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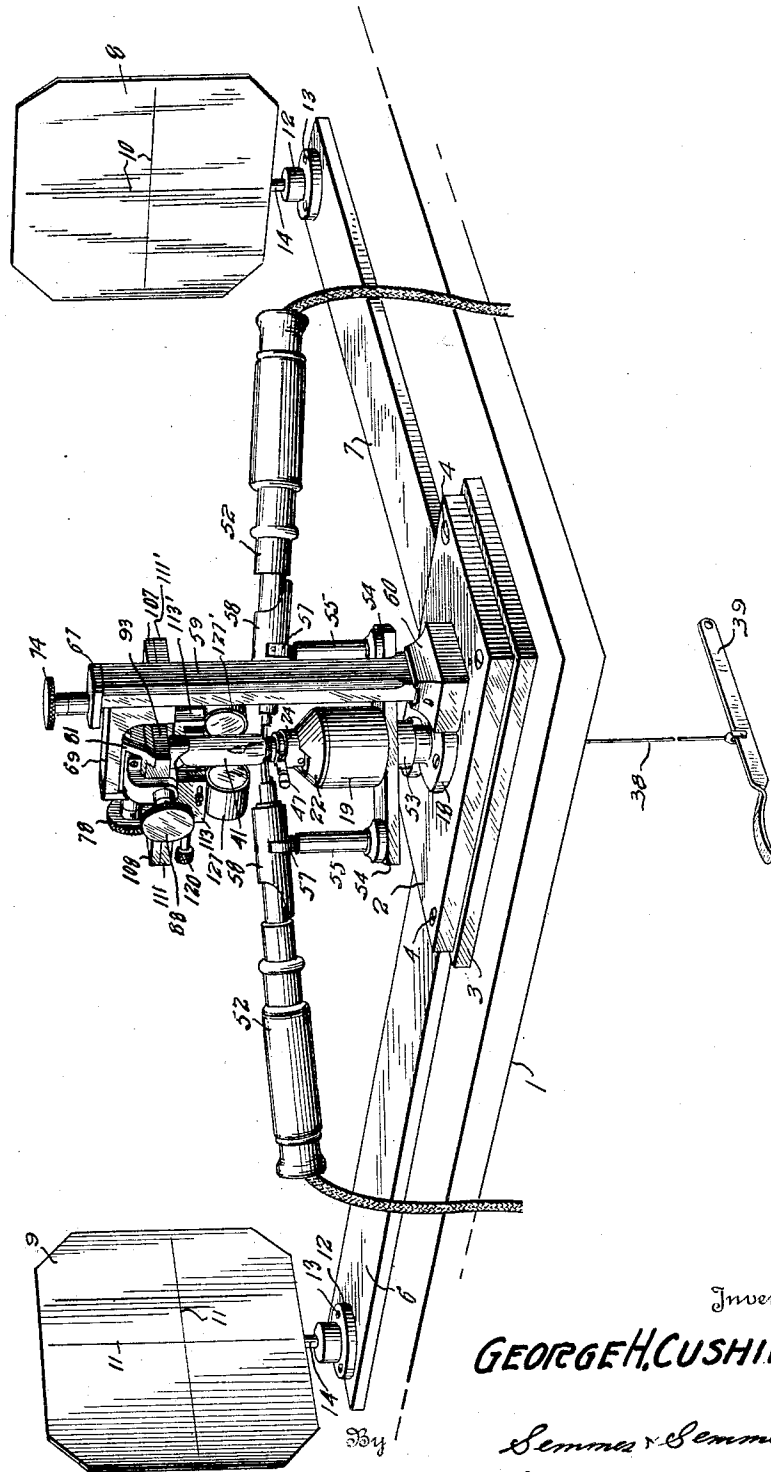
G. H. CUSHING

1,894,733

FOCUSING MACHINE

Filed Jan. 10, 1930

4 Sheets-Sheet 1



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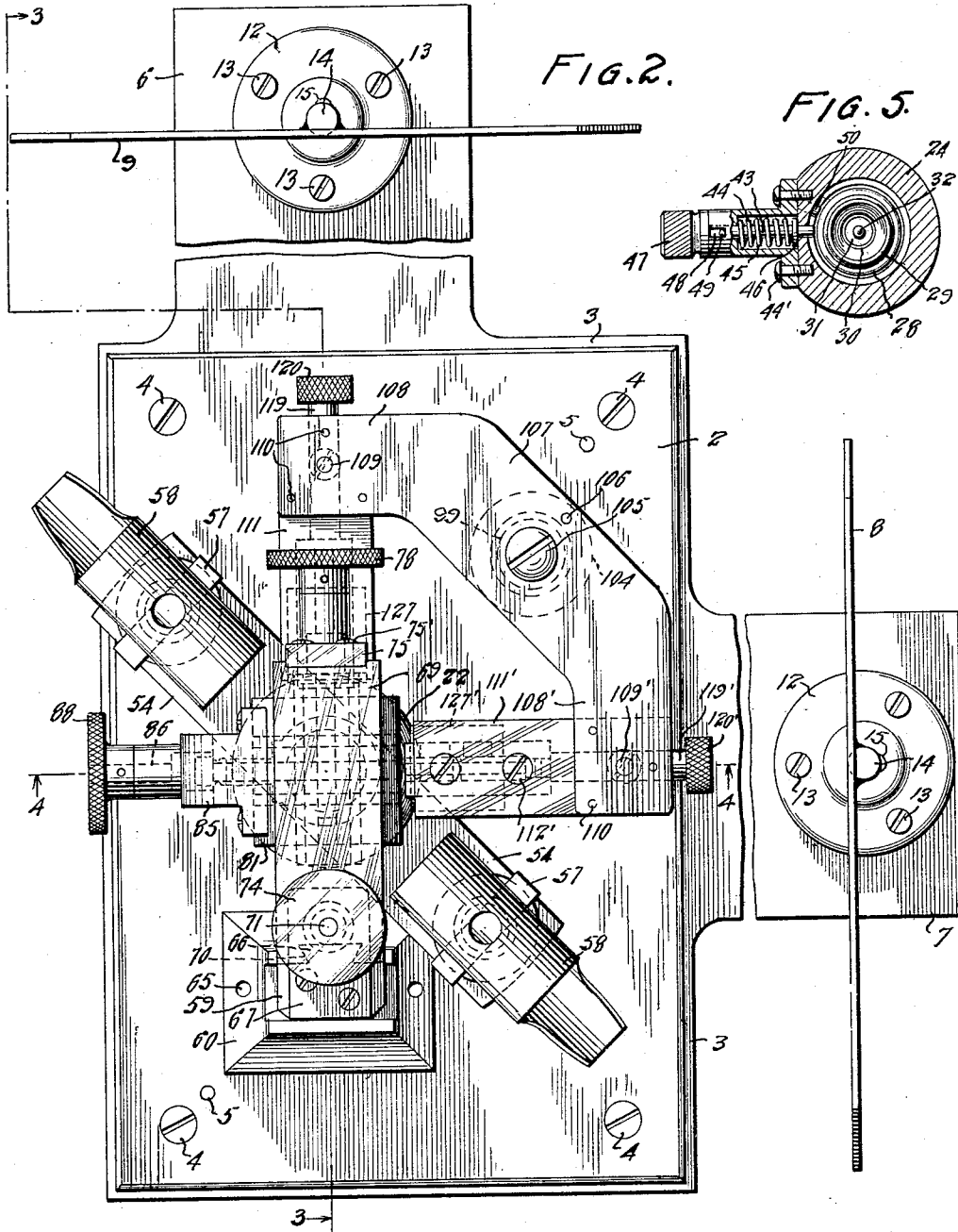


