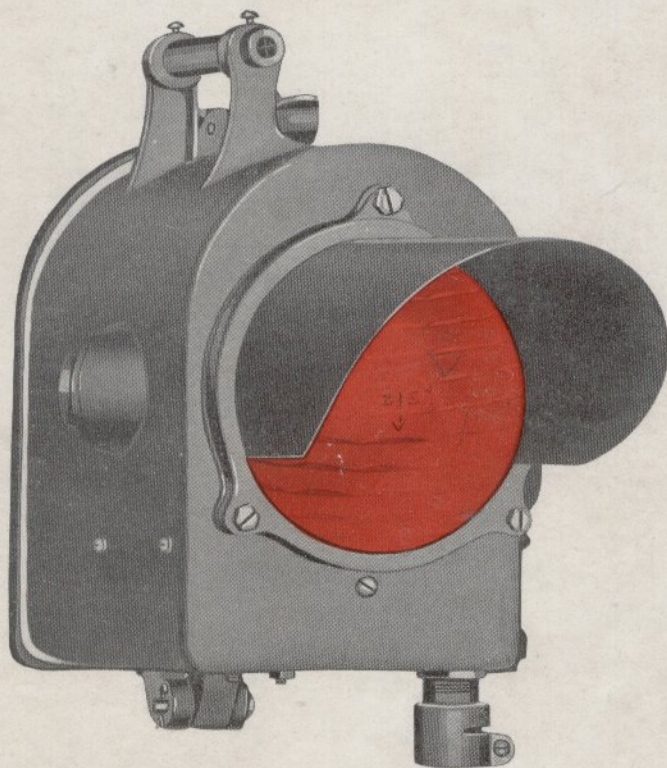


# The Adams & Westlake Company

CHICAGO

NEW YORK

Electric Signal Lamp  
equipped with  
Decentered CORNING-LEBBY Mirror  
Adlake "LEBBY Focusing Device"  
and  
6<sup>3</sup>/<sub>8</sub> in. 25° Ruby Deflecting  
Cover Glass



No. 1184

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*THE ADAMS & WESTLAKE COMPANY*  
*Chicago, Illinois*



**Adlake Signal Lamps**  
equipped with  
**Decentered CORNING-LEBBY Mirror**  
adapted to  
**Signal Service**

The introduction of electricity into the signaling field has stimulated the development of new devices for this service. Better signals are available today than ever before. The demand is for even greater efficiency. It is most important that such efficiency be increased to the point where electrical energy in its more expensive forms, such as storage and primary batteries, may be used economically.

In the past the most satisfactory service has been rendered by the pressed lens. For two and four-way indications from a single source of light the lens will probably remain the best available signal. For one-way indications, such as semaphore signals, the inherently greater light economy obtainable by a mirror has at last been successfully achieved in the development of the Decentered CORNING-LEBBY Mirror.

The Decentered CORNING-LEBBY Mirror in its simplest form is made by silvering the convex surface of a clear glass lens. The refractive power of the lens supplements the reflective power of the silvered surface, thereby properly and efficiently controlling the rays of light which compose the desired beam.

The Decentered CORNING-LEBBY Mirror has been perfected by its inventor, S. L. Lebbby, working in conjunction with the Corning Glass Works. The mirror as first developed was used for high power marine searchlights. To meet signal requirements, additions were made to the original design in order to secure greater spread of beam.

## Efficiency of the Semaphore Lens Compared with that of Decentered CORNING-LEBBY Mirror

An optical device depends for its efficiency upon the amount of light collected or accepted by the instrument, and in addition, the ability of the instrument to project all of this light into the desired beam. Fig. 1 shows that the Decentered CORNING-LEBBY Mirror subtends an angle of 165 degrees at the light source. All of this light is used except for the small part intercepted by the incandescent lamp and its holder.

Contrasted with this is the angle of 70 degrees subtended by a  $5\frac{3}{8}$ " lens. Of this light a part never enters the beam, since it is deflected by the risers to one side.

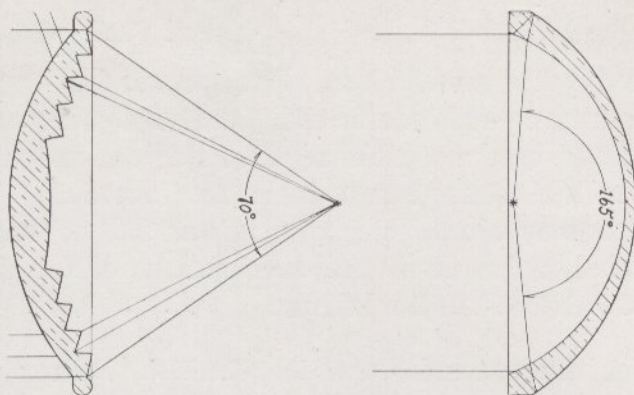


Fig. 1

From the curves given in Fig. 2 the following table has been prepared:

Optical Device	Light Source	Maximum Beam Candle Power	At 25 Degrees	TOTAL SPREAD		
				Beam C.P. Feet per Hundred	At 200 Beam C.P. Degrees	Beam C.P. Feet per Hundred
$4\frac{1}{2}$ " Decentered CORNING-LEBBY Mirror	$3\frac{1}{2}$ volt Electric	775	6.7°	11.7'	5°	8.9'
$5\frac{3}{8}$ " Optical Lens	$3\frac{1}{2}$ volt Electric	275	3.9°	6.8'	2°	3.5'
$5\frac{3}{8}$ " Optical Lens	Long Time Burner	70	7.2°	13'	...	...



## What the 4½ in. Decentered CORNING-LEBBY Mirror Has Accomplished

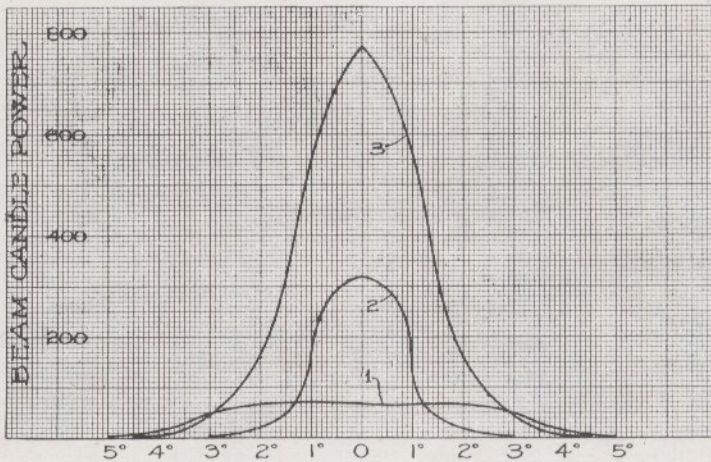


Fig. 2—Distribution Curves for Semaphore Lamps

- Curve 1. Optical Lens,  $5\frac{3}{8}$ " diameter,  $3\frac{1}{2}$ " focus, with a long time kerosene burner at one candle power.
- Curve 2. Optical Lens,  $5\frac{3}{8}$ " diameter,  $3\frac{1}{2}$ " focus, with A. R. A. incandescent lamp  $3\frac{1}{2}$  volts, 0.3 amp., 0.5 C.P.
- Curve 3. Decentered CORNING-LEBBY Mirror,  $4\frac{1}{2}$ " diameter with  $3\frac{1}{2}$  volt 0.3 amp., 0.5 C.P., S-11, C-2 bowed filament incandescent lamp.

