Nov. 12, 1929. P. R. BASSETT 1,735,667

DRUMLESS SEARCHLIGHT

Filed Aug. 30, 1918 2 Sheets-Sheet 1

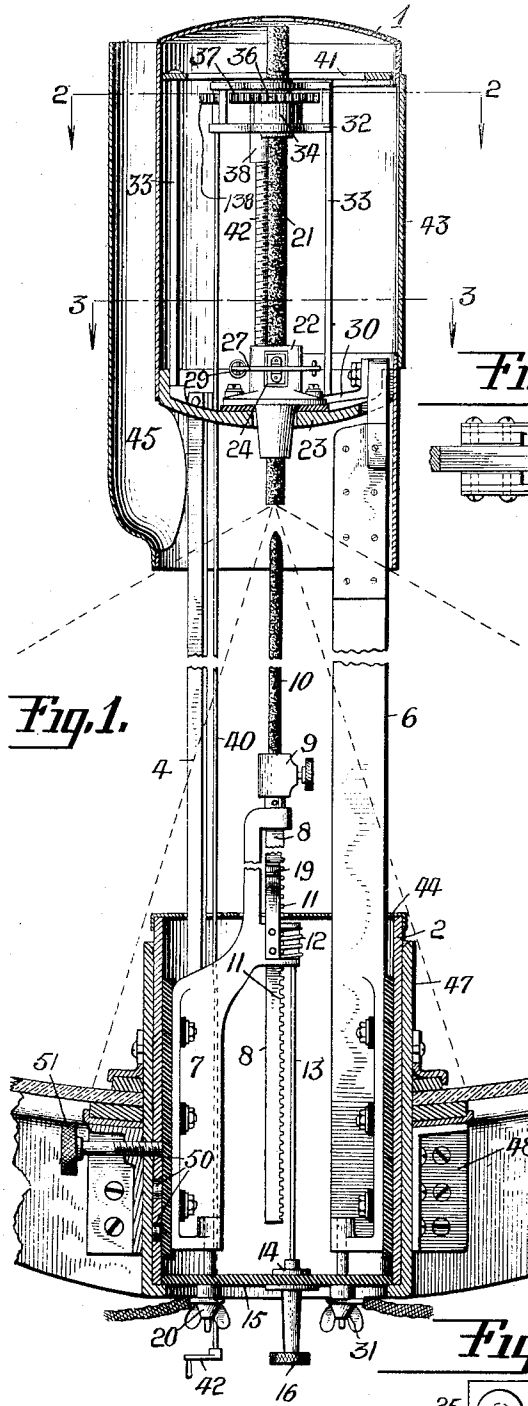

Fig. 1.

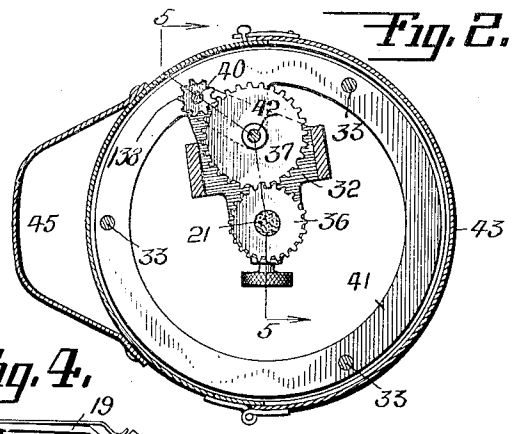

Fig. 2.

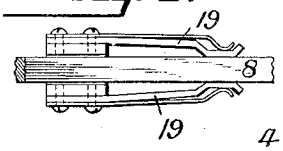

Fig. 4.

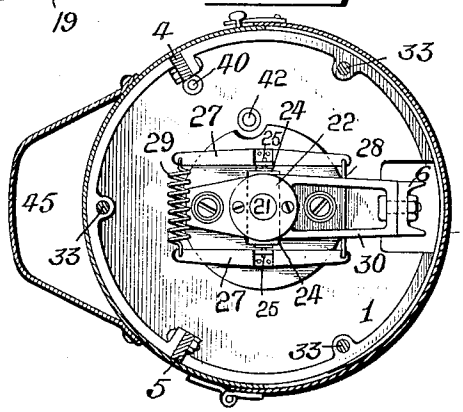

Fig. 3.

