

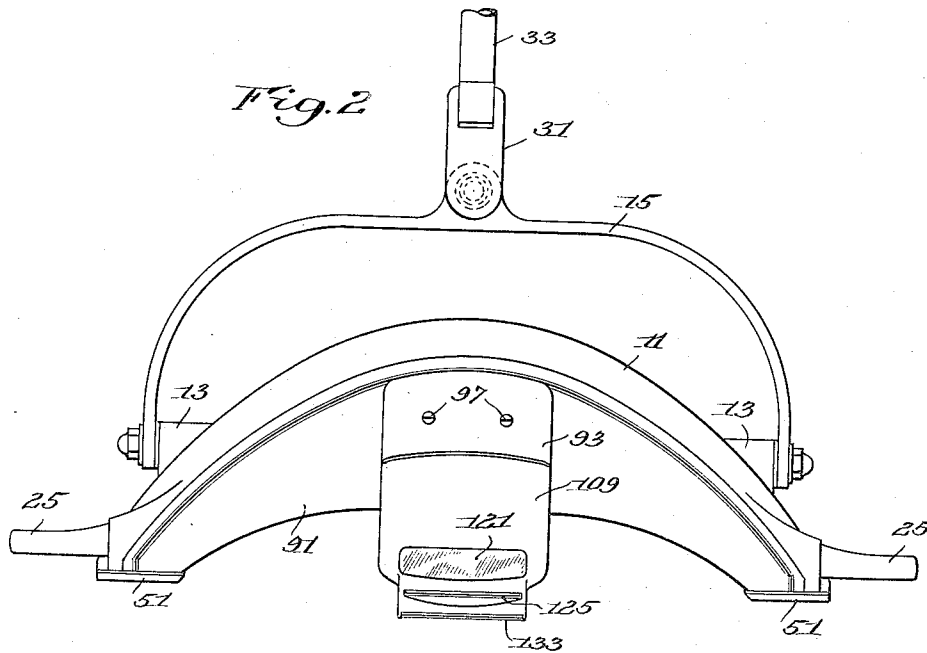
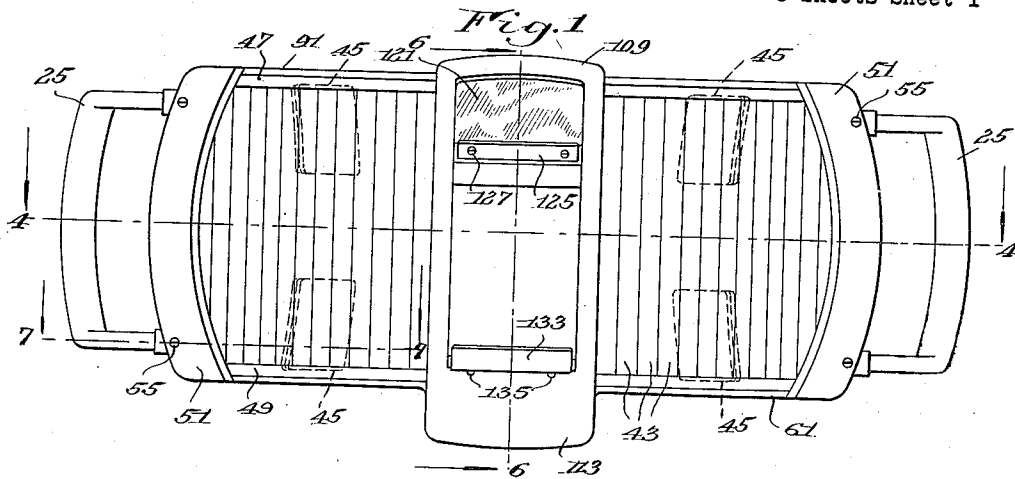
Feb. 6, 1951