Experience indicates that a most satisfactory night indication can be obtained with 25 beam candle power. At this intensity the  $4\frac{1}{2}$ " Decentered CORNING-LEBBY Mirror gives 80% more spread than the lens with an electric lamp. When contrasted with the optical lens and the electric lamp the  $4\frac{1}{2}$ " Decentered CORNING-LEBBY Mirror not only gives greater spread but the high intensity of its beam is of the greatest use when the range of the signal is decreased by smoke, mist or other unfavorable atmospheric conditions.

During the *dusk-dawn period* the visibility of signals is low since it is most difficult to see the signal blade. It is at this time that the  $4\frac{1}{2}$ " Decentered CORNING-LEBBY Mirror is of the greatest use, for with its high intensity, the light can be seen over the full range of the signal. Not only does the  $4\frac{1}{2}$ " Decentered CORNING-LEBBY Mirror have high intensity, but also possesses sufficient spread to give a satisfactory signal during this period.

## Efficiency of Doublet Lens Compared with that of 6½ in. Decentered CORNING-LEBBY Mirror

The doublet lens combination consists of two lenses mounted as shown in Fig. 3 and is equivalent to a single lens of short focal length. The advantages of such a design are, increased light gathering ability and greater spread of the projected beam. This combination is intended for use with light sources of limited area to obtain sufficient spread.

Though the doublet lens collects practically the same percentage of light flux as the Decentered CORNING-LEBBY Mirror, losses inherent in lenses prevent it from even approaching the performance of the 6½" Decentered CORNING-LEBBY Mirror.

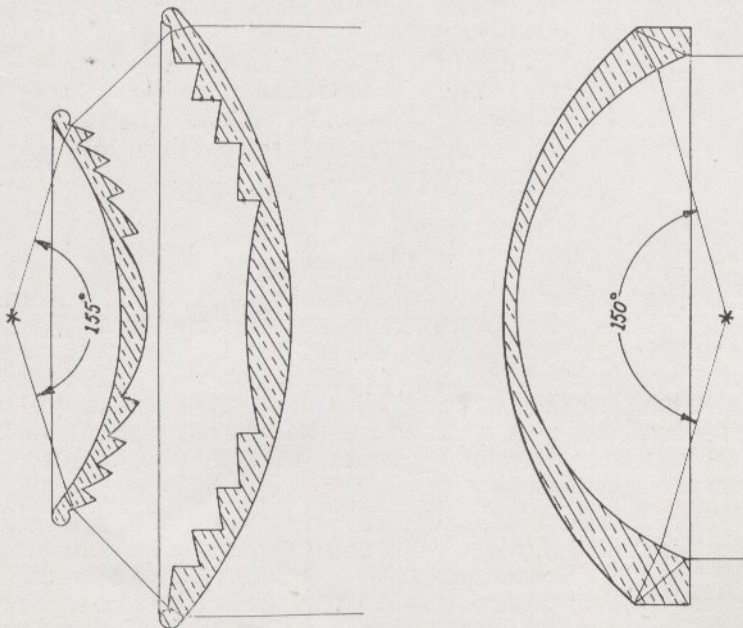


Fig. 3

Data furnished by Corning Glass Works



## Table Proves Superior Light Distribution of Adlake No. 1184 Signal Lamp

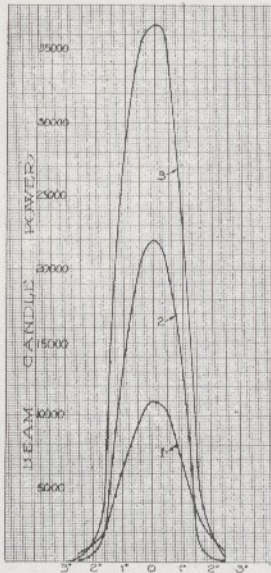


Fig. 4

- Curve 1.  $8\frac{3}{8}$ " fluted bull's-eye doublet combination with an 8 volt 10 watt lamp double filament PS-16 burning at 9.5 spherical candle power.
- Curve 2.  $6\frac{1}{2}$ " Decentered CORNING-LEBBY Mirror with  $25^\circ$  Deflecting Cover Glass with an 8 volt 5.6 watt, CT-8 lamp operating at 4.2 spherical candle power.
- Curve 3.  $6\frac{1}{2}$ " Decentered CORNING-LEBBY Mirror with  $25^\circ$  Deflecting Cover Glass with an 8 volt 10 watt, CT-8 lamp operating at 9.5 spherical candle power.

From curves given in Fig. 4, the following comparisons can be made:

Optical Device	Light Source	Maximum Beam Candle Power	At 3,000 Degrees	Horizontal Spread		
				At 10,000 B.C.P. Ft. per Hundred	At 10,000 B.C.P. Ft. per Hundred	At 10,000 B.C.P. Ft. per Hundred
$8\frac{3}{8}$ " Fluted Bull's-Eye Doublet-Combination	8 volt 10 watt lamp	11,000	3.1	5.4	1.0	1.8
$6\frac{1}{2}$ " Decentered CORNING-LEBBY Mirror with $25^\circ$ Cover Glass	8 volt 5.6 watt lamp	21,600	2.9	5.1	2.5	4.4
$6\frac{1}{2}$ " Decentered CORNING-LEBBY Mirror with $25^\circ$ Cover Glass	8 volt 10 watt lamp	35,000	3.7	6.5	3.0	5.2

Data furnished by Corning Glass Works

## The Advantages of the Decentered CORNING-LEBBY Mirror Over Other Forms of Reflectors

When a strong beam of light is desired a deep parabolic mirror is usually employed, since this mirror collects a high percentage of the light given out by the incandescent lamp. Unfortunately, it is impossible to secure an optically accurate deep paraboloid. As a result of the surface inaccuracies, all of the light is not confined to the useful beam and the increased efficiency in light gathering power is offset by the scattering of the light.