FIG. 5.

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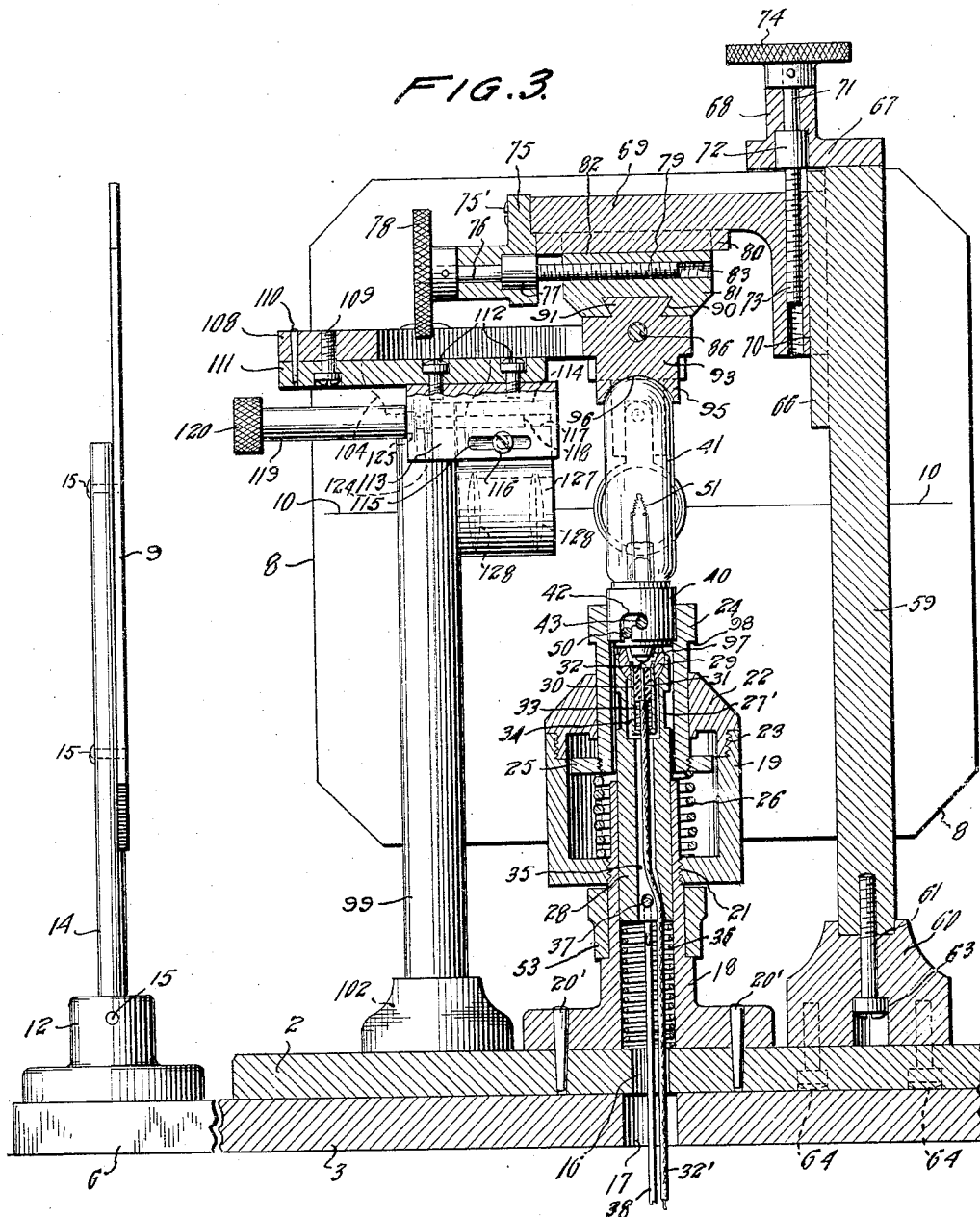
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4 Sheets-Sheet 3



