Oct. 4, 1949. E. H. GREPPIN 2,483,699

MOUNTING MECHANISM FOR DENTAL LAMPS

Filed Oct. 22, 1946 3 Sheets-Sheet 1

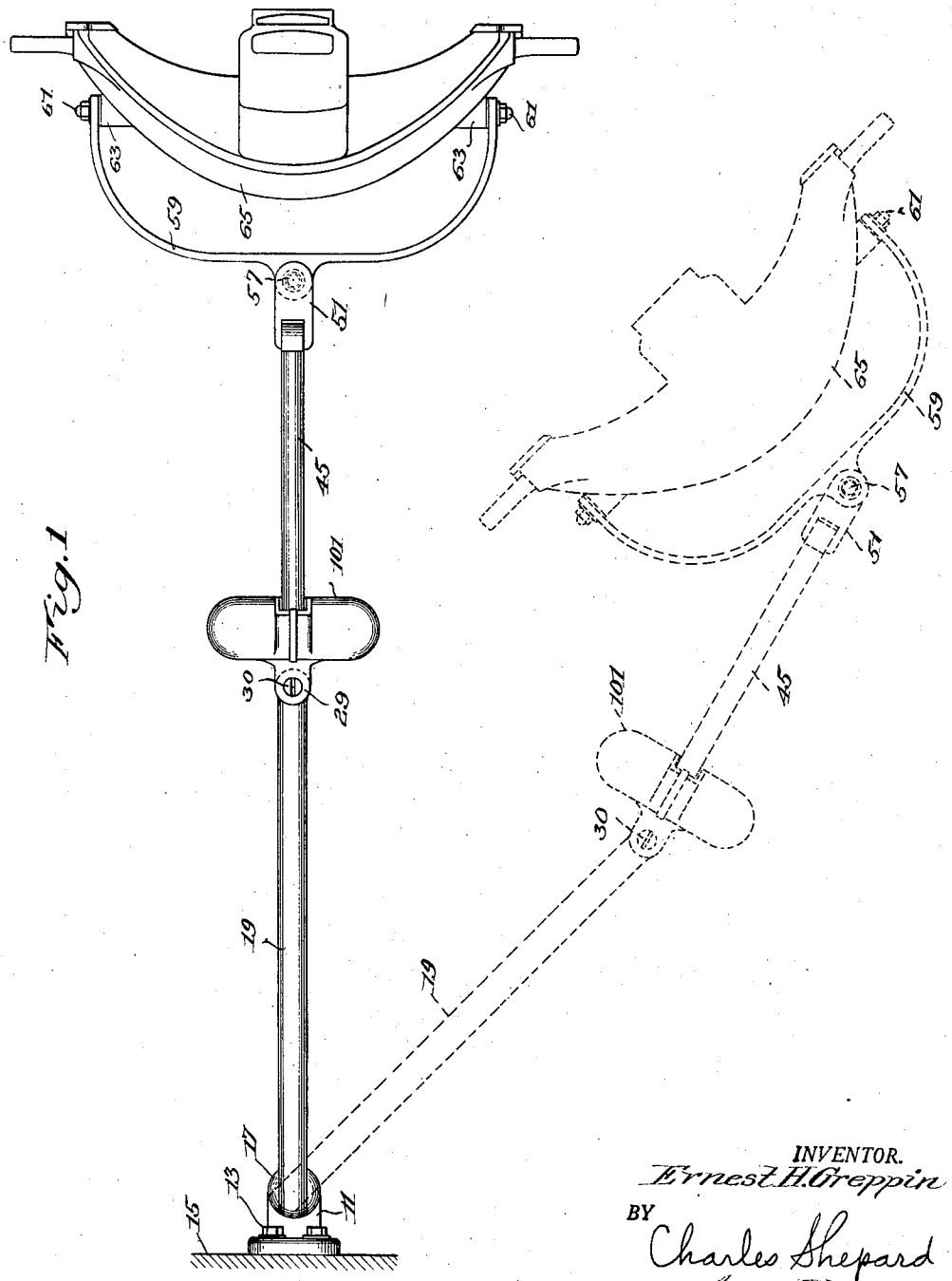

Fig. 1