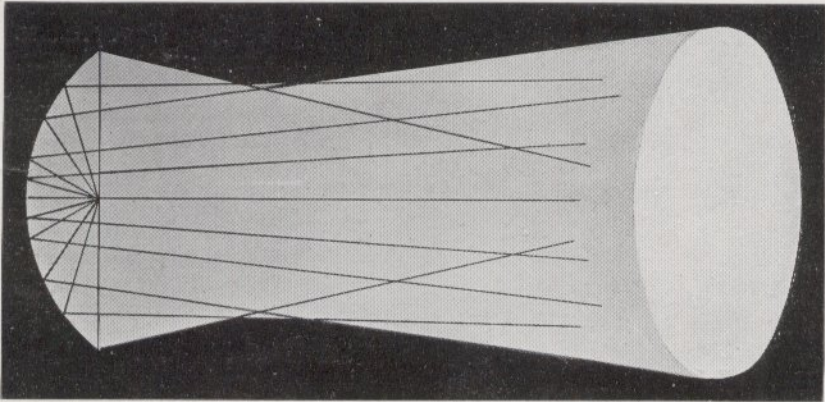


Fig. 5—Spherical Mirror

Spherical surfaces can be ground to optical accuracy by commercial methods but their use in the past has been limited. Fig. 5 shows the standard spherical mirror. As a result of the spherical aberration always present in this type, a strong diverging beam is produced. Satisfactory intensity can be secured with this mirror only by using lamps of large wattage.



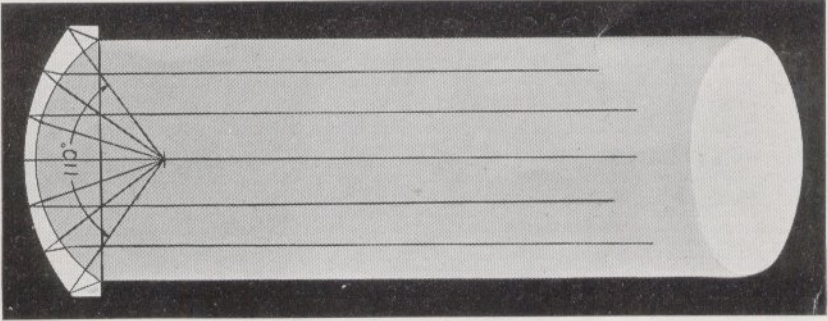


Fig. 6—Mangin Mirror

The Mangin Mirror shown in Fig. 6 has spherical surfaces of such radii that the spherical aberration of the convex reflecting surface is fully corrected by the refraction of the concave surface. A beam of parallel rays results when a light source is located at the focal point. This focal point is, however, so far away from the mirror that only a limited angle of light flux from the source is accepted by the mirror. This means low efficiency for the Mangin Mirror.

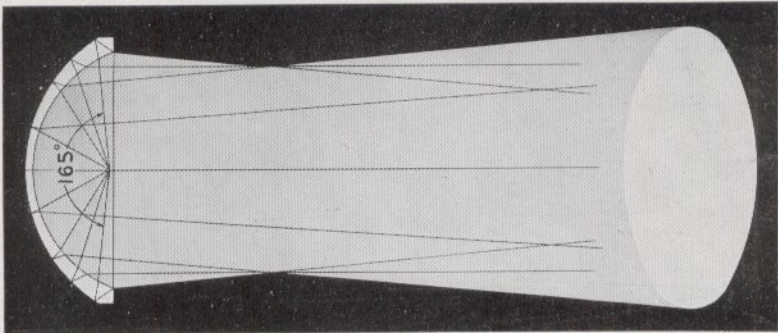


Fig. 7—CORNING-LEBBY Mirror

The Decentered CORNING-LEBBY Mirror has its radii of curvature so selected that the refraction due to the concave surface partially neutralizes the spherical aberration of the convex surface. These radii can be chosen so as to give any desired spread to the beam. It will be noticed in Fig. 7 that converging rays are formed in the outer zone of the mirror, parallel rays from the intermediate portion and diverging rays from the inner portion. The design is such that the most divergent ray is parallel to the most convergent ray. The Decentered CORNING-LEBBY Mirror collects a greater angle of light flux and therefore projects a beam of ample spread and high candle power.

## More Reasons Why Decentered CORNING-LEBBY Mirror Used in Adlake Signal Lamps Surpasses All Other Projectors

Projectors heretofore used in Railway signaling have projected beams with the highest intensity at the center with the light intensity decreasing radially as shown in Fig. 8. Fig. 9 indicates the serious defect in this symmetrical beam distribution, since the light above the high intensity axial portion, being above the engineman, is of no use and is actually lost.

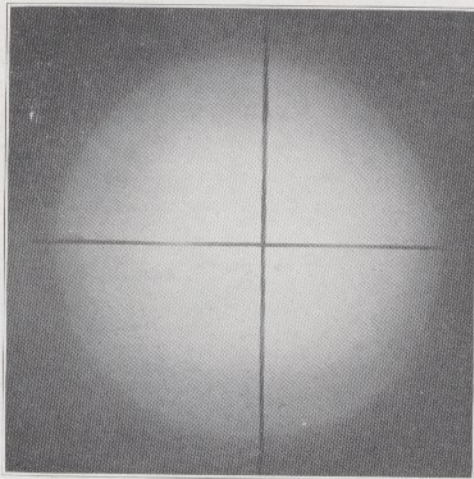


Fig. 8



Fig. 9

The Decentered CORNING-LEBBY Mirror is an unsymmetrical optical projector and, therefore, produces an unsymmetrical beam distribution. By this it is meant that the mirror instead of being of similar structure and function at all points about its axis, is constantly dissimilar in structure, so that the mirror is relatively thick at the bottom and gradually thinner at the sides and thinnest at the top. Thus, the reason for calling this mirror a decentered mirror; since by decentering the inner surface of the glass lens upward with respect to the rear outer surface, the lens upon which the mirror is formed is made thin at the top side and proportionately thicker at the bottom. This in turn causes a lesser refraction in the lens at the top and a greater refraction at the bottom. The result from this decentering is to cause practically



all rays of light above the high intensity axial portion of the beam to move downward contributing to the lower portion of the beam, thus producing the ideal unsymmetrical beam.

Due to the unique construction of the Decentered CORNING-LEBBY Mirror, shown in Fig. 3, page 6, the axial high intensity portion of the beam remains unchanged while all other rays are projected below the axis in gradually decreasing intensity where they become useful.

