

E. A. SPERRY,  
FEEDING MECHANISM FOR SEARCHLIGHTS.  
APPLICATION FILED FEB. 7, 1917.

1,362,575.

Patented Dec. 14, 1920.

4 SHEETS—SHEET 1.

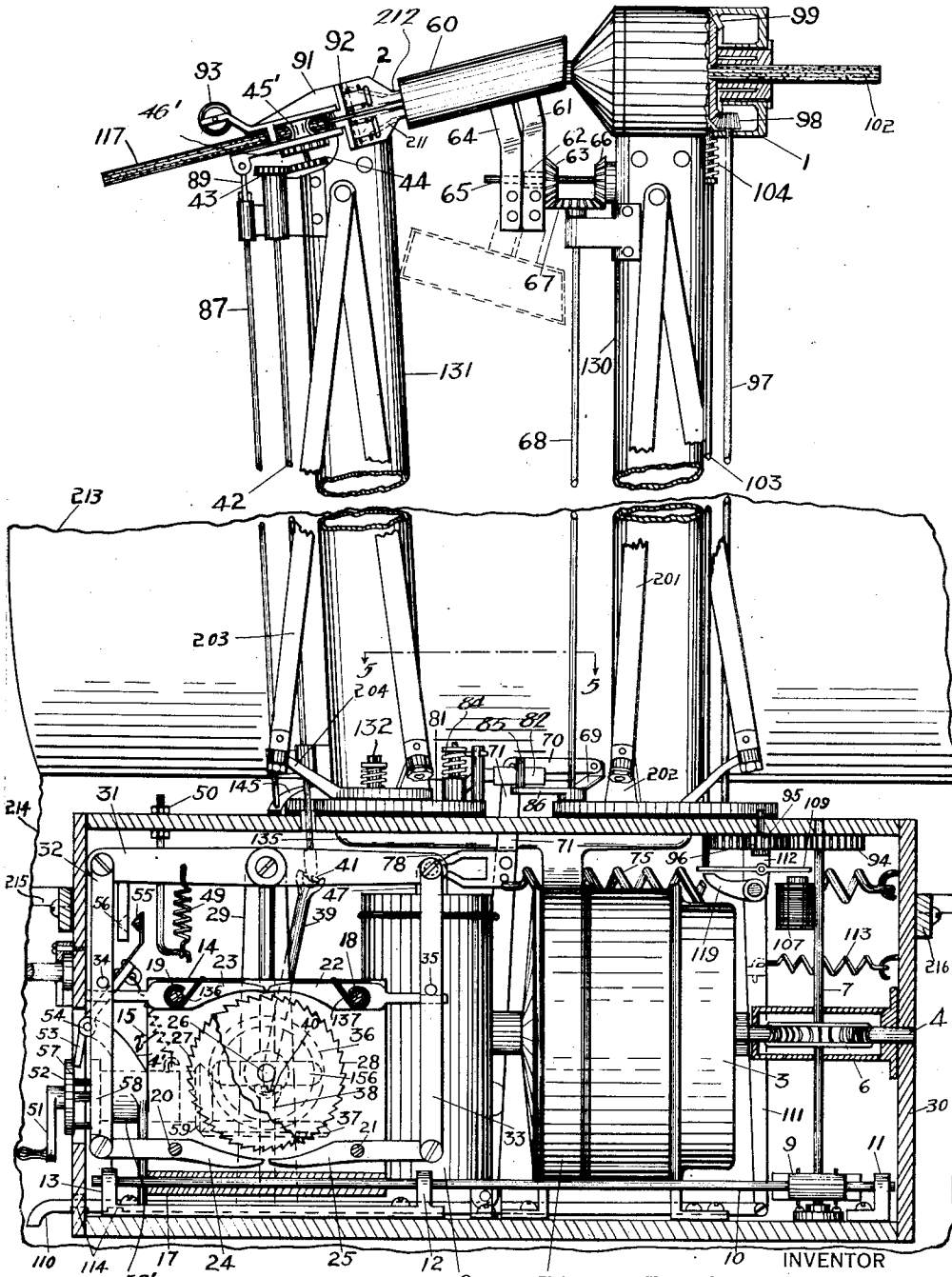


Fig. 1.

INVENTOR  
ELMER A. SPERRY.  
BY  
Herbert H. Thompson  
ATTORNEY.

E. A. SPERRY,  
FEEDING MECHANISM FOR SEARCHLIGHTS.  
APPLICATION FILED FEB. 7, 1917.

1,362,575.

Patented Dec. 14, 1920.