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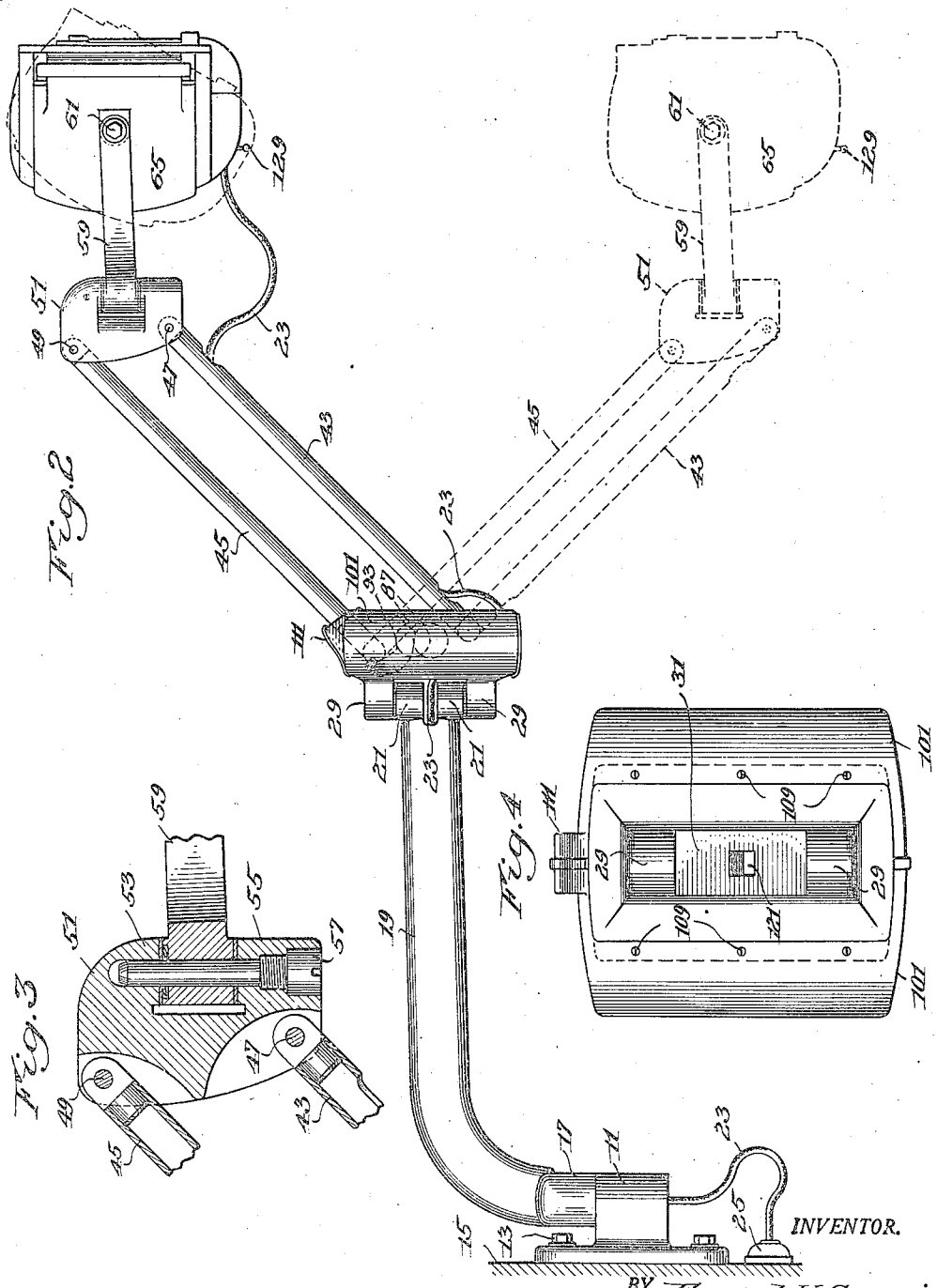

Fig. 2

Fig. 3

Fig. 4

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MOUNTING MECHANISM FOR DENTAL LAMPS

