

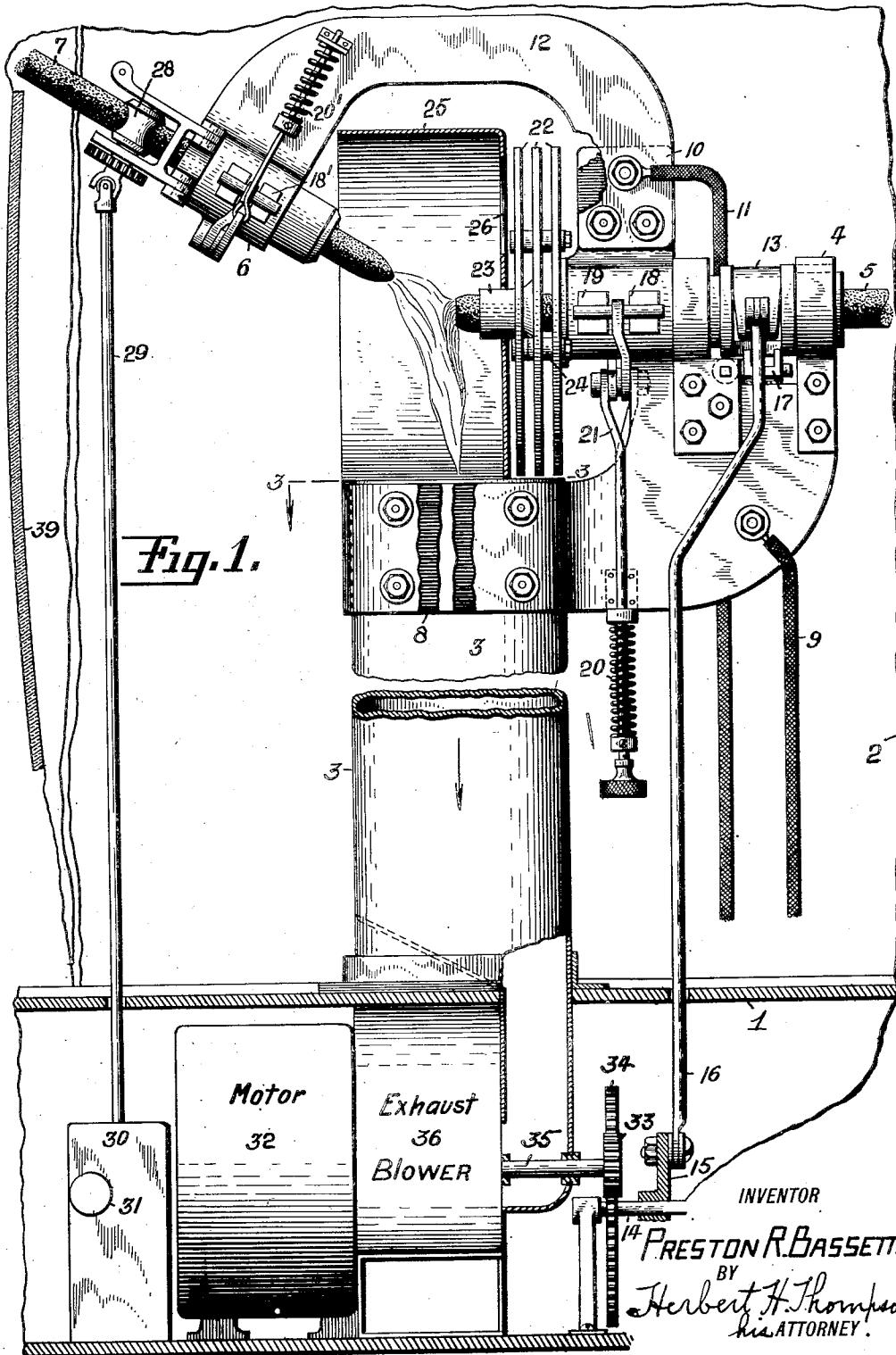
May 7, 1929.

