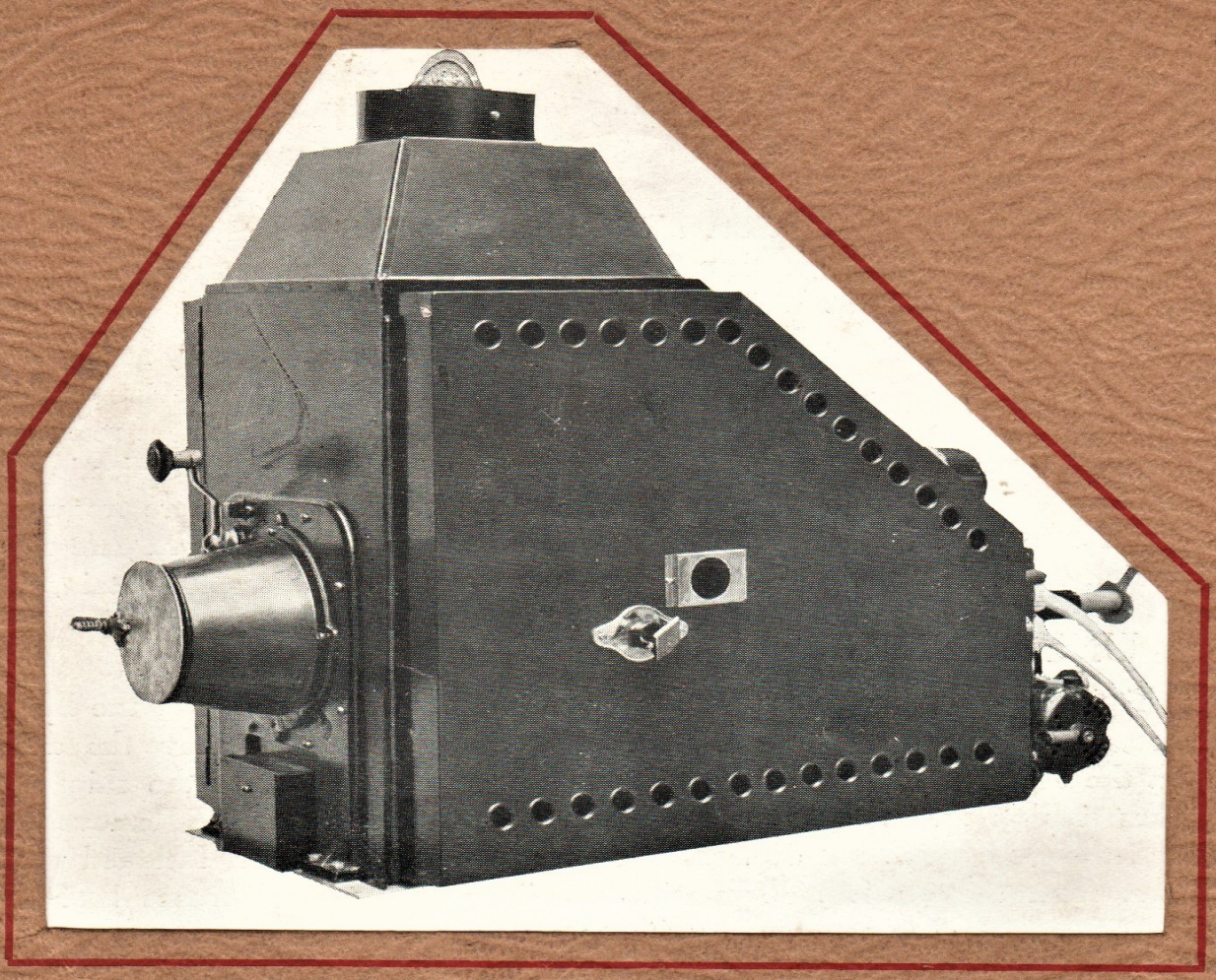

The HALL & CONNOLLY HIGH INTENSITY ARC

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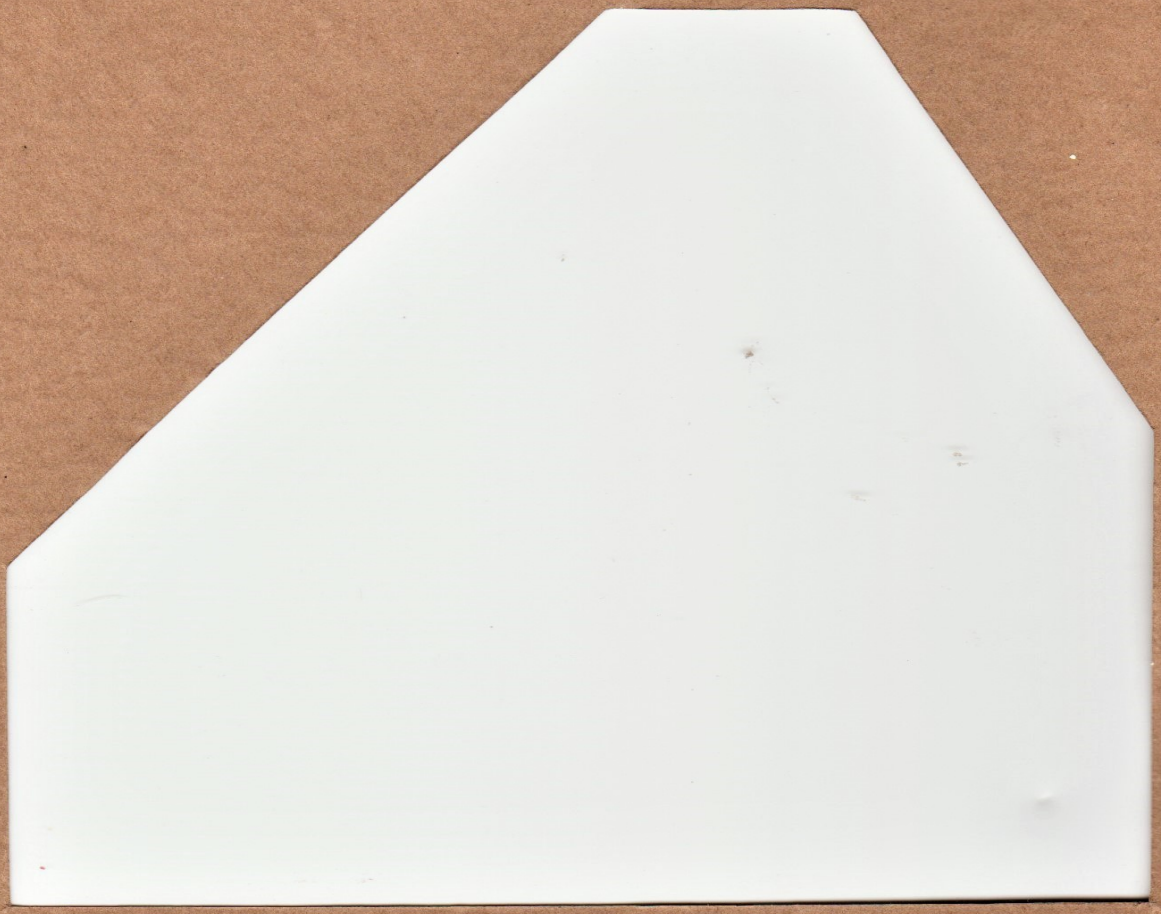
EXCLUSIVELY FOR
J. FRANK BROCKLISS LTD.
58 GREAT MARLBOROUGH ST., W. 1.



