July 27, 1937. E. BABER 2,088,024

OPERATING ROOM LAMP

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FIG. 1.

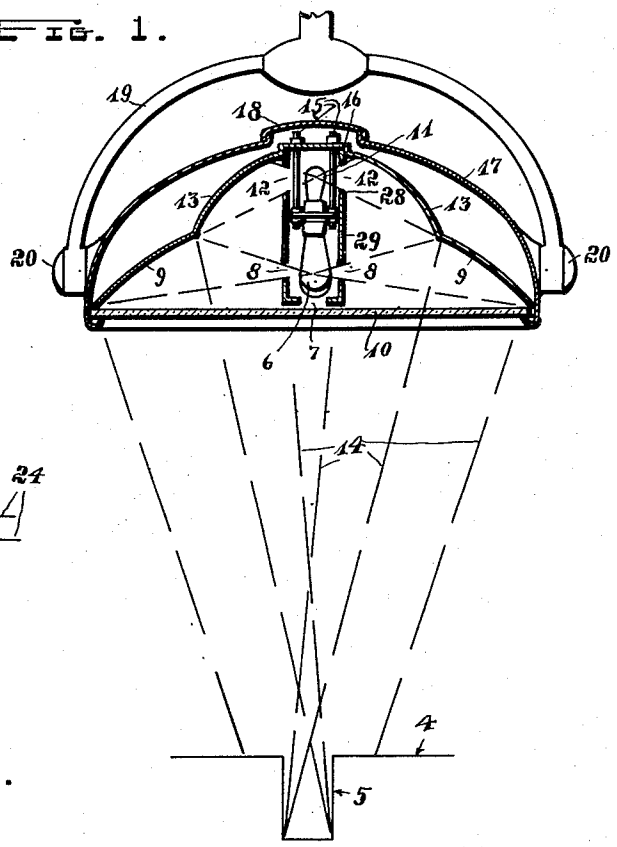

FIG. 3.

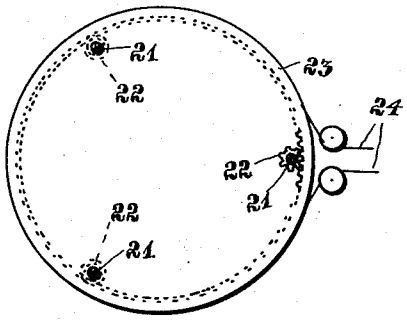

FIG. 2.

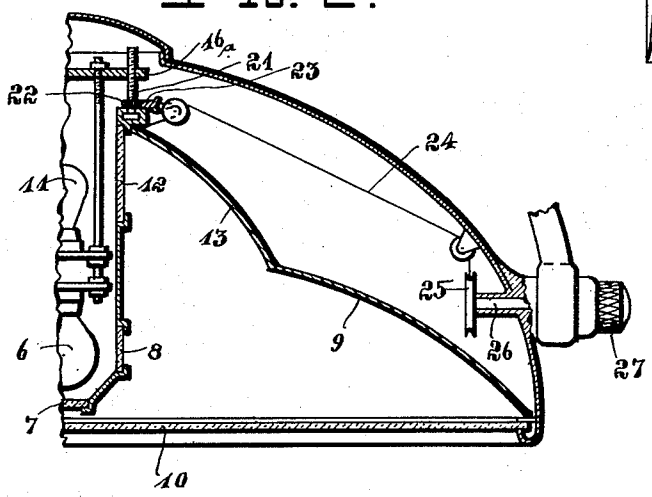

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FIG. 4.

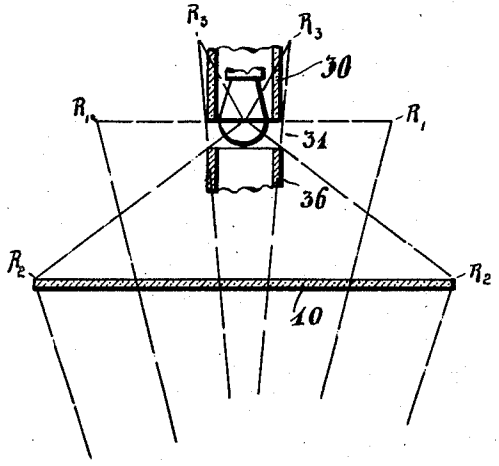


FIG. 5.