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HIGH INTENSITY FLAMING ARC LAMP

Filed June 14, 1918 2 Sheets-Sheet 1



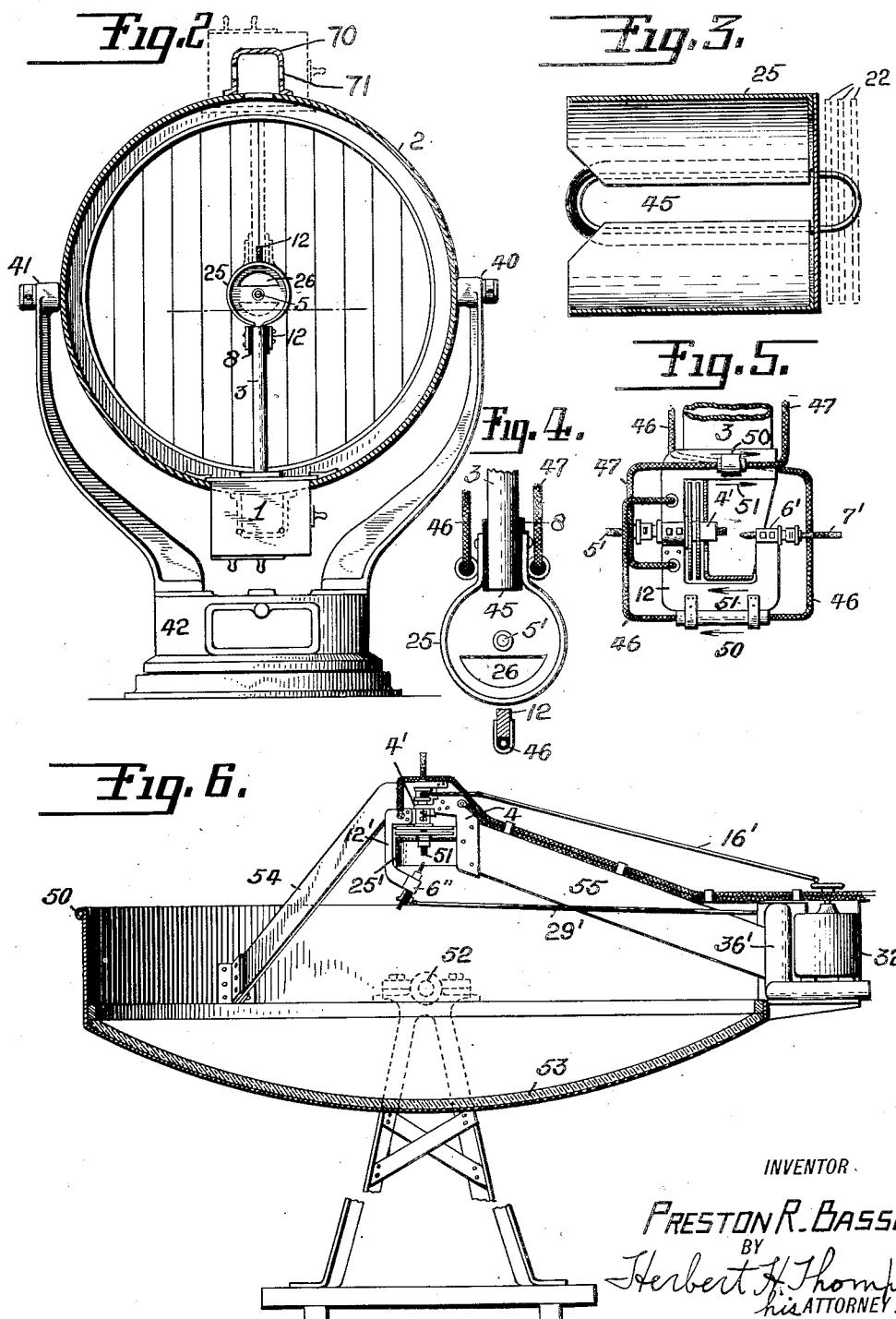
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Patented May 7, 1929.