4 SHEETS—SHEET 2.

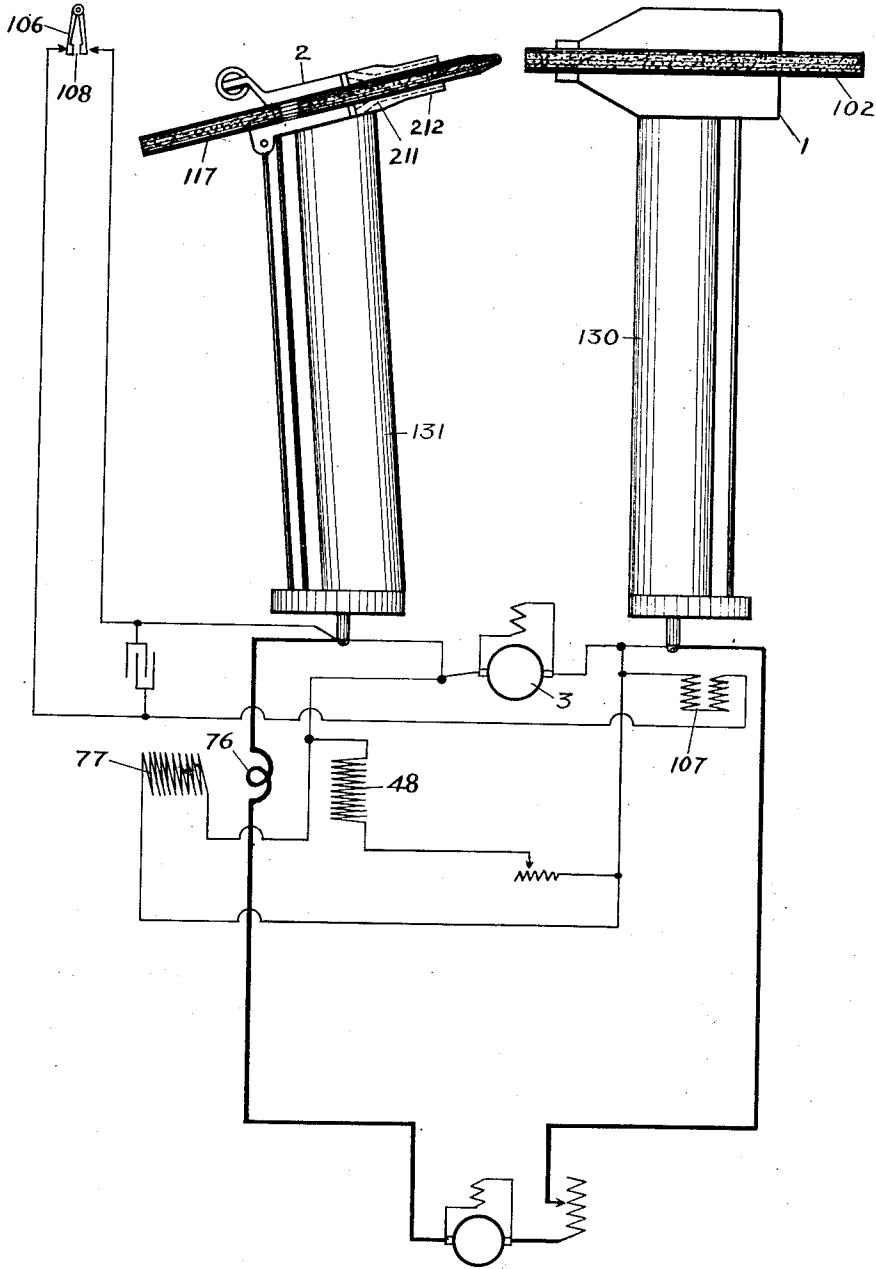


Fig. 2.

INVENTOR  
ELMER A. SPERRY.  
BY  
Herbert H. Thompson  
ATTORNEY

E. A. SPERRY.  
 FEEDING MECHANISM FOR SEARCHLIGHTS.  
 APPLICATION FILED FEB. 7, 1917.

1,362,575.

Patented Dec. 14, 1920.

4 SHEETS—SHEET 3.

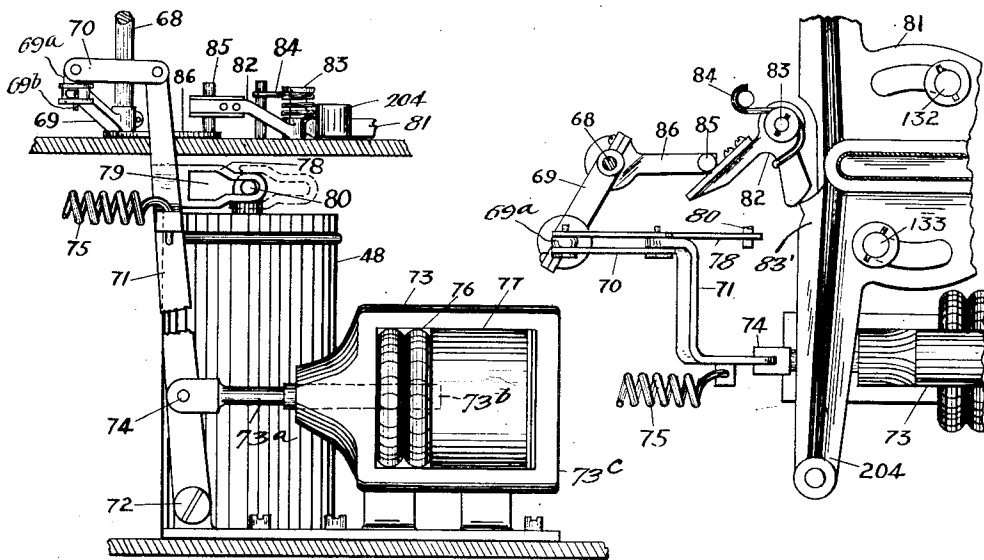


Fig. 4.

Fig. 5.

