

A LL G.B-KALEE Arc Lamp Mirrors are manufactured by Messrs. C. A. Parsons & Co. Ltd. of Newcastle upon Tyne, who have specialised in the production of silvered glass reflectors for more than 50 years. Their long experience in the manufacture of the highest quality searchlight and signalling reflectors, especially during two world wars, and the technique developed in this field has been freely applied to the design and manufacture of cinematograph arc lamp mirrors.

The result is an arc lamp mirror possessing the highest standard of accuracy and efficiency. Every G.B-Kalee Mirror is carefully and scientifically examined and tested, from the flat glass stage to the fashioned and finished product. The utmost care and attention is given by skilled craftsmen throughout every process of manufacture to ensure the highest degree of quality.

G.B-Kalee Ltd., hold the exclusive distribution rights throughout Great Britain and the world of cinema arc lamp mirrors for 35 mm. projection equipment, manufactured by C. A. Parsons & Co. Ltd.

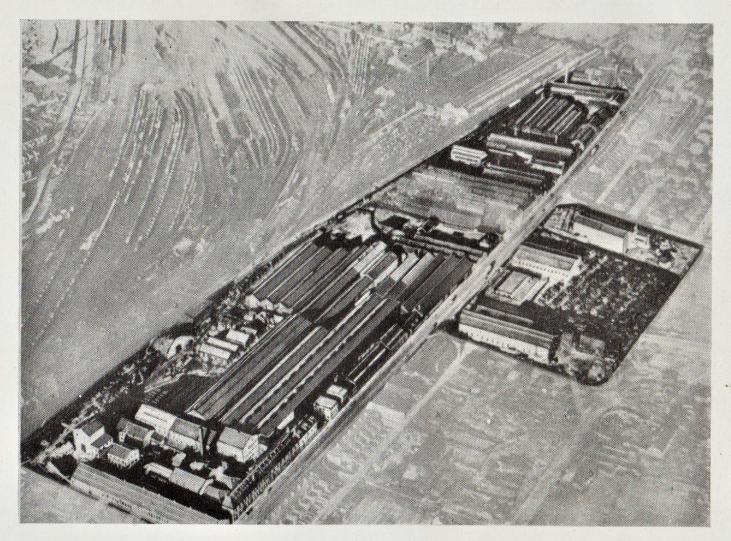


FIG. I
Aerial view of Heaton
Works of Messrs. C.A.
Parsons & Co. Ltd.,
where all G.B.-Kalee
mirrors are made.

SILVERED glass reflectors have been one of the standard products of Messrs. C. A. Parsons & Co. Ltd., since the foundation of Heaton Works in 1889. At that time, the reflector department was housed in a timber building measuring 40 ft. by 20 ft. and the plant consisted of one gas fired furnace 4 ft. in diameter and one polishing machine, largely constructed of wood and capable of working mirrors up to about 30 ins. in diameter. This department was gradually increased to deal with the growing demand for mirrors, and in 1905 a considerably larger factory area was essential.

To cope with the large orders received for searchlight reflectors at the outbreak of the 1914-18 War, the department was completely reorganised and the buildings extended to their present size, the greater part of five bays, each 255 ft. long by 32 ft. wide. Fig. 1 shows an aerial view of Heaton Works.

Naturally the demand for this type of reflector fell after the War, but a few years later the manufacture of small reflectors for the cinematograph industry was developed, and their manufacture has increasingly continued to the present time.

During the 1939-45 War the demand for searchlight reflectors for use both on land and sea again rose rapidly, and Messrs. C. A. Parsons & Co. Ltd. were called upon to meet the various government requirements. During this war over 60,000 glass reflectors of the highest quality, in sizes ranging from 6 ins. diameter to 78.6 ins. (200 cm.) diameter, were supplied to the various Ministries. The skill and technique developed in their production has been applied to the manufacture of cinematograph reflectors, thus ensuring a very high standard of efficiency and quality. In addition to the reflectors completed for war purposes, many thousands of arc lamp mirrors were supplied during the same period to the cinematograph industry. Pages 12 and 13 show a representative group of glass reflectors ranging in size from 4 ins. diameter to 78 ins. diameter.