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UNITED STATES PATENT OFFICE.

PRESTON R. BASSETT, OF BROOKLYN, NEW YORK, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE SPERRY GYROSCOPE COMPANY, INC., A CORPORATION OF NEW YORK.

HIGH-INTENSITY FLAMING-ARC LAMP.

Application filed June 14, 1918. Serial No. 239,927.

This invention relates to high intensity flaming arc lights, having especial reference to searchlights.

The principal objects of the invention are 5 to simplify and to improve the construction of such lamps whereby steady operation is obtained irrespective of the position of the light; or in other words, whether it is right side up, up side down, or on end.

10 A further object is to secure proper burning conditions with a minimum number of parts and to simplify the ventilation of such lamps.

Referring to the drawings in which, what 15 is now considered the preferred forms of my invention, are illustrated:

Fig. 1 is a view of the lamp partly in section, as it appears within the searchlight drum.

20 Fig. 2 is a section through the searchlight drum looking toward the front door.

Fig. 3 is a cross section taken approximately on line 3—3 of Fig. 1.

25 Fig. 4 is a sectional view showing a modification in the manner in which the current is led to the arc, the lamp also being shown in the inverted position from that shown in Figs. 1 and 2.

Fig. 5 is a side view of the holders, constructed according to said modification.

30 Fig. 6 is a section of a modified form of searchlight having little or no drum and no front door.

As is now usual in searchlights, I have 35 shown the lamp proper mounted on a control box 1, which is slidably mounted in the base of the drum 2. Rising from said box is a standard 3 preferably of hollow construction and elliptical or elongated cross section. To 40 said standard is secured the holder 4 for the positive electrode 5. Said standard also preferably supports the holder 6 for the negative electrode 7. As shown the positive holder is insulated by fireproof insulation 8 from 45 the standard; the current being introduced to the holder by a wire 9. The negative holder is also shown as bolted to the positive holder at 10 and insulated therefrom; the current to the negative holder being introduced by 50 wire 11. A bar 12 which leads the current to the negative holder is shown as supporting it from the positive holder and passing over the top of the holders. Preferably both electrodes are rotated and fed within their re-

spective holders by any suitable mechanism 55 which forms no part of this invention. For rotating and feeding the positive electrode an oscillatory intermittent gripping mechanism 13 is illustrated. Said mechanism is operated from the shaft 14 in the control box through 60 a crank shaft 15 and link 16. The rate of feed is controlled by adjusting the angle of the member 17 which controls the advance of the gripping means during its oscillation. As said mechanism forms no part of this 65 invention, and is completely described in a copending application of Theodore Hall, Serial No. 235,771, filed May 21, 1918, for gearless feeding and rotating mechanism for electrodes, of which The Sperry Gyroscope Company, the assignee of the present invention, 70 is the owner, no further details need be presented.

Spring pressed brushes 18 and 19 may also 75 be provided, said brushes being pressed against the electrode by spring 20 connected thereto through linkage 21. Near the forward end of the holder comparatively large cooling ribs 22 are shown. The said shields or ribs are shown as secured together by bolts 80 24. To said ribs are secured a forwardly extending refractory sleeve 23 adapted to shield the positive electrode up to a point a predetermined distance back of the electrode tip. A 85 comparatively large housing 25 which may or may not be formed as a part of said ribs is so placed as to enclose on substantially three sides the arcing faces of the electrodes with the opening side facing the mirror, a portion of which is represented at 39. Said housing and preferably also substantially all 90 parts of the holders are formed of non-magnetic material. The housing is shown as secured to the standard 3 and may be provided with an opening 26 at the back. Preferably 95 the opening 45 in the top of the standard extends some distance behind the shield 25 as shown in Fig. 3 so that air is also drawn down over the cooling ribs 22. The negative holder is also shown as provided with spring 100 pressed brushes 18', held in place by spring 20'. The feeding mechanism is shown as comprising feed rollers 28 which are actuated by the shaft 29 leading to the control box. The mechanism for turning the shaft 29 is represented as enclosed within the box 30 and may be of any standard type of mechanism for feeding an electrode by voltage 105

control or otherwise. A knurled knob 31 is shown for actuating the feed manually if desired.