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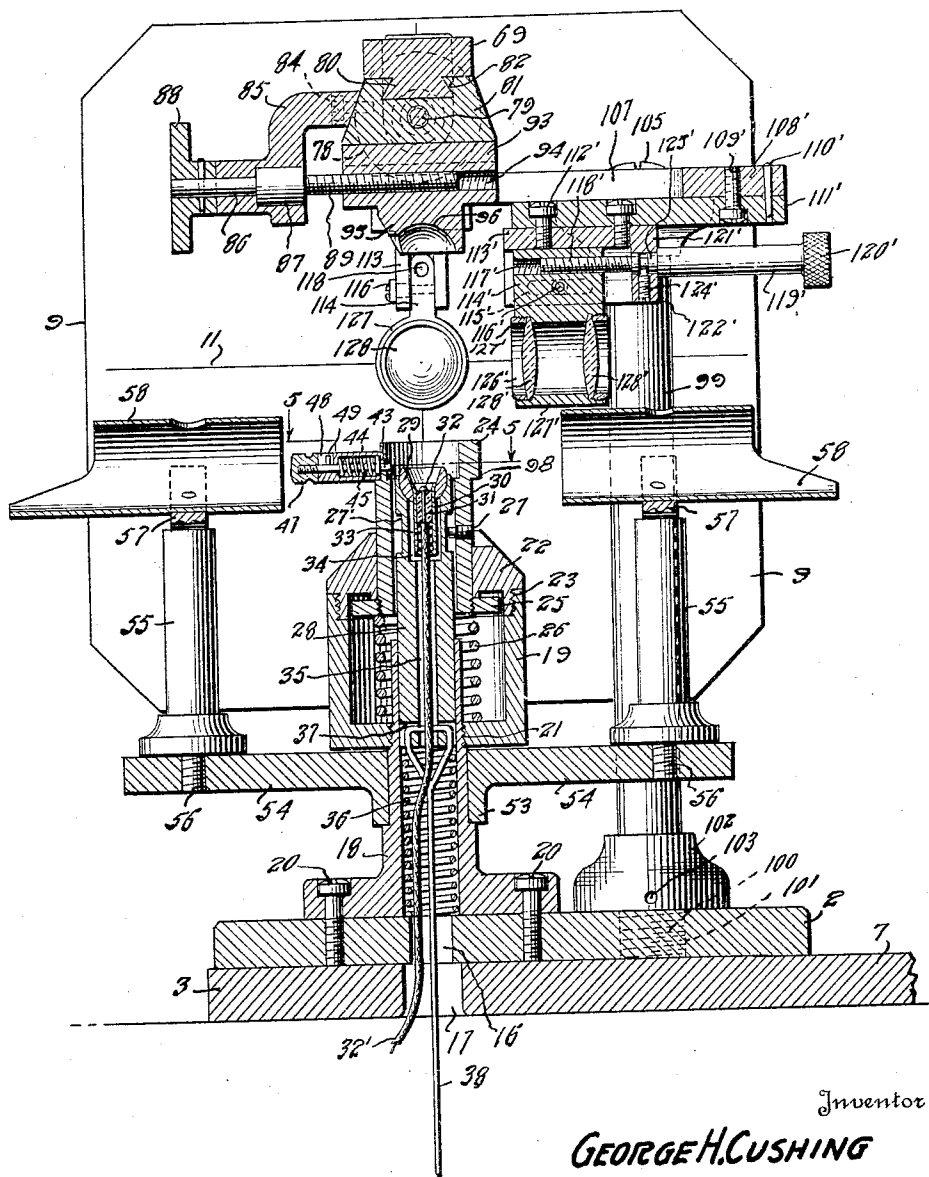
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4 Sheets-Sheet 4

FIG. 4.



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FOCUSING MACHINE

Application filed January 10, 1930. Serial No. 419,353.

The invention relates to the art of illumination and more particularly has reference to a method and apparatus for positioning a light source relative to a reflecting surface.

At the present time reflectors and lenses are constructed so that the light from a reflector may be diffused, concentrated, and directed as desired, depending upon the particular purpose of illumination.

In many instances, where it is desired to properly project light to illuminate a particular object of a definite predetermined area located at a definite distance from the source of illumination, the reflector is very accurately constructed so that light from a source generally positioned at the focus of the reflector will be projected as desired.

While a reflector may be constructed very accurately so as to project light from a source located at a point about which the reflector is designed, nevertheless, when electric light bulbs, such as are commercially available today, are placed in the socket associated with the reflector, the light projected from the reflector may be thrown upon an object other than that upon which the light was originally intended to be projected. The above disadvantage is due to the fact that in the manufacture of electric light bulbs, the filament is not placed in the exact position relative to the base of the bulb. The variation in location of the filament, while being comparatively small, nevertheless plays an important part in the direction of the beam of light projected from the lamp, particularly since there is a magnification of the variation in the positioning of the filament from the true position for which the reflector was designed.

In spite of the many developments in the illuminating art, no satisfactory method or apparatus for compensating for the inaccurate positioning of the filaments of electric bulbs have been devised.

The major object of this invention is to devise a method of positioning the filament of an electric light bulb relative to a reflector.

Another object of the invention is to devise a method for correcting the structural error in the positioning of a filament in an electric light bulb.

Still another object of the invention is the provision of apparatus for positioning an electric light bulb relative to a base in order that the filament of the bulb will be located at the focus of a reflector with which the bulb is to be employed.

Yet another object of the invention is the provision of a novel focusing machine having a three dimensional adjuster adapted to position an electric light bulb relative to a base.

A further object of the invention is the designing of a focusing machine having a novel electric bulb socket.

A still further object of the invention is the devising of novel means for mounting a plurality of lenses associated with the machine.

Yet a further object of the invention is the provision of a focusing machine adapted to position the filament of an electric bulb relative to a base and means for casting the image of the filament upon a plurality of screens.