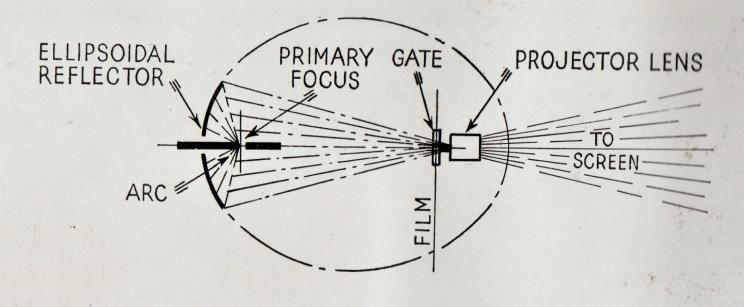


FIG. 2

Schematic diagram of optical system of Cinematograph Projector employing ellipsoidal reflector.

Projector System

The main types of arc lamp reflectors in use are ellipsoidal, paraboloidal and spherical, and of these the most convenient and efficient is the ellipsoidal. Cinematograph projectors using this type of reflector have an optical system consisting of an ellipsoidal reflector and projection lens, in contrast to the type employing a paraboloidal or spherical reflector with a frontal condenser and projection lens.

With the ellipsoidal reflector arc system a larger amount of light is reflected from the source and utilised than with the condenser system, with the added advantages that condenser breakage and light absorption do not have to be taken into consideration. Fig. 2 shows a schematic diagram of the optical system of a cinematograph projector employing an ellipsoidal reflector. The reflector has two focal points on the (horizontal) axis of projection, one called the primary focus, and the other the secondary (or more usually the conjugate) focus. The source of illumination (or arc lamp



FIG. 3
Battery of Polishing Machines.

crater) is placed in the primary focus, and the light rays from the mirror converge and cross at the conjugate focus, near which point the film passes through the "gate." It will thus be seen that concentrated light of very high intensity is available at the place where it is most wanted.

In the reflector arc system employing a paraboloidal reflector for collecting the light emitted by the arc, a condenser for converging the rays for concentration on the film at the gate is required, with the consequent loss of efficiency due to light absorption.

Material

Reflectors can be made in ordinary, in heat resisting borosilicate, or in Pyrex glass. The important difference lies in the expansion coefficients which are approximately in the ratio 9:6:3. Pyrex with its low expansion coefficient is essential for use in arc lamps where the reflector is subject to high temperature or to intense local heating, but it suffers from the disadvantage that it is liable to include bubbles and striae.

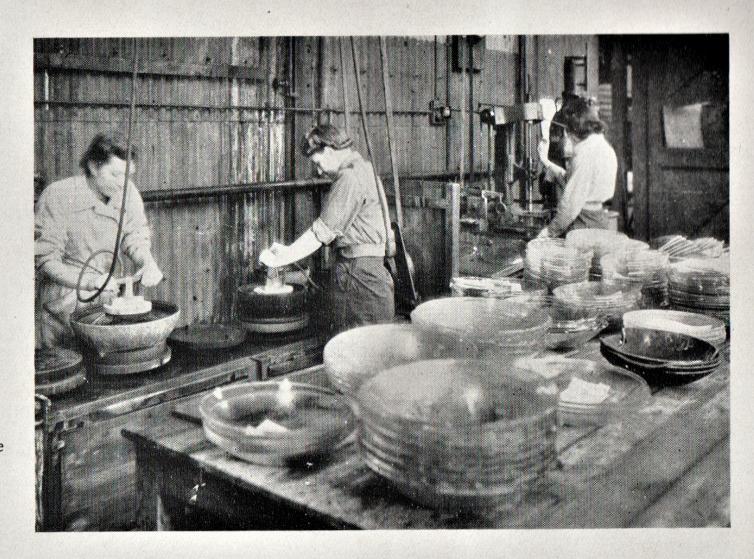


FIG. 4
Section of the Edge
Grinding Shop.

These defects inherent in the glass may interfere somewhat with the appearance of the reflector, but the light loss is negligible.