Within the control box an electric motor 32 is shown for actuating the feeding and rotating means. Said motor is shown as provided with a pinion 33 meshing with the gear 34 on said shaft 14. The motor shaft 35 passes through a centrifugal blower or other air exhausting means 36, the said shaft serving to operate said blower. A section of the drum 2 is roughly illustrated in Fig. 1 and a portion of the mirror is shown at 39; the mirror being of the usual type as shown more clearly in Fig. 6.

The searchlight as a whole is shown as mounted in trunnion arms 40—41 on a rotatable base 42. In Fig. 2 the dotted lines represent the position of the light when it is inverted as frequently happens in following aircraft with a searchlight.

It should be noted that the current passing through the bar 12 travels in the opposite direction from the current passing through the arc. Since very heavy currents are employed in this type of light, preferably 150 amperes or more, I have found that by this simple means a marked deflecting effect may be produced upon the arc flames. It should be further noted that the electrodes are positioned at an angle, the apex of which is directed away from the current carrying member 12. An arc of this character in which electrodes are positioned at an angle, operates substantially as outlined in the patent to Elmer A. Sperry, No. 1,227,210, May 22, 1917, according to which a brushing contact by the negative flame across the mouth of the positive crater is effected. I prefer however combining the above feature with said method of operating as outlined therein whereby the operation of the arc is assured in all positions of the searchlight. The operation of the form of invention described is as follows:

The exhaust blower 36 creates a continuous downward current of air through the standard 3 thereby continuously withdrawing the air and fumes from within the shield 25. Air may be admitted to the drum at any suitable location. A ventilating hood 70 with apertures 71 therein is shown for this purpose. As the electrodes are positioned at an angle the arc flames naturally curve toward the said opening as outlined in the said patent to Elmer A. Sperry, especially if the electrodes are in the inverted position from that shown in Fig. 1; i. e., in the dotted line position shown in Fig. 2. In the normal position of the lamp shown in Figs. 1 and 2 with the tail flame lying underneath the crater of the positive electrode, the downward draft of air created by the exhaust blower on the flame assists in maintaining the proper burning conditions for the high intensity arc by re-

placing the normal upward draft of air due to convection currents on the standard high intensity arc. This inverted position of the tail flame has an advantage in searchlights since in the ordinary high intensity arc the image of the tail flame illuminates the foreground (as the reflector inverts the image), while according to my invention the illumination from the tail flame appears above the main beam and, therefore, it does not illuminate the foreground. Since the standard or chimney 3 extends close to the tip of the flame so produced, the downward current of air carries off immediately the fumes through the standard; while side deflecting currents of air are prevented by the shield. The opening 26 in the back of the shield assures a parallel movement of air from the top of the shield toward the bottom so as not to deflect the arc flames. In addition the repelling influence of the oppositely traveling current through bar 12 aids in steadyng the arc in directing it toward the said outlet irrespective of the position of the searchlight and in assuring the proper brushing contact under all conditions.

In Figs. 4 and 5 the holders are substantially of the same form except that additional conductors are placed near the arc whereby a further deflection is secured. According to this modification the negative holder 6' is placed substantially parallel to the positive holder 4, but slightly out of line with the same, the negative holder being slightly nearer the repelling conductors than the positive holder. The current to the positive holder is shown as introduced through the insulated wire 46 which is supported to one side above the top of the holders; thence downwardly; thence parallel to the holders, the wire being shown as supported by the bar 12; thence upwardly and into the positive holder. The wire to the negative electrode is shown at 47 and leads first to one side and over the holders, thence downwardly where it is secured to the bar 12. The direction of the arrows show the direction of the current passing through the wires and through the arc, the arrows 50 showing the direction of the current through the positive leading-in wire; while the arrows 51 show the direction of current in the negative leading-in wires.