Because of this unique mirror construction not only is the greatest percentage of the rays made useful, but the ideal distribution of light is built up to provide uniform signal strength from the time the indication is picked up in the distance until within close proximity of the signal. In calculating the intensities through a beam which would provide a uniform signal strength throughout the zone of approach, it was found that an unsymmetrical beam having powerful rays close to the top with rays decreasing at a specific rate downward was necessary. This was considered the ideal distribution and resulted in the design of the Decentered CORNING-LEBBY Mirror. Figure 10 shows this ideal distribution on a screen and figure 11 shows its logical application along a right of way.

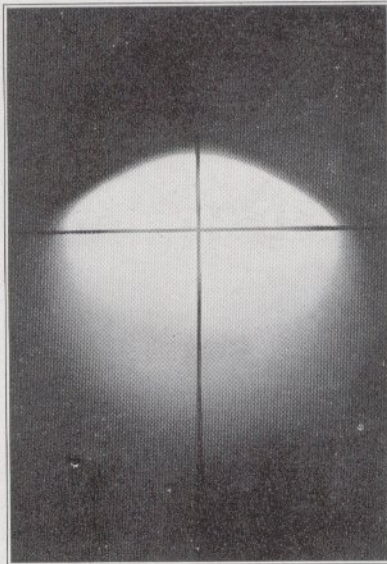


Fig. 10

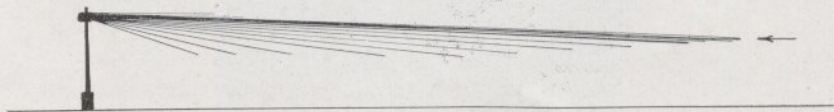
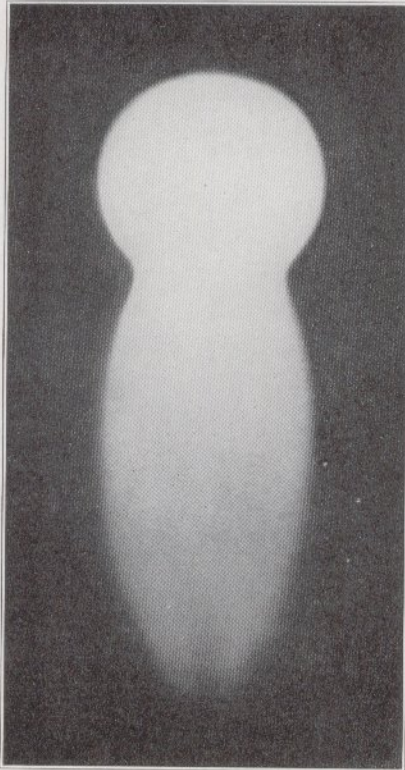


Fig. 11

## Decentered CORNING-LEBBY Mirror Gives Secondary Beam for Close-Up Indication

An effective signal must be clearly visible from the time it can be first seen by the engineer until he is practically under it. If there is any space near the signal through which it is not visible, there is a possibility of the engineer not seeing a change in indication which may lead to serious results. In other words, the perfect signal must have a primary indication which enables the signal to be seen at a distance, and a secondary indication for close-up observation with no region of low intensity between these two beams.

Such a beam distribution is obtained by using a special cover glass with the Decentered CORNING-LEBBY Mirror. This glass has small prisms distributed over its surface which produce a downward indication through an angle of  $40^\circ$  for the  $4\frac{1}{2}$ " mirror and  $25^\circ$  for the  $6\frac{1}{2}$ " mirror. Due to proper arrangement of these prisms the close-up indication appears over the entire face of the cover glass, thus producing a filled aspect close-up signal.



Photograph of Beam



## Reason for Mounting Incandescent Lamp Socket and Holder in Front of Decentered CORNING-LEBBY Mirror

If the incandescent lamp socket passes through a hole in the center of the mirror a large solid angle of light is obstructed by the base of the lamp. This form of mounting not only necessitates boring a hole through the mirror but the base of the incandescent lamp also shades a considerably larger useful area of the mirror than is necessarily removed to let the socket pass through.

By placing the incandescent lamp socket and holder in front of the mirror a relatively small angle of light is absorbed by the base of the incandescent lamp and its mounting. Fig. 12 illustrates this difference.

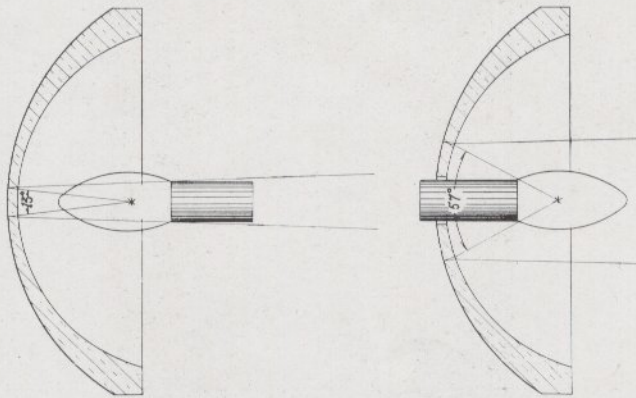
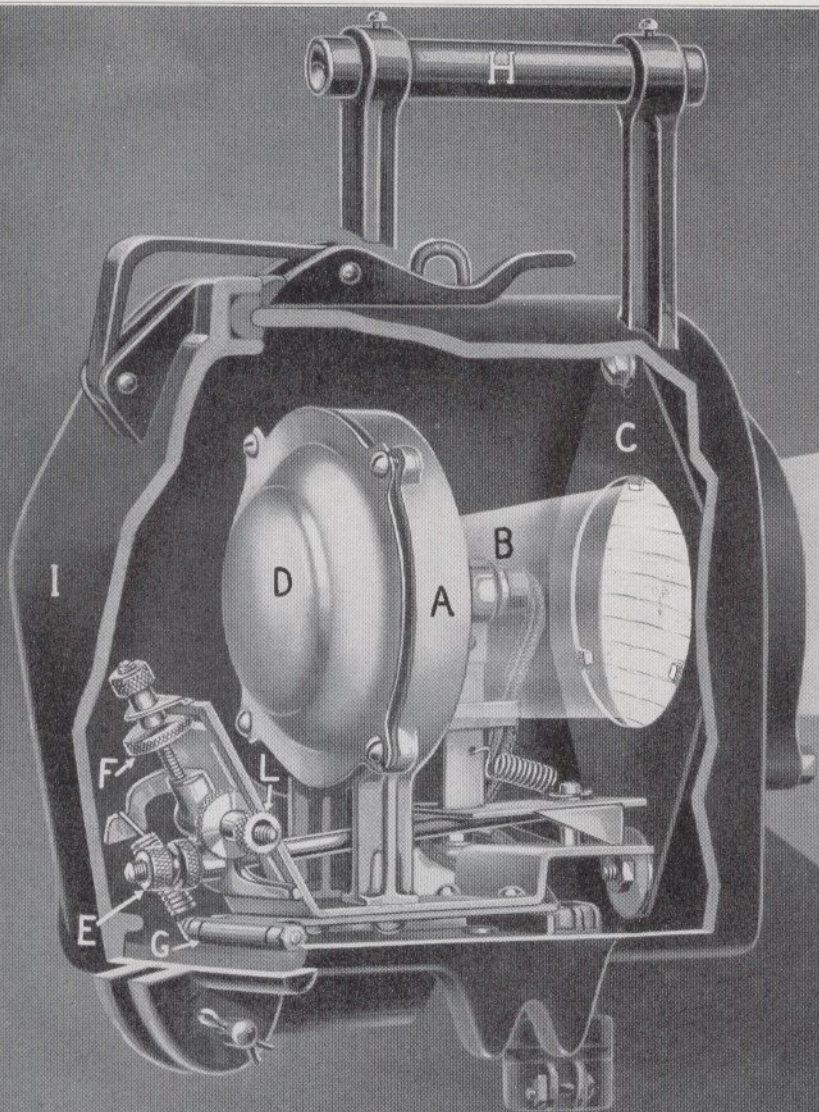