E. H. GREPPIN  
DENTAL OPERATING LAMP

2,540,577

Filed Oct. 22, 1946

3 Sheets-Sheet 1



INVENTOR.  
*Ernest H. Greppin*  
BY *Charles Shepard*  
his Attorney

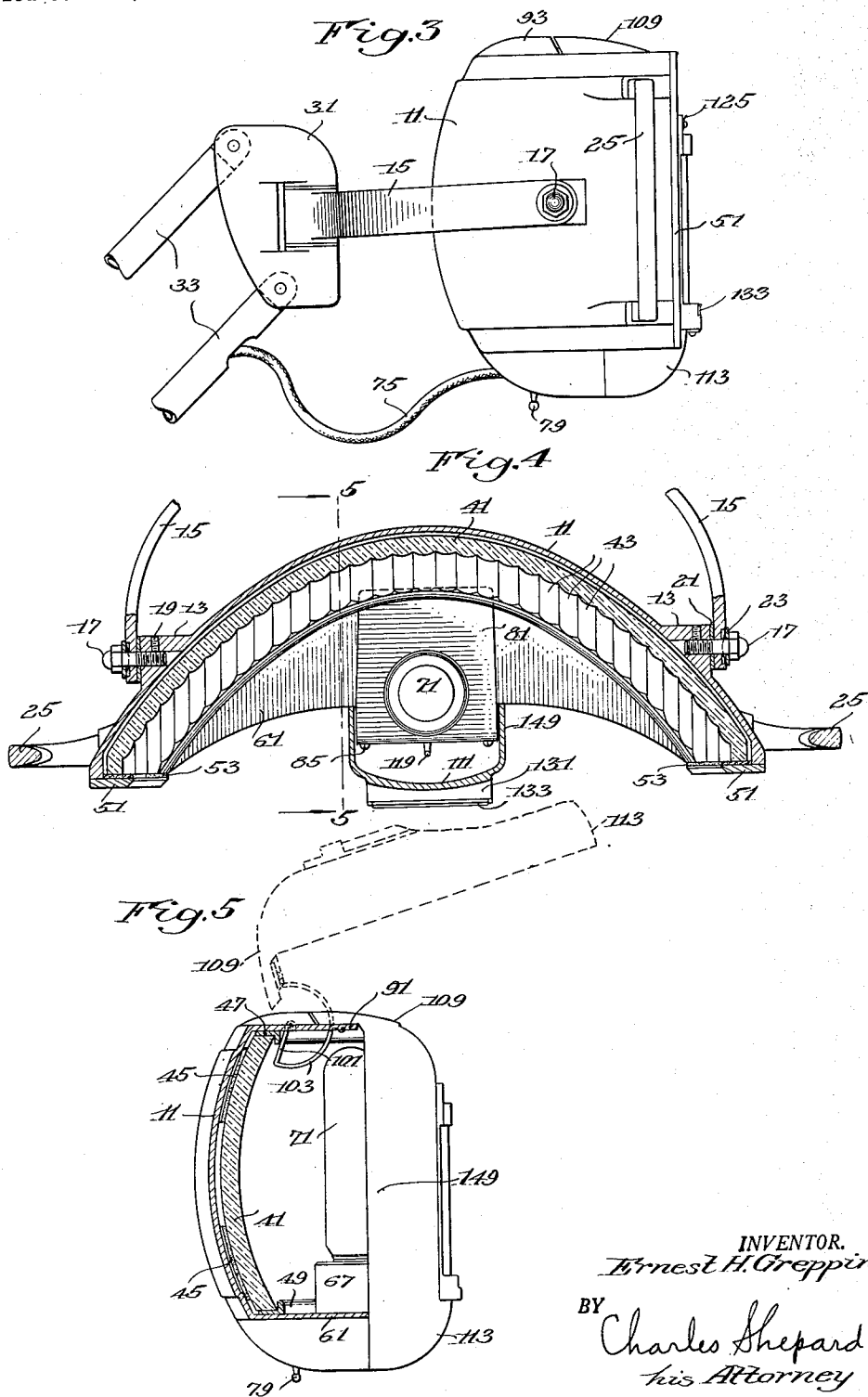
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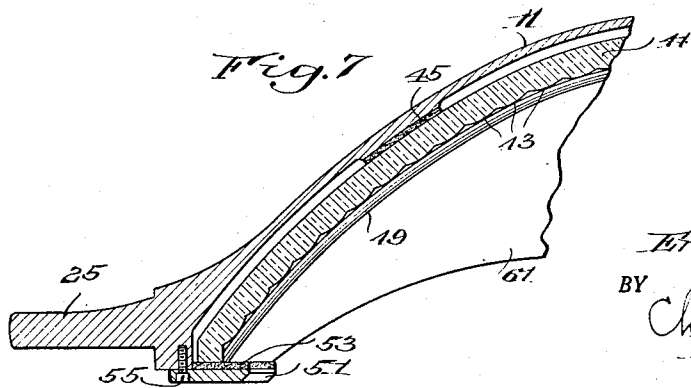
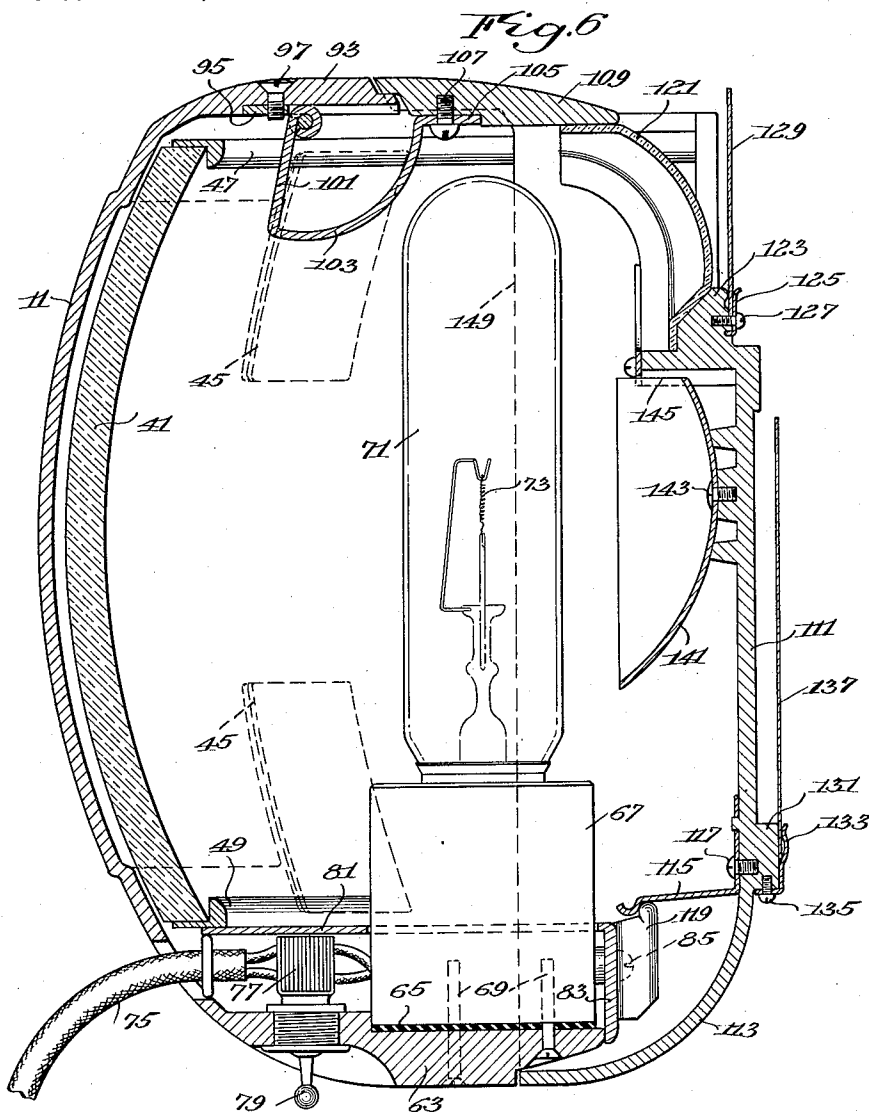
**Feb. 6, 1951**