Borosilicate glass is very satisfactory for general work with its smaller coefficient of expansion compared with ordinary glass and its almost complete freedom from defects in the glass itself. It has also a low coefficient of absorption, giving a resultant absolute reflectivity when silvered of some 92% as compared with about 91% for Pyrex and 87% for ordinary plate glass.

Bending

The mirrors are accurately bent to the required shape in temperature controlled ovens. The cooling is controlled in suitably designed annealing chambers.

Surface Grinding

To remove any surface skin formed on the glass during bending, the circles are ground with a flexible grinding head in order to present a fresh surface for polishing.



FIG. 5 Section of the Silvering Shop.

Polishing

Inside and outside surfaces of the reflectors are polished on high speed machines using rouge and felt polishers, and after this operation the reflectors are rough cut to size. Fig. 3 shows a battery of polishing machines.

Edge Grinding

To bring the reflectors down to the specified diameter they are placed in cast iron bowls and the outside edge ground smooth to size. Fig. 4 shows this operation.

Final Polishing

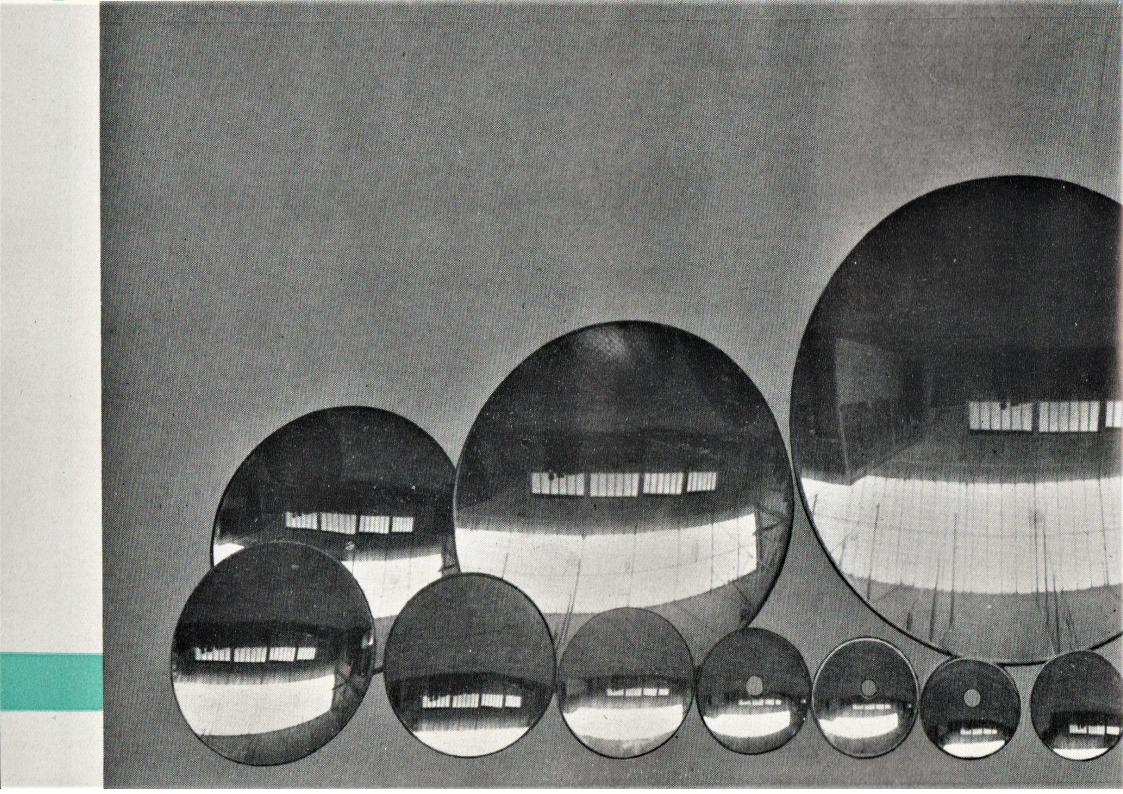
A final polishing on the outside gives the brilliant finish necessary for high light reflection.