Yet another object of the invention is the provision of a focusing machine for positioning the filament of an electric light bulb relative to a base and means for securing the bulb in its adjusted position.

With these and other objects in view, which may be incident to my improvements, the invention consists in the parts and combinations to be hereinafter set forth and claimed, with the understanding that the several necessary elements comprising my invention may be varied in construction, proportions and arrangement without departing from the spirit and scope of the appended claims.

There is described in copending application Serial Number 409,333, filed November 23, 1929, a device comprising an adapter which is placed over the base of an electric light bulb in order that the filament of the bulb may be relatively positioned with respect thereto. By such an expedient the bulb with the adapter fixed thereon is associated with a reflecting surface so that the filament of the bulb is positioned at the focus of the reflector.

The present invention comprehends the provision of a method and a machine for positioning the filament of an electric light bulb relative to a base. Briefly considered, this method comprises the steps of placing an

adapter or similar member around the bulb base, fixing the position of the bulb filament relative to the adapter, securing the bulb in such position and placing the bulb with the adapter in a socket associated with a reflecting surface. One manner of practically effecting the concept of this invention is the provision of a machine having an electric bulb socket, a plurality of standards carrying focusing means, an adjuster for positioning an electric bulb relative to the socket and means for securing the bulb in its adjusted position. The invention also comprehends casting the image of the energized filament of the bulb upon a plurality of screens so that the image is symmetrically positioned with respect to a target formed upon each screen and means for securing the electric light bulb in such position.

In the drawings:

Figure 1 is a perspective view of the focusing machine forming the subject matter of this invention.

Figure 2 is a horizontal plan view of the machine.

Figure 3 is a sectional elevation of the machine taken along the line 3—3 of Figure 2.

Figure 4 is a sectional elevation of the focusing machine taken along the line 4—4 of Figure 2.

Figure 5 is a horizontal sectional view of the upper end of the lamp socket taken along the line 5—5 of Figure 4.

In order to make my invention more clearly understood, I have shown in the accompanying drawings, means for carrying the same into practical effect without limiting the improvements in their useful applications to the particular constructions which, for the purpose of explanation, have been made the subject of illustration.

Throughout the drawings like reference numerals refer to similar parts throughout the different views. There is shown in Figure 1 a perspective view of the focusing machine which is mounted upon a suitable table or support 1. The machine is positioned upon an upper base plate 2 secured to a lower base plate 3 in any suitable manner as by means of screws 4, and tapered pins 5. Extending from the base plates are base arms 6 and 7 positioned so that their longitudinal axes coincide respectively with the longitudinal and the transverse axis of the base plates 2 and 3. Thus it may be observed the base arms 6 and 7 are so positioned that they form an angle of 90° with respect to each other.

It will be noted that upon the end of each base arm there is positioned an image screen 8 and 9. Each screen is provided with a suitable target 10 and 11. While the targets have been shown as formed of a vertical line intersecting a horizontal line, it is to be understood that other forms of targets may be

employed if desired without departing from the spirit of the invention. The screens 8 and 9 are provided with suitable supports 12 which are secured to the base arms as indicated at 13. From an inspection of Figure 3 it will be observed that the screens are each secured to an adjustable standard 14 which may be maintained in adjusted position by means of the set screw 15.

As may be observed from Figures 3 and 4 the base plates 2 and 3 are provided with openings 16 and 17 respectively. Mounted directly over these openings is a supporting member 18 to which is secured a housing 19 for a lamp socket. The supporting member 18 is secured to the base plate 2 by means of suitable screws 20 and tapered pins 20'. Between its upper and lower ends the supporting member is provided with external screw threads adapted to engage internal threads formed upon the housing 19 as shown at 21. By this construction the housing is suitably secured and supported upon the supporting member 18.

As shown in Figures 3 and 4 the housing is provided with a head 22 which is secured to the housing by means of the screw threads cooperating with similar threads formed upon the end of the housing as shown at 23. Through the housing head 22 there is adapted to be slidably mounted a lamp socket 24 which is employed for holding an electric bulb. The lower end of the socket 24 is provided with an extension portion 25 which may be screwed to the socket. Bearing against the extension 25 is one end of a spring 26, the opposite end thereof bearing against the bottom of the housing. It should be observed that the spring 26 encircles a portion of the supporting member. It will also be noted that the socket 24 is provided with an adjustable screw like lug 27 (shown in Figure 4) which projects within the socket.

Extending through the hollow standard 18, so as to be freely slidable therein, is a hollow contact member 28. The inner portion of the upper end of the contact member is provided with a hemi-spherical recess adapted to receive a split hollow ball 29 which supports a receptacle 30. Within the receptacle 30 is an insulating member 31 with a contact point 32 positioned thereon.

It should be noted that the mounting of the ball 29 within the recess provides a ball and socket joint allowing universal movement of the container supported by the ball. The contact point 32 is positioned upon the upper end of the insulating member 31 and bearing against the lower end of this member and upon the bottom of the receptacle, is a spring 33 adapted to maintain the contact point in bearing against a light bulb positioned in the socket. In order to position the receptacle 30 within the upper end of the contact member this portion of the contact member is

provided with the enlarged bore 34 which communicates with a smaller bore 35. Through the latter the electrical conductor 32' is adapted to extend and to be secured to the contact point 32. The conductor after passing through the contact member extends through the support 18 and through the two base plates.

It may be observed that positioned within the supporting member 18 so that one end bears against the base plate 2 and the other end bears against the lower portion of the contact member is a spring 36. By means of this spring it will be appreciated that the contact member will be maintained in bearing with an electric bulb associated with the device. The lower end of the contact member is provided with an opening 37 secured to which is an actuating wire 38. The actuating wire extends through the supporting member and the base plates, its lower end being secured to a foot pedal 39 as shown in Figure 1. It will be appreciated that by the operation of the pedal 39 the contact member will be pulled downwardly with respect to the socket housing and the supporting member 18.