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Fig. 6

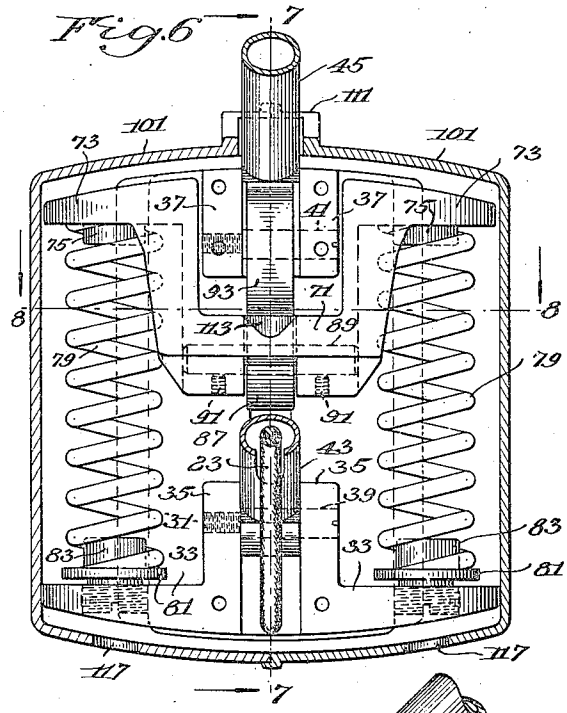


Fig. 5

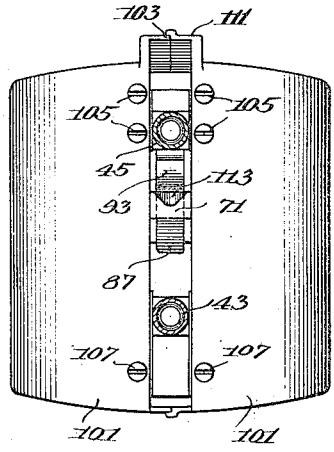


Fig. 7

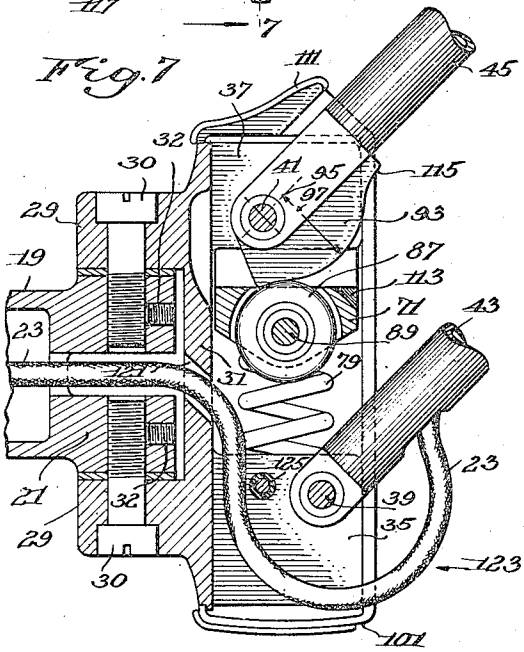
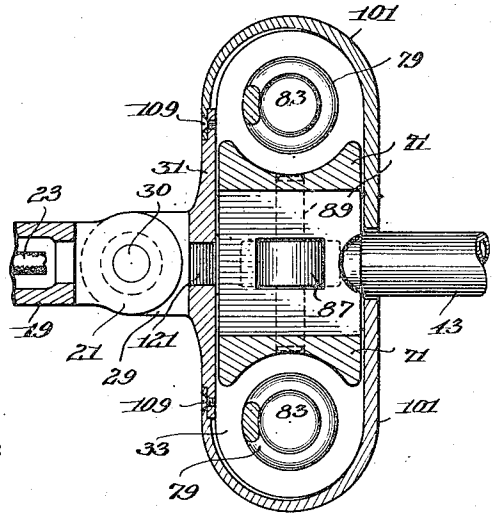


Fig. 8



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UNITED STATES PATENT OFFICE

2,483,699

MOUNTING MECHANISM FOR DENTAL LAMPS

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Application October 22, 1946, Serial No. 704,850

10 Claims. (Cl. 248—292)

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The present invention relates to an adjustable mounting mechanism for dental operating lamps or the like. An object of the invention is the provision of a generally improved and more satisfactory mounting mechanism of this kind.