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3 Sheets-Sheet 3



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*Ernest H. Greppin*  
BY *Charles Shepard*  
*his Attorney*

## UNITED STATES PATENT OFFICE

2,540,577

## DENTAL OPERATING LAMP

Ernest H. Greppin, Rochester, N. Y., assignor to  
Wilmot Castle Company, Rochester, N. Y., a  
corporation of New York

Application October 22, 1946, Serial No. 704,849

21 Claims. (Cl. 240—41.15)

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The present invention relates to a dental operating lamp and has for its principal object the provision of a generally improved and more satisfactory lamp of this character.

Another object is the provision of a dental operating lamp of simple, compact, and light weight construction while at the same time being of neat and attractive appearance.

Still another object is the provision of a dental operating lamp so designed and constructed as to provide high intensity illumination of the patient's oral cavity with substantially shadowless effect, without shining brightly into the patient's eyes, the band of illumination being spread laterally to a substantial extent so that the lamp ordinarily does not require readjustment when the position of the patient's mouth shifts horizontally, as when turning his head from side to side.

A further object is the provision of a dental operating lamp of the above-mentioned character, having improved and convenient means for holding a tooth chart and for holding and illuminating an X-ray film, both in convenient position of observation by the dentist.

A still further object is the provision of a dental operating lamp in which the above-mentioned constructional features are so correlated that, without sacrifice of the optical and mechanical efficiency of the lamp, the lamp may be made of very attractive modern or "streamlined" appearance.

A still further object is the provision of a lamp having the above-mentioned characteristics, yet so designed and constructed that it is easy and inexpensive to manufacture and sturdy and rugged in use.