In order that the socket 24 may be depressed or withdrawn into the socket housing a portion of the contact member near its upper end is provided with a recess having shoulders 27'. When the foot pedal is depressed the contact member will descend and the upper shoulders 27' formed upon the contact member will engage the lug 27 positioned within the socket 24. Further depression of the foot pedal will cause the simultaneous descent of the contact member and the socket. Upon the release of the foot pedal it will be appreciated that the spring 26 and 36 will force the socket and the contact member upwardly. The purpose of this construction will hereinafter appear.

As it has been previously mentioned in employing the focusing machine, an adapter, such as described in application Serial No. 409,333, is placed around the light bulb. Such an adapter has an internal diameter slightly larger than the exterior diameter of the standard base of an electric light bulb and it is provided at one end with an inwardly projecting flange (not shown in the drawings) which restricts the size of the opening so that the adapter at this end will snugly receive the standard base of an electric light bulb. An adapter 40 of this description is shown positioned around an electric light bulb 41, positioned within the lamp socket. It should be noted that an adapter of this type is provided with a bayonet slot 42.

For the purpose of maintaining the bulb and its adapter within the lamp socket there is shown a spring pressed plunger 43. Such a plunger is shown in detail in Figure 5 and comprises a housing 44 secured to the socket

24 by means of screws 44' or other suitable securing means. The plunger 43 is provided with a flange 46 and bearing against this flange and the closed end of the housing, is a spring 45. Plunger 43, as may be observed from Figure 4, extends through the closed end of the housing and is provided with a thumb nut 47.

Formed within the housing is a recess portion 48 through which a projecting pin 49 positioned upon the plunger extends. The recess 48 is of such shape that when the thumb nut is pulled outwardly or away from the lamp socket and then slightly turned, the projecting pin will engage the recess portion so that the plunger may be maintained in this position. By turning the thumb nut in the opposite direction from that described, and releasing it, the plunger will be forced inwardly by reason of the spring and will extend within the lamp socket. The upper portion of the plunger 43 extending within the lamp socket is adapted to engage the bayonet slot formed upon the adapter as may be seen in Figure 3.

For the purpose of further securing an electric light bulb within the socket, a fixed lug 50 is positioned within the socket 24 as may be observed from Figures 3 and 5. The lug 50 is adapted to engage the lower portion of the bayonet slot formed in the adapter as is shown in detail in Figure 3.

To position an electric light bulb having an adapter, placed around its base, within the socket the thumb nut 47 is pulled outwardly and slightly turned so as to secure the projecting pin 49 in engagement with the recess formed in the housing of the plunger. Such procedure withdraws the plunger 43 and will allow the bulb and the adapter to be positioned in the socket so that the lower part of the bayonet slot 42 engages the fixed lug 50. After positioning the bulb and adapter as just described the thumb nut is turned so as to release the plunger and engage its inner end with the upper portion of the bayonet slot formed in the adapter.

It will be appreciated that by such construction the bulb and adapter are securely maintained in the socket. Moreover it will be observed that by pressing downwardly upon the head of a bulb within the socket it will be moved downwardly with respect to the adapter which is fixed to the socket. Such movement is against the action of the spring 36 and upon the release of the pressure the spring will force the contact member and the bulb upwardly, the bulb again being moved within the adapter. By the use of the split ball positioned in the head or upper portion of the contact member, it will likewise be recognized that the electric light bulb may be pivoted about the contact point of the contact member so as to allow the bulb to be moved in horizontal lines forming

angles of 90° with each other. It may also be observed, that the spring 36 bearing against the lower end of the contact member and the spring 33 within the receptacle 30 will maintain the contact point 32 in bearing with the lower end or contact point of the electric bulb within the lamp socket and also that such contact will be maintained during any movement of the bulb relative to the adapter so that during such movement the filament 51 of the bulb may be energized.

As it may be seen in Figure 1, there is provided with the machine a pair of soldering or heating irons 52. These irons may be electrically heated or they may be heated in any desired manner. For the purpose of supporting the irons 52, the standard 18 is provided with a shoulder 53 formed near its base. Adapted to be supported upon the shoulder 53 is a platform 54 through which the supporting member 18 passes. The platform 54 is so mounted upon the support that it may be rotated if desired. It should be noted that the platform 54 is positioned directly below the bottom of the socket housing.

Provided upon opposite ends of the platform 54 are uprights 55 which are secured to the platform by screw threaded engaging means 56. However, any other suitable securing means may be employed if desired. Upon the upper end of each upright 55 there is positioned a mounting member 57 to which is pivotally secured a support or retaining member 58 adapted to support the soldering irons 52.

It has been pointed out that by the use of the adapter 40 the electric bulb may be relatively positioned thereto as desired. After such positioning it is desired to maintain the bulb in such relation with the adapter, and by the use of the soldering irons 52 the base of the bulb may be fused thereto. By forming the platform upon which the soldering iron supports are mounted so that it may be rotated, the solder or other fusing material may be dropped at any desired point on the adapter.

I wish it to be clearly understood, however, that other means besides soldering for effecting a bond or attachment between the base of the electric bulb and the adapter may be employed without departing from the spirit of the invention.

For the purpose of positioning the bulb or filament relative to the adapter I have provided a three dimensional or universal adjusting mechanism supported upon a standard 59. The standard 59 is provided with a base 60 having an opening therein allowing the screw 61 to pass therethrough. The lower end of the standard 59 is internally screw threaded and adapted to cooperate with the screw or bolt 61. It should be noted that the upper end of the base 60 is recessed so as to provide a firm seat for the standard 59 and further-

more that the bottom of the base which seats upon the base plate 2 is formed with a recess 63 into which the head of the tap bolt 61 is sunk. In order to maintain the standard and its base upon the base plate 2, suitable tap bolts 64 and tapered pins 65 are shown extending through the lower side of the base plate 2, the former engaging screw threads formed in the base 60.