Fig. 12

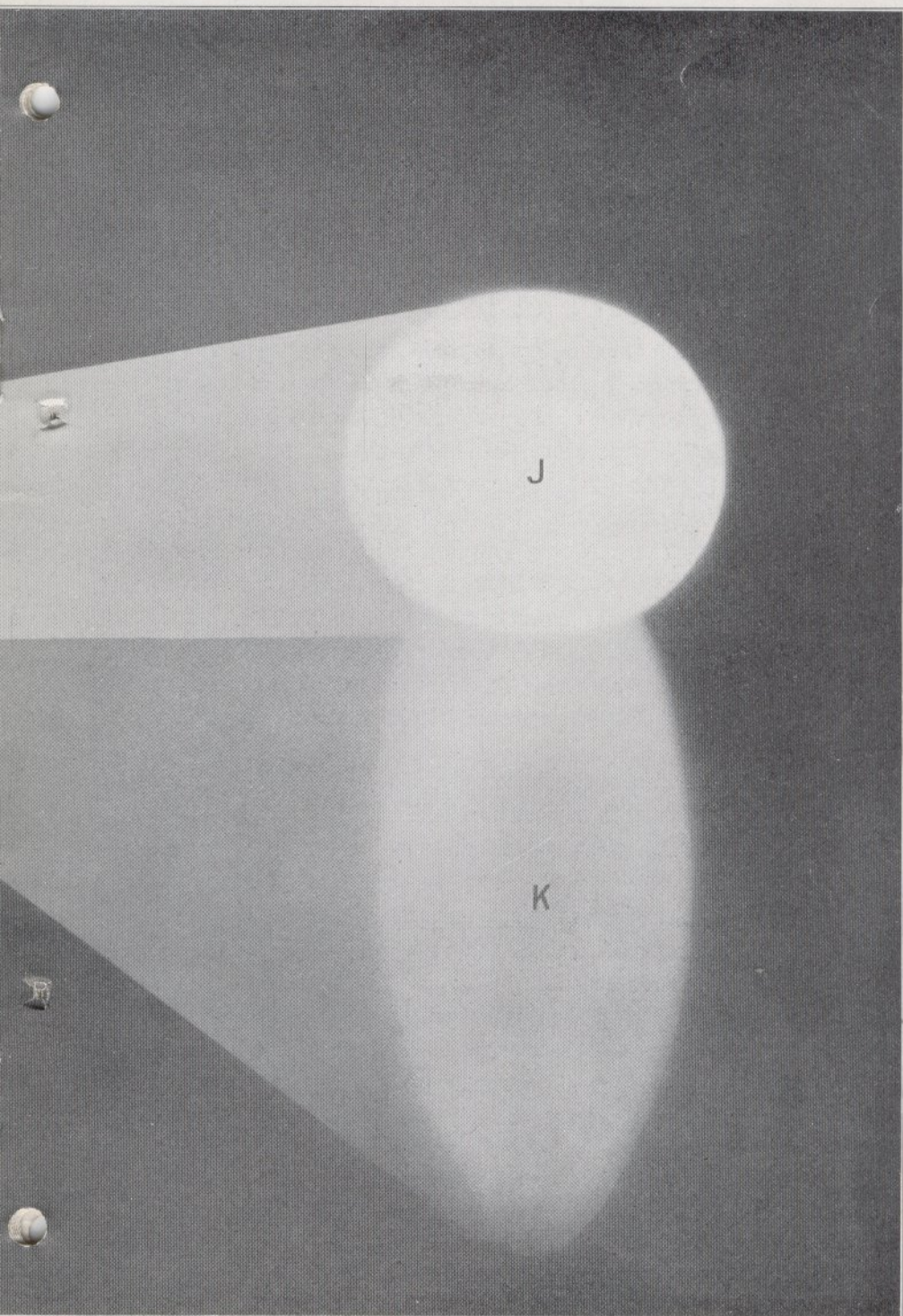
Tests have shown about 20% more total light in the beam when the socket is mounted in front of the mirror than when it is mounted through the mirror.

With the front mounting the socket can cast no shadow due to the fact that the beam from the Decentered CORNING-LEBBY Mirror is made up not only of parallel rays, but also convergent and divergent rays, as shown in Fig. 7.



This illustration pictures in detail the complete functioning of the Adlake No. 1142 Semaphore Lamp, equipped with Decentered Corning-Lebby Mirror and Adlake "Lebby Focusing Device." "A" is mirror housing. "B" is incandescent lamp socket. "C" is focusing diaphragm. "D" is cast aluminum casing, protecting back of mirror. "E" is knurled nut, controlling horizontal adjustment of incandescent lamp. "F" is knurled nut, controlling vertical adjustment of incandescent lamp. "L" is knurled nut, controlling lateral adjustment of incandescent lamp. "G" is hinge, allowing the focusing device to be thrown back for replacement of incandescent lamp when door is open. "H" is sighting tube for locating a pick-up point. "I" is weather-proof lamp case. "J" is image of primary beam. "K" is image of secondary beam.