These and other desirable objects are accomplished by the construction disclosed as an illustrative embodiment of the invention in the following description and in the accompanying drawings forming a part hereof, in which:

Fig. 1 is a front elevation of a lamp in accordance with a preferred embodiment of the invention;

Fig. 2 is a top plan thereof;

Fig. 3 is a side elevation thereof;

Fig. 4 is a horizontal section taken substantially on the line 4—4 of Fig. 1;

Fig. 5 is a vertical section taken substantially on the line 5—5 of Fig. 4;

Fig. 6 is a vertical section taken substantially on the line 6—6 of Fig. 1; and

Fig. 7 is a fragmentary horizontal section taken substantially on the line 7—7 of Fig. 1.

The same reference numerals throughout the several views indicate the same parts.

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The present application constitutes a continuation in part of the copending United States patent application of Ernest H. Greppin, Serial No. 668,268, filed May 8, 1946, now Patent No. 2,437,516, granted March 9, 1948, for Dental operating lamp construction. Certain subject matter disclosed but not claimed in the present application is claimed in said copending application.

In the preferred embodiment of the invention the lamp comprises, in general, a casing 11 having a curved back and having ears or lugs 13 formed integrally on the back, which lugs serve to support the entire lamp by any convenient supporting mechanism such as the yoke or fork 15 carrying screws 17 passing through the arms of the yoke and threaded into tapped openings in the lugs 13 and held against turning therein by set screws 19. Washers 21 between the yoke arms 15 and the lugs 13, and resilient spring washers or friction washers 23 between the heads of the screws 17 and the yoke arms 15, serve to place a certain amount of frictional resistance on the joint so that the lamp will stay in any position to which it is tilted relative to the yoke, but it may be easily tilted to a new position when desired, by grasping one or both of the handles 25 which project laterally from opposite ends of the casing 11 as best seen in Figs. 1 and 4. The pivotal axis passing in a straight line through the two pivot screws 17 passes substantially through the center of gravity of the lamp, so that there is no substantial tendency for the lamp to tilt one way or the other when it has been set in the desired position.

The yoke 15 is supported in any convenient manner, such as by being pivoted for horizontal swinging movement on a vertical pivot in the block 31 which is supported, in turn, by supporting arms or links 33 (Fig. 3). The details of the supporting mechanism constitute no part of the present invention, but form the subject matter of the copending United States patent application of Ernest H. Greppin, Serial No. 704,850, filed October 22, 1946, for Mounting mechanism for dental lamps, now Patent No. 2,483,699 issued Oct. 4, 1949.

Mounted within the curved casing 11 is a combined reflecting and refracting unit (that is, a catadioptric unit) indicated in general by the numeral 41, and having a rear face substantially in the shape of a prolate spheroid; that is, an ellipsoid of revolution formed by the revolution of an ellipse about its major axis. The rear face of the catadioptric member 41 is silvered or otherwise treated to cause it to reflect light rays incident upon it. The front face of the unit 41

is, in general, a similar prolate spheroid, but superimposed upon the theoretical spheroid surface are convex flutes 43 arranged vertically as seen in Figs. 1 and 4. The unit 41 is made preferably of borosilicate glass containing ferrous oxide or ferrous oxalate, and cobalt, and either zinc or cadmium or a mixture thereof, so that it is both heat absorbing and heat resisting and color correcting. The details of the shape or configuration of the catadioptric unit 41, and the composition thereof, and the optical results or effects produced thereby, are fully set forth in Patent No. 2,437,516, and need not be repeated here, reference being hereby made to said patent for a full disclosure thereof. The optical unit 41 in the present structure is preferably identical with the unit disclosed in said patent, except that in the present construction the top and bottom flanges designated in said patent by the numeral 31 are omitted, but this does not in any way alter the optical properties of the device, since said flanges in the disclosure of the patent were merely for strengthening purposes and had no optical effect.

As explained in said patent, the catadioptric unit 41 has curved lateral ends and an approximately straight top and bottom which lie in horizontal planes when the optical axis of the unit is arranged horizontally. This is well seen in the present drawing, particularly in Figs. 1, 4, and 6. The casing 11 has its rear face shaped to conform very closely to the rear face of the catadioptric unit, but throughout the major part of the area there is a slight space between the casing 11 and the rear face of the unit, as seen in Figs. 4 and 6, in order to avoid any possibility of scratching the reflecting surface of the optical unit by contact with the casing. The unit is supported from the casing at four spaced points by pads 45 (Figs. 1, 5, 6, and 7) of soft material such as felt, cemented or glued to the inner or forward face of the rear wall of the casing 11. It is held tightly and immovably against these pads by a curved molding strip 47 extending along the curve of the top edge of the optical unit 41 and having an angular cross section to embrace the edge as shown, and a similar molding strip 49 extending along the bottom edge of the unit, as seen in Figs. 5 and 6. The ends of both molding strips underlie and are held in place by lateral strips 51 at the ends of the casing, which strips 51 press rearwardly against soft pads 53 of felt or the like interposed between the strips 51 and the front faces of the lateral edges of the optical unit 41. These strips 51 are secured to the casing 11 by screws 55 or other suitable fastenings.