While the standard and its base have been shown formed of separate members and secured by tap bolts extending through the base plate 2 and engaging the bottom of the standard's base, it will be understood that other means for securing the standard to the base plate may be employed if desired. Also the standard and its base may be formed of one piece of material. A base for the standard could be employed which would allow the bolts secured to the base plate to pass through the upper portion of the base.

From an inspection of Figures 2 and 3 it may be noted that the standard 59 is provided with a tongue 66 formed upon the side of the standard adjacent to the light bulb, while the upper end of the standard is provided with an arm 67 having an upright portion 68 offset from the center line of the standard. Adapted to be supported from the arm 67 is a carriage 69 having a groove 70 which slidably engages the tongue 66. It will be seen in Figure 2 that the tongue 66 and the groove 70 form in effect a sliding dove tail support.

For the purpose of supporting and moving the carriage 69 with respect to the standard, a shaft 71 is rotatably mounted and secured within the upright 68. Upright 68 forms a bearing for the shaft 71 and fixedly mounted thereon, within a recess at the lower end of the upright, is a collar 72. The lower end of the shaft, that is the portion extending below the upright and the arm 67, is screw threaded and is adapted to engage an internally screw threaded arm 73 formed upon the carriage 69. It should be noted that the groove 70 of the carriage is formed in the side of the arm 73 and is coextensive therewith. Upon the upper end of the shaft 61 which extends beyond the upright 68 there is secured by any suitable means a thumb screw 74.

Upon the rotation of the thumb screw 74, the shaft 71 will also be rotated and by reason of the screw threaded engagement of the shaft with the carriage 69 the latter will be moved upwardly or downwardly in a vertical direction. By providing the collar 72 upon the shaft 71, it will be appreciated that the shaft will be maintained in fixed relation with respect to the upright 68 and that the carriage 69 is in effect a follower member.

Supported upon the end of the carriage 69 opposite from the standard is a bracket 75 secured thereto by screws 75', bolts or the like. The bracket 75 provides a bearing for

a shaft 76, similar to the shaft 71, which is maintained in fixed relation thereto by means of a collar 77 recessed within the portion of the bracket nearest the standard. The outer end of the shaft 76 is secured to a thumb screw 78 while its inner end is screw threaded as shown at 79. The purpose of this construction will hereinafter appear.

A construction similar to that shown upon the standard 59 is also formed upon the lower side of the carriage 69. Thus it may be observed, in Figure 4, the carriage 69 has a tongue 80 of a considerable length formed thereon. Adapted to be supported from the main carriage 69 is an auxiliary carriage 81 provided with a groove 82 adapted to slidably engage the tongue 80 formed upon the carriage 69. The carriage 81 is provided with an internally screw threaded bore 83 which is engaged by the screw threads 79 upon the shaft 76. Such construction allows the carriage 81 to be supported upon the main carriage 69. It will be appreciated that by the rotation of the thumb screw 78 the auxiliary carriage 81 may be moved away from or towards the standard 59.

Secured to the carriage 81 by any suitable securing means such as shown at 84 is a bracket 85 which supports a rotatable shaft 86. The bracket 85 forms a bearing for the shaft 86 and the end of the bracket nearest the main carriage 69 is provided with a recess in which is a collar 87, secured to the shaft. The free end of the shaft 86, extending beyond the bracket, has mounted thereon a thumb screw 88 while the opposite end of the shaft is screw threaded as shown at 89.

Similarly to the main carriage construction the auxiliary carriage 81 has formed upon its lower side a groove 90. This groove 90 extends substantially the full length of the carriage and is adapted to have slidably mounted therein a tongue 91 formed upon a secondary auxiliary carriage 93. The auxiliary carriage 93 is also provided with screw threaded bore 94 which is engaged by the screw threaded shaft 86. It may be observed that by rotating the thumb screw 88 since the relation of the shaft 86 is fixed with respect to the bracket 85 due to the collar 87, the secondary auxiliary carriage 93 may be drawn towards the bracket or moved away from it.

From an inspection of Figures 1 and 2 it will be appreciated that the secondary auxiliary carriage 93 is formed with an extension 95 provided with a hemi-spherical like recess 96 adapted to engage the head of the electric bulb positioned within the lamp socket.

It may be appreciated that by the use of the three dimensional adjustor just described the filament 51 of the electric light bulb within the lamp socket may be positioned relatively with respect to the adapter 40. Upon the actuation of the thumb screw 74 the main carriage which supports the auxiliary carriage

81 and the secondary auxiliary carriage 93 may be moved either upwardly or downwardly in a vertical plane. Since the head of the bulb is firmly engaged by the extension portion 95 formed upon the secondary auxiliary carriage of the adjustor, it may be observed that upon the rotation of the thumb screw 74 so as to cause the main carriage to descend, the bulb will also descend. Such movement of bulb is relative to the adapter which is fixed by reason of the plunger 43 and the lug 50 to the lamp socket. During the downward movement of the bulb its contact point 97 is in bearing with the contact point 32 of the contact member 28. Likewise the upper portion of the split ball is in bearing engagement with the base of the bulb. The descent of the bulb and its base causes a depression of the contact member against the spring 36. This movement is relative to adapter 40 which is fixedly secured to the lamp socket. Upon rotating the thumb screw 74 in a direction opposite from that just described, the energy compressed within the spring 36 will force the bulb upwardly, as the pressure upon the spring is released. Thus it will be appreciated that the position of the bulb filament may be vertically adjusted with respect to the adapter.