Another object is the provision of mounting mechanism whereby a dental operating lamp may be moved universally in either vertical or horizontal directions, or tilted as desired, and yet will remain stationary in the position to which it has been adjusted until force is exerted to adjust it to a new position.

Still another object is the provision of improved mechanism whereby upward and downward adjusting movements of the lamp may take place without any tendency to tilt the lamp, so that the lamp may be moved bodily upwardly or downwardly without changing its inclination, unless it is desired to tilt it to a new inclination.

Still another object is the provision of a lamp mounting in which the parts may be moved from one position to another with the greatest ease and convenience.

A further object is the provision, in a lamp mounting of this character, of compensating mechanism for compensating for the increased downward force or leverage exerted by the lamp when the supporting arms are distended to their greatest horizontal extent, as compared to the lesser leverage exerted when the arms are distended to a lesser extent.

A still further object is the provision of a neat and attractive construction whereby the counterbalance springs and various other working parts are enclosed and hidden from view, the exposed portions of the construction being relatively slender and attractive.

A still further object is the provision of mounting mechanism of the character above set forth, which is simple and inexpensive to build and rugged and reliable 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 plan of mounting mechanism in accordance with a preferred embodiment of the invention;

Fig. 2 is a side elevation thereof;

Fig. 3 is a vertical section taken centrally through one of the joints of the mounting mechanism;

Fig. 4 is a rear elevation of another of the joints of the mechanism, with parts omitted;

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Fig. 5 is a front elevation of the same, with parts in section;

Fig. 6 is a transverse section taken through the parts shown in Figs. 4 and 5;

Fig. 7 is a longitudinal section through the same, taken substantially on the line 7—7 of Fig. 6; and

Fig. 8 is a horizontal section through the same, taken substantially on the line 8—8 of Fig. 6.

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

The problems involved in adjusting the position of a dental operating lamp are substantially different from those involved in the adjustment of most lamps of other types. To obtain the greatest usefulness from a dental operating lamp it is necessary to be able to adjust it upwardly and downwardly so as to place the lamp at different elevations, and to adjust it horizontally from side to side so as to illuminate the oral cavity in different ways as required from time to time, and to adjust the lamp horizontally toward and away from the patient's face, and also to tilt the lamp at various angles to a horizontal plane, for it is sometimes desired to have the light shine from a low position upwardly toward the patient's upper teeth, and at other times it is desired to have the light shine from a higher elevation obliquely downwardly toward the patient's lower teeth. The great variety of adjustments which are required to enable a dental operating lamp to be used most successfully and efficiently go far beyond the adjustments ordinarily required for other types of illuminating units.

In the preferred construction, a bracket 11 is secured by screws or bolts 13 to any suitable stationary support such as the wall 15. This bracket contains a vertical bore or bearing which rotatably receives a vertical trunion formed on the lower end of an arm 17, which arm extends upwardly and then curves forwardly to provide a relatively long horizontal section 19 having a pair of vertically spaced ears 21 formed integrally therewith at the forward end thereof. This arm 17, 19 is hollow so that an electric cord 23 supplied with current from a plug 25 may pass upwardly through the bracket 11 and through the arm 17, 19 and out through the front end thereof in the space between the two ears 21.

The top and bottom surfaces of the ears 21 are smoothly faced off horizontally, and these surfaces are embraced between upper and lower