In the above it will be seen that the plurality of conductors through which the current travels in the opposite direction to that through the arc are closely positioned and placed to that side of the arc away from the exhaust opening; while the plurality of conductors through which the current passes in the same direction as that through the arc are positioned adjacent but spaced to either side of said opening. By this means a very powerful deflecting influence is exerted on the arc, since, according to the well known laws of attraction and repulsion the first men-

tioned conductors will repel the arc, while the second mentioned conductors will attract the arc. Furthermore, by positioning the conductors in the form of a triangle a remarkably steady flame is obtained which is of such steadiness as to be substantially undisturbed by air currents. Also by spacing the conductors which attract the flame so that the flame will pass between rather than toward either 10 conductor, the damaging effect of the heat from the flame is avoided, the heat being led directly up the chimney 3. In this form of arc in order to secure the coaction of the negative flame with the positive flame as outlined 15 in the aforementioned patent of Elmer A. Sperry, I find it preferable to position the negative electrode slightly nearer the repelling conductors as outlined above, so that a brushing contact across the mouth of the positive 20 may be secured.

In employing an arc of this character I find it unnecessary to employ a drum for enclosing the mechanism of the arc, since sufficient steadiness may be obtained by the methods 25 outlined herein without shutting off all air currents. Furthermore by burning the arc more or less in the open the problem of removing the fumes is less serious, the weight of the light is reduced, and the front door rendered 30 unnecessary. Such a lamp is illustrated roughly in Fig. 6 wherein a skeleton drum 50 of only sufficient depth to cut off stray light from the crater 51 of the positive electrode is shown. The said drum is pivoted on trunnions 52 in any suitable manner and supports 35 the mirror 53. The electrode holders 4' and 6" are shown as supported from the drum by a tripod having two similar legs 54, one of which is cut away in Fig. 6, and a third hollow leg 55. Said leg 55 may perform all of the 40 functions of the standard 3 in the preferred form of the invention. The exhaust motor 32' and blower 36' are shown at the base of said leg 55. Shaft 16' is shown for rotating and 45 feeding the positive electrode while the shaft 29' is shown for feeding the negative electrode. As hood 25' encloses the arc on three sides, it also serves, in this form of the invention, to cut off all light from the arc except 50 that striking the projector 53.

In this form of the invention the construction of the holders may be similar to either of the structures heretofore outlined. In the construction shown the holders are provided 55 with a similar form of shield 25', the negative electrode being supported at an angle to the positive by a bar 12'.

In accordance with the provisions of the 60 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 65 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. 70

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

1. In a searchlight, the combination with a 75 drum, of a plurality of electrode holders, a hollow standard extending within said drum and supporting one of said holders with the axis of the electrode at a substantial angle to the standard, said standard having an 80 intake for receiving the arc gases, and means for withdrawing air through said standard.

2. In a searchlight, the combination with a supporting frame, of a plurality of electrode holders, a hollow standard supported by said 85 frame and supporting said electrode holders with the axes of the electrodes at substantial angles to the holders, said standard having an intake adjacent said holders for receiving the arc gases and means for withdrawing air 90 through said standard.

3. In a flaming arc lamp, a pair of electrode holders, a current-carrying conductor to one side of the holders for causing deflection of the arc flames in a predetermined direction, and means adjacent the arc for conducting air from the lamp in the direction of such deflection. 95

4. In a flaming arc lamp, a pair of electrode holders, a current-carrying conductor 100 to one side of the position adapted to be occupied by the arc for causing deflection of the arc flames in a predetermined direction, and a chimney having an intake adjacent the position of the arc and placed in line with said 105 direction of deflection.