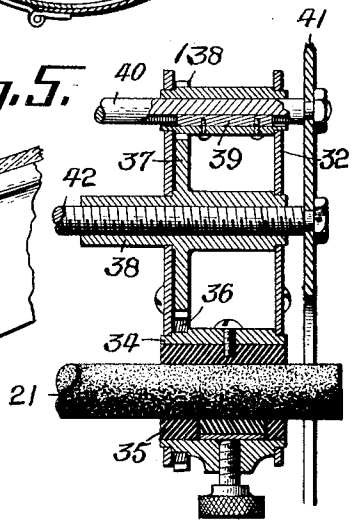

Fig. 5.

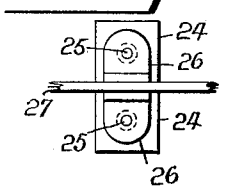

Fig. 6.

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DRUMLESS SEARCHLIGHT

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Fig. 13.

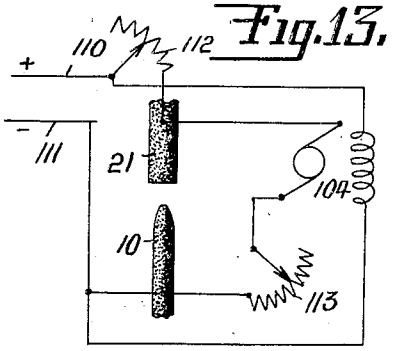


Fig. 7.

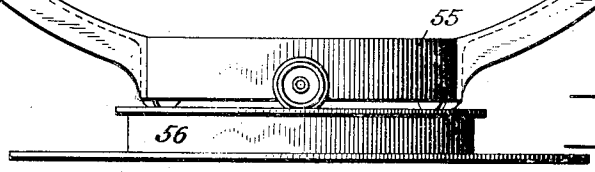


Fig. 12.

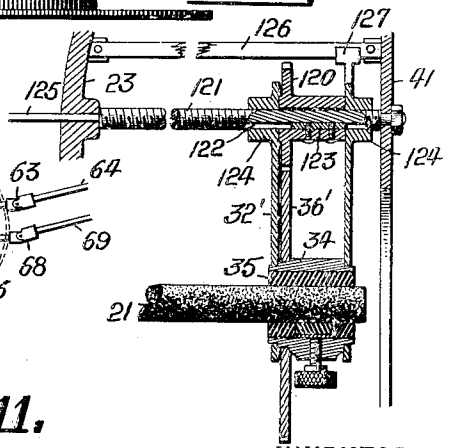


Fig. 8.

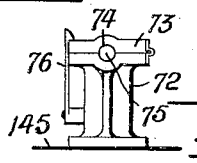


Fig. 9.

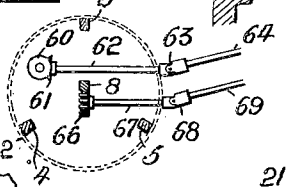


Fig. 10.

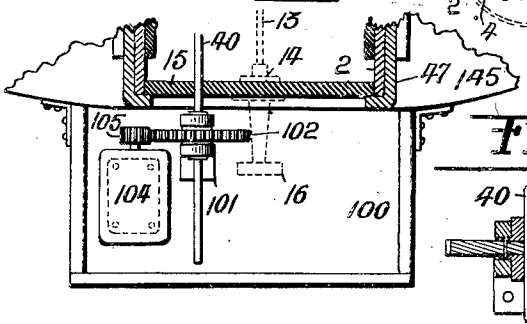
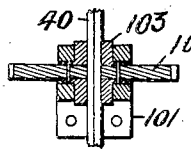


Fig. 11.



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UNITED STATES PATENT OFFICE

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DRUMLESS SEARCHLIGHT

Application filed August 30, 1918. Serial No. 252,114.

This invention relates to high intensity arc lamps capable of broad application but particularly adapted to be employed in conjunction with a mirror, or other light condensing means to form a high intensity projector, preferably of the drumless type.

It has been the practice so to design drum type searchlights that the lamp unit proper might be detached from the drum to facilitate repair, etc. One of the objects of the present invention is to provide this feature of detachability of the lamp unit for drumless lights.

Another object is to provide a metallic arc surrounding shield to minimize deflection of the arc due to the wind, which shield is preferably insulated from the arc electrodes to prevent flashing or arcing over and consequent destruction of the shield.