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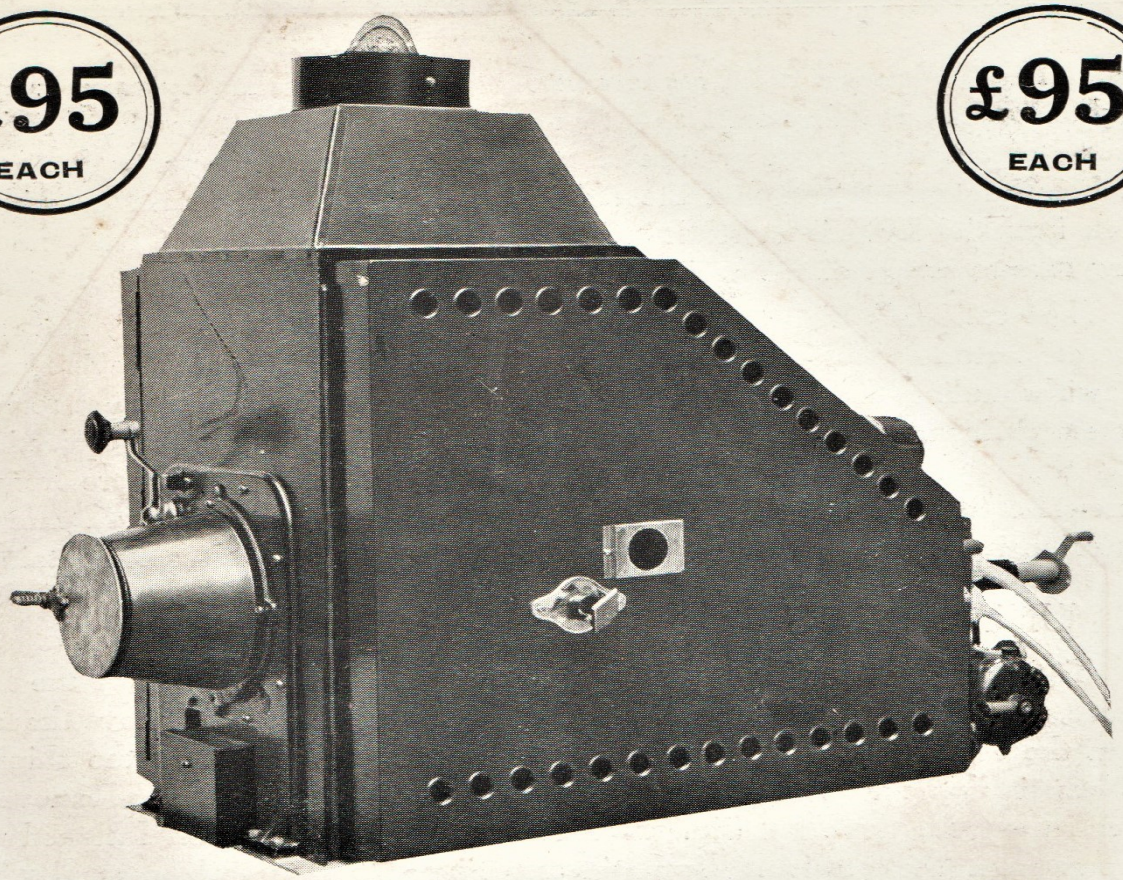

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Instructions for the Operation of the HC High Intensity Projection Lamp.