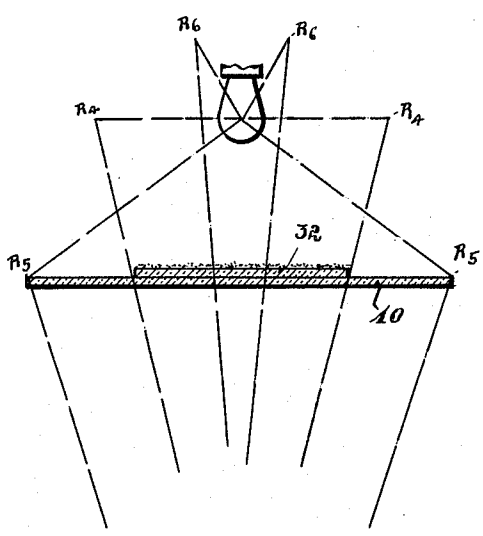


FIG. 6.

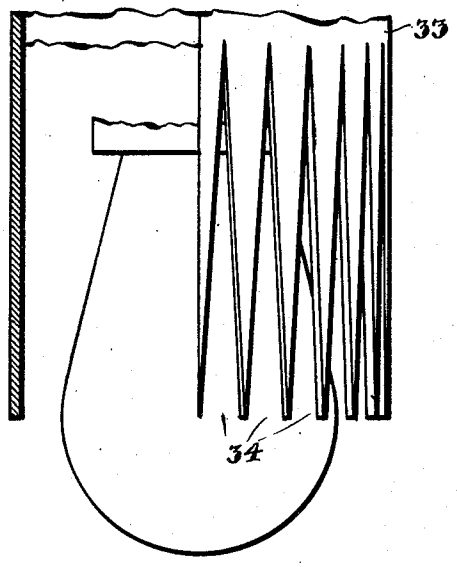
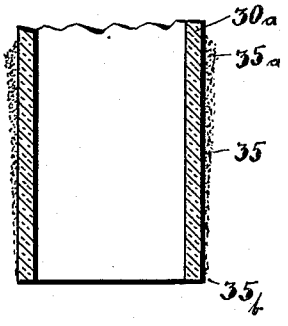


FIG. 7.



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OPERATING ROOM LAMP

Emil Baber, Los Angeles, Calif.

Application September 11, 1935, Serial No. 40,140

7 Claims. (Cl. 240—1.4)

This invention relates to devices especially designed to furnish a desired light and illumination for the operating field.

One of the objects of this invention is to provide a lamp with high intensity light.

Another object is to provide a lamp well concentrated and still with a suitable large operating field.

Another object is to provide a lamp with the greatest possible shadow reduction.

Another object is to provide a lamp with deep penetrating light, to give an excellent incision illumination without disturbing differences of intensity even in the deepest surgical cavity.

Another object is to provide a lamp that is designed that it will satisfy requirements for the safety in operating rooms, for one thing to be vapor-proof.

Other objects will appear from the following description and appended claims as well as from the accompanying drawings, in which—

Fig. 1 is a fragmentary vertical section through a lamp designed according to this invention with a diagrammatic illustration of its application.

Fig. 2 is a fragmentary vertical section through a lamp of a slightly modified form.

Fig. 3 is a plan view of an adjusting means of the lamp in Fig. 2.

Fig. 4 is a fragmentary vertical section through a slightly modified light control.

Fig. 5 is a similar section of still another slightly modified light control.

Fig. 6 is a fragmentary section through a screen of slightly modified form.

Fig. 7 is a similar section through still one more slightly modified form of light control.

Modern surgery requires lamps efficient and effective not only in the strength of light produced but more particularly in giving the proper illumination at the proper place in a proper amount and with the least amount of shadow effect.

The illustration in Fig. 1 may serve to make this clear. Considering 4 to designate the surface into or below which a cavity 5 constitutes the surgical field for which proper illumination is required, it becomes at once apparent that the least shadow effect would make a successful operation very difficult.

However, as here designed, lamps have been provided to cooperate with reflectors to produce a desired light over a suitable large surface as well as to the desired depth, with the various reflections so intermingled as to reduce any possible shadow effect to the possible lowest value.