ears 29 which are pivotally connected to the ears 21 by vertical pivot screws 30, held in place by set screws 32. These ears 29 extend rearwardly from and are integral with an approximately vertical plate 31 (Fig. 7) which carries near its bottom edge a pair of latterally spaced forwardly extending flanges 33 (Fig. 6) formed integrally with spaced upwardly extending lugs 35. At the top of the plate 31 there are two other forwardly extending lugs 37 laterally spaced from each other and integral with the plate. The lugs 35 and 37 have laterally extending holes into which pivot screws 39 and 41, respectively, are fitted, forming pivots for the rear ends of a lower arm 43 and an upper arm 45, respectively, which arms form part of a parallelogram linkage. The forward ends of the arms 43 and 45 are pivoted respectively on horizontal pivots 47 and 49 (Fig. 3) near the rear edge of a block 51. At the front of this block 51 are an upper lug 53 and a lower lug 55 vertically separated from each other. A vertical pivot screw 57 is fitted in suitable openings in the lugs 53 and 55, and on this screw is pivotally mounted the rear central part of a forked yoke 59 mounted to swing horizontally on the pivot 57. At the forward ends of the two arms of the yoke 59 are pivot screws 61 extending into bosses or lugs 63 (Fig. 1) on the casing of the dental operating lamp indicated in general by the numeral 65. The exact details of construction of the lamp form no part of the present invention, since the mounting mechanism herein disclosed may be used for mounting various different kinds or designs of dental lamps. However, it is preferred to employ a lamp having the construction disclosed in the copending United States patent application of Ernest H. Greppin, Serial No. 704,849, filed October 22, 1946, for Dental operating lamp. The general outline or shape of such a lamp is indicated in Figs. 1 and 2 of the present drawings.

The two parallelogram arms 43 and 45 are of the same length, and the spacing between the pivots 39 and 41 at the rear ends of these arms is the same as the spacing between the pivots 47 and 49 at the forward ends of these arms, so that these two arms, together with the members 31 and 51, constitute a true parallelogram. The block 51 may, consequently, move upwardly and downwardly in response to vertical swinging movements of the arms 43 and 45 on their pivots 39 and 41, the approximate extreme limits of upward and downward movement being indicated by full lines and dotted lines in Fig. 2. These upward and downward movements will not, however, tilt the block 51, but, because of the parallelogram action, will keep the block 51 always in the same upright position with the pivot 57 always vertical. On this vertical pivot 57 the yoke 59 may swing horizontally in one direction or the other, as indicated in full lines and dotted lines in Fig. 1. The lamp 65 itself may tilt upwardly or downwardly to swing its optical axis in a vertical plane, by swinging the lamp on its yoke pivots 61. The lamp may be shifted horizontally in a lateral direction either by swinging the arm 19 on its trunion in the bracket 11 or by swinging the arms 43 and 45 and their supporting plate 31 on the pivots 30 which support the plate 31 from the arm 19. The lamp may be moved horizontally in a direction toward or away from the wall 15 by collapsing or extending the supporting arms in the fashion of accordion pleats; that is, by causing the pivots 30 to swing to one side or the other of a straight line joining the bracket 11 to the block 51, when the lamp is to be moved closer to the wall 15, or by causing the pivots 30 to move toward such a straight line joining the bracket 11 to the block 51, when it is desired to move the lamp to its maximum distance away from the wall 15.

Spring counterbalancing means are provided for counterbalancing the weight of the lamp and other parts supported from the vertically swingable arms 43 and 45, so as to hold the lamp at any desired elevation at which it is set. The counterbalance mechanism comprises a generally U-shaped yoke 71 (Fig. 6) having, at the tops of the two vertical legs of the yoke, laterally extending ears 73 on the bottom surfaces of which there are short cylindrical protruberances 75. The lateral space between the two vertical arms of the yoke is such that the yoke embraces the lugs 37 and is guided thereby against lateral displacement. Two coiled compression springs 79 are provided, the upper end of each spring pressing against the under side of one of the lateral ears 73 on the yoke 71, and being held against lateral displacement by the projection 75 which extends into the end of the spring. The lower end of each spring rests on an abutment flange 81 formed integrally on a pin 83 which extends partly into and guides the lower end of the spring, the lower end of which pin is threaded through a tapped opening in the flange 33. By means of this screw threaded arrangement, one or the other of the pins 83 may be screwed slightly upwardly or downwardly as may be necessary to cause the two springs 79 to exert equal upward force on the yoke 71 or to adjust the force of both springs.