# Phantom Signal Dangers Eliminated

by

## Decentered CORNING-LEBBY Mirror

### Filled Aspect Signal

An optical device to give real satisfaction must first give ample intensity, second, sufficient beam spread, and third, of great importance, it must not reflect light from an outside source of sufficient intensity to produce a false or phantom indication. The foregoing pages have already explained how the Decentered CORNING-LEBBY Mirror more than meets the first two requirements. The third has been equally well met—demonstrated by the fact that illumination of the Decentered CORNING-LEBBY Mirror by either the sun or a locomotive headlight produces a reflection of only a pin point of light, which is entirely absorbed by the lamp housing and incandescent lamp holder. The absorption of all the reflex light inside the lamp housing is especially noteworthy, when remembering the admitted fact that no optical combination has ever been produced but that gives reflex light.

As explained above, the Decentered CORNING-LEBBY Mirror in itself cannot project a phantom indication. Certain types of incandescent lamps will cause troublesome reflections, when not illuminated, in any design of optical device. For example, the standard S-11 incandescent lamp reflects light and causes the mirror to fill, giving a beam of very low intensity. The CT-8 bullet shaped incandescent lamp when used with the Decentered CORNING-LEBBY Mirror, has the opposite effect, breaking up the reflex. Under no circumstances will the mirror fill with reflex from the CT-8 lamp. Thus the reflex from the lamp bulb has been reduced to a lower minimum than in any signal device known. There is no reflex, when the incandescent lamp is illuminated that can possibly be mistaken for the *filled aspect signal* produced by the Decentered CORNING-LEBBY Mirror with the special design cover glass.



## Superiorities of the Decentered CORNING-LEBBY Mirror in Signalling

The Decentered CORNING-LEBBY Mirror has greater signal strength per watt than any other signal. This means a satisfactory indication obtained at less wattage or for the same wattage a signal of greater range and greater spread, particularly at the higher intensities.

The lamp can be aligned and focused readily in daylight avoiding the necessity of rebased incandescent lamps. In addition, properties peculiar to the Decentered CORNING-LEBBY Mirror and Adlake "LEBBY Focusing Device" prevent incorrect focusing being unnoticed.

Impossibility of phantom indications.

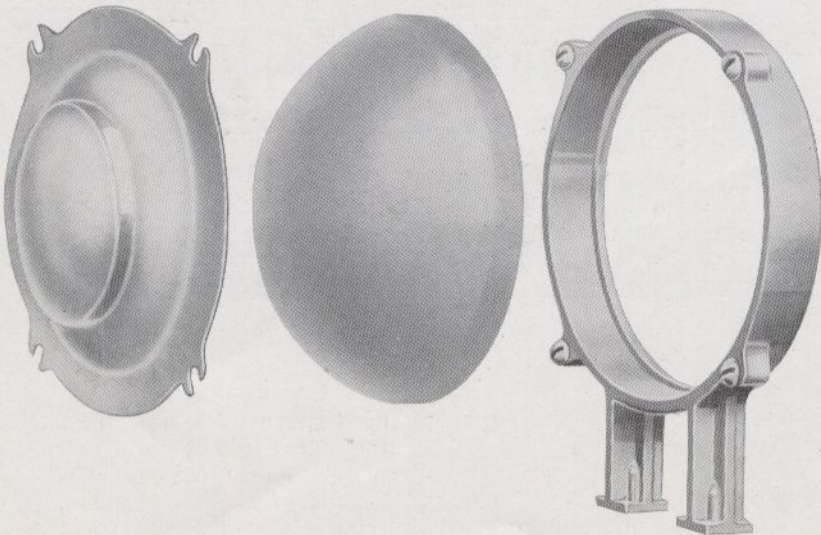
The filled aspect produced by the specially designed cover glass gives a characteristic signal from the pick-up point to within fifty feet from the signal pole.

## Care Used to Insure Continued Efficiency of the Decentered CORNING-LEBBY Mirror

Every precaution is taken to make the Decentered CORNING-LEBBY Mirror impervious to heat, cold, acids, and the action of the elements.

The reflecting medium of the mirror is a heavy coat of pure silver, protected by a thick layer of copper, electrolytically deposited. Covering this is a special heat and acid-resisting coating so tough that blows by a sharp instrument will not chip it.

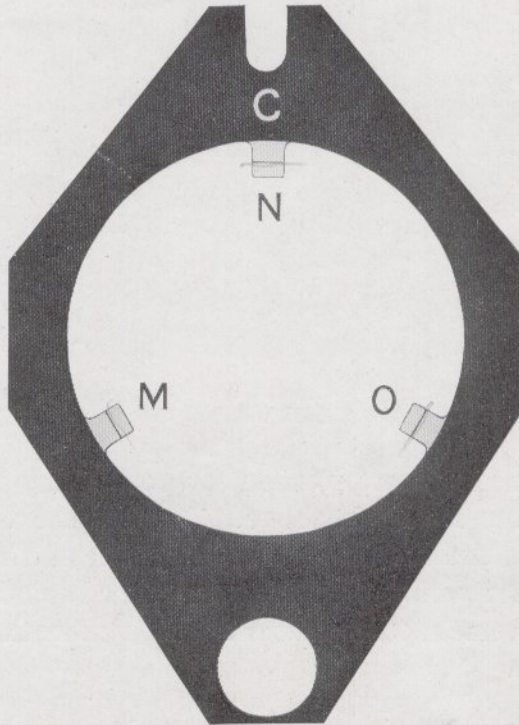
For mounting in the Adlake signal lamp a heavy casting is provided, against which the mirror is held by a cork lined cast aluminum casing, fitting snugly over the rear surface of the mirror. This protects the mirror against accidental blows after it has been mounted in the lamp. Thus there can be given assurance that the mirror will maintain its full efficiency for many years.