A shelf or flange 61, preferably formed integrally with the rear wall of the casing 11, projects horizontally forwardly at the bottom of the optical unit 41, throughout most of the width of the unit, as seen in Figs. 1, 4, and 5. For a short distance at the center, however, this flange 61 is omitted, and is replaced by an integral flange 63 (Fig. 6) which is thicker and stronger and at a lower elevation than the flange 61 and which carries an insulating plate 65 which supports a lamp socket 67 held by screws 69. In the lamp socket is an incandescent lamp bulb 71 having a short filament 73 located on the optical axis of the optical unit 41 and substantially at one focus of this optical unit, as explained in said Patent No. 2,437,516. The lamp is fed with current through electric wires 75 controlled by a small toggle switch 77 mounted in an opening in the flange 63 as seen in Fig. 6, the switch being operated by a

handle 79 conveniently accessible at the bottom of the casing. Above the flange 63 and switch 77 is a plate 81 at the same level as the flanges 61 and forming in effect a smooth continuation of these flanges, bridging the space between them (around the lamp socket 67) in the central portion of the casing. A depending flange 83 at the front edge of the plate 81 abuts against the front edge of the flange 63, and the plate is held in place by screws 85 passing through this front flange 83.

At the top of the casing is a forwardly extending flange 91 preferably formed integrally with the rear wall 11 and having a somewhat curved front edge as seen in Fig. 2. At the center, this top wall is somewhat raised and thickened as at 93 (Fig. 6) and forms a mounting for a hinge having a stationary leaf 95 secured to the underside of the flange 93 by screws 97. Pivoted to the stationary leaf 95 by the usual pintle is the movable hinge leaf having a radial part 101 supporting an arcuate part 103 concentric with the pintle, and extending through a central angle of about 100°, at the end of which arcuate part is a radial part 105 secured by screws 107 to the top flange portion 109 of a swinging door having also a front plate 111 and a curved bottom plate 113 curved downwardly and rearwardly and abutting against a shoulder on the bottom flange 63 when the parts are in the closed position shown in Figs. 5 and 6. The door parts 109, 111, and 113 are preferably made integrally from a single piece of opaque material such as metal or molded opaque plastic. A resilient spring clip 115 is secured by the screw 117 to the inner face of the front wall 111 near the bottom thereof and resiliently engages a protuberance on a member 119 mounted on the flange 83, thus constituting a latch resiliently holding the door in closed position. By pulling outwardly or forwardly on the lower part of the door 111 with sufficient force to cause the resilient latch 115 to disengage itself from the member 119, the entire door may be swung forwardly and upwardly about the hinge 95, 101 as a pivot, from the position shown in full lines in Fig. 5 to the position shown in dotted lines. In its uppermost position shown in dotted lines the radial portion 101 of the hinge comes into contact with the forward edge of the flange 93 of the casing which projects forwardly beyond the hinge pintle as seen in Fig. 6, and prevents further rotary movement of the hinge, stopping the parts in a position such that the upper rear edge of the part 109 of the door does not quite touch the top of the casing 93 and thus does not mar the casing or cause any damage to the parts.

In the upper part of the door 111 is an opening of substantial size as seen in Figs. 1 and 6, which opening is filled with a plate 121 of translucent material, preferably a translucent plastic having light-transmitting and diffusing properties approximately similar to those of ground glass. This member 121 is conveniently curved through a substantial arc when viewed in vertical section as in Fig. 6, and somewhat curved on a larger radius in horizontal section to agree with the larger radius horizontal curvature of the front face of the door 111 as seen in Fig. 4. Along the bottom of the window opening in which the translucent member 121 is placed there is a straight flange or rib 123, on the front edge of which there is a horizontally elongated metal strip 125 constituting a resilient spring clip held by screws 127. The material of the rib 123 is slightly relieved or recessed behind the upper part of the

strip 125, and the upper edge of the strip is slightly curved forwardly, to assist easy insertion of a transparency behind the strip. Any transparency which is helpful to the dentist, such for example as an X-ray film showing the teeth which are to be worked upon, may be held in place as shown at 129 in Fig. 6 by thrusting its lower edge downwardly between the spring clip 125 and the flange 123, and when thus held by the spring clip the transparency will maintain an upright position as indicated in Fig. 6 and will be illuminated by diffused light coming from the lamp 71 and passing through the translucent window 121.