At the center of the lower horizontal part of the yoke 71 there is a cylindrical roller 87 rotatably mounted on a shaft 89 held in place by set screws 91. This roller bears upwardly against the face of a cam 93 fixed to the rear end of the link arm 45. The cam is so arranged that as the arm 45 swings downwardly from its upmost position toward its lowermost position, the cam 93 progressively pushes the follower roller 87 farther downwardly, compressing the springs 79 more and more. The eccentricity of the cam is just enough to counterbalance the weight of the vertically movable parts, so that the force of the springs 79 exerted through the roller 87 bearing against the cam 93 will be just sufficient to counterbalance the parts without causing any tendency for the parts to move either upwardly or downwardly. The preferred shape of the active surface of the cam 93 is a circular arc having a center at the point 95 and a radius indicated at 97. The center 95 is offset in a direction along the arm 45, from the center of the pivot 41, and with this arrangement the cam is easy to construct, yet effective to produce the result above indicated.

The actual weight of the lamp 65 and the upwardly and downwardly movable parts 43, 45, 51, and 59 is constant, but the apparent weight thereof varies according to the elevation of the lamp. As the lamp swings down from the position shown in full lines in Fig. 2, the lamp moves to a greater horizontal distance from the pivots 39 and 41, thus producing a greater lever arm and exerting a greater turning moment on the cam 93, until the maximum turning moment is reached when the arms 43 and 45 are horizontal, the turning moment decreasing as the arms 43 and 45 swing further downwardly below a horizontal position. Hence the counterbalance springs should exert

their greatest lifting force on the arm 45 when the arm is horizontal, and the lifting force should decrease as the arm 45 is swung above or below the horizontal position. The described construction accomplishes this desirable result. The contact between the cam follower roller 87 and the cam 93 will always be on a straight line joining the roller center 89 and the cam arc center 95. Since the cam arc center 95 is displaced from the rotation center 41 in a direction along the arm 45, it follows that when the arm 45 is horizontal the cam center 95 will be at its maximum horizontal displacement in front of the rotation center 41, so that the point of contact between the roller 87 and the cam 93 will be at its maximum forward position and the upward thrust of the follower roller will act with the maximum moment arm. As the arm 45 swings upwardly or downwardly from the horizontal position, the cam center 95 swings closer to a vertical line through the rotation center 41, and the point of contact between the follower roller and the cam shifts rearwardly, so that the upward force of the cam follower acts with a shorter moment arm, reducing the turning moment for a given upward thrust of the springs. The springs exert an upward thrust which is not perfectly constant but which varies somewhat with increasing or decreasing degree of compression of the springs, of course, but this is not serious and is adequately allowed for in designing the general proportions and dimensions of the cam, with the net result of perfectly counterbalancing the lamp at all elevations thereof, as above stated.

Surrounding and enclosing the plate 31, the springs 79, the roller 87, the cam 93, and associated parts is a casing 101 formed in two complementary halves joining each other on the meeting line 103, each half being secured solidly in place by upper front screws 105 (Fig. 5) threaded into openings in the front faces of the lugs 37 and a lower front screw 107 threaded into an opening in the flange 33, and also by rear screws 109 (Fig. 4) threaded into the plate 31. These two halves of the casing not only enclose the operating mechanism and protect it from dirt and give it a more pleasing and sightly appearance, but also act as guides for the upward and downward movements of the yoke 71. Lateral displacement of the yoke is prevented by the fact that the stationary lugs 37 are embraced between the side arms of the yoke, but forward displacement of the yoke is prevented by the front wall of the casing 101, while rearward displacement is prevented by the plate 31. At the center of the casing 101 the top wall thereof is slightly raised as indicated at 111 (Figs. 5 and 7) to allow the arm 45 to rise somewhat higher and thus to increase the vertical range of movement of the parts. The lower horizontal part of the yoke 71 is notched at 113 (Figs. 6 and 7) to allow the arm 45 to swing downwardly somewhat farther, thus increasing the range of movement in a downward direction. Following the convex arcuate face of the cam 93 there is an outward curve or concave curve 115 at the end of the cam, which comes into contact with the follower roller 87 when the arm 45 reaches the downward limit of its motion and thus stops further downward swinging of the arm. A similar outward curve at the opposite end of the cam limits the upward swinging of the arm.