## The Adlake Electric Signal Lamps Are Easily Focused

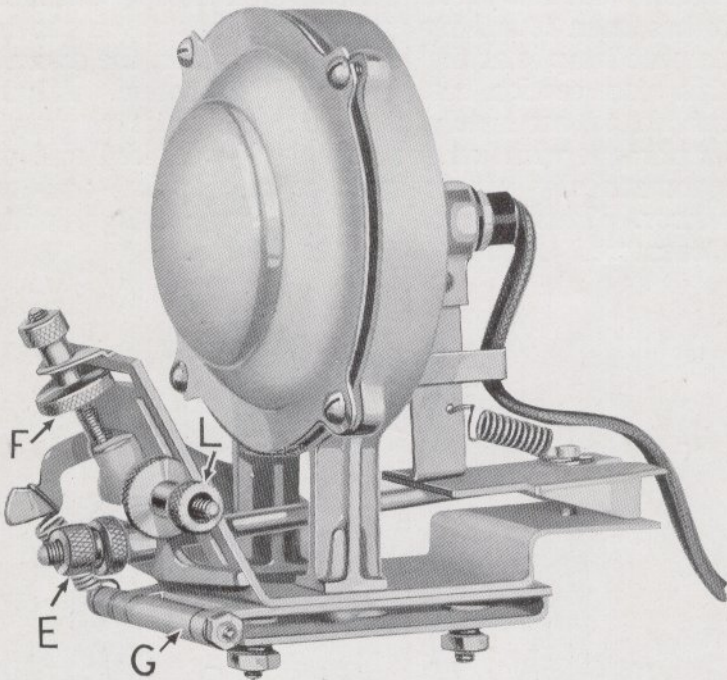
Fig. 7 shows the beam projected by the Decentered CORNING-LEBBY Mirror. The converging and diverging rays are so projected that at a short distance in front of the mirror the beam converges to a minimum cross-section. At this position the beam is sharply outlined and it has been found by experiment that when the incandescent lamp is at the focus of the mirror, the diameter of this cross section has a certain fixed value. All that is needed to accurately focus the mirror is to provide a diaphragm with an opening of the required size placed symmetrically with respect to the optical axis of the mirror. This method of focusing is unique with the Decentered CORNING-LEBBY Mirror.



Cut of Diaphragm

The cut shows that the focusing diaphragm is provided with three marked indices "M," "N" and "O." These indices show the size of the beam when the mirror is properly focused. Photograph on pages 14 and 15 shows diaphragm in place. It is positioned by the manufacturer so that the axis of the main beam is parallel to the sighting tube "H."

## Adlake "LEBBY Focusing Device" Used in Both Nos. 1184 and 1142 Signal Lamps



The mechanism provided for positioning the incandescent lamp is shown above. Turning the thumb nut "E" moves the incandescent lamp back and forth. As the lamp is moved toward the mirror, the beam is widened and the reverse motion narrows the beam at the focusing diaphragm.

Vertical adjustment of the beam is controlled by the knurled nut "F." Movement to the right lowers and to the left raises the beam. The knurled nut "L" provides for lateral adjustment. Turning the nut to the right moves the beam to the left and vice versa.



## Directions for Focusing and Aligning Adlake Electric Signal Lamps A One-Man Job

First: By means of the focusing nut "E" move the incandescent lamp back or forth until the beam outline is completely visible on the diaphragm. (See pages 14 and 15.)

Second: Center the beam with respect to the indices "M," "N," and "O" by moving vertical adjustment nut "F" and lateral adjustment nut "L." (Opposite page explains effect on beam.)

Third: Move the incandescent lamp by the nut "E" until the beam edge touches the black lines on the indices "M," "N," and "O."

Fourth: Tighten lock nuts on all three adjustments after beam is definitely centered.

The incandescent lamp is now in focus and the axis of the main beam parallel to the sighting tube.

To replace incandescent lamp or clean mirror, turn the focusing device back upon the hinge "G". See that focusing device goes securely back into place, and then check alignment of beam on diaphragm as explained above.

## Adlake Signal Lamps Nos. 1142 and 1184 Are Built to Withstand Severe Service

Dependability being essential in any signal apparatus, it has been our aim to produce lamps which will be as durable as they are efficient.

Adlake Signal Lamp housings are made of special cast aluminum alloy, japanned black. The advantages of the lightness of aluminum along with the durability, strength and rigidity of cast housings are quite obvious as a protection to the vital instruments contained within. Conduit connections are made through the bottom of the housings.

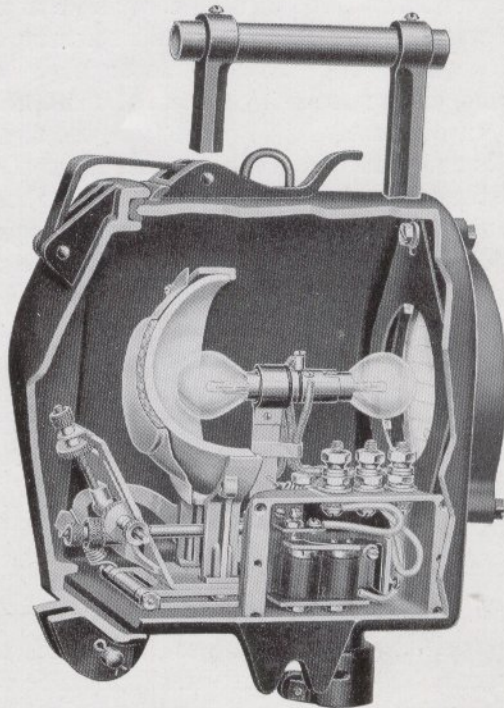
At the back of the housings, the doors are hinged at the bottom. The doors open downward by releasing spring actuated hasps made to take standard padlocks. Weatherproof gaskets fit tightly between the doors and the bodies of the housings when the lamps are closed to keep out the moisture, dust and dirt under all weather conditions.

Like the housings, all parts entering into the complete lamps meet the Adlake standard of quality.



## Adlake No. 293 Cut-In Relay Prevents Signal Failure

The Adlake No. 293 Cut-in Relay illustrated below applied to the No. 1142 Semaphore Lamp assures a signal indication at all times. In the event of the primary incandescent lamp failing, the auxiliary lamp automatically cuts in, providing a signal until the primary incandescent lamp is replaced.



Train delay and the accompanying expense due to signal failure is impossible with the No. 293 Relay arrangement.

Cut-in Relays can be applied to either the No. 1142 Semaphore or No. 1184 Signal Lamp.

## Prismatic Cover Glasses Add Downward and Horizontal Spread to Beam

Proper control of the distribution of light in the beam is of vital importance both for efficient and uniform signal results.

On a straight track a beam with an unnecessarily wide horizontal spread is waste of light since the engineman's eye practically scribes a line vertically through the beam as he approaches the signal. For example, the actual spread necessary to cover an entire 50 foot right of way at a 3,000 foot pick-up point is less than one degree, one degree being the equal of  $1\frac{3}{4}$  feet spread in each 100 feet of distance. At 500 feet from the signal a spread of 6 degrees is required to cover the same right of way. It is quite evident therefore, that the powerful primary beam with the several times necessary spread, as a safety factory projected by the Decentered \*CORNING \*LEBBY Mirror with the specially designed prismatic cover glasses, meets the ideal conditions.

Together with the powerful long range beam with more than ample spread, provision must be made for a downward distribution tapering in candle power to produce uniform signal strength as the block is approached. Horizontal spread must also be increased proportionately with the downward spread. Here again the properties of the prismatic cover glasses meet the conditions fully.