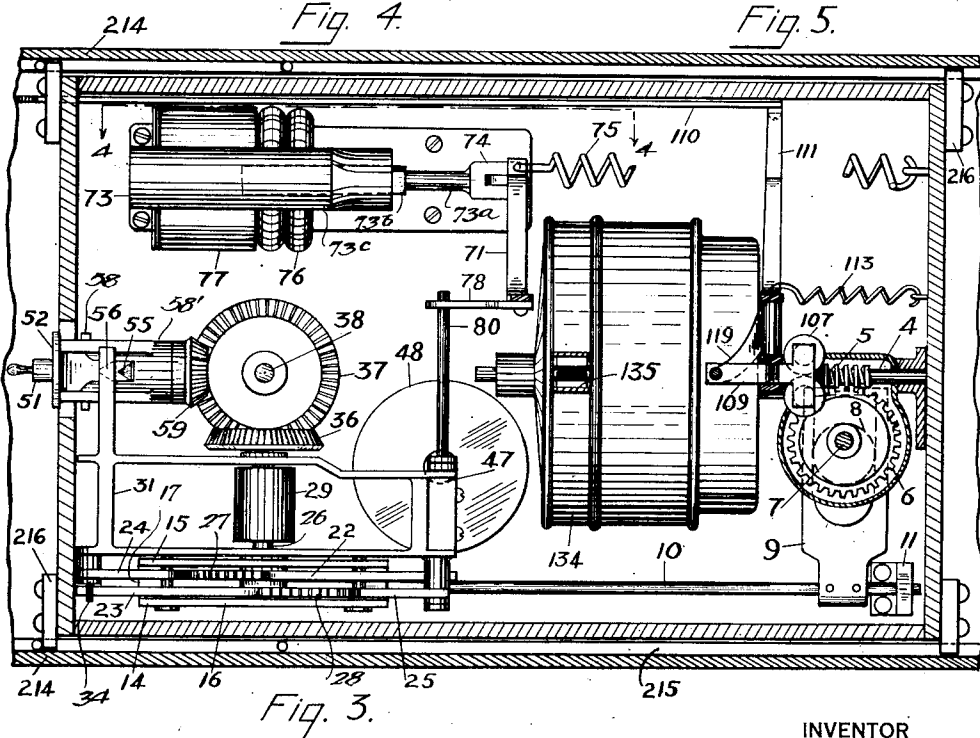


Fig. 3.

INVENTOR  
 ELMER A. SPERRY.  
 BY  
 Herbert H. Thompson  
 ATTORNEY.

E. A. SPERRY,  
 FEEDING MECHANISM FOR SEARCHLIGHTS.  
 APPLICATION FILED FEB. 7, 1917.

1,362,575.

Patented Dec. 14, 1920.

4 SHEETS—SHEET 4.

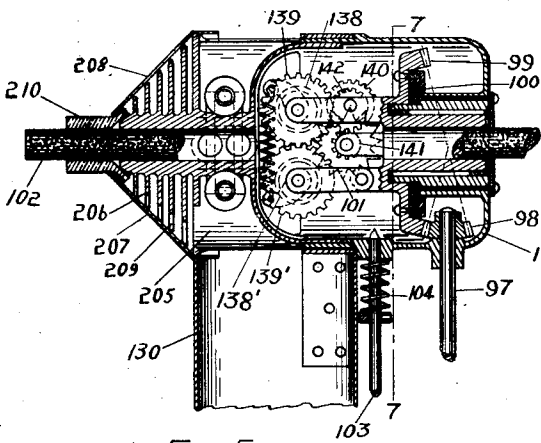


Fig. 6.

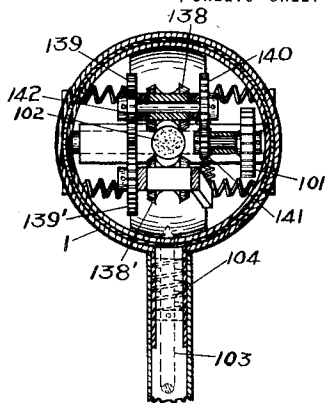


Fig. 7.

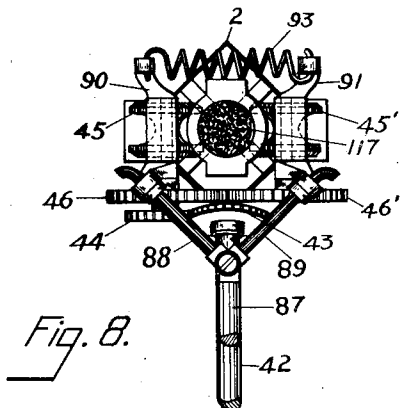


Fig. 8.

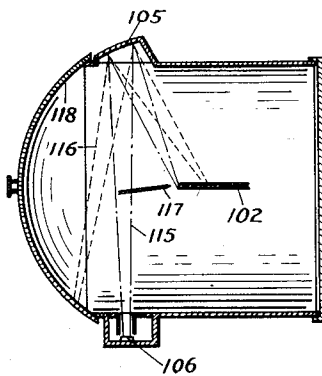


Fig. 9.

INVENTOR  
 ELMER A. SPERRY.  
 BY  
 Herbert H. Thomson  
 ATTORNEY.

# UNITED STATES PATENT OFFICE.

ELMER A. SPERRY, OF BROOKLYN, NEW YORK.

FEEDING MECHANISM FOR SEARCHLIGHTS.

1,362,575.

Specification of Letters Patent. Patented Dec. 14, 1920.

Application filed February 7, 1917. Serial No. 147,071.

*To all whom it may concern:*

Be it known that I, ELMER A. SPERRY, a citizen of the United States of America, residing at 1505 Albermarle road, Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Feeding Mechanism for Searchlights, of which the following is a specification.

10 This invention relates to improved electrode holders for high intensity searchlights, in which one or both of the electrodes is fed through the holder, and where-  
15 in means are provided adjacent to the holders for extinguishing the afterglow.

This application contains some of the matters disclosed in my pending application Serial No. 21,661 relating to improvements in searchlights, filed April 15, 1915, and as to such matters is a continuation of the same.

20 One object of my invention is to provide means whereby the negative carbon may be fed at various speeds in response to the various values of potential drop across the arc, and to use the same mechanism with which I accomplish this, to also strike the arc; most of the existing methods in actual use being  
25 to strike the arc and feed the carbon with different mechanisms.