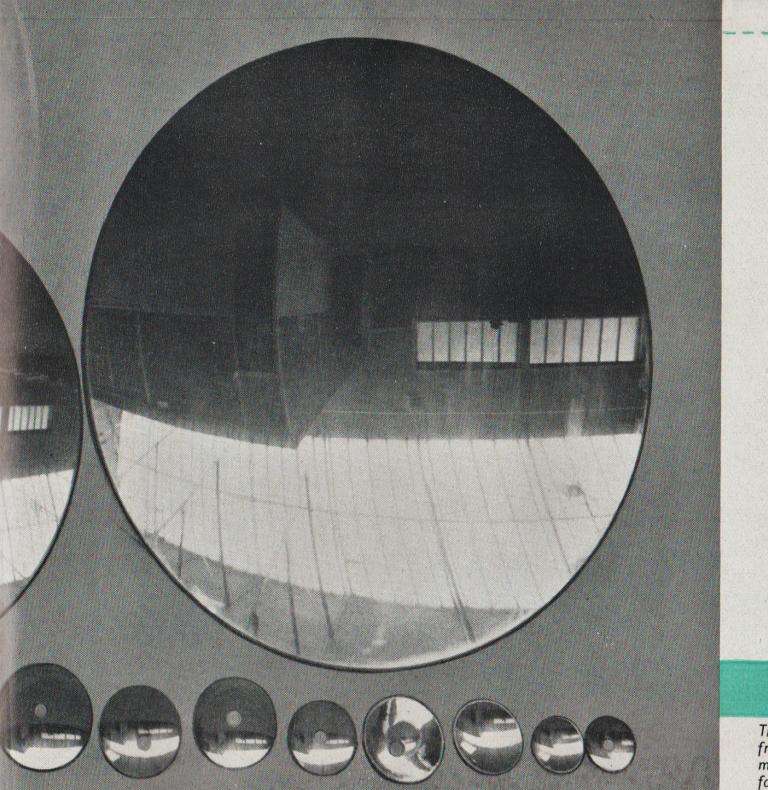
Drilling

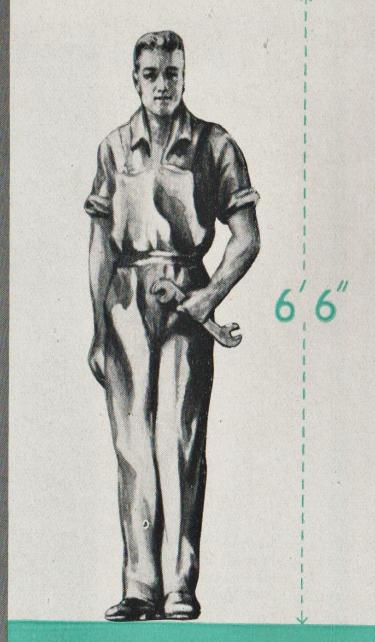
At this stage any holes which may be required in the reflector are trepanned out.

Silvering

In preparation for the silvering, the reflectors are chemically cleaned and thoroughly washed in distilled water.







These reflectors, ranging in size from 4" to 78" emphasize the manufacturing resources of the factory.



FIG. 6
Section of the Backing Shop, showing lead covering and paint spraying.

page FOURTEEN

The reflecting surface consists of a heavy coat of heat resisting silver backed with a coat of electro-deposited copper.

Fig. 5 shows a view in the silvering department.

Backing

The reflectors are finally covered with a coat of anti-oxidising material and an outside covering of spun copper or thin sheet lead which serves the dual purpose of distributing the heat evenly over the back of the reflector, thereby giving more effective cooling, and also of holding it together should it be broken in service. Fig. 6 shows the backing department.

Testing

At an early stage in the manufacturing process the reflectors are tested for accuracy, and when completed they are again tested before finally being transferred to stock.

An ellipsoidal reflector is tested by placing a small source of light at the primary focus and projecting it on to a screen placed at the secondary focus. Limits are placed on the size of the projected spot at the secondary focus and these vary according to the size and focal points of the reflector.

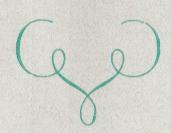
The paraboloids are tested for their light concentration when placed in a collimated beam from a distance source and rigid limits placed on the size and shape of the resulting focal spot.