5. In a flaming arc lamp, a pair of electrode holders, a current-carrying conductor so positioned as to lie to one side of the arc 110 for causing deflection of the arc flames in a predetermined direction, a chimney having an intake so positioned as to lie adjacent the arc and placed in line with said direction of deflection, and means for creating an outward draft through said chimney. 115

6. In a flaming arc light, the combination with a pair of electrodes positioned at an angle to one another whereby the resultant arc flame sweeps toward the apex of said angle irrespective of the position of the lamp, 120 and an outlet opening positioned beyond the apex of said angle.

7. In a searchlight, an upwardly extending, hollow supporting standard, an electrode holder supported on either side of said standard, said standard having an opening to receive the arc fumes and means for creating a downward draft through said standard. 125

8. In a flaming arc light, the combination with a pair of electrodes positioned at an 130

angle to one another, with the apex of said angle facing substantially downwardly whereby the resultant arc tail flame tends to sweep downwardly, an exhaust opening positioned below the apex of said angle, and means for creating an outward flow of gases therethrough whereby a downward draft of air is created on said arc.

9. The combination with a searchlight, 10 of a control box, a hollow standard on said box, electrode holders supported on said standard, and an exhaust blower located in said box for ventilating the searchlight through said standard.

15. 10. In a searchlight, the combination with a pair of electrode holders, of an electrical conductor positioned substantially parallel to one side of said holders and means adjacent the opposite side of said holders for 20 withdrawing the air adjacent said holders.

11. In a searchlight, the combination with a positive and a negative electrode holder, of an electrical conductor adjacent one side of said holders and adapted to carry a current substantially parallel to said holders in a direction running from said negative holder to said positive holder and means adjacent the opposite side of said holders for exhausting the air between said holders.

25. 12. The combination with a searchlight, of an electrode holder therein, cooling ribs on said holder, a hollow standard extending transversely into said searchlight and supporting said holder and having an intake opening adjacent said ribs, and an exhaust blower for withdrawing air through said standard, whereby a circulation of air over said ribs is caused.

30. 13. In a flaming arc searchlight, the combination with the electrodes, of a reflector, means for supporting the positive electrode so that it points towards said reflector, a hood enclosing the space adapted to be occupied by the arc on all sides except the side nearest to the reflector to cut off stray light, said hood having an opening on one side thereof, and means for withdrawing air through said opening, including a duct leading without the beam and an exhaust fan connected thereto.

45. 14. In a searchlight, the combination with

a pair of electrodes, of a hollow standard upon which both of said electrodes are supported, and means for causing a flow of air through said standard away from said electrodes.

15. In a searchlight, the combination with a pair of electrodes, of a hollow standard 50 upon which one of said electrodes is mounted, an arm supported by said standard and carrying the other electrode, said standard having an opening adjacent the space adapted to be occupied by the arc, and means for causing a downward flow of air through said standard away from such space.

16. In a searchlight, the combination with a pair of electrodes, of a hollow standard upon which one of said electrodes is mounted at 55 a substantial angle thereto, a current conducting arm along which current is adapted to pass to the other of said electrodes, said arm being supported by said standard and carrying said other electrode, and means for causing a flow of air through said standard.

17. In a flaming arc searchlight, the combination with the electrodes, of a reflector, means for supporting the positive electrode so that it points toward said reflector, a hood 75 enclosing the space adapted to be occupied by the arc on all sides except the side nearest to the reflector to cut off stray light, said hood having an opening on one side thereof, means for withdrawing air through said opening, and means for deflecting the arc flames towards said opening.

18. In a flaming arc searchlight, the combination with the electrodes, of a reflector, means for supporting the positive electrode so 85 that it points toward said reflector, a hood enclosing the space adapted to be occupied by the arc on all sides except the side nearest to the reflector to cut off stray light, said hood having an opening on one side thereof, and 90 means for withdrawing air through said opening, including a duct leading without the beam and an exhaust fan connected thereto.

In testimony whereof I have affixed my signature.

PRESTON R. BASSETT.