A further object is to provide means whereby the lamp unit may be bodily shifted with respect to the focus of the light condensing means so that the angle of the beam may readily be controlled.

A still further object is to provide a compact, reliable but simple form of electrode feed and rotating means. Other objects and advantages will appear as the invention is hereinafter developed.

Referring to the drawings which illustrate what I now consider the preferred forms of my invention:

Fig. 1 is a sectional elevation of one form of my invention.

Figs. 2 and 3 are sections taken on the lines 2—2 and 3—3 of Fig. 1, respectively.

Fig. 4 is a detail view illustrating one form of means for conveying current to the negative electrode.

Fig. 5 is a section on the line 5—5 of Fig. 2.

Fig. 6 is a fragmentary detail view illustrating a portion of the means for conveying current to the positive electrode.

Fig. 7 is a sectional elevation illustrating my invention applied to a reflector and support and embodying certain modifications.

Fig. 8 is a detail view illustrating one form of operating rod support forming a part of the structure illustrated in Fig. 7.

Fig. 9 is a fragmentary sectional detail illustrating certain of the operating parts embodied in the unit illustrated in Fig. 7, the view being taken on line 9—9, Fig. 7.

Fig. 10 is a fragmentary detail partly in section illustrating a modified form of feed and rotating means.

Fig. 11 is a sectional detail of a portion of the mechanism illustrated in Fig. 10.

Fig. 12 is a view similar to Fig. 5 but illustrating a modification.

Fig. 13 is a wiring diagram for the form of the invention shown in Fig. 10.

Referring to Figs. 1, 2 and 3, it will be seen that the arc lamp unit comprises upper and lower containers 1 and 2, which are connected by a plurality of bars or strips 4, 5, and 6. The lower container 2 may be of various forms and is here shown as substantially cylindrical. A metallic bracket 7 is secured to, but insulated from said container 2 and slidably supports a rod 8. The last mentioned member is provided adjacent one end with a clamp 9 adapted to receive and grip the negative carbon or electrode 10. Various forms of mechanisms may be adopted for sliding the rod 8 longitudinally to control the position of the carbon 10. Thus the said rod 8 may be provided with teeth 11 along one of its edges, said teeth being adapted to mesh with a worm 12 secured to a shaft 13, which shaft may be rotatably mounted on the bracket 7. The shaft 13 is shown journaled at 14 in a plate of insulation 15 suitably secured to the container 2 and forming the bottom thereof. A thumb nut 16 may be provided on said shaft 13 to form a means for manually controlling the position of the carbon 10. Preferably a plurality of spring pressed brushes 19 are mounted on the said bracket 7 on each side of the rod 8 for the purpose of forming a positive electrical connection between said bracket and said rod. A stud or terminal 20 may be secured to the bracket 7 and extended through the insulation 15 to provide an easily accessible means for connecting the current carrying conductor to said bracket.

The upper or positive electrode 21 is shown slidably mounted in a bushing 22 carried by but insulated from the metallic bottom 23 of the container 1. While brushes such as the

brushes 19 illustrated in connection with the negative electrode may be employed to convey current to the positive, I prefer to employ the means shown in Figs. 1, 3 and 6, which means may be constructed substantially as follows:

The bushing 22 is provided with diametrically opposed openings in which are slidably mounted contact blocks or brushes 24. Each of said blocks 24 is shown provided with an outwardly extending pin 25 which fits into an opening provided in each of the angle brackets 26. Two of the latter are secured to each of levers 27 which are connected at one end by a rod 28 and at the other by a tension spring 29 so that the blocks 24 will be held firmly in contact with the positive carbon 21.

In order to convey current to the positive electrode one of the supporting rods, i. e., the rod 6, is employed as a bus bar. It will appear hereinafter that this member 6 not only serves as a support and as a means for conveying current to the positive carbon, but also forms a means for deflecting the arc. Said member 6 is secured at one end to, but insulated from the lower container 2 and extends at its other end through an opening in the bottom 23 of container 1. The last mentioned end of said member 6 is rigidly connected by means of a metallic bracket 30 to the bushing 22. A binding post or terminal 31 in all respects similar to the terminal 20 may be connected to the lower end of said bus bar 6.