Lower down on the front face of the front wall of the door 114 is a second horizontally extending rib 131 having an elongated metallic spring clip 133 mounted against the front face of the rib by screws 135. This spring clip 133 may be used for mounting any diagram, chart, or indicia 137 which will be helpful to the dentist while he is working on the patient and which does not require illumination from the rear, such for example as an ordinary tooth chart usually made of thick paper or thin cardboard, on which the dentist's assistant has marked the cavities found in the patient's teeth.

On the inner face of the front wall 114 of the door is mounted a fragmentary reflector 141 held in place by screws 143, the reflector preferably being a polished metal reflector in the shape of a fragment of a sphere, mounted in such position as to be directly in front of the incandescent filament 73 of the lamp bulb. The upper part of the reflector is cut off or truncated as at 145 so that the reflector will not interfere with passage of light from the filament obliquely upwardly to the translucent window 121 for the purpose of illuminating the X-ray film or other transparency 129. Most of the light passing forwardly from the filament 73 in other directions is, however, intercepted by the reflector and reflected rearwardly onto the optical unit 41, where the light is both reflected and refracted to form the highly desirable projected beam of light having a wide horizontal spread but a narrow or confined vertical spread, for the purpose above mentioned and as more fully described in said Patent No. 2,437,516.

The door 109, 111, 113 also has rearwardly extending lateral flanges 149 which extend rearwardly far enough to cut off all rays of light which, if not cut off, would pass forwardly beyond the front edges of the optical unit 41 at the ends thereof. It will be noted from Fig. 4 that the incandescent bulb 71 is set back a substantial distance behind the vertical plane of the front edges of the optical unit 41, and it will be noted that the side walls 149 of the door extend back far enough to touch or go slightly behind a straight line which may be drawn from the center of the bulb 71 to the extreme ends of the optical unit 41 or to the molding strips 51 at the ends of the optical unit. Hence it is assured that any ray of light from the filament 73 which passes behind the side flanges 149 of the door will necessarily fall on the optical unit and be reflected and refracted thereby, so as to be optically directed and controlled in the desired manner. No matter from what position one looks at this dental lamp, there is no possibility of experiencing the glare and disagreeable sensation which would be caused by a direct view of the incandescent filament. In any position of observation, illumination can

be received only by light rays which have been reflected and refracted by the optical unit 41.

The reflected and refracted rays coming from near the center of the catadioptric unit 41 are, of course, obstructed and cut off by the door 109, 111, 113, 149, so that the rays which illuminate the oral cavity necessarily come from those portions of the optical unit 41 which lie to the left and right of the door when viewed as in Fig. 1. Thus the field of illumination is lighted by rays converging toward the field from different directions at a substantial angle to each other, which makes for well nigh shadowless illumination of the field, eliminating or greatly reducing the shadows which would be cast by the dentist's tools and implements if the oral cavity were illuminated by rays coming from substantially a single point.

As the patient sits in the dental chair and as the light shines on the lower part of the patient's face, it does not shine brightly into his eyes because of the laterally extended and vertically restricted nature of the beam of light. The handles 25 may be grasped to adjust the light quickly and easily so that the bright field is below the level of the eyes of the patient. The tooth chart 137 and the X-ray film 129 will constantly be available for instant inspection by the dentist as the work progresses, in addition to which they are also in a position where they can be easily viewed by the patient himself if the dentist desires to point out or explain to the patient any of the features of the X-ray or of the tooth chart.

Whenever it is desired to replace the incandescent bulb 71 or to clean the reflector 141 or to clean the front face of the optical unit 41, the door may be quickly and easily thrown open from the full line position of Fig. 5 to the dotted line position in that figure, thus obtaining instant access to the interior of the lamp. When the door is closed again, the spring latch 115 operates automatically and holds it in closed position.

It will be noted that the door constitutes what may be described aptly as a bridge member, since it bridges across the narrow dimension (that is, the height) of the optical unit 41, in a direction transverse to the major dimension (that is, the lateral width) of the unit, and occupies a position in front of the source of light so as to block off direct forward transmission of light from the source.

It is seen from the foregoing disclosure that the above-mentioned objects of the invention are admirably fulfilled. It is to be understood that the foregoing disclosure is given by way of illustrative example only, rather than by way of limitation, and that without departing from the invention, the details may be varied within the scope of the appended claims.

What is claimed is:

1. A dental operating lamp including a casing containing a reflecting element having a general rearwardly convex and forwardly concave shape, said element being substantially elongated in one direction compared to its dimension transverse to the elongated direction, a bridge member mounted on said casing and bridging said reflecting element in said transverse direction at a point near the center of said element in the direction of elongation thereof, a source of light mounted behind said bridge member so that light from said source may pass obliquely rearwardly to said reflecting element and thence be reflected forwardly past one side of said bridge member, said bridge member being mainly of substantially

opaque material and having a substantially translucent window portion, and retaining means adjacent an edge of said window portion for holding a dental transparency in position to be illuminated by light coming through said window portion.