The bottom wall of the casing has holes 117 (Fig. 6) alined below the screw studs 83, permitting the insertion of a screwdriver to turn the

studs and thus to adjust the force of the springs.

The previously mentioned electric cord 23 which passes through the hollow arm 19 and out between the two spaced lugs 21 thereon, passes through an opening 121 (Figs. 4 and 7) in the plate 31, into the interior of the casing 110, then forms a large loop as seen in Fig. 7 at 123 and enters an opening in the lower side of the hollow arm 43 near the pivot 39 thereof. A cross pin 125 with an insulating bushing on it serves as a guide to hold the wire 23 at a sufficient distance from the pivot 39 so that it will not interfere with movement of the parts. The wire passes through the hollow arm 43 and out through an opening in the lower side of this arm near the forward end thereof as indicated in Fig. 2, and thence extends loosely to the operating lamp 65, the light of which is controlled by the switch handle 129.

It will be readily understood, especially from Figs. 1 and 2 when taken in conjunction with the foregoing description, that the entire assembly of parts has great flexibility in operation, allowing the lamp 65 to be shifted upwardly and downwardly and in any direction horizontally, and to be swung or tilted as required, and that this great flexibility of adjustment is obtained with a mechanism which is simple, light, compact, and of pleasing appearance.

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 lamp mounting mechanism including a fixed support, two elements pivotally connected to each other and to said support to swing substantially horizontally relative to each other and to said support on substantially vertical pivotal axes, one of said elements being mounted also for substantially vertical swinging movement relative to the other of said elements about a substantially horizontal pivotal axis, means including a cam associated with said substantially horizontal axis and a spring pressed follower roller engaging and rolling on said cam for counter-balancing the upward and downward swinging movements of said vertically swingable element, and a lamp holding member mounted on that one of said elements which is remote from said fixed support.

2. A construction as described in claim 1, in which said cam has an effective surface in the shape of a circular arc arranged eccentrically with respect to the horizontal pivotal axis with which said cam is associated.

3. A mounting for a lamp or the like whereby the elevation of the lamp may be changed without thereby causing tilting of the lamp, said mounting including a support, a member spaced from said support, a pair of arms substantially parallel to each other extending from said support to said member and pivotally connected both to said support and to said member for movement relative thereto about substantially horizontal pivotal axes in such manner that said support, said member, and said arms together constitute a parallelogram linkage swingable in a vertical plane whereby said member may be swung upwardly and downwardly relative to said support to various positions parallel to each other, a vertical pivot on said member, a lamp holder

mounted on said vertical pivot for horizontal swinging movement thereon, a cam connected to one of said parallelogram arms adjacent said support to turn with said arm as said arm is swung upwardly or downwardly, a cam follower mounted on said support and engaging said cam, and compression spring means for pressing said cam follower against said cam to exert an upward counterbalancing force thereon.

4. A mounting for a lamp or the like whereby the elevation of the lamp may be changed without thereby causing tilting of the lamp, said mounting including a support, a member spaced from said support, a pair of arms substantially parallel to each other extending from said support to said member and pivotally connected both to said support and to said member for movement relative thereto about substantially horizontal pivotal axes in such manner that said support, said member, and said arms together constitute a parallelogram linkage swingable in a vertical plane whereby said member may be swung upwardly and downwardly relative to said support to various positions parallel to each other, a vertical pivot on said member, a lamp holder mounted on said vertical pivot for horizontal swinging movement thereon, a cam connected to one of said parallelogram arms adjacent said support, a cam follower mounted on said support and engaging said cam, a pair of compression springs mounted on opposite sides of said cam follower and operatively connected thereto for pressing said cam follower against said cam to produce an upward counterbalancing force on said arms, and means for separately adjusting the force of each of said springs.

5. Lamp mounting mechanism including a support, a pair of arms pivotally mounted on said support for vertical swinging movement about substantially horizontal pivotal axes, said arms being mounted one above the other in substantially parallel relation to each other, a member pivotally connected on substantially horizontal pivotal axes to the outer ends of both of said arms, said support, said arms, and said member together constituting substantially a parallelogram linkage, means carried by said member for adjustably supporting a lamp, a cam mounted on the upper one of said arms adjacent the end thereof pivoted to said support, a cam follower movably mounted on said support for cooperation with said cam, and a pair of coiled springs arranged in straddling relation to the lower one of said arms and operatively connected to said cam follower to cause said cam follower to coact with said cam to counterbalance said arms and the parts carried thereby.