In order to prevent lipping of the positive crater and consequent loss in efficiency of the lamp, it is preferable that the positive carbon 21 be rotated, as well as fed. I combine the feed and rotating mechanism in one compact structure as illustrated in Figs. 1, 2 and 5, which may be described as follows:

A carriage 32 is shown slidably mounted in the container 1 so as to travel in a direction parallel to the axis of the positive carbon. A clamp 34 is rotatably carried by said carriage and is adapted to receive and grip the positive carbon 21. It will be noted that the clamp 34 is insulated from said carbon by means of an insulating bushing 35. A gear wheel 36 is secured to the clamp 34 and is adapted to mesh a gear wheel 37 forming an integral part of a nut 38 rotatably but non-slidably mounted on said carriage 32. The nut 38 is internally threaded to receive an elongated screw 42 rigidly connected at one end to an annular plate 41 and at its other end to the bottom 23 of container 1. Said plate 41 is secured to the upper portion of the last mentioned container and is connected to the bottom member 23 by rods 33.

It will be seen that the rotation of the gear wheel 37 will not only rotate the clamp 34 and consequently carbon 21, but will also cause the entire carriage to move longitudinally with respect to the screw and container 1. The gear 37 may be rotated by means of a pinion 138 meshing therewith and rotatably mounted on said carriage 32. The said pinion is shown keyed at 39 to a shaft 40 so that although rotation of the last mentioned member will cause rotation of said pinion the latter may slide with respect to said shaft. The shaft 40 may be journaled in the plates 41, 23, and 15. A handle or crank 42, secured to said shaft 40 may be employed for the purpose of controlling the rotation and feed of the positive carbon from a point at the lower end of container 2. The upper container 1 may be provided with a door 43 and the lower container 2 with a detachable lid or cover 44 for the purpose of permitting access to the lamp mechanism.

The upper container 1 is preferably provided with a chimney or flue 45 having its inner opening on the side of the arc opposite the bus bar 6. Bearing in mind that the current passes upwardly in bus bar 6 and downwardly through the arc it will be appreciated that the current in bus 6 will deflect the arc towards the chimney 45 at all times when the lamp is in operation.

The lamp unit above described is particularly adapted to be employed in connection with the drumless type of searchlight. Thus in Fig. 1 I have illustrated a support 145 for the mirror 46, said support having secured thereto, by means of angles 48, a socket 47. The plug-shaped base or container 2 of the lamp unit is adapted to seat in said socket 47 so that the axis of the carbons is substantially coincident with the optical axis of the reflector. Means may also be provided for securing the base 2 in socket 47 in any one of a plurality of positions with respect to the mirror. Thus the member 2 is shown provided with a plurality of holes 50 each of which is adapted to receive the inner end of a screw 51, threadedly engaged with the socket 47. By placing one or another of holes 50 opposite said screw and inserting the latter the lamp unit may be secured in various positions along the optical axis of the mirror and angle of the beam thereby controlled without disturbing the position of the carbons with respect to said lamp unit.

The arrangement of parts and operation is preferably such that the flare or chimney 45 is never below the arc. Thus, if the plane of the paper on which Fig. 1 is shown is a vertical plane, the lamp unit should be rotatable about an axis normal to this plane and care should be taken not to rotate the mechanism to the left of the position illustrated in the last mentioned figure.

One suitable form of mounting for the support 145 and the mechanism it supports is shown in Fig. 7. Said support is shown pivoted for oscillation about a normally horizontal axis 52—52, in trunnion arms 54.

The latter may be secured to a turn-table 55 rotatable about a vertical axis with respect to the base 56. By virtue of the above described supporting structure it is obvious that the beam may be directed at any point in space without placing the chimney 45 below the arc.

It will be noted that the container 1 surrounds the arc and extends downwardly to a position as low as possible without intercepting the rays emanating from the positive crater and directed at the mirror 46. The shield so formed prevents deflection of the arc by the wind and cuts off stray light from the arc without the use of a drum. Its use is made possible by virtue of the fact that it is insulated from both carbons, as otherwise flash-overs would lead to its destruction. Not only is the container 1 insulated from the carbons but so also is the other container 2, so that neither terminal of the lamp is grounded and the safety of handling is enhanced.