It must be realized that the hands of the operator as well as tools are constantly between the light source and the operating field at 4 and 5 and still it is absolutely necessary that there should not be any shadow at the point where such tools or instruments are applied or used in order that the effect of such instruments in the operating field may constantly and instantly be under perfect observation.

The two lamps are therefore provided to furnish illumination at depth, over a suitable large surface, and from different sides simultaneously, by means of suitably arranged reflectors that again, or in turn, are provided with cooperating means by which light strikes the reflectors in a very particularly effective manner.

The lamp 6 in Fig. 1 may to a small extent furnish light directly through the window 7, but the larger values in or amount of rays from this lamp are projecting through the windows 8, to be reflected by the reflector 9 through the main window 10.

Another lamp 11 serves to project rays through the windows 12, to be reflected by the reflector 13 through the main window 10.

Some ray reflections have been indicated by the dash lines 14, but it will readily be understood by any man skilled in the art that a multitude of reflected rays can be and are thus provided to fall in from so many different angles that any shadow effect may be eliminated to a great extent, so as to give a desired illumination over the surface 4 as well as for any portion of a surgical cavity such as indicated at 5.

The mounting of the windows has not been shown fully connected in Fig. 1 since this figure is too small and, particularly, since other lines and details were to be shown in this illustration that would only have been made unclear by further details, but it will readily be understood that the window mountings may easily be provided in connection with the reflector mountings.

A simple adjustment for the lamps, however, is indicated here, bolts 15 being suspended from the reflector mounting at 16, whereby the lamps can be adjusted in an up and down direction, for varying the focus of the lamps with respect to the reflectors and with respect to the windows 8 and 12.

The outer housing 17, together with the reflectors 9 and 13 form a safety chamber, the lamps being accessible through a cap 18 in the top of the housing, nevertheless providing a heat absorbing compartment and the structure as a whole

being designed to make it vapor-proof as far as possible.

A bracket 19 serves to support the whole lamp structure by the pivots 20 on the opposite sides of the lamp.

With the slightly modified form illustrated in Figs. 2 and 3, the focusing of the lamps may be accomplished from the outside, the mounting 16_a being adjustable by the columns 21, which are provided with small pinions 22, in turn operative by a ring-gear 23 that again is operative by a line 24 leading over a pulley 25, mounted on a shaft 26 turnable from the outside of the lamp by the knob 27, as clearly illustrated.

While a sufficiently strong, penetrating, central light is very desirable, it is more essential, to have light rays provided so as to strike from all sides in a converging cone of light, with the multitude of light-rays intermingling so as to eliminate shadow effects at the point of operation, and the rays in the combined beam will give best results as arranged here, with the lower lamp 6, in the form illustrated in Fig. 1, preferably stronger than the lamp 11, so that there will always be some rays striking from some side, to eliminate any possible shadow effect, due to any more centrally striking light rays.

It must be understood that the arrangements of the different lamps and the different reflectors, to produce light-rays, to strike the point or place of operation from many different directions, to result in an elimination of shadow effect, as disclosed by this invention, involves distinctly stronger reflections coming from the outside and striking centrally.

It must be clear that rays from the lamp 11, by means of the reflector 13, result in a rather centrally projecting beam.

Regardless of how any rays from the lamp 11 strike the reflector 13, the combined rays from the reflector are preferably used at a point of broadening effect, or, in other words, the arrangement is preferably made so that the combined rays will focus above the point of use.

The rays from the other lamp 6, on the other hand, besides surrounding the beam from the lamp 11, being particularly concentrated by a distinctly independent and separate reflector 9, so concaved and arranged so as to cooperate with the reflector 13 in a manner that the innermost rays from the reflector 9 practically align with the outermost rays from the reflector 13, the combined rays from the reflector 9 being focused rather at the point of use, the combination with the short-focused rays from the reflector resulting in a peculiar overlapping and intermingling of the two resultant light beams at the point of use, and in a particular stronger light striking from the outside, in such a manner that a possibly created shade effect under the central light beam, due to any hand or tool within this beam, should be undercut so as to eliminate or overcome the created shade effect to a great extent by means of this outer light beam.

Similar undercutting of one light beam by another light beam is also accomplished by the other modified forms illustrated in Figs. 4, 5.

In the slightly modified form of Fig. 4, a dimmer 30 is arranged to affect rays striking the upper reflector between the points R_1 and R_3, while leaving other rays striking the lower reflector between the points R_1 and R_2 unaffected, providing a weakened central beam and an unweakened outer beam.