2. A dental operating lamp including a casing containing a reflecting element having a general rearwardly convex and forwardly concave shape, said element being substantially elongated in one direction compared to its dimension transverse to the elongated direction, a bridge member mounted on said casing and bridging said reflecting element in said transverse direction at a point near the center of said element in the direction of elongation thereof, a source of light mounted behind said bridge member so that light from said source may pass obliquely rearwardly to said reflecting element and thence be reflected forwardly past one side of said bridge member, said bridge member being mainly of substantially opaque material and having a substantially translucent window portion, retaining means adjacent an edge of said window portion for holding a dental transparency in position to be illuminated by light coming through said window portion, and other holding means on said bridge member substantially spaced from said window portion for holding a tooth chart or the like in convenient position to be observed by a person in front of said lamp.

3. A dental operating lamp including a casing containing a reflecting element having a general rearwardly convex and forwardly concave shape, said element being substantially elongated in one direction compared to its dimension transverse to the elongated direction, a bridge member mounted on said casing and bridging said reflecting element in said transverse direction at a point near the center of said element in the direction of elongation thereof, and a source of light mounted behind said bridge member so that light from said source may pass obliquely rearwardly to said reflecting element and thence be reflected forwardly past one side of said bridge member, said bridge member being mainly of substantially opaque material and having a substantially translucent window portion, and spring clip means adjacent an edge of said window portion for retaining a dental transparency in position to be illuminated by light coming through said window portion.

4. A dental operating lamp including a casing, a source of light mounted in said casing, a first reflecting element behind said source of light, said reflecting element being of relatively low height from top to bottom and being of relatively great lateral extent with the ends thereof curving forwardly to positions ahead of the transverse plane of said source of light and being of substantially continuous unbroken form throughout the entire width of said lateral extent, a bridge member extending from the upper central part of said casing downwardly in front of said source of light to the lower central part of said casing, and a second reflecting element carried by the rear face of said bridge member and located substantially directly in front of said source of light to reflect light rays therefrom rearwardly toward said first mentioned reflecting element.

5. A construction as described in claim 4, in which said first reflecting element has approximately the general shape of a portion of a prolate spheroid with said source of light approximately at the near focus thereof.

6. A dental operating lamp including a casing

substantially open at the front and having approximately parallel top and bottom walls and a rear wall curved to be generally concave on its front face and being of substantially greater lateral extent in a direction parallel to said top and bottom walls than its vertical extent in a direction between said top and bottom walls, a lamp socket mounted on said bottom wall near the center thereof, an incandescent electric lamp bulb mounted in and projecting upwardly from said lamp socket, and a bridge member movably connected to said upper wall approximately at the center thereof and extending therefrom downwardly in front of said bulb substantially to said bottom wall.

7. A dental operating lamp including a casing substantially open at the front and having approximately parallel top and bottom walls and a rear wall curved to be generally concave on its front face and being of substantially greater lateral extent in a direction parallel to said top and bottom walls than its vertical extent in a direction between said top and bottom walls, a lamp socket mounted on said bottom wall near the center thereof, an incandescent electric lamp bulb mounted in and projecting upwardly from said lamp socket, a bridge member movably connected to said upper wall approximately at the center thereof and extending therefrom downwardly in front of said bulb substantially to said bottom wall, said bridge member being mainly of opaque material and having a translucent portion, and spring clip means for holding a dental transparency in position in front of said translucent portion to be illuminated by light passing from said incandescent bulb through said translucent portion.

8. A dental operating lamp including a casing substantially open at the front and having approximately parallel top and bottom walls and a rear wall curved to be generally concave on its front face and being of substantially greater lateral extent in a direction parallel to said top and bottom walls than its vertical extent in a direction between said top and bottom walls, a lamp socket mounted on said bottom wall near the center thereof, an incandescent electric lamp bulb mounted in and projecting upwardly from said lamp socket, a bridge member movably connected to said upper wall approximately at the center thereof and extending therefrom downwardly in front of said bulb substantially to said bottom wall, said bridge member being mainly of opaque material and having a translucent portion, spring clip means for holding a dental transparency in position in front of said translucent portion to be illuminated by light passing from said incandescent bulb through said translucent portion, and other spring clip means for holding a non-transparent dental chart or the like in position on said bridge member in front of an opaque portion thereof.