INTRODUCTORY.

The Sperry High Intensity Arc Lamp is the most powerful light source available. These lamps have been made in the United States of America by Hall and Connolly under Sperry licence, but they are now being manufactured for Cinema work by the Sperry Gyroscope Co., Ltd., Brentford.

The high intensity arc lamp is the most powerful light source available for motion picture projection. The principles employed in this type of lamp and the special mechanical features required for its operation are radically different from the old style of carbon arcs.

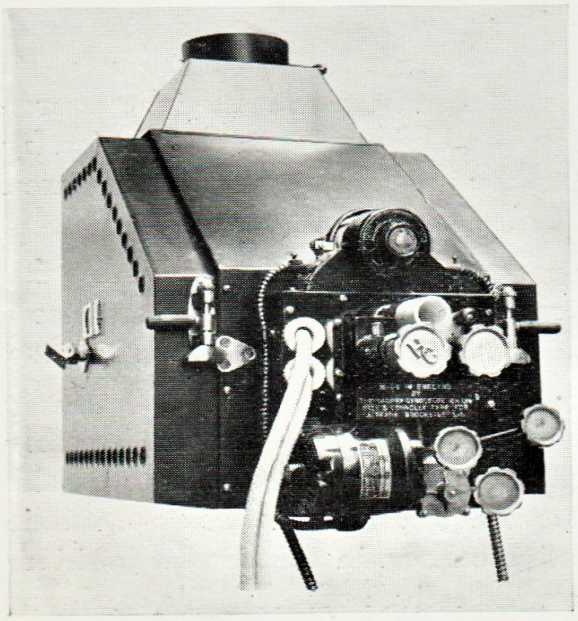
The special carbons used with the high intensity arc lamp are considerably smaller in diameter as compared with the carbons of the old style lamps for the same current rating. The positive carbon has a large core composed of metallic salts which, when used with the proper negative carbon in the correct position, burns away rapidly forming a deep crater which gives off a highly luminous

gas. The generation of this gas can only be accomplished by vaporizing the carbon and its chemical salts at an extremely high temperature which is far in excess of the crater temperature of the ordinary arc. It is partly due to this high crater temperature that the efficiency of illumination obtainable with the high intensity lamp is more than 100 per cent when compared with the light output per ampere of the ordinary arc.

The extremely high temperature under which the high intensity lamp must operate naturally subjects certain parts of the lamp to a very severe strain, notwithstanding the fact that these parts are made from special heat resisting metals or insulating materials. We therefore frankly inform the projectionist that the high intensity lamp will require more attention and more frequent renewal of certain parts than the old style arc lamps, but this extra care and attention is fully compensated by the greatly superior screen results obtained.

1. UNPACKING.

To avoid denting or breaking any of the protruding parts of the lamp house, the following procedure should be carefully followed to remove the lamp from the shipping case. Place the case on the floor so that the shipping address is uppermost. The lamp will then set upright in the case. Remove the cove , then the three 2 x 4 in. cross braces which have been fastened with screws from the outside. You will also find two diagonal braces 1 x 3 in. fastened to each side of the case with screws from the inside which must be removed, as well as the paper packing between the sides of the case and the lamp house. The lamp can then be lifted out of the case with the help of an assistant, one man taking hold of the lamp house by placing the hand through the condenser opening, the other man taking hold of the control handles at the rear of the lamp house.