Fig. 5 merely provides for a central heavier portion 32 just above the main window 10, whereby the central beam is weakened while the outer beam is left unweakened or unaffected.

While the dimmer 30 in Fig. 4 may readily be of the so-called frosted type produced on an otherwise transparent body, the slightly modified form of Fig. 6 is of a more solid material, such as metal, the body 33 being provided with slots wider near the lower edge and gradually diminishing upwardly, whereby even the upper portions of rays differ gradually from the lower rays of the upper portion of the lamp, to project towards the upper reflector, while all rays from the lower portion of the lamp, projecting towards the lower reflector, are left unaffected.

With the dimmer 30_a in Fig. 7 a similar effect as created in Fig. 6 may be created by means of a transparent body, the frosting 35 being merely made to differ so that the frosting near the upper edge 35_a is less transparent than the frosting near the lower edge 35_b, it being understood that the frosting here is merely shown of different thickness for the sake of illustration, though such frosting may be differed in any well known manner without standing out in thickness.

From the above it will be understood that it is not absolutely necessary to provide more than one lamp, since with the arrangements illustrated in Figs. 4 to 7 it is possible to create effects readily lending itself to equal effects obtained with the double lamp structures of Figs. 1 and 2.

The principal feature of this invention rests rather in having provided reflectors so designed as to bring the beam of one reflector to a focus at a shorter distance than the beam of another reflector; besides having the reflectors designed so as to produce beams of not only converging cone form but even hollow, with the outermost rays of one beam practically aligning with the innermost rays of another beam, the fact of the inner beam being focused short creating the effect that the outer rays from one side undercut the inner rays from the opposite side, the whole uniting in the effect of shadow elimination, centrally with a deep penetrating light beam and this surrounded by a practically annular evenly distributed second shadow eliminating light beam.

Having thus described my invention, I claim:—

1. In a lamp structure, a central reflector designed to project light-rays beyond its focus to a level where normally used, a second reflector with its innermost edge joining the outermost edge of the first-named reflector and designed to project light-rays having a focus beyond said level, but so as to bring the innermost rays to inwardly overlap the rays of the first-named reflector, a light-source for each reflector, and means for limiting light projections from each source to one of the reflectors.

2. In a lamp structure, distinct light sources, reflectors cooperatively associated and arranged so as to reflect rays from said sources in centrally concentrating and focally converging and uniting light beams with rays from one reflector evenly encircling and undercutting the rays from another reflector, a light source control designed so that the rays from one source can be limited to act through one of the reflectors individually arranged and designed for each source, operating means extending to the outside of the lamp structure for adjusting the light source control, and a housing spaced from the reflectors forming an insulating compartment and to form the casing

for the inner parts of the control and operating means.

3. In a lamp structure, a central reflector designed to project a beam of light-rays beyond its focus to a level where normally used, and a second reflector designed to project a hollow light cone of annular form and so as to adjoin and surround said beam above said focus and with the inner rays of less convergence than the outer rays in a generally converging light cone and so as to undercut the rays of the first-named beam below said focus.

4. In a lamp structure, a central reflector designed to project a beam of light-rays beyond its focus to a level where normally used, and a second reflector designed to project a hollow light cone of annular form so as to adjoin and surround said beam above said focus and so as to undercut the rays of the beam below said focus.

5. In a lamp structure, a central reflector designed to project a beam of light-rays beyond its focus to a level where normally used, and a second reflector designed to project a hollow light cone of annular form so as to adjoin and surround said beam above said focus and so as to undercut the rays of the beam below said focus by having the focus of the cone below the first-named focus.

6. In a lamp structure, a central reflector designed to project a beam of light-rays beyond its focus to a level where normally used, and a second reflector designed to project a hollow light cone to focus at said level with the inner rays having a convergence of similar form as the convergence of the outer rays of said beam.

7. In a lamp structure, a central reflector designed to project a beam of light-rays beyond its focus to a level where normally used, a second reflector designed to project a hollow light cone of annular form so as to adjoin and surround said beam above said focus and so as to undercut the rays of the beam below said focus, and means for providing stronger light in the cone than in the beam for greater shade elimination by the undercutting rays from the outer cone.

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