Conclusion

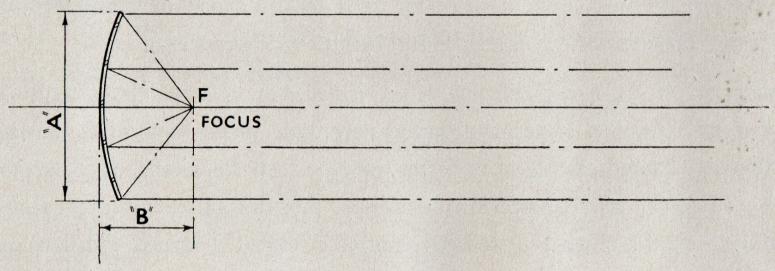
Figs. 7 and 8 show the principles of the paraboloidal and ellipsoidal reflectors and the tables give the range of standard sizes which can be supplied at very short notice. Other sizes can be manufactured if the relevant data i.e., diameters and foci are supplied or if a sample reflector is provided.

The deep and aspherical nature of the curves involved render the orthodox machines for grinding and polishing glass useless for these mirrors, and all the machines in use at Heaton Works have been developed and built in their own shops.

Throughout all stages of production of a G.B-Kalee mirror scientifically controlled testing and inspection is maintained, and only those which conform to the rigid standards demanded are passed fit for distribution. All this means, of course, that when you specify a G.B-Kalee Mirror for your projector arc, you can rest assured that you have the ultimate in reflective mirror efficiency combined with long and satisfactory service.



PARABOLOIDAL REFLECTORS



DIMENSIONS IN INS.

" A "	"B"
DIA.	FOCUS
12"	6"
12"	44
12"	3 1/2
$10^{\frac{1}{2}''}$	4 3 11
10"	44

"A"	"B"
DIA.	FOCUS
10"	31/
10"	3"
83/1	31/2
8"	3″
6"	21//2

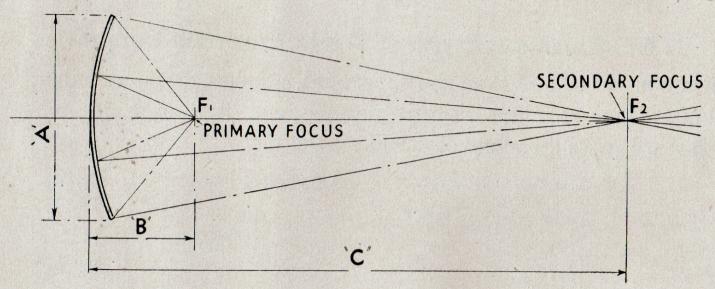
DIMENSIONS IN MA

"A"	"B"
DIA.	FOCUS
305 ¹ / _M	152 M
305 M	108%
3O5 ¹ / _M	89 M
268 ¹ / _M	121 1/1
254 ¹ / _M	1085

"A "	"B"
DIA.	FOCUS
254 1/4	89 ¹ / _M
254 ¹ / _M	76 M
208%	89 ¹ / _M
203%	76 %
152 1/2	63 ¹ / _M

FIG. 7

ELLIPSOIDAL REFLECTORS



DIMENSIONS IN INS.

`A'	B"	`C″
DIA.	PRIM. FOCUS	SEC. FOCUS
16"	6"	36"
14"	5″	36"
131	5″	31
13"	4.1/2	$31\frac{1}{2}''$
12"	5″	31"
12"	4 4 "	29 ¹ / ₄
12"	4 4 "	25"

`A'	*B"	`C"
DIA.	PRIM. FOCUS	SEC. FOCUS
111/2	5"	31"
104	41/	25
10"	4 1 "	25"
10"	3 3 4	25"
10"	3 1/2	25"
8 1 8	4 1 1	25
7 7 8	44	25

DIMENSIONS IN MM.