The above described structure may be modified in various ways. Thus, instead of extending the shafts or rods 13 and 40 to the rear of the support 145, the mechanism shown in Figs. 7 to 9 may be employed. This mechanism may be constructed substantially as follows:

The shaft 40 terminates adjacent the upper part of the container 2 and has secured thereto a beveled gear 60. The last mentioned gear is shown meshing with a beveled gear 61 secured to a shaft 62 suitably journaled in the container 2 and extending to the exterior of said container. The projecting end of said shaft 62 may be connected by means of a universal joint 63 to a comparatively long shaft 64 which terminates in an operating crank 65.

Instead of employing the gear 12 and shaft 13, mechanism 67 to 70 similar to elements 62 to 65 may be employed to effect the negative feed. The shaft 67 is however provided with a gear 66 secured thereto, which meshes with the rack bar 8. In conjunction with the last described form of the invention I prefer to provide means whereby the rods or shafts 64, 69 may be detachably secured to the lamp unit, when the latter is detached from its support 145, and whereby said shafts may be rotatably but detachably secured to said support adjacent one of the trunnion arms 54 when the lamp unit is in the operative position. As the means for each of said shafts is a duplicate of that for the other a description of one will suffice for both.

The container 1 has mounted thereon a clip 71, which may be similar to the clip of the ordinary knife switch and adapted to receive the rod 69 and detachably hold the latter in the dotted line position, shown in Fig. 7. The edge of support 45 adjacent one of the trunnion arms 54 has secured thereto a bracket 72 clearly shown in Figs. 7 and 8. This bracket is shown provided with a hinged portion 73, said hinged portion being provided with a semi-cylindrical recess 74 adapted to cooperate with a similar recess 75 in the main portion of said bracket to form a seat in which the rod or shaft 69 may rotate. A spring catch 76 may be provided on said bracket 72 for holding the member 73 closed on said bracket. When the lamp unit is detached the shafts 64, 69 may be engaged in the clips on container 1 so that the whole lamp unit will be compact and easy to handle. When the unit is placed in the socket 47 said shafts may be disengaged from the last mentioned clips and placed into the brackets on the support 145. By rotating the cranks 65, 70 the control of the electrodes may be effected.

If the last described form of the invention is employed it is preferable to provide means for controlling the position of the lamp unit, with respect to its support 145, from a position adjacent the cranks 65, 70. Thus the means 50, 51 shown in Fig. 1 may be dispensed with and the means illustrated in Fig. 7 employed. The last mentioned means may be constructed substantially as follows:

The rear or bottom portion of the socket 47 is shown closed to support for rotation the meshing, beveled gears 77, 78. The former may be journaled at 79 on said socket and the latter in a bracket 80 also secured to said socket. The shaft 81 of the gear 77 is threaded and is adapted to screw into a nut 82 secured to the bottom of the base or container 2. The shaft of the gear 78 is shown connected by means of a universal joint 83 to a shaft 84 journaled at 85 in the rim of the support 145. The projecting end of said shaft 84 may be provided with a hand wheel 86 for operating the same. In order to prevent rotation of the lamp unit when the latter is placed in the operative position the container 2 may be provided with a pin 87 adapted to enter a slot 88 in the socket 47, said slot preferably being parallel to the axis of the lamp unit. Assuming that the latter is disengaged from its support the operation in assembling may be substantially as follows:

The base 2 may be seated in its socket 47, care being taken to register the pin 87 with slot 88. The nut 82 will then engage the screw shaft 81 so that by rotating the wheel 86 the lamp unit may be adjusted and held in any desired position along the optical axis of the reflector 46. The current conducting leads should be connected to the lamp terminals before the unit is placed into its socket. The operation to disassemble will be obvious in view of the above description.

If desirable the lamp may also be provided with an occulting device 90 slidable from

the position illustrated in Fig. 7 to a position in which it surrounds the arcing ends of the carbons. This device may be constructed in the form of a hollow metallic cylinder coaxial with the carbons and having secured thereto a plurality of arms 91 each slidably connected to a corresponding one of supporting strips 4, 5. There should preferably be enough friction between said arms and strips to prevent accidental displacement of the occulter on manipulation of the projector. A handle 92 may be provided on said device 90 for the purpose of moving it from operative to inoperative position and vice versa.