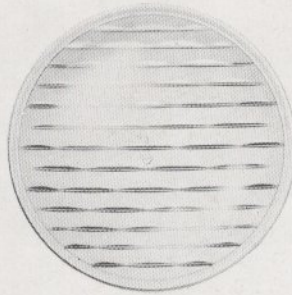
In the case of wide curves, the engineman's eye scribes a line substantially horizontal which curves downward within close range of the signal. Accordingly the beam should be concentrated and powerful for the long range pick-up, but should more gradually decrease in candle power in a horizontal direction and finally toward the light source the spread should be downward. This ideal result is produced with the 25 degree \*SPREDLITE deflector, which spreads the light in a horizontal beam and also deflects the proper proportion downward to provide uniform signal strength within close approach of the signal itself.

\*Trade Mark Reg. U. S. Pat. Office.

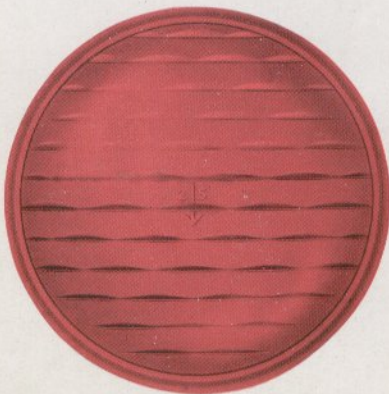


Both the deflecting cover glasses mentioned several times before in this bulletin and the 25 degree SPRED-LITE deflector produce the important filled aspect signal through the entire zone of observation.

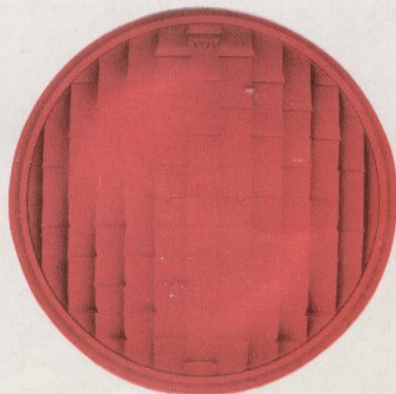
The  $5\frac{3}{8}$ " 40 degree deflecting cover glass for use in the No. 1142 Semaphore Lamp, the  $6\frac{3}{8}$ " 25 degree deflecting cover glass for use in the No. 1184 Signal Lamp under usual conditions, and the  $6\frac{3}{8}$ " 25 degree SPRED-LITE deflector for use in the No. 1184 signal lamp on wide curves or regularly in the Adlake Highway Crossing Signals, all spread the beam to an equal extent both sides of the axis with substantially equal light intensity over the spread beam, in addition to providing ideal downward distribution for their respective purposes.



$5\frac{3}{8}$ "—40° deflecting cover glass



$6\frac{3}{8}$ "—25° deflecting  
cover glass



$6\frac{3}{8}$ "—25° SPREDLITE  
Deflector

## **Incandescent Lamps for Maximum Efficiency with Decentered CORNING-LEBBY Mirror**

Adlake Electric Signal Lamps equipped with Decentered CORNING-LEBBY Mirrors do not require either rebased or precision incandescent lamps.

Maximum efficiency from the Decentered CORNING-LEBBY Mirror is obtained with incandescent lamps having compact filaments. In fact, the highest beam candle power with adequate spread is produced by the C-2 bowed filament with a length of about four millimeters. Ideal distribution for efficiency and uniform signals results.

The use of incandescent lamps not having compact filaments produces a beam of great spread and moderate intensity. For example the ARA C-3 filament is so large that a very non-uniform beam results with the highest intensity usually in the sides of the beam. At such points in the beam where the loop filament image happens to be, the candle power is often more than three times greater than even the axial candle power.

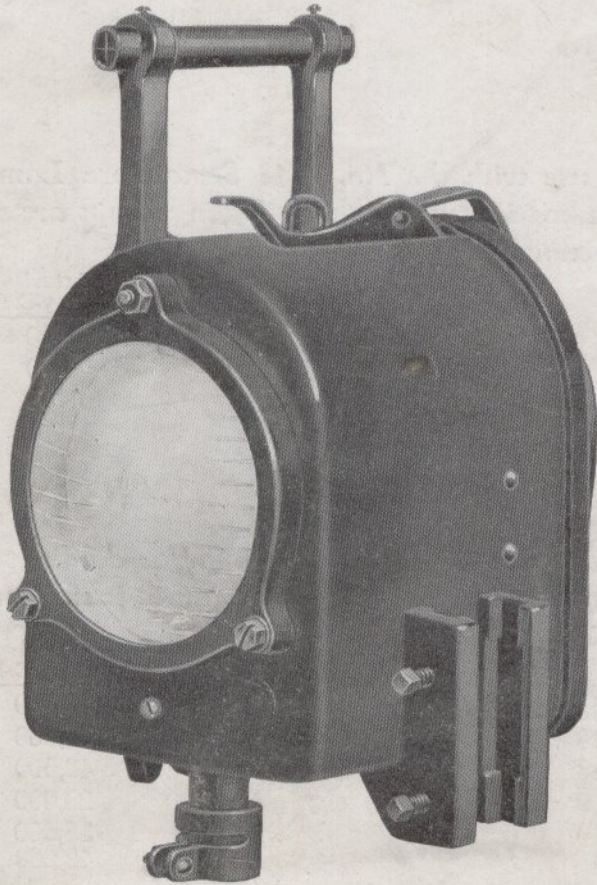


*For use with the No. 1142 Semaphore Lamp as a night indication signal, the following lamps are strongly recommended:*

								Actual	Spread
								Intensity	C. P.
3½ volt	.3 amp.	bowed	C-2 filament	S-11 bulb				800	5°
8	"	.25	"	"	"	"	"	1600	5°
10	"	.25	"	"	"	"	"	1700	6°
12	"	.25	"	"	"	"	"	1700	7°
13½	"	.25	"	"	"	"	"	1700	9°

*In the No. 1184 Signal Lamp for daylight signals the following list of incandescent lamps is suggested:*

								Actual	Spread
								Intensity	C. P.
8 volt	5.6 watt	bowed	C-2 filament	CT-8 bulb				22,000	3°
8	"	10	"	"	"	"	"	37,000	3½°
8	"	18	"	"	"	"	"	42,000	3½°
10	"	5	"	"	"	"	"	20,000	3°
10	"	10	"	"	"	"	"	35,000	3½°
10	"	18	"	"	"	"	"	42,000	3½°



Adlake No. 1142 Semaphore Lamp Equipped with  $4\frac{1}{2}$ " CORNING-  
LEBBY Mirror  $5\frac{3}{8}$ "  $40^\circ$  Clear Deflecting  
Cover Glass

ADLAKE