



INSTRUCTION MANUAL

for the
KALEE GK-40
Sound - Film
Projection Equipment

Sole Distributors:
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KALEE G.K.-40 SOUND-FILM PROJECTION EQUIPMENT

INSTRUCTIONS FOR INSTALLATION AND OPERATION.

IMPORTANT. This equipment is shipped in cases specially designed to give adequate protection in transit, and it is in your interest to study the instructions carefully before commencing to unpack.

The complete dual equipment as ordinarily supplied comprises the following items:

- 2—Projection Mechanisms each comprising Picture and Soundhead on Stand with 2,000ft. Spool Boxes, $\frac{1}{4}$ h.p. Driving Motor and 12" Mirror Arc (for D.C. or A.C. operation as ordered).
- 2—Series "H" bloomed Projection Lenses, focal length as ordered.
- 1—Extra Exciter Lamp Mount for Soundheads.
- 2—2,000ft. Standard Spools.
- 2—2,000ft. Split Spools.
- 1—Amplifier Set comprising a 12 watt First Stage Amplifier and 40 watt Power Stage Amplifier unit in Wall Rack with Monitor Speaker.
- 1—Speaker Unit comprising HF Speaker with 3 cell-Multi-Cellular Horn, LF Speaker with "V" Baffle, Cross Over Unit, 7ft. high triangular Speaker Tower and 50 yard length of Speaker Cable.

together with all minor accessories as valves and so forth required for operation.

The equipment is shipped in cases as detailed below. Each case is lettered and carries a list of its contents which will be found beneath a metal label on its outside. A circular disc of red paint about 3" diameter on the top and one side of each case indicates where to open.

Two Cases marked "A" each contain one Stand dismantled, Motor, Belt Guard, and motor driving belts.

Two Cases marked "B" each contain one Soundhead with driving flywheel and mechanism driving gear (both

detached), bolts for attaching soundhead to stand, and oil pipe and "take-up" belt.

Two Cases marked "C" each contain one Picture Head with bolts for fixing picture head to soundhead, bracket and bolts for attachment of top spool to top of mechanism, and one tin of oil.

Two Cases Marked "D" each contain one Lamp complete with straps and bolts for attachment to stand and a Mirror packed in special carton.

One triangular Case marked "E" followed by a serial number contains three triangular frames for speaker tower with braces and bolts and nuts for erection of tower.

One Case marked "F" followed by a serial number which should match that of "E" above, contains one long channel and two corresponding angles being vertical members of speaker tower.

One Case marked "G" contains LF and HF Speakers—"V" Baffle and HF cellular speaker Horn, Cross Over Unit, Speaker Cable, two sets, top and bottom Spool Boxes with bolts for attachment to projectors, two standard and two split Spools, three exciter lamp Mounts for soundheads, two Projection Lenses, three exciter lamps, two photoelectric cells, one photoelectric cell extractor, one Allen key, chains and hooks for slinging speakers in speaker tower, screws and bolts for attachment of cross over unit and LF speaker to "V" baffle, box cover for LF speaker.

One case marked "H" contains a complete Amplifier set in Wall Rack with Monitor Speaker and set of Valves.

Additional equipment which may be ordered extra to the equipment above is packed as convenient in foregoing cases or may involve additional cases and some rearrangement of above packing.

When unpacking check the contents of each case with the packing note attached to it, taking care not to overlook any minor parts. Carefully remove all supporting and cushioning packing and wash off carefully with paraffin the protective grease applied to bright parts.

ERECTION

Commence by unpacking Case A containing one stand dismantled with motor. The stand is packed in three parts, viz. Pedestal, Bracket which bolts on pedestal complete with tilting jack screw, and Tilting Top Platform comprising

nose piece which carries soundhead with rails which carry lamp above and motor beneath.