Similarly it will be appreciated that by the rotation of the thumb screws 78 and 88 the bulb may be horizontally moved within the adapter in lines forming right angles with each other. By reason of the pivotal mounting of the split ball within the head of the contact member the contact point 32 will be maintained in bearing with the contact point 97 of the bulb during its movement.

The reason for slidably mounting the lamp socket within the housing 19 will now be appreciated. To insert a bulb with its adapter within the lamp socket the plunger 43 is pulled outwardly and secured in this position by means of the thumb nut 47 as previously described. The foot pedal 39 is then depressed and the contact member lowered. Upon the shoulder 27 striking the lug 27', the socket is also lowered upon further actuation of the foot pedal. Thus it will be observed that the socket may be depressed until its upper portion, having the shoulder 98 formed upon its end, strikes against the top of the head of the socket housing. A bulb with an adapter positioned around its base is then inserted in the socket so that the lower part of the bayonet slot of the adapter engages the fixed lug 50. In order to finally secure the adapter and bulb within the socket the thumb nut 47 is turned so as to release the plunger 43 and engage the upper portion of the adapter. After the bulb has been secured within the socket the pressure upon the foot pedal is gradually released so that the spring 26 forces the socket upwardly until the head of the bulb is seated within the spherical like

recess formed upon the extension of the secondary auxiliary carriage 93. It should be noted that the contact member ascends simultaneously with the socket.

5 For the purpose of positioning the filament of the electric bulb relative to the adapter so that the filament will be at the focus of the reflecting surface, I have provided means comprising a plurality of lenses, for
10 focusing the image of the energized filament upon the screens 8 and 9. A suitable support for the lenses just mentioned is provided by a standard 99 which is secured to the base plate 2 by means of the screw threads 100 cooperating with similar threads formed in an opening 101 extending through the base plate.
15 The standard 99 is provided with a base member 102 which affords a bearing surface for the standard with the base plate. The base member 102 may be formed integrally with the standard or it may be a separate member screwed upon the end of the standard and fastened in fixed relation thereto by means of a pin 103. The upper end of the standard is
20 provided with an enlarged head 104 to which is secured, by means of the tap screw 105 and the tapered pin 106, a platform generally designated as 107. Formed upon the platform are arms 108 and 108' from which the
25 lenses are supported.

30 Secured respectively to the arms 108 and 108' by means of tap screws 109 and 109' and tapered pins 110 and 110' are plates 111 and 111'. These plates 111 and 111' have mounted respectively thereon, by means of the
35 counter sunk tap screws 112 and 112' lenses carriage guides 113 and 113' adapted to support a lens carriage 114 and 114' respectively. From an inspection of Figure 3 it will be
40 noted that the lens carriage guide 113 is provided with an elongated slot 115 having a screw 116 passing therethrough and engaging the side of the lens carriage. The screw 116 is freely slidable within the slot and
45 by this means the carriage is slidably supported within its guide. A similar construction employing a slot 115' and screw threaded means 116' projecting therethrough is employed to support the carriage 114'.

50 It should be noted that each carriage is provided with a horizontal internally screw threaded bore 117 and 117'. Adapted to engage each bore of each carriage are shafts 118 and 118' having a screw threaded portion at their inner ends and an enlarged portion 119 and 119' provided with thumb nuts 120 and 120'.

60 For the purpose of supporting the part of the shaft 118 which extends through the rear wall of the carriage guide member, a suitable opening is provided therein. The material forming the wall of the carriage guide above the shaft 118 is solid as shown at 121. The wall of the carriage guide directly below this, however, is formed with a

screw threaded recess 122 extending into the guide and adapted to cooperate with a screw threaded key 124. The key 124 is provided with a projection which cooperates with spaced
70 collars 125 formed near the end of the threaded portion of the shaft 118. A similar construction is shown for supporting and mounting the shaft 118' associated with the lens carriage 114'.

It is evident that the rotation of either
75 thumb nut 120 or 120' will cause the rotation of the shaft 118 or 118' and will cause the movement of the lenses carriages since these shafts are fixed relatively to the lenses carriage guides.

80 Formed upon each lenses carriage 114 and 114' is a tubular projection 126 and 126'. Mounted in the projections 126 and 126', which are screw threaded at 127 and 127' are conventional lenses 128 and 128'. It is
85 evident that upon the movement of the carriage the lens will likewise be moved since they are carried directly thereby.

90 Having completed a description of the focusing machine, the method of operation of the device will now be given. The electric light bulb to be tested is provided with the adapter 40 and the foot pedal 39 is then depressed so as to lower the lamp socket 24,
95 the plunger 43 having first been withdrawn to its position without the socket, and secured in such position. The bulb with the adapter are then positioned in the socket so that the lower part of the bayonet slot of the adapter engages the fixed lug 50 and the
100 plunger 43 is then released so that it engages the upper part of the bayonet slot. After this operation the pressure on the foot pedal is gradually released until the head of the bulb engages the hemispherical recess 96 formed in the extension portion of the secondary auxiliary carriage.

110 The bulb is now ready to be positioned relative to the adapter. In order to accomplish this an electric current is passed through the conductor 32' so as to energize the bulb filament and by manipulating the thumb nuts 120 and 120' the image of the filament is focused upon the screens 8 and 9.

115 Assume for example, that the image of the energized filament is unsymmetrically positioned with respect to the targets 10 and 11 formed upon the screens. It will be appreciated that by the actuation of the thumb
120 screw 74 the image may be raised or lowered vertically while actuation of the thumb screw 78 will move the bulb and its filament in a straight line in a horizontal plane, and the actuation of the thumb nut 88 will move the
125 filament also in a horizontal line but at an angle of 90° with respect to the movement caused by the thumb screw 78. By the operation of these thumb screws the bulb may be so moved that the image of the ener-

gized filament will be symmetrically positioned with respect to each target.