A DIA.IN %	PRIM FOCUS	SEC. FOCUS
406	152	914
356	127	914
343	127	787
330	115	800
305	127	787
305	108	743
305	108	635

THE RESERVE OF THE PERSON NAMED IN COLUMN		MINISTER WITH A STATE OF THE ST
`A" DIA IN M	PRIM FOCUS	C" SEC.FOCUS IN MM
292	127	787
260	108	635
254	108	635
254	95	635
254	89	635
206	108	635
200	108	635

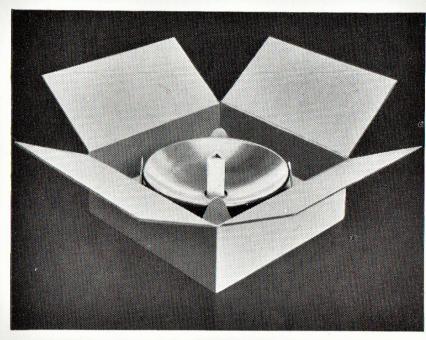
FIG. 8

Arc Lamp Mirrors for all makes and types of 35 mm. Projection Equipment

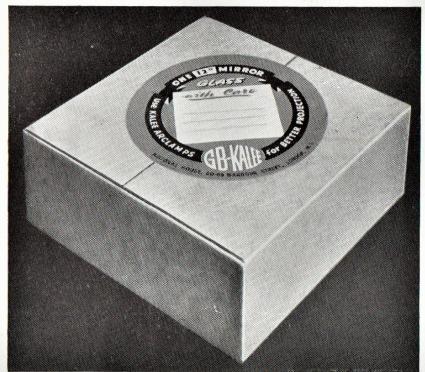
Mirrors for arc lamps not listed above can also be supplied. Orders should state the make and model of arc lamp or mirror diameter, hole size, and depth of mirror, or the focal length from the arc to the centre of the mirror and throw.

									Diam.
BRENKERT							••••		13"
BTH	•••				•••	•••			$11\frac{1}{2}''$
BTH (All types)	•••	•••			•••				13"
G.B. AUTO-ARC	•••		•••		•••				10"
GAUMONT Mirroli	te				•••	•••			$5\frac{1}{2}$ "
GAUMONT Mirroli	te	•••		•••	•••	•••	•••		7"
GAUMONT Eclipse	•••	•••				•••		•••	10"
GAUMONT-KALEI	E "21"	•••	•••	•••	•••	•••	•••		16"
HAHN GOERZ	•••	•••	•••	•••	•••		•••	•••	8"
HAHN GOERZ	•••			•••	•••	•••	•••		10"
KALEE RL			•••	•••			•••		$5\frac{1}{2}''$
KALEE 8 ML		•••		•••		•••		•••	8"
KALEE 10 ML	•••	•••	•••	•••	•••			***	10"

KALEE HML			 •••	 	 10"
KALEE Vulcan	•••		 	 	 10"
KALEE Vulcan AC/DC			 	 	 12"
KALEE Regal			 	 	 14"
PEERLESS			 	 	 $11\frac{1}{2}''$
PEERLESS Small Magnard			 	 •••	 10"
PEERLESS Magnarc			 •••	 	 $13\frac{7}{8}''$
PEERLESS Magnarc	•••	•••		 •••	 14"
ROSS "A"			 	 	 10"
ROSS "B"			 	 	 10"
ROSS "C"		//	 	 	 10"
ROSS "D"			 	 	 12"
STURGEON Auto-arc		•,••	 	 	 10"
STURGEON	•••		 	 	 10"
STRONG		•••	 ,	 	 $10\frac{1}{4}''$
ZEISS Artisol			 	 a craning	 10"
ZEISS Mirrosol					10"



These photographs illustrate the method of packing employed. The specially designed cases are proof against rough handling in transit, and ensure safe delivery of our mirrors



THOUGHTFUL PACKING

Arc lamp mirrors supplied by G.B-Kalee are packed in stout corrugated board containers, specially designed to give adequate protection against rough handling in transit.

Those who have suffered the irritation of receiving broken mirrors will appreciate this thoughtful care in packaging.

G.B-KALEE Service

You will find a prompt and reliable Service awaiting you with G.B.-Kalee. And behind that Service an oganisation which has spent many years in the development of arc lamp mirrors.

We will gladly co-operate with you over any problem in projection, seating or furnishing which you may have. You are invited to send your enquiry to our Head Office or to any of our branches.



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and at

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