Bolt motor to two straps on under side of rail. Bolt Bracket to Pedestal and assemble Top Platform complete with Motor to Bracket, locking King Post about which it tilts in position by grub screw and securing end of tilting jack screw into hole provided in square cross brace between rails of platform. Adjust jack screw to bring tilting upper part of stand approximately horizontal to facilitate mounting of projector and lamp.

Unpack Case B containing Soundhead, and bolt Soundhead on to nose piece of Top Platform of Stand.

Unpack Case C, containing picture head, lifting this out of case by means of the battens screwed across its top, then remove these.

Mount the picture head on top of the soundhead, bolting it in position by the two $\frac{3}{8}$ " bolts provided. These go from beneath through two holes in the upper surface of the soundhead into tapped holes in the under surface of the picture head. Fit the intermediate gear (packed with the soundhead) which couples the sound and picture heads. The post on which it runs is carried on a swinging quadrant in the soundhead to enable adjustment of gear engagement. This quadrant is clamped by a hexagon headed bolt in the rear of the soundhead which will be noticed below and behind the gear spindle. Set it so that the gears run freely but without backlash. Couple the oil pipe (packed with the soundhead) to the Spindle of the intermediate gear by means of the nipple and union nut on the pipe which fit on the screwed end of the spindle. Secure the other, upper end, of the oil pipe under the clip provided on the shutter guard of the picture head.

Mount the driving flywheel, packed separately in case with soundhead, on tapered end of Soundhead spindle. Be particularly careful to see that this taper and the corresponding bore in the flywheel are quite clean and that the flywheel runs true when mounted in position.

Align the motor pulley with this flywheel and fit the two motor driving belts and the belt guard which is packed with the stand.

Bolt bracket for attachment of upper spool arm (packed with picture head) to top face of latter.

Unpack Case "D" containing lamp and clamp it on rails

of stand, securing it by means of the straps and bolts packed with the lamp.

The lamphouse should be mounted close behind the mechanism with just sufficient gap for free operation of the dowsers. Before finally clamping it in position it should be centred accurately with the projector, the notches which position it on the slide rails allowing sufficient sideways freedom for this. A convenient setting gauge is a rod about 5/16" diameter × 3' long. This is passed through and lightly gripped by both carbon holders so that it projects through the shutter of the picture head to the picture aperture. It is, of course, necessary to turn the mechanism so that the shutter is open and to lift out of the way the safety fire shutter blade which operates inside the shutter casing. Adjust the lamphouse so that the rod is central and square in the aperture, and clamp the lamphouse securely in this position.

Note that the card indicator for crater position at front upper corner of the lamphouse has been reversed in position to avoid damage in transit. Re-position it so that it projects above the lamphouse.

Unpack Cases E and F containing all parts for erection of the Speaker Tower, and build this up. Note that corresponding holes in different components are numbered to facilitate erection. If a perforated sound screen is used the speaker tower should stand behind this, otherwise stand it to one side of the screen frame.

Unpack Case G containing Speakers, Horns, Spool Boxes and sundry small parts.

Attach top and bottom spool boxes to the projector mechanism and fit up the latter with the take-up belts packed with the Soundheads.

Bolt the large 12" diameter LF Speaker to the back of the big wooden "V" baffle using the four OBA × 1 3/4" cheesehead screws, nuts and washers provided, and attach over it the box cover provided, which is secured in position by the latch type fasteners fitted.

Screw the Cross-Over Unit on top and near one edge of the big LF Baffle using the 2—2 BA Bolts and 2—1" × 8 Woodscrews provided. The top face of the Baffle is the one having four staples at its corners for attachment of the chains by which it is hung in the speaker tower.

Screw the HF Speaker Unit into the throat of the 3 cell Horn.

Hang the speaker assemblies in the tower by means of the chains and hooks provided and wire them up to the marked terminals of the terminal block mounted on the side of the cross-over unit. Connect the end of the speaker run, similarly to the terminals marked "IN."

The sides and top of the speaker tower should be draped with heavy felt to reduce back-stage reverberation.