The above description for positioning the filament has assumed that there is a three dimensional error in its location with respect to the adapter. In the event that two or even one dimension is off, it is evident that this dimension need only be corrected and that by turning suitable thumb screws or screw this error may be overcome. Should the filament, however, be correctly positioned it is evident that it will be unnecessary to make use of the three dimensional adjustor as this fact will immediately appear upon the casting of the image of the energized filament upon the screens.

In order to secure the bulb and the filament in its correct position with respect to the adapter, the soldering irons 52 are employed. Drops of solder are placed upon the lamp bulb base and upon the adapter so as to fuse these two members together and maintain the lamp bulb in its position.

The bulb having been positioned with respect to the adapter and secured in such position thereto, it will be appreciated that upon placing the adapter and bulb in the lamp socket of a lamp, the bulb filament will be located at the focus point of the reflector associated therewith or the point about which the reflector is designed.

From the foregoing description, it will be appreciated that I have provided a novel method and apparatus for positioning an electric light bulb relative to a base in order that the filament of the bulb may be located at the focus of a reflector with which it is to be employed. Likewise it is apparent that I have devised a novel three dimensional adjustor for positioning an electric light bulb relative to its base. Moreover, it will be appreciated that I have provided a novel lamp socket for use with the machine. It is apparent also that I have devised a machine which is of simple operation and of great accuracy.

While I have shown and described the preferred embodiment of my invention, I wish it to be understood that I do not confine myself to the precise details of construction herein set forth, by way of illustration, as it is apparent that many changes and variations may be made therein, by those skilled in the art, without departing from the spirit of the invention, or exceeding the scope of the appended claims.

I claim:

1. In a focusing machine a hollow supporting member mounted upon a base plate, a housing secured to said supporting member, a lamp socket slidably mounted within said housing, a hollow contact member slidably mounted within said housing and said lamp socket, a receptacle carrying a spring pressed contact point mounted in said contact mem-

ber, an electric conductor extending through said contact member and secured to said contact point, and a spring in bearing with said socket and said housing, and a second spring in bearing with an end of said contact member and a base plate.

2. In a focusing machine having an adjusting mechanism engaging an electric bulb for moving the same relative to a base, a support for said bulb comprising a socket slidably mounted within a housing and normally maintained in extended relation thereto by a spring, a contact member slidably mounted within said housing and said socket, said contact member being maintained within said housing and socket by a second spring, means for moving said contact member against its spring, and other means for coupling said contact member and socket together so as to cause the withdrawal of the latter into the housing.

3. In a focusing machine having an adjusting mechanism engaging an electric bulb for moving the same relative to a base, a support for said bulb comprising a socket slidably mounted within a housing and normally maintained in extended relation thereto by a spring, a hollow contact member slidably mounted within said housing and said socket, said contact member being provided at its end adjacent the exterior end of said socket with a recess, a split hollow ball rockably mounted within said recess, a receptacle supported by said ball, said receptacle having a spring pressed contact therein, said contact member being mounted within said socket and housing by a spring, means for moving said contact member against its spring, and other means for coupling said contact member and socket together so as to cause the withdrawal of the latter into the housing.

4. In a focusing machine having an adjusting mechanism engaging an electric bulb for moving the same relative to an adapter placed around the base of said bulb, said adapter having an internal diameter greater than the bulb base so as to allow universal movement of the base therein, a support for said bulb with adapter comprising a socket slidably mounted within a housing and normally maintained in extended relation thereto by a spring, means in said socket for securing the adapter thereto, a contact member slidably mounted within said housing and said socket, said contact member being maintained within said housing and socket by a second spring, means for moving said contact member against its spring, and other means for coupling said contact member and socket together so as to cause the withdrawal of the latter into the housing.

5. A focusing machine comprising a lamp socket adapted to have an electric bulb positioned therein, a standard having a plurality of lenses, a second standard carrying thereon

- universal adjusting means adapted to engage said bulb to move the filament thereof relative to said socket, said socket being slidably mounted within a housing and maintained in extended relation thereto by a spring, a contact member slidably mounted within said housing and said socket, said contact member being maintained within said housing and socket by a second spring, means for moving said contact member against its spring, and other means for coupling said contact member and socket member together so as to cause the withdrawal of the latter into the housing.
6. A focusing machine comprising a lamp socket adapted to have an electric bulb positioned therein, a plurality of lenses carried upon said machine for focusing the image of the energized filament of said bulb upon a plurality of screens, a second standard carrying thereon universal adjusting means for effecting the movement of the filament of said bulb relative to said socket, said socket being slidably mounted within a housing and normally maintained in extended relation thereto by a spring, a contact member slidably mounted within said housing and said socket, means associated with said contact member for raising it vertically upon upward vertical movement of said adjusting mechanism, other means for moving said contact member downwardly, still other means for coupling said contact member with said socket so as to cause the withdrawal of the latter into the housing.
7. A focusing machine comprising a plurality of image screens, a lamp socket for holding an electric bulb provided with an adapter around its base, said adapter having an internal diameter slightly greater than said bulb so as to allow the latter to be universally positioned relative thereto, a standard having a plurality of lenses for focusing the image of the energized filament of said bulb upon a plurality of screens, the second standard carrying thereon universal adjusting means for effecting the movement of said bulb relative to said adapter, means in said socket for securing said adapter thereto, said socket being slidably mounted within a housing normally maintained in extended relation thereto by a spring, a hollow contact member slidably mounted within said housing and socket, one end of said contact member provided with a recess, a split ball mounted therein for universal movement, the ball being in bearing with the base of said bulb, a receptacle having a spring pressed contact point carried by said ball, an electric conductor extending through said contact member and secured to said contact point, said contact member being maintained within said housing and socket by a second spring, means for moving said contact member against its spring, and other means for coupling said contact member and socket together so as to withdraw the latter into the housing.
- In testimony whereof I affix my signature.
 GEORGE H. CUSHING.

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