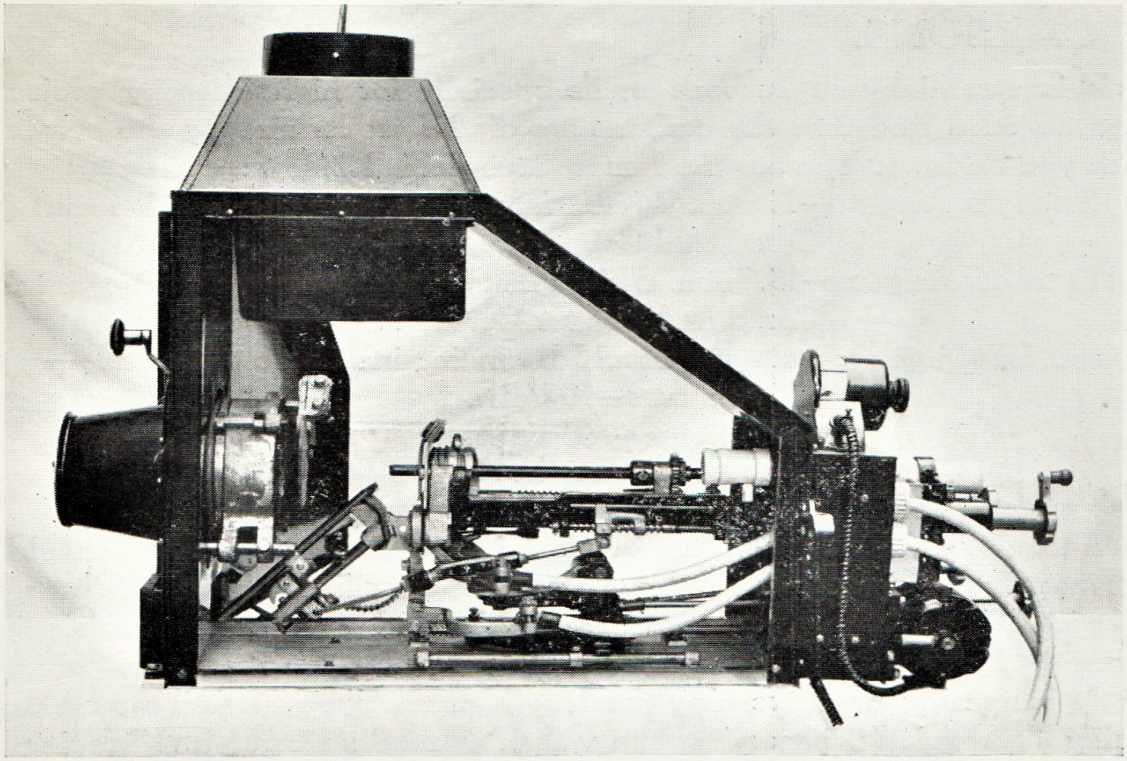


2. VENTILATION.

Sufficient ventilation should be provided by running ducts, 6 in. in diameter from the top of the lamp house directly to the atmosphere outside of the projection room or connected to a blower system, having as few bends in the ducts as possible. CAUTION.—If forced draft is used, do not have the air currents so strong that they cause the arc to flicker.

3. CURRENT.

The high intensity lamp is designed to operate on direct current only. This should be supplied from either the house service (110 Volts) through suitable



rheostats connected in series with the lamps or from a motor-generator set designed to deliver a steady current of the proper amperage and voltage. Be sure that all rheostats on direct current house service or the ballast resistors used with some types of motor-generator sets are in good condition and can be adjusted to limit the current to the proper values at which the carbons used are rated.

4. INSTRUMENTS.

It is very important that the projectionist knows at all times the exact amperage and voltage at which the high intensity lamps are operated and to maintain the current at the correct values specified for the carbons used, as any variation from the normal current will result in a considerable decrease in screen illumination or an extremely rapid deterioration of certain parts of the lamp.

A reliable voltmeter and an ammeter should therefore be installed for each lamp. These instruments should preferably be mounted on the front wall of the projection room underneath the observation port, so that the instrument scales can be read at a glance by the projectionist as he stands at the operating side of each projector. The voltmeter must be connected " across " the arc so as to include the arc voltage and the ammeter in series with the feed wires supplying current to the lamps. Judging the amperage by counting the number of contacts cut in on the rheostats or the arc voltage by the length of arc gap is like working in the dark and cannot be relied upon in the successful operation of high intensity lamps.

5. CARBONS.

It is essential that carbons made specially for high intensity projection lamps be used and that the carbons are of the proper size for the current at which you desire to operate the lamps, as specified below :—

70 to 85 Ampere—11 mm. White Flame High Intensity Positive and $\frac{3}{8}$ in. Cored and Copper Coated Negative.

110 to 125 Ampere—13.6 mm. White Flame High Intensity Positive and $\frac{7}{16}$ in. Cored and Copper Coated Negative.

The following arc voltages should be maintained across the arc :—

75 Amperes—50 Volts.

120 Amperes—68 Volts.

6. ARC VOLTAGE.

Where slightly more or less current is used, the arc voltage should be correspondingly higher or lower from that specified above. Where the projectionist has been provided with a volt and ammeter as explained in section 4, the proper arc voltage for a given current can readily be found by slightly increasing or decreasing the length of the arc gap until the arc burns steadily and quietly, observing the voltmeter reading and then keeping the arc gap at this voltage.

7. APPEARANCE OF THE ARC.

The arc when viewed through the colored glass in the lamp house door should appear like the sketch shown (Page 8) which is drawn full scale and shows the relative position of the positive and negative carbons and the length of arc gap, also the general contour of the flame of the 120 ampere arc. When the lamp is operated on 75 amperes the arc gap length would be shorter but otherwise the relative position of the carbons should be the same. If the arc is burned with the positive carbon protruding too far out from the flame shield " F," the flame will envelop the entire tip of the carbon and will also spread under the carbon thereby greatly decreasing the light given off by the crater. If the positive carbon does not protrude a sufficient distance from the flame shield the flame does not properly fill the crater and the arc will sputter and hiss. In this position there is also great danger of over-heating the flame shield and the positive carbon contacts.