6. A dental lamp mounting mechanism including a fixed support, an arm mounted on said support for horizontal swinging relative thereto about a substantially vertical pivotal axis, a casing pivotally mounted on the end of said arm remote from said fixed support for horizontal swinging movement on said arm about a substantially vertical pivotal axis, a pair of links arranged one above the other substantially in a common vertical plane and having their rear ends pivotally mounted in said casing for swinging movement in said vertical plane about substantially horizontal axes, a member pivotally connected to the forward ends of both of said links for movement relative thereto about substantially horizontal pivotal axes so that the elevation of said member may be altered by swinging said links in said vertical plane, a yoke pivotally mounted on said

member for horizontal swinging movement relative thereto about a substantially vertical pivotal axis, said yoke having two substantially horizontal arms spaced laterally from each other, a pair of substantially horizontal pivots on said arms of said yoke for mounting a lamp for tilting movement in a vertical plane, and spring counterbalance means within said casing for holding said links and the parts supported thereby from downward movement due to gravity.

7. Lamp mounting mechanism including a support, a pair of arms pivotally mounted on said support for vertical swinging movement about a pair of substantially horizontal pivotal axes, one of said axes being above the other, said arms extending approximately parallel to each other, a member pivotally connected on substantially horizontal pivotal axes to the outer ends of both of said arms, means carried by said member for supporting a lamp, a cam element, and a cam follower element, one of said elements being mounted on one of said arms and the other of said elements being mounted on said support, said cam follower element including a cam follower roller and spring means pressing said follower roller against said cam element in a direction approximately perpendicular to the adjacent surface of said cam element, said cam element and said cam follower element being so shaped and positioned relative to each other that the force of said spring means tends to counterbalance the downward swinging force exerted on said arms by gravity, so that said arms may be readily swung upwardly or downwardly by application of external force and will tend to remain in any position at which they are set.

8. A construction as described in claim 7, in which said cam element is adjacent one of said pivotal axes by which said arms are pivoted on said support, and said cam element comprises a body having an effective cam surface against which said cam follower roller bears, said cam surface having its major effective portion in the shape of a convex curved surface which is substantially a sector of a circular cylinder whose center is offset from said one of said pivotal axes.

9. A construction as described in claim 7, in which said cam element is adjacent one of said pivotal axes by which said arms are pivoted on said support, and said cam element comprises a body having an effective cam surface against which said cam follower roller bears, said cam surface having its major effective portion in the shape of a convex curved surface which is substantially a sector of a circular cylinder whose center is offset from said one of said pivotal axes, and having at least at one end of said convex curved surface a concave curved surface adapted to bear against said follower roller to provide a limit stop limiting the extent of swinging movement of said arms in one direction.

10. Lamp mounting mechanism including a support, a pair of arms pivotally mounted on said support for vertical swinging movement about a pair of substantially horizontal pivotal axes, one of said axes being above the other, said arms extending approximately parallel to each other, a member pivotally connected on substantially horizontal pivotal axes to the outer ends of both of said arms, and means carried by said member for supporting a lamp, characterized by a cam element and a cam follower element, one of said elements being mounted on said support and the other of said elements being mounted on one of said arms adjacent said sup-

port, said cam element being adjacent one of said pivotal axes by which said arms are pivoted to said support and including a curved surface having a circular cylindrical portion in eccentric relation to said one of said pivotal axes, said cam follower element including a movable frame guided for movement toward and away from said cam element, a cam follower roller rotatably mounted in said frame, and spring means pressing said frame toward said cam element to keep said follower roller in engagement with said curved surface of said cam element, the reaction of said follower roller against said curved surface tending to counterbalance the downward swinging force exerted on said arms by gravity without interfering with upward and downward swinging movement of said arms as a result of application of external force.

ERNEST H. GREPPIN.

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