will be evident that the rays of light from the focal point 10 will be reflected upwardly around the periphery of a dark background 22a as indicated by the dotted lines 21, so that the rays are concentrated around the superficial area of the diamond supported at the upper focal point.

The dark field, or background, against which the diamond is viewed, is provided preferably by means of a slide 22 that slides in through the casing 1 and the reflector 13 through slots 23 and 23a. This slide 22 is located over a circular box or rest 24, the axis of which substantially coincides with the line joining the focal points of the reflectors. The slide 22 may be reversible, one-half of it being formed of an opaque plate 22a, and the other half composed of a translucent plate 22b. The rest 24 may have a central opening 25 formed with an inturned flange 26, said flange being formed with a stop 27 for the forward edge of the slide. The arms 19 support the rest 24.

In order to prevent the glare from the reflecting surface of the secondary reflector 13 from detracting from the perfect vision of the observer in examining the diamond, the reflecting surface 13*a* of the secondary reflector, is formed or treated so that it has a partial diffusing effect on the light rays reflected by it upon the diamond. This is accomplished by employing a finish which is known as a "satin" finish. By this means although the diamond will be highly illuminated, its capacity for enabling imperfections in the diamond to be observed is greatly increased.

The satin finish on the secondary reflector is highly advantageous for the reason that it permits the observer's eye to examine the diamond without being blinded by too intense reflected rays. However, a quite beneficial effect can be obtained by providing the satin finish on the reflecting surface of the primary reflector, and using the usual highly polished reflecting surface for the secondary reflector. In accordance with my invention, one or the other of these reflectors, however, should have the diffusing effect.

In examining some stones for other purposes, it may be desired to employ the instrument without the dark background, and with the under face of the diamond illuminated by direct rays passing up from the lamp, but slightly diffused. In order to permit this instrument to be used in this way, the slide 22 should be removed and reversed so as to present the translucent plate 22*b* between the gem and the lamp. Of course, such translucent plates or screens may have different degrees of translucency so as to enable the amount of transmitted light to be regulated as desired.

What I claim is:

1. A dark field illuminator for examining precious stones, having a primary substantially parabolic reflector and a secondary substantially parabolic reflector, said reflectors being mounted substantially coaxially with their concave sides toward each other, a source of illumination located substantially at the focal point of the primary reflector, the secondary reflector being truncated and of annular form so as to present an opening, and with its focal point located beyond the plane of the opening with respect to the body of the reflector, one of said reflectors having a surface finish operating to partially diffuse the reflected light; and a dark background located on the axes of the reflectors and between the reflectors against which the stone may be viewed, said reflectors cooperating to reflect the rays from the source of illumination, around the periphery of the background and up through the said opening onto the stone when held at the focal point of the secondary reflector.

2. A dark field illuminator for examining precious stones, having a primary substantially parabolic reflector and a secondary substantially parabolic reflector, said reflectors being mounted substantially coaxially with their concave sides toward each other, a source of illumination located substantially at the focal point of the primary reflector, the secondary reflector being truncated and of annular form so as to present an opening, and with its focal point located beyond the plane of the opening with respect to the body of the reflector, said secondary reflector having a surface finish operating to partially diffuse the reflected light; and a dark background located on the axes of the reflectors and between the reflectors, against which the stone may be viewed, said reflectors cooperating to reflect the rays from the source of illumination, around the periphery of the background and up through the said opening onto the stone when held at the focal point of the secondary reflector.

3. A dark field illuminator for examining precious stones, having a casing disposed on a vertical axis with an opening at its upper end, a primary reflector supported in the lower portion of the casing, a lamp carried at the focus of the primary reflector, a secondary reflector consisting of a truncated annular shell presenting an opening at its smaller end and with its focal point located beyond the plane of the opening with respect to the body of the shell, said reflectors being disposed coaxially with their concave sides toward each other, said secondary reflector having a slot in the wall thereof, a slide adapted to be slid through said slot and carrying a dark background on its upper side located on the axes of the reflectors, said lamp and reflectors cooperating to reflect the rays upwardly around the periphery of the dark field and up through said opening to the focal point of the secondary reflector to cast the reflected rays onto the precious stone when held at the focal point of the secondary reflector and viewed against the said background.

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