8. TRIMMING THE LAMP.

Release the catch and weight at the positive carbon holder carriage and move the carriage back as far as it will go toward the rear of the lamp house. Insert a positive carbon through the carbon tube in the back end of the lamp house, push the carbon through the carbon holder and carbon contact head until it extends about one inch outside of the flame shield. Turn the carbon clamping holder until the carbon clamp screw is accessible. Tighten the clamp screw firmly with a medium size screw driver.

Bring the negative carbon holder carriage to its lowest position on the two guide rods by turning the feed handle crank on the arc controller. Insert a negative carbon and set it so that its tip is about $\frac{3}{4}$ in. from the tip of the positive carbon. Clamp the negative carbon tightly in its holder with a screw driver. To get the carbons in the proper position for striking the arc bring the negative carbon tip up by means of the feed crank (with the current off) until it touches the end of the positive. The tip of the negative carbon should strike the lower bevelled edge of the positive carbon or the lower edge of the crater if the positive carbon has already been burned. If the tip of the negative carbon is too high feed the positive carbon out or forward a little and if too low feed the positive carbon backward.

9. STRIKING THE ARC.

Close the main switch. Push in on the negative feed handle crank to disengage the automatic feed, turn the crank until the negative carbon touches the positive, then immediately turn the crank rapidly in the opposite direction—six turns. Then observe the arc through the colored glass peep hole and adjust the negative carbon for the proper arc length. Pull the feed handle crank back until you feel or hear a click indicating that it is in mesh with the gears. Observe the rate of the carbon feed for a few moments. If the carbons tend to feed too close together, push in on the feed handle, readjust the carbons for the proper arc gap length, then turn the knob on the small rheostat above the controller, which will lower the speed of the feed motor. It may be necessary to experiment until you find the proper setting, but it must be borne in mind that the controller can only automatically feed the carbons at the proper rate if the amperage used is within the limits of that specified for the particular size carbons you are using.

10. GENERAL CARE OF THE LAMP.

Keep the burner clean, free from dust, scale and pulverized carbon. Keep the positive guide head and contact clean and be sure that they make good wiping contact with the carbon. We recommend that the lamp be carefully inspected and cleaned every day preceding the show, brushing out all scale and carbon dust from the interior of the lamp house. A few minutes devoted to the cleaning of the lamp will greatly prolong the life of the parts and the efficiency of the lamp. The carbon contacts and connecting leads should be replaced as soon as they show signs of breaking up and cracking, or even when scaled very badly.

The "V" guide for the negative carbon should be kept free from copper deposits which may accumulate from the copper coating from the negative carbon. If any lumps of copper stick to the "V" they should be pried or chipped off. See that all current carrying connections of the lamp are tight. They should be tightened when the lamp is warm. Draw up firmly on all nuts and cap screws with the small open end wrench furnished with the lamp.

11. LUBRICATION.

All the sliding and moving parts of the burner should be lubricated with finely powdered graphite mixed with a little kerosene. The kerosene will evaporate, leaving a fine coating of graphite. Care should be taken not to get any of this lubricant on or near any of the insulations as graphite is a good conductor of electricity and will cause short circuits or grounds. Lubricate all bearings in the controller with a good grade of machine oil and fill the motor worm gear case half full of vaseline or a good grade of cup grease. To lubricate the gears, it will be necessary to remove the gear case cover.

12. ADJUSTMENTS.

It is especially important to keep the positive and negative carbons directly in line with each other. To check the carbon alignment, open the condenser holder gate, look at the lamp and determine if the tip of the negative carbon points directly at the center of the positive carbon or crater. If not the lamp will burn unsteadily and there will be a considerable loss of light. To bring the carbons in line loosen the two cap screws, holding the negative carbon guide head in place, shift the head over or turn it slightly sidewise, until the carbons are properly in line. Then tighten up evenly on both cap screws, checking the alignment as you give each screw a slight turn to make sure that the head is not being drawn over to one side.

13. ADJUSTMENT OF CONTROL.

The controller is properly adjusted at the factory for the proper relative feed of the carbons for the amount of current and kind of carbons specified. Should it, however, be necessary to change the relation of the two carbon feeds, this can be done by removing the lower part of the cover over the arc controller and changing the setting of the pawl stop screws, so that the pawls may engage the desired number of teeth on the negative or positive feed ratchet wheels.

14. ADJUSTMENT OF MOTOR CHAIN.

The motor mounting plate is secured to the controller plate with two screws in slotted holes. By loosening these screws the motor may be lowered or raised to secure the proper tension on the driving chain. This chain should always be operated with a little slack.

15. NEGATIVE TENSION SPRING.

If the negative carbon does not lie firmly in the "V" guide, the tension should be increased on the helical spring located underneath the negative carbon holder. This tension can be adjusted by turning the small nut on the threaded stud to which one end of the spring is attached. Three or four turns of the nut will be sufficient.