Unpack Case H containing the Amplifiers complete with Rack and Monitor Speaker. The rack is provided with lugs enabling it to hang on the front wall of the operating box between the two projectors.

The valves for the Amplifiers are separately packed in same case. To insert valves remove the grilles in front of amplifiers. Valve "line-up" from left to right is as follows:—

12 watt stage:	EF.37	ECC.35	6V6	6V6	6V6	5V4G
	6J7M	6SL7	6V6GT	6V6GT	6V6GT	5U4G or 5T4
40 watt stage:	6L6G	6L6G	5V4G	5V4G	5U4G or 5T4	5U4G or 5T4
	6L6	6L6	5U4G or 5T4	5U4G or 5T4	5U4G or 5T4	5U4G or 5T4

In each case upper code is preferred type, usually supplied with equipment: lower code is equivalent replacement.

CONNECTING UP

Projector Motor. The motor is provided with a terminal box, to which make mains connection via a 10amp. DP switch, to be provided by the user. For convenience in making change-overs the motor switches for the two machines should be arranged together on the front wall of the operating box beneath the amplifier rack.

WARNING. Before running the equipment under power make sure that it turns over freely and has been lubricated, and the cross box filled to level with oil in accordance with instructions below under "Cleaning and Lubrication—Weekly (3)".

Arc Lamp. The lamp is fitted with two asbestos insulated arc leads for connection into the arc current inductor or rectifier equipment, in accordance with the instruction plates mounted on these, to suit the desired carbon current combination — see table below under "Operation—Arc Lamp."

The lamp is not usually provided with a switch, the mains switch on the arc current serving instead, but a special iron clad DP arc switch can be provided with a

bracket for mounting beneath the lamphouse rails, if specially ordered.

The lamp feed motor is specially wound and operates on DC supply only. . **It must not be connected to an AC supply.** In case of a DC fed lamp it is connected across the DC lamp supply. In the case of an AC lamp used with a Kalee inductor, it is connected to special terminals in the inductor in accordance with the inductor instruction plate. If the inductor in use is any other make a special DC supply unit, the Kalee Motoverter, must be provided.

The Amplifiers. The 12 watt amplifier section has at its back a recessed 3 pin male socket for mains entry and a corresponding 3 pin plug is provided ready wired with a 5ft. length of 3 core P.V.C. cable for connection to a 5 amp. with earth supply point. The green wire of this cable is the earth for the complete amplifier system and it is important that this be earthed. If the wiring in the operating box is not in earthed screwed steel conduit or sheathed cable, a special earth line must be provided to say, the nearest water pipe.

The 40w. amplifier is not separately connected to the mains but draws its power supply via its connection to the 12w. amplifier.

Both amplifiers incorporate mains transformers with adjustable taps to suit the usual supply voltage ranges, i.e. 100/120, 200/220, 230/240 and unless labelled to the contrary are sent out set for 230/240 volts. Should the available supply be other than this the bottom covers of the amplifiers should be removed and the lead to the mains transformer terminal marked 230v. unsoldered and reconnected to 210v. or 110v. as appropriate. **Both Amplifiers must be reset.**

The amplifiers are for operation off 50-60 cycle AC supply only and must not be connected to a DC supply.

Interconnection between soundheads, amplifiers, and speakers is by non-interchangeable plug and socket connections, thus simplifying installation and enabling rapid disconnection for testing without possibility of confusion.

The two leads (from photocell and exciter lamp) coming from the front end of the soundhead are fitted with plugs

which fit corresponding sockets in the end of the 12w. amplifier. Corresponding sockets are provided in the two ends of this amplifier for connection of both soundheads, a switch being provided in the front panel of the amplifier, to switch from one soundhead to the other for sound change-over.

Interconnection between 12w. and 40w. amplifiers is by a multi-core lead from the rear of the 40w. Amplifier fitted with a 10 pin plug which connects into a corresponding 10 pin socket in the rear of the 