The carbon feed and rotating means thus far described is entirely manually operated, but is susceptible of automatic or semi-automatic operation. In Figs. 10, 11 and 13, I have shown one form of automatic means for controlling the position and effecting rotation of the positive electrode. The similarity between this form and that shown in Fig. 1 will be readily recognized in view of the fact that the same reference characters are employed to designate corresponding parts. It will be seen that the crank at the lower end of the shaft 40 is dispensed with and that said lower end is of square cross-section. A casing 100 is secured to the lower side of the support 145 and carries a journal bracket 101 which in turn rotatably supports a gear 102. The hub 103 of the latter is provided with an opening which is square in cross-section and adapted to receive the squared end of the shaft 40. The casing 100 carries also an electric motor or other source of power 104, the pinion 105 of which meshes with the gear 102. Various forms of electrical connections may be employed with the form of invention illustrated in Figs. 10 and 11, one form of connections being illustrated in Fig. 13.

The carbons 10, 21 are shown connected in series with a rheostat 112 across the mains 110, 111. The motor 104, as shown, is of the shunt wound type and has its armature connected in series with a rheostat 113 across the arc. The field of said motor is shown connected across the mains 110, 111. By virtue of the above described connections, motor 104 will not only automatically rotate the carbon 21 but will automatically maintain the distance between the carbons, i. e., the arc length, constant. If the arc becomes too long the armature of the motor 104 will receive more current so that said motor will speed up and feed the positive electrode 21 at a rate greater than the rate of electrode consumption so that the arc length will be diminished. If on the other hand the arc becomes too short the motor 104 will slow down to a speed lower than that necessary to compensate for electrode consumption so that the arc length will increase. Bearing in mind that the above described mechanism automatically maintains the arc length constant it will be understood that the position of the crater of the positive electrode 21 with respect to the reflector 46 may readily be adjusted or changed by changing the position of the negative electrode by means of the nut 16. Furthermore the entire lamp unit may be shifted to adjust the position of the positive crater with respect to the mirror by either of the means shown in Figs. 1 or 7. If it is desired to change the arc length, the rheostat 113 may be operated to cut in or out resistance in the armature circuit of said motor 104.

A modified form of feed and rotating mechanism for the positive electrode is illustrated in Fig. 12. In this figure the elements 21, 23, 32′, 34, 35 and 36′ correspond to elements 21, 23, 32, 34, 35 and 36 of Figs. 1 and 5, and will readily be recognized. The gear 36′ meshes with a gear 120 non-slidably but rotatably mounted with respect to the carriage 32′. The last mentioned gear is slidably but non-rotatably mounted on a shaft 121 by means of a key 123 and elongated key-way 122. The last mentioned shaft is rotatably but non-slidably mounted in the members 23, 41 and is exteriorly screw threaded to engage internally threaded bosses 124 on the carriage 32′. An arm 127 may be provided on said carriage, said arm being forked at its end 127 to straddle a guide strip 126 secured to members 23 and 41. On rotation of the elongated portion 125 of the shaft 121 in the proper direction the electrode 21 will not only be rotated but fed as well. The shaft 125 may be actuated in any of the ways previously described in connection with the shaft 40. The form of invention shown in Fig. 12 possesses the important advantage of effecting a combined feed and rotation with a small number of moving parts.

The shaft 125 should preferably be placed between the arc and one or the other of the supporting strips 4, 5 i. e., in a position corresponding to that of the shaft 40 in Fig. 3. By so placing said shafts the area of opaque objects between the positive crater and the reflector is reduced to minimum.

In accordance with the provisions of the patent statutes, I have herein described the principle of operation of my invention, together with the apparatus, which I now consider to represent the best embodiment thereof, but I desire to have it understood that the apparatus shown is only illustrative and that the invention can be carried out by other means. Also, while it is designed to use the various features and elements in the combination and relations described, some of these may be altered and others omitted without interfering with the more general results outlined, and the invention extends to such use.

Having described my invention, what I claim and desire to secure by Letters Patent is:

1. In combination, an arc lamp unit having

a plug-shaped base, a support having a socket adapted to receive said base, electrode positioning means carried by said unit and including a control rod, and means for detachably connecting said rod to said unit or to said support.

2. In a searchlight, the combination with a projector of an arc lamp comprising two containers in substantial alignment with the axis of said projector, a carriage slidably mounted in one of said containers, electrode-clamping means rotatably mounted on said carriage, mechanism mounted in the last mentioned container for imparting sliding movement to said carriage and rotary movement to said clamping means and an operating rod operatively connected to said mechanism and extending through the other container.