16. CONDENSER COMBINATIONS.

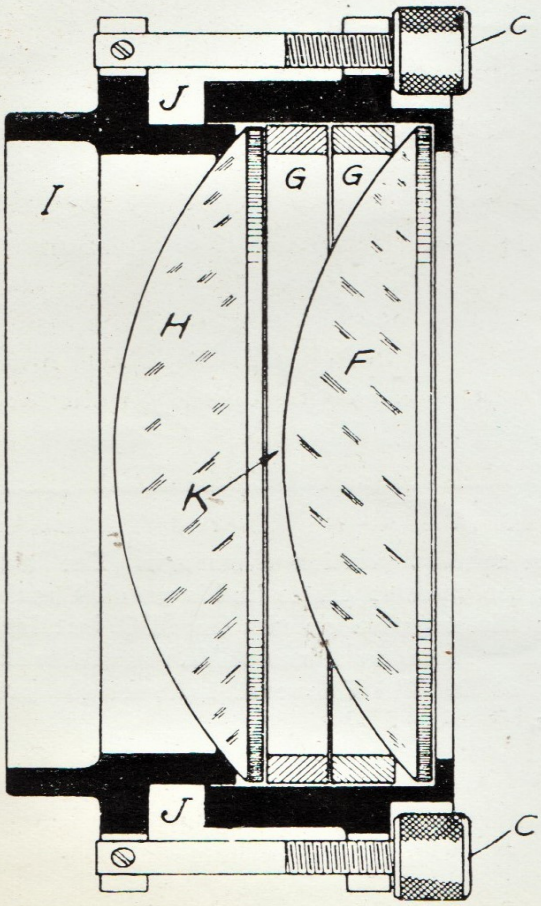
The condenser combinations and distances used with the old type of arc lamp will not give a clear even field on the screen when such combinations and distances are used with the high intensity lamp.

In the H. C. Sperry type of arc lamp a new size of condenser mount has been adopted—in previous Hall and Connolly arcs a condenser mount to take a back condenser of $4\frac{1}{2}$ in. diameter and a front condenser of 5 in. diameter was used.

Experience has resulted in the use of a condenser mount accommodating two condensers of 6 in. diameter.

The standard combination consists of two 6 in. x 9 in. plano-convex condensers which should be inserted in the mount as in the following illustration :—

Instructions for Fitting Standard 6″ x 9″ Plano-Convex Condensers.



Plano-Convex Condensers for H. I. Arc.

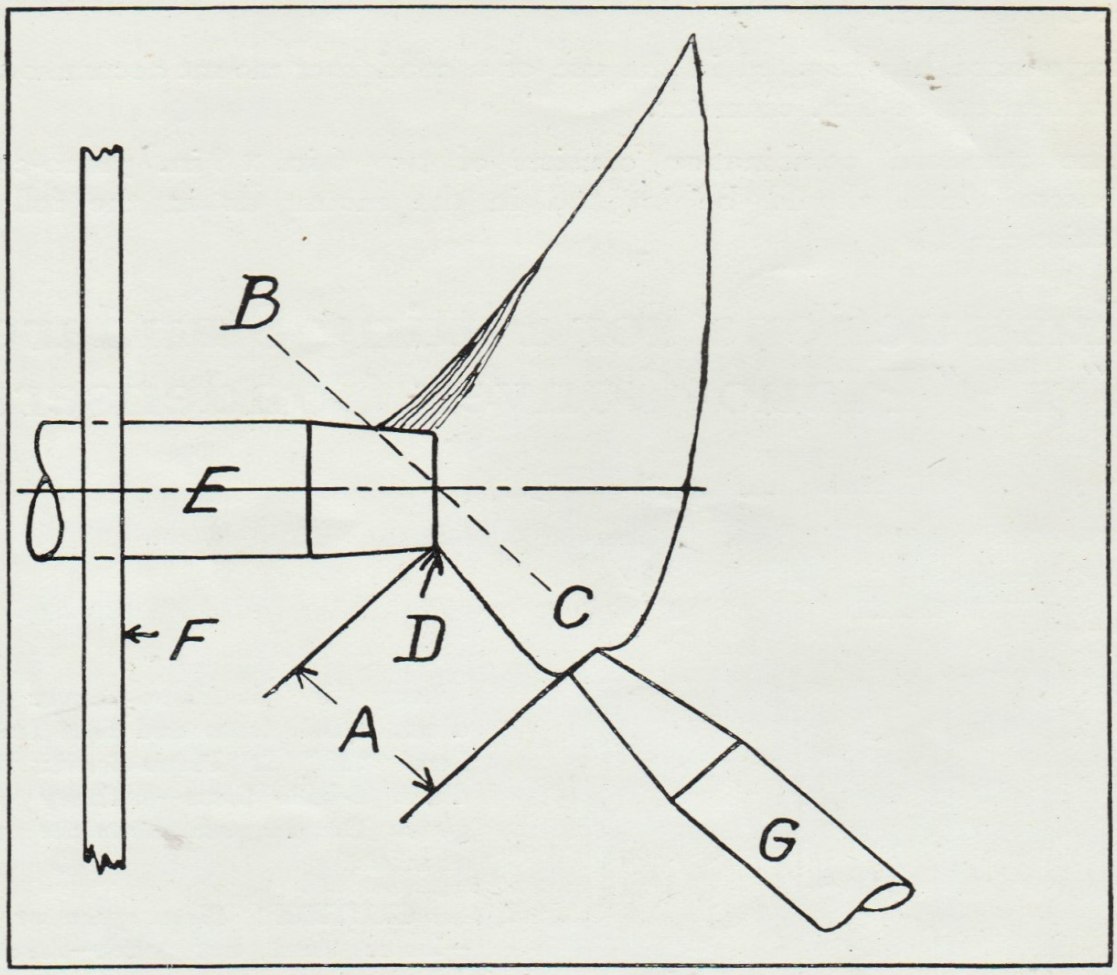
Lens "F" is Plano-Convex 6-inch diam. 9-inch focus and heat resisting. Lens "H" is Plano-Convex 6-inch diam. 9-inch focus—ordinary optical glass. The diagram shows the method of mounting.