I propose to provide means whereby the negative carbon may be fed up to the positive, for striking the arc, at a rapid speed until it touches the said positive carbon, and  
35 to then recede therefrom at a graduated speed varying inversely proportional with the potential drop across the arc, until the said potential reaches a predetermined value. The feeding of the carbon is then to be  
40 maintained by the same mechanism which will feed at speeds varying with the potential drop across the arc. When the feeding mechanism begins to operate, the distance through which the carbon is to be  
45 advanced is not always the same. The greater this distance, the more rapidly I propose to feed the carbon. With a variable speed feeding mechanism, capable of responding to the necessity of the moment, it  
50 will be seen that the desired arc length is maintained with remarkable accuracy, and therefore a maximum uniform brilliancy maintained.

Another object of my invention is to  
55 provide means for feeding the positive carbon whereby the crater of said carbon may

be kept constantly at a predetermined distance from the reflector.

A further object is to provide locking means which will prevent the arc from striking while the occulter or light quenching shields are closed, and also to prevent the occulter from closing while the arc is burning. The importance of this provision will be readily appreciated when it is understood that the intense heat from the burning arc would soon destroy the occulter if the latter were closed over said arc.

A further object of the invention is to provide means for causing the occulter to open part way when the negative carbon holder is turned to remove and replace the carbon, so as to set the carbon and holder free; and to close again when the carbon holder is turned back.

Referring to the drawings in which what I now consider to be the preferred form of my invention, is shown: Figure 1 is a side elevation partly in section of the control box containing the feeding mechanism with the carbon holders mounted rigidly thereon; most of the searchlight drum being cut away. Fig. 2 is a wiring diagram. Fig. 3 is a horizontal section through the control box showing the mechanism contained therewithin. Fig. 4 is a back elevation taken approximately on line 4—4, of Fig. 3 of means for operating the occulter. Fig. 5 is a detail taken approximately on line 5—5, Fig. 1, from the rear, showing the mechanism for opening the occulter when the negative carbon holder is turned to remove and replace the carbon. Fig. 6 is a sectional view of the head of the positive carbon holder. Fig. 7 is a cross section thereof taken at right angles to Fig. 6 on line 7—7. Fig. 8 is a rear elevation of the negative carbon head and Fig. 9 is a diagrammatic view of the arrangement of the thermostat for controlling the feeding of the positive carbon.

In Fig. 1 the searchlight drum is shown at 213, being mostly broken away. Extending downwards from the bottom of the drum are walls 214 in the sides of which are provided runways 215. The control box is shown at 30, having projections 216 which fit into the guideways, so that the box may be slid into place in a manner similar to that of a drawer. This may readily be seen in Fig. 3.

The head of the positive electrode holder

is shown at 1, mounted on the top of a hollow leg 130, which is in turn rigidly mounted on the top of the control box 30. Braces 201 fastened to the top of the leg and to arms 202 extending out from the base thereof, serve as braces to keep the holder rigid. The head of the negative electrode holder is shown at 2, mounted on the top of hollow leg 131, on the top of the control box, the entire holder being capable of rotation on its base 81 around pegs 132 and 133 (see Fig. 5) for removing and replacing the carbons. Strips 203 and arms 204 serve as braces for the negative holder.

In order to cool the electrode holders and a predetermined portion of each electrode, I provide a centrifugal fan 134 in the control box 30. This fan is operated by a motor 3 and forces a blast of air or other cooling fluid up through duct 135 into the hollow legs 130 and 131 of the positive and negative electrode holders respectively.

The air passes from the hollow leg 130 through a channel 205 (see Fig. 6) to heat extracting ribs 206 which surround the positive carbon 102 a short distance from the arc tip thereof, being prevented from escaping by a shield 207, fitting closely around the ribs.

A slot 208 is cut in the top of the shield, through which the air escapes. The ribs are cut away at their bottoms, forming a channel 209, so that the cooling blast may be properly distributed between the ribs.

Between the cooling ribs and the arc is positioned a highly refractory, heat insulating sleeve 210 which is designed to extend close to, but preferably to stop slightly back of the arc tip of the electrode. The said sleeve preferably forms an extension from the holder, being clamped to the forward end thereof. This sleeve performs several important functions, among which is that it maintains that portion of the electrode which it surrounds at white incandescence by reducing radiation and shielding it from heat abstracting air currents. It also shields the electrode from vaporization and oxidation, which at operating temperature would cause too great spindling of the electrode. The metallic holder also performs the last named functions, being joined to the sleeve.

The air entering the head of the negative holder from the hollow leg 131, passes through ducts 211 in contact fingers 212. The air emerges at the ends of the fingers and passes upward and out of the drum. The blast of air passing through the negative holder is limited by the size of the ducts so as to prevent the air from causing flickering of the arc.

On the shaft 4 of motor 3 is a worm 5 (see Fig. 3) which engages and turns worm wheel 6 on shaft 7. On shaft 7 is also fas-

tened a cam 8 or the like located within the forked member 9 which is rigidly secured to a rod 10 mounted in guides 11, 12 and 13. The revolving of the cam will impart a reciprocating movement to rod 10. Mounted on rod 10 is a carriage or pawl unit 14. This unit may consist of upright plates 15 and 16 which are integral with member 17 through which the rod 10 passes and is snugly fitted. In Fig. 1 plate 16 is removed to show the pawls, and member 17 is shown in section. Between the plates and secured thereto are placed pins 18, 19, 20 and 21 upon which are loosely mounted pawls 22, 23, 24 and 25 respectively. Mounted rigidly on a shaft 26 between said plates are two ratchet wheels 27 and 28; wheel 28 being partly broken away to show 27. The shaft 26 has its bearing in a post 29 which is secured to the box 30. The shaft passes through a slot 156 in plate 15. Shaft 26 carries at its other end a bevel gear 36 meshing with bevel gear 37 on shaft 38. Shaft 38 may be connected through an intermediate rod 39 and universal joints 40 and 41 to feed rod 42. At the top of the feed rod is a gear 43 meshing with gear 44. On the same shaft with gear 44 is provided one of the feed rollers 45 and another gear 46. Gear 46 meshes with a similar gear 46' on the shaft with which is provided the other feed roller 45'. The carbon 117 is placed between the feed rollers.