3. In a searchlight, the combination with a projector, of an arc lamp comprising two connected containers, a rotatable rod extending from one of said containers to the other, electrode-clamping means and means including a slidably mounted carriage connected to said clamping means and rod for imparting a screw motion to said clamping means on rotation of said rod.

4. In an arc lamp mechanism, a support, a carriage, means for slidably but non-rotatably mounting said carriage on said support, electrode-gripping means rotatably mounted on said carriage, a shaft, means for rotating the same and a single means actuated by said shaft for causing movement of said carriage and rotation of said gripping means.

5. In an arc lamp mechanism, a support, a carriage, means for slidably but non-rotatably mounting said carriage on said support, electrode-gripping means rotatably mounted on said carriage, a threaded element connected to said support, a coacting threaded element supported on said carriage, a rotatable shaft and gearing for rotating and feeding said gripping means and one of said elements by rotation of said shaft.

6. In an arc lamp mechanism, a support, a carriage, means for slidably but non-rotatably mounting said carriage on said support, electrode-gripping means, means for rotatably but non-slidably mounting said gripping means on said carriage, a threaded element connected to said support, a coacting threaded element supported on said carriage, a rotatable shaft and gearing for rotating said gripping means and said coacting element from said shaft.

7. In an arc lamp, an electrode holder comprising a forward stationary sleeve adjacent the arc, a rearward slidable carriage, a rotatable member thereon adapted to clamp the electrode, a threaded shaft extending between said sleeve and carriage, a toothed nut rotatably mounted on said carriage and threaded on said shaft, and means for rotating said nut, said nut being geared to said member to rotate the same.

8. In an electric arc mechanism, the combination with a casing, of a longitudinally and rotatably operable positive carbon mounted in offset relation with respect to the casing, manually operable means for effecting the longitudinal and rotatable movement of the positive carbon, a rectilinearly operable negative carbon supported by the casing, and manually controlled means for producing movement of the negative toward the positive carbon.

9. In an electric arc mechanism, the combination with a casing, of a longitudinally and rotatably operable positive carbon mounted in lateral offset relation with respect to the casing and in alignment with its horizontal axis, manually operable means for effecting the longitudinal and rotatable movement of the positive carbon, a rectilinearly operable negative carbon supported by the casing, and manually controlled means for producing the rectilinear movement of the negative toward the positive carbon.

10. In an arc lamp, an electrode holder comprising a forward stationary sleeve adjacent the arc, a rearward slidable carriage, a rotatable member thereon adapted to clamp the electrode, a fixed threaded shaft, a toothed nut rotatably mounted on said carriage and threaded on said shaft and means for rotating said nut, said nut being geared to said member to rotate the same.

11. In a normally vertical searchlight, a support, a reinforced projector pivotally supported thereby, said projector having a central aperture, and an arc lamp mechanism slidably mounted in said aperture, said lamp mechanism consisting of a pair of spaced housings adapted to support the two electrodes substantially in the axis of the projector, one of which fits within said aperture while the other is in offset relation thereto and a chimney rising vertically from adjacent the lower end of said upper housing.

12. In a normally vertical drumless searchlight, a support, a projector pivotally supported thereby, spaced electrode-holders supported by the projector, a housing for the upper holder adapted to cut off light from the arc except that directed toward the projector, and a light-proof chimney rising vertically from said housing.

13. In a normally vertical drumless searchlight, a support, a projector pivotally supported thereby, spaced electrode-holders supported by the projector, a housing for the upper holder adapted to cut off light from the arc except that directed toward the projector, electrode feeding and rotating means in said housing, and a light-proof chimney rising vertically from one side of said housing to carry off the arc fumes out of contact with said feeding and rotating means.

14. In an arc lamp, an electrode holder comprising a forward stationary sleeve adjacent the arc, a rearward slidable carriage, a rotatable member thereon adapted to clamp the electrode, a threaded shaft, a gear rotatably mounted on said carriage and threaded on said shaft, said shaft and gear being relatively rotatable, means for imparting relative rotation to said gear and shaft, and a second gear fixed to said rotatable member and meshing with said first mentioned gear whereby the electrode is both rotated and fed.

In testimony whereof I have affixed my signature.

PRESTON R. BASSETT.