CAUTION! Note space at "K" —lenses must not touch—should be $\frac{1}{8}$-inch apart.

Do not tighten clamp nuts "C" too much.

See that space "J" is even.

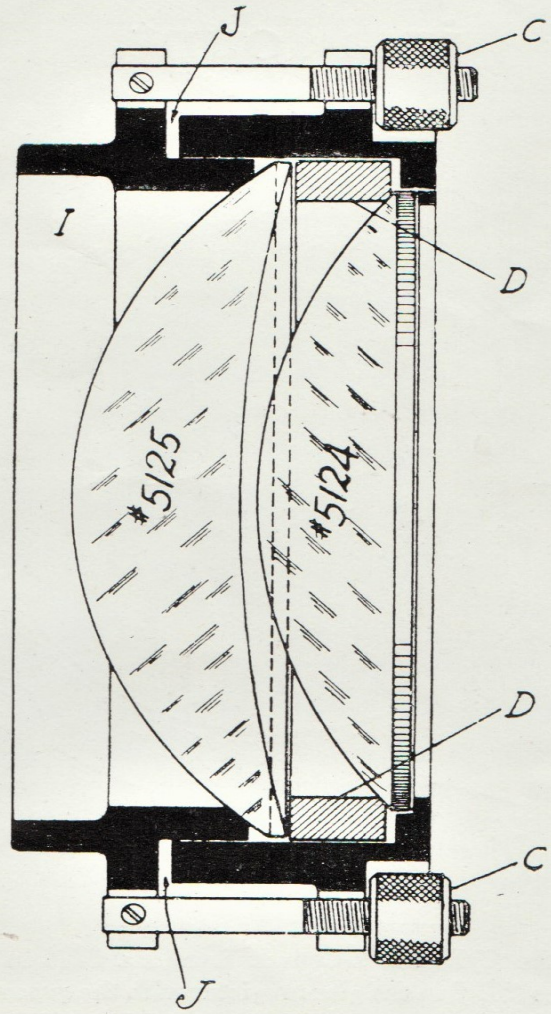
Appearance of the Arc.



HC High Intensity Arc, showing relative position of carbons. The line BC passes through the exact center of the positive crater and is parallel with the negative carbon. Do not line up the negative on the line BC, but let the positive carbon E extend a little farther from the flame shield F until the flame fills the crater and slightly overlaps at D. The distance A indicates the proper length of arc gap for 120 amperes.

Following exhaustive tests it has been found that the use of a cylindrical-aspherical condenser in conjunction with a parabolic meniscus condenser greatly increases the illumination.

Instructions for Fitting Special Aspherical Condensers, Nos. 5124 and 5125.



CONDENSERS for PROJECTION LAMP.

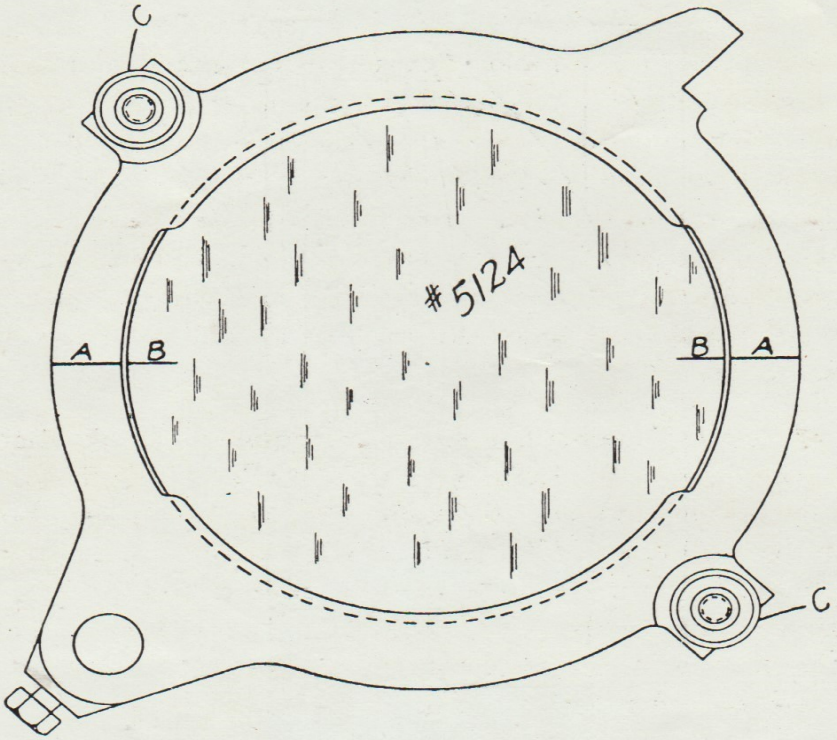
No. 5124 is Cyl.-Spher, and should be placed first in the mount—Cylind. face to the arc—next spacing ring "D"—on spacing ring Parabolic-Meniscus Condenser 5125 with convex side to aperture. Against No. 5125 rests the clamp ring "I" which is secured by the two nuts "C". Draw up evenly on nuts "C" so that the space "J" is even all around the ring.