9. A dental operating lamp including a source of light, a catadioptric unit behind said source of light for directing and controlling light from said source so that the same will be projected in a beam toward the mouth of a dental patient, two separate spring clip means for holding dental indicia in front of said source of light, one of said spring clip means being in position to hold non-transparent indicia such as a tooth chart or the like and the other being in position to hold transparent dental indicia such as an X-ray film or the like, and a substantially translucent member between said source of light and said transparent

indicia so that said transparent indicia will be illuminated by diffused light from said source.

10. A dental operating lamp including a metallic casing, a glass catadioptric unit mounted in said casing, said casing and unit being relatively elongated in a lateral horizontal direction and relatively constricted in a vertical direction, a source of light mounted in front of said catadioptric unit to provide light to be reflected and refracted thereby so as to be projected forwardly in a beam toward the mouth of a dental patient, and a handle projecting from each lateral end of said casing in convenient position to be grasped to adjust the position of said casing and the direction in which said beam of light is projected.

11. A dental operating lamp including a rearwardly convex and forwardly concave casing elongated in a lateral horizontal direction as compared with its vertical height, a forwardly concave reflector within said casing, said casing including a shelf projecting forwardly from a point near the center of the bottom edge of said reflector, a lamp socket mounted on said shelf, a tubular electric lamp engaging said socket and extending upwardly therefrom in a position forwardly of said reflector at its center, and a bridge member pivotally mounted on said casing for swinging movement on a hinge axis rearwardly of said electric lamp, said bridge member, when in normal closed position, extending in front of said electric lamp and obscuring direct forward passage of light rays therefrom.

12. A construction as described in claim 11, in which said reflector has a substantially continuous unbroken reflecting surface in said elongated direction from one lateral edge to the opposite lateral edge thereof.

13. A construction as described in claim 11, in which said bridge member has a major portion of opaque material and a minor portion of translucent material.

14. A construction as described in claim 11, further including a pair of trunnions on the rear convex face of said casing near the lateral ends thereof, means for mounting said casing on said trunnions for pivotal movement about an axis substantially parallel to the direction of lateral elongation of said casing and located approximately midway of the height of said casing, and a pair of handles projecting laterally from the lateral edges of said casing at points laterally beyond said trunnions, in position to be grasped for convenient adjustment of said casing on said axis.

15. A construction as described in claim 11, in which a fixed part of said casing projects forwardly beyond said hinge axis, and in which the pivotal mounting of said bridge member on said casing includes a hinge part extending from said hinge axis in a radial direction for a substantial distance and thence arcuately to said bridge member, the arcuately extending portion being spaced sufficiently far from said hinge axis to clear said fixed part of said casing during opening and closing movements of said bridge member and the radially extending portion serving to contact with said fixed part of said casing to limit the extent of swinging movement of said bridge member in an opening direction.

16. An illuminating unit including a rearwardly convex and forwardly concave casing elongated in a lateral horizontal direction as compared with its vertical height, a catadioptric unit within said casing, said catadioptric unit being

of substantially transparent material and having a convex rear reflecting surface lying closely adjacent the concave forward surface of said casing and having a generally concave forward surface provided with a series of integral flutes arranged approximately in planes perpendicular to the direction of lateral elongation of said casing, a flange projecting from the bottom of said casing forwardly past the bottom edge thereof near the midpoint of said bottom edge, a second flange projecting from the top of said casing forwardly past the top edge thereof near the midpoint of said top edge, an electric lamp socket supported from one of said flanges in position to hold a lamp approximately in front of the midpoint of said catadioptric unit, and a bridge member connected to one of said flanges and extending in a generally vertical direction to the other of said flanges and lying in front of a lamp held in said lamp socket to intercept direct forward rays from said lamp.

17. A construction as defined in claim 16, in which the lateral ends of said catadioptric unit extend farther forwardly than a lamp held in lamp socket, and in which said bridge member has lateral flanges extending rearwardly at the sides of a lamp held in said lamp socket, far enough to intercept direct light rays from said lamp which would otherwise pass in front of said lateral ends of said catadioptric unit.

18. A construction as defined in claim 16, in which the front face of said catadioptric unit is freely open to the surrounding atmosphere for direct and unobstructed passage of light rays from said catadioptric unit forwardly to the place to be illuminated, except where intercepted by said bridge member.

19. A construction as defined in claim 16, in which said bridge member has a translucent portion of minor area, the major area of said bridge member being opaque.

20. A construction as defined in claim 19, further including a spring clip mounted on said bridge member adjacent an edge of said translucent portion, for holding indicia in a position alined with said translucent portion to be viewed by light transmitted through said translucent portion of said bridge member.

21. A construction as defined in claim 20, further including a second spring clip mounted on said bridge member at a point remote from said translucent portion, for holding other indicia in a position alined with an opaque portion of said bridge member.

ERNEST H. GREPPIN.

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