Pivotaly mounted at the top of post 29 is a rocking member or rocker arm 31. Pivotaly fastened at the ends of said rocker arm and extending downwardly are links 32 and 33. The bottoms of links 32 and 33 are in turn loosely secured to pawls 24 and 25 respectively. Pins 34 and 35 in links 32 and 33 operate to engage the tops of pawls 23 and 22 respectively and to hold them normally disengaged from the ratchet wheels, while springs 136 and 137 serve to press them into engagement with said wheels when released by said pins 34 and 35. Secured to one end of rocker arm 31 and extending downwardly therefrom is a bar 47 which serves as the core of a solenoid 48, the winding of which is placed in shunt with the arc circuit.

When the arc is not burning the full potential is maintained in the solenoid 48, the core 47 is drawn in, pulling down one end of the rocker arm 31. When the current is off, spring 49 pulls the other end of 31 down.

As previously explained, when the current is on and motor 3 is turning, the plates carrying the pawls, move back and forth, while the ratchet wheels remain in one place. Assuming now that the arc is not burning, the full potential will be maintained in the solenoid 48 and the rocker arm will be caused to tilt, raising link 32 and lowering link 33. Pawl 25 will be placed in contact

with the bottom of ratchet 28, while pawl 23 being released by pin 34, will be pressed by spring 136 into contact with the top of said ratchet 28. It will be seen then that the reciprocating motion of the pawl unit 14 will cause pawls 25 and 23 to alternately grip and slightly turn said ratchet. This will feed the negative carbon toward the positive until it strikes. The striking will greatly reduce the current in the solenoid 48, allowing the spring 49 to tilt the rocker arm in the opposite direction, disengaging pawls 25 and 23 from the ratchet, and causing pawls 22 and 24 to engage ratchet 27. The reciprocating movement will then cause the pawls to turn the ratchets in the opposite direction, thus drawing the negative carbon away from the positive and lengthening the arc. As the arc lengthens the potential across it will increase, thereby causing the current in the solenoid to again increase and draw upon the rocker arm.

The spring 49 is so adjusted by means of nuts 50 that when a predetermined length of arc is reached, drawing a given potential, the strength of the solenoid will be sufficient to just balance the rocker arm and hold all of the pawls in a disengaged position. At any time the arc may be too long or too short, the solenoid will become stronger or weaker and tilt the rocker arm to cause the carbon to feed in or out as the case may be.

The longer the arc is, the greater will be the current flowing through the solenoid. This will cause a greater tilt of the rocker arm and likewise of the pawls, causing the pawls to take a deeper grip upon the ratchets at each stroke and turn the ratchets a greater distance (*i. e.*, through a greater number of teeth). It will be seen by this that I have a feeding mechanism capable of working at various speeds, depending upon the necessity of the moment.

In order to obtain a very slow rate of feed when the variation in potential across the arc is very slight the lower pawls may have their points a slightly greater distance from the ratchet teeth than in the case of the upper pawls. Thus, when the rocker arm is tilted very slightly, only the upper pawls will engage the ratchet teeth while the lower ones pass freely under the ratchets.

By this method of feeding at various rates of speed, I am able to readjust the arc in a minimum length of time irrespective of the distance through which the carbon is to be advanced or retracted; the greater the distance from the normal burning position, the faster the carbon will move; whatever the distance, the carbon will move through it in very nearly the same length of time.

In order to feed the carbon by hand, I may employ means such as a crank 51. By pressing in upon said crank of which the

disk 52 is a part, I rock the arm 53 pivoted at 54 to a bracket 4', thereby forcing the cone shaped pin 55 into the hole 56 in an extension from the rocking member. This furnishes a convenient means for placing and holding the pawls in the central or disengaged position when the crank is turned. At the same time, the pins 57 in the disk 52 are pressed into holes not shown in the disk 58. Disk 58 is mounted on one end of a shaft not shown, which passes through bearing 58' and carries on its other end a bevel gear 59 which meshes with bevel gear 37 of the feeding mechanism. The turning of the crank will effect the turning of gear 37 and the feeding of the negative carbon. The ratchets 27 and 28 will, during the feeding, turn freely between the pawls. Upon releasing crank 51, spring 2' will return arm 53 to its normal position (Fig. 1) and the said arm will in turn remove crank 51 to its inoperative position.

In order to extinguish the afterglow caused by the hot carbons when the arc is broken, I employ an occulter 60, comprising a pair of shields, which inclose the carbon tips from opposite sides. The leg 61 of one of the shields is mounted on sleeve 62 with bevel gear 63 while the leg 64 of the other shield is mounted on shaft 65 with bevel gear 66. Meshing with said bevel gears 63 and 66 is another bevel gear 67 on shaft 68. The opening and closing of the shields is effected by revolving shaft 68. The manner in which this may be accomplished will be seen by reference to Figs. 1, 4 and 5. To the bottom of shaft 68 is secured arm 69. A member 69<sup>a</sup> pivotally mounted on arm 69 by means of a pin 69<sup>b</sup> fixed to said member 69<sup>a</sup> and passing through arm 69 may also be pivotally connected to link 70 which is in turn connected to an actuating arm 71. Thus a longitudinal movement of link 70 will actuate arm 69 to rotate shaft 68 and actuate the occulter. Said actuating arm is pivotally connected to the casing at 72. Pivotally secured to arm 71 at 74 is a rod 73<sup>a</sup> attached to core 73<sup>b</sup> of a solenoid 73. Spring 75 serves to hold the arm 71 in a position which will keep the occulter normally closed. But when the current is passing through solenoid 73, arm 71 is pulled in the opposite direction and the occulter opened.

I prefer to supply the solenoid 73 with two coils; 76 in series with the arc and 77 in shunt therewith, said coils being mounted in frame 73<sup>c</sup>. When the current is turned on to light the searchlight, the shunt coil 77 becomes energized, thereby opening the shields. The negative carbon will be fed in as previously described. When the carbons touch, the potential in coil 77 will of course drop so low that there is danger of the occulter closing over the burning arc. But it will be seen that the current across

the arc will now be maintained in the series coil 76, thus serving to hold the occulter open.

It will be seen that by this or similar means I may provide an electrical locking means, whereby the occulter can never close, while the arc is in operation as the heat from the arc would soon destroy the occulter as previously pointed out.

Another point which I wish to avoid is the possibility of striking the arc before the shields have opened. This may be accomplished by providing on the actuating arm 71 a lock member 78, securely fastened thereto, having an irregular slot 79 therein. Passing through slot 79 is a rod 80 extending from the rocker arm 31 of the carbon feeding mechanism. When the occulter is closed and the lock member is in the full line position shown in Fig. 4, rod 80 is in the narrow part of the slot and is prevented from moving either up or down. The pawls are in their central position and cannot be actuated by the solenoid 48. When the occulter opens, however, the lock member moves into the dotted line position, and rod 80 being in the wide part of the slot is free to move up or down, and feeding of the carbon will take place.

To facilitate the removing and replacing of the negative carbon, I prefer to turn the holder thereof about its base 81 through a slight angle. As the occulter fits closely around the end of the carbon and holder, however, it is necessary to open it part way to allow the holder to turn. For convenience, and in order to avoid wrenching any of the parts, I prefer to provide means whereby the turning of the base 81 will automatically cause the occulter to open. This may be done by providing a member 82 pivoted at 83, and sufficiently pressed against the base of the carbon holder 83<sup>1</sup> by spring 84 to hold said base normally in place. When the base is turned, however, member 82 is forced to revolve about its pivot, and by pressing against pin 85 in arm 86, causes said arm to rotate with shaft 68 to which it is securely fastened. The rotation of said shaft as hereinbefore pointed out will open the occulter. When the base is turned back the spring 75 will cause the occulter to close again.

I desire also to have the rotation of the base cause the feed rollers to release their grip upon the carbon and to grip the new carbon when returned to position. For this purpose I may provide a rod 87 which carries at its top two spreading links 88 and 89. The outer ends of these links are connected with members 90 and 91 which carry the feed rollers 45 and 45' respectively. These members are hinged to the holder at 92 and are pressed toward each other by spring 93, thus pressing the feed rollers against the

carbon. The bottom of rod 87 rests on the lower part of an inclined member 145 which is rigidly fastened to the case. When the carbon holder is revolved, the rod slides up the incline and raises the lower ends of links 88 and 89 causing them to spread at the top thus spreading members 90 and 91 and releasing the carbon from the pressure of the feed rollers.

The feeding of the positive carbon is accomplished as follows: As has been pointed out, motor 3, through worm 5 and worm wheel 6, constantly rotates shaft 7. At the top of this shaft is a gear 94 meshing with an idler 95 which in turn meshes with gear 96 on shaft 97. At the top of 97 is a bevel gear 98 meshing with crown gear 99. The turning of shaft 97 causes crown gear 99 to revolve on ring 100 as a bearing. Mounted on projections from crown gear 99 are the feed rollers 138 and 138', gears 139, 139' and 140 and a star wheel 101 on the same shaft with which is a pinion 141 which meshes with gear 140. On the shaft with gear 140, is a pinion 142 meshing with gear 139, which in turn meshes with gear 139'. The feed rollers 138 and 138' are mounted on the shafts with gears 139 and 139' respectively. It will be seen that the rotation of the star wheel will cause the feed rollers to operate. As the crown gear 99 rotates, it carries these gears and feed rollers around with it, thus rotating the carbon 102 which is gripped between the feed rollers. During each revolution the star wheel 101 passes over the pointed end of a rod 103 which is normally held down by spring 104, so that the star wheel will not touch it. When the rod is raised, however, it will engage one of the points of the star wheel as the latter passes by, and cause said wheel to revolve a predetermined amount about its axis, thus slightly advancing the positive carbon.

In the searchlight drum is a reflector opposite to which is a thermostat. When the crater of the positive carbon 102 is in the desired position, the reflection of rays from the light source will fall upon the thermostat as shown by the dot and dash lines 115. But when the light source is not in the proper place the rays will not fall upon the thermostat, as shown by the dotted lines 116. The thermostat is connected in series with one or more magnets 107. When the rays are reflected upon the thermostat, the contact points 108 are caused to spread, thus opening the circuit in the magnets 107. But when the light source is not in its proper place, and the rays are consequently not focused upon the thermostat, the contact 108 closes the circuit in the magnets 107. This will rock arm 109 and raise the rod 103, placing it in the path of the star wheel and cause the positive carbon to be fed in. Thus it will be seen that whenever the light source

is not in its place, as when the burning of the carbon tends to cause the crater to recede with respect to a given distance from the searchlight reflector 118, necessary to cause a predetermined dispersion of the light beam, the feeding mechanism will be caused to operate, while, when the light source is in its place, this mechanism will remain idle.

In order to feed the positive carbon by hand, I may provide bar 110 pivotally connected to arm 111. The arm 111 is pivotally secured to a bracket 112. A projection 119 is rigidly secured to said arm 111 so that when bar 110 is pulled out the said projection will raise rod 103. A spring 113 serves to hold the hand feeding means normally in an inoperative position. Notches 114 may be provided in bar 110 which may fit over the wall of the case to lock the hand feeding means in an operative or inoperative position.

From the foregoing description, it will be seen that when the current is turned on to operate the searchlight, motor 3 will begin to turn, and with it the fan 134 for cooling the carbons; the positive carbon will rotate; coil 77 will become energized, thereby opening the occulter and releasing the rocker arm for operation; solenoid 48 will receive the full working potential, thereby causing the negative carbon to move at the maximum speed into contact with the positive. Contact 108 in thermostat 106 will of course be closed, thereby placing rod 103 in position to feed the positive carbon, but the arc will be struck so soon that if the positive carbon is in its proper place, it will not advance beyond that point. As soon as the negative carbon touches the positive, the current in coil 77 drops but coil 76 becomes energized, thereby preventing the occulter from closing as would otherwise be apt to result from the drop in coil 77. At the same moment the current drops in solenoid 48, thereby loosening the pull on the rocker arm and allowing spring 49 to tilt the arm in the opposite direction reversing the feeding mechanism and withdrawing the carbon at a maximum speed. As the arc lengthens and the potential in solenoid 48 increases, the rocker arm is brought smoothly back to its central position, causing the movement of the carbon to become slower until it stops at the normal burning distance from the positive. The thermostat will now keep the positive carbon tip in its place, while the negative carbon will be kept the proper distance therefrom by the negative feeding mechanism.

As soon as the current is turned off to put out the light, solenoid 73 becomes deenergized and spring 75 closes the occulter over the hot tips of the carbons and shuts off all after glow.

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 a searchlight, the combination with a pair of electrode holders, of means responsive to the variations in the potential across the arc for feeding one of the electrodes at a rate proportional to the amount of said variation in potential and means for maintaining the arcing face of the other electrode in a predetermined position.

2. In a searchlight, the combination with a pair of electrodes, of feeding mechanism for each electrode including means responsive to the variations in the potential across the arc for governing one of said mechanisms so as to feed the electrode connected therewith at a rate proportional to the amount of said variations in potential, and means responsive to the position of the arc tip of the other electrode for feeding said other electrode.

3. In a searchlight, the combination with a pair of electrodes, of a holder for each of said electrodes, means responsive to the deviation from normal of the potential across the arc for feeding one of said electrodes and means responsive to the position of the arc tip of the other electrode for feeding said other electrode.

4. In a searchlight, the combination with an electrode holder, of an occulter movably mounted adjacent thereto, yielding means normally holding said occulter in the closed position, means responsive to the turning on of the arc current for opening the occulter, and a lock for preventing striking of the arc before the occulter opens.

5. In a searchlight, the combination with an electrode and a holder therefor, of feeding means for said electrode comprising a ratchet wheel, a carriage mounted adjacent thereto, a pawl adapted to cooperate with said ratchet adjustably mounted on said carriage, means for altering the adjustment of the ratchet to effect a variable throw, means for imparting a relative reciprocating motion to said carriage, and feeding means for said electrode connected with said wheel.

6. In a searchlight, the combination with an electrode and a holder therefor, of feeding means for said electrode comprising a

ratchet wheel, a carriage mounted adjacent thereto, a pawl adapted to cooperate with the said ratchet adjustably mounted on said carriage, means responsive to the potential drop across the arc for altering the extent of throw of the ratchet by a reciprocation of the carriage, means for imparting a relative reciprocating motion to said carriage, and feeding means for said electrode connected with said wheel.

7. In a searchlight, the combination with an electrode and holder therefor, of feeding means for said electrode, a ratchet wheel operatively connected with said feeding means, a carriage mounted adjacent said wheel, means for imparting a reciprocating motion to said carriage, a plurality of pawls mounted on said carriage, a rocker member connected with said pawls, means for normally tilting said rocker member in one direction for causing a pawl to turn said ratchet in one direction, means responsive to the potential drop across the arc for tilting said rocker member in the opposite direction to cause another of said pawls to turn said ratchet in the opposite direction, said latter means being so adjusted as to hold the rocker member in a central position with the pawls disengaged, in response to a predetermined potential drop across the arc.

8. In a feeding mechanism for arc light electrodes, the combination with a power means, of a constantly reciprocating carriage actuated thereby, a plurality of pawls pivotally mounted on said carriage, a ratchet mounted adjacent said pawls for feeding one of said electrodes forward or backward, a rocker member for controlling the position of said pawls with respect to said ratchet, means for normally actuating said rocker member so as to place one or more of said pawls in contact with said ratchet for feeding the electrodes forward, and means responsive to the potential drop across the arc for actuating said rocker member so as to place one or more of the other of said pawls in contact with said ratchet for feeding the electrode backward.

9. In a searchlight, a normally stationary holder for an electrode, mechanism for feeding the electrode through said holder, a pawl and ratchet unit mounted without the searchlight drum, a shaft connecting said unit with said mechanism, power means also without said drum for actuating said unit and means responsive to the potential drop across the arc for governing said unit, whereby said electrode will be fed backward or forward at rates proportional to said potential drop.

10. In a searchlight, a stationary holder for each of the electrodes, means responsive to the position of one of said electrodes for feeding the same through the holder,

power means without the searchlight drum for actuating said feeding means, mechanism for feeding the other electrode through the other holder, a pawl and ratchet unit also without said drum, a shaft connecting said unit with said mechanism, means connecting said power means with said unit for actuating said unit, and means responsive to the potential drop across the arc for governing said pawl and ratchet unit whereby said latter electrode will be fed backward or forward at speeds proportional to said potential drop.

11. The combination with a plurality of holders for electrodes, of mechanism for feeding an electrode through one of said holders, a pawl and ratchet unit for actuating said mechanism, power means for actuating said unit, means responsive to the potential drop across the arc for controlling the relation between the pawls and ratchet for governing the direction and speed of the feeding of the carbon, a handle for actuating said mechanism manually and a lock actuated upon the movement of said handle for holding said pawls in an inoperative position.

12. Feeding mechanism for electrodes comprising a ratchet wheel, a reciprocating carriage mounted adjacent said wheel, a plurality of pawls movably mounted on said carriage to engage and turn said ratchet in one direction, a plurality of pawls movably mounted on said carriage to engage and turn said ratchet in the opposite direction, means responsive to the potential drop across the arc for placing one or more of said pawls in contact with said ratchet, whereby said ratchet will be turned in either direction at speeds proportional to said potential drop.

13. In a feeding mechanism for electrodes, a movably mounted carriage, means for reciprocating said carriage, a pair of pawls adjustably mounted thereon, said pawls being positioned for successively turning the ratchet in the same direction when both are in an operative position, and means responsive to the potential drop across the arc for bringing either one or both of said pawls into engagement with the ratchet and means actuated by the movement of said ratchet for feeding the electrodes.

14. In connection with an electrode feeding mechanism for searchlights, a plurality of ratchet wheels for actuating said mechanism, a plurality of pawls for acting upon said ratchet wheels, means responsive to the variations in potential across the arc for causing said pawls to engage and turn said ratchet wheels through varying angles per stroke.

15. A feeding mechanism for electrodes comprising a ratchet wheel, means for trans-

- mitting the movements thereof to the electrode, an adjustable pawl, power means for oscillating the pawl to turn the ratchet and hand operated means connected to the ratchet for turning the same.
16. A feeding mechanism for electrodes comprising a ratchet wheel, means for transmitting the movements thereof to the electrode, an adjustable pawl, power means for oscillating the pawl to turn the ratchet, hand operated means connected to the ratchet for turning the same, and a lock rendered operative by the actuation of said hand means for holding the pawl in an inoperative position.
17. In a searchlight, the combination with a pair of electrodes and holders therefor, of a light shield for extinguishing the afterglow, means for normally holding said shield closed, means for opening said shield on turning on the arc current, means for preventing the arc from striking when the shield is closed, and additional means for preventing said shield from closing while the arc is burning.
18. In a searchlight, the combination with a pair of electrodes and electrode holders therefor, of a light shield comprising a pair of pivoted members adapted to inclose the electrode tips from opposite sides and means for operating said shield including means for preventing the same from closing while the arc is burning.
19. In a searchlight, the combination with a pair of electrodes and electrode holders therefor, of a light shield comprising a pair of pivoted members adapted to inclose the electrode tips from opposite sides and means for operating said shield including means for preventing the arc from striking while said light shield is closed.
20. In a searchlight, the combination with a pair of electrodes and electrode holders therefor, of a light shield comprising a pair of pivoted members adapted to inclose the electrode tips from opposite sides and means for operating said shield including means for opening the same before the arc is struck.
21. In a searchlight, the combination with a pair of electrodes and holders therefor, of a light shield, means responsive to the rotating of one of said holders for opening and closing said shield, and means also responsive to said rotating for releasing the electrode contained within said rotated holder.
22. In a searchlight, the combination with a pair of electrodes and electrode holders therefor, of a light shield for extinguishing the afterglow, means responsive to the rotating of one of said holders for opening said shield and means for closing said shield when the holder is returned to its normal position.
23. In a searchlight, a pivoted electrode holder, means whereby said holder may be rotated to turn the electrode to one side, gripping means for the electrode on said holder, and means responsive to said rotation of the holder to release said gripping means.
24. In a searchlight, a pivoted electrode holder, means whereby said holder may be rotated to turn the electrode to one side, spring pressed feed rollers on said holder, and means responsive to said rotation of the holder for spreading said rollers.
25. The combination with an electrode holder, of a rotary member journaled thereon, a feed roller mounted on the said member, a spur wheel also journaled on said member upon an axis at an angle to the axis of the electrode, said spur wheel serving to rotate the feed roller on its axis, and a pin mounted on said holder to one side of the said first named axis so as to engage between the spurs of said wheel as it is revolved with the rotary member.
26. In an arc lamp, an electrode and holder for the same, means for rotating the holder and electrode about their common axes, a spur wheel and a spur gear on a shaft carried by the holder at an angle to the axis of the electrode, a feed roller also carried by the holder and provided with a spur gear adapted to engage the first mentioned spur gear and a pin adapted to project between the adjacent spurs of the wheel.
27. The combination with an electrode holder, of a rotary member journaled thereon, a feed roller mounted on said member and means for rotating said roller about its axis for feeding the electrode comprising a spur wheel journaled upon said member upon an axis parallel to the axis of said feed roller, and a stop mounted to one side of said spur wheel to engage the same as it rotates with the member.
- In testimony whereof I have affixed signature.

ELMER A. SPERRY.