CAUTION! Do not tighten the nuts "C" so as to chip the Condensers. Leave a slight shake in lenses. See that the marks on lens No. 5124 are opposite marks on mount.

NOTE! The spot on the aperture with above Condensers is not round but oblong to conform to aperture.

Distance aperture to front Condenser 12 inches more or less.

Method of Inserting Special Aspherical Condensers in Mount.



In placing the Cylindrical-Convex Lens No. 5124 in the mount be sure that the lines " B " in the glass register with the grooves " A " on the mount.

Keep Condensers clean by washing in soap and water.

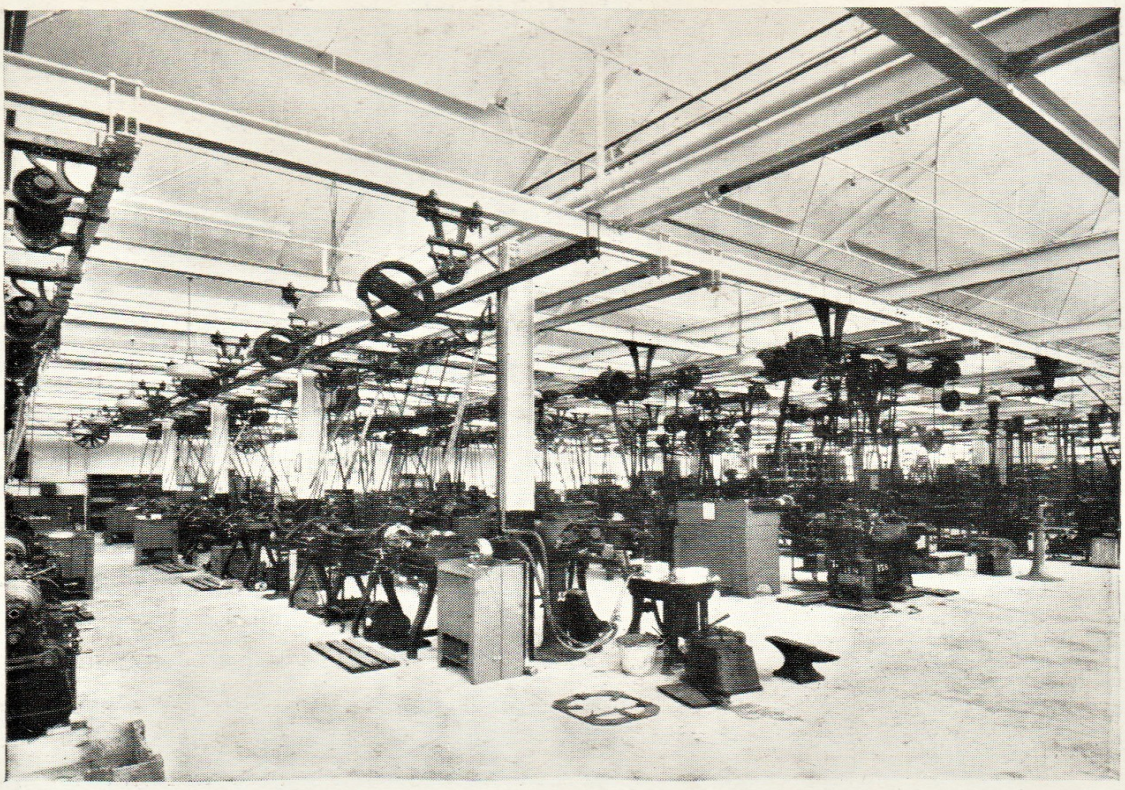
Do not clamp lens too tight in the mount.

Replacement of Parts.

We have for a number of years been engaged in developing the high intensity arc lamp for projection and other purposes. During this time we have constantly experimented with every type of heat resisting metal known and various designs for certain parts of the HC Lamp, in an endeavour to produce parts which would have the longest life under the extremely severe conditions of operation. Our Engineering Department is ever on the alert for better materials and improvements in construction.

When replacement parts are required, it is therefore important that you obtain genuine HC Parts, which will give the maximum service. Genuine HC Parts can be obtained from the authorised HC dealer, from whom your lamps were purchased. Imitation parts may be offered at a price slightly less than ours. Such parts, however, will prove more expensive in the long run, because of their shorter life and possible damage caused to other parts of the lamp.

We cannot guarantee the HC Lamps or hold ourselves responsible for their satisfactory performance, when any but genuine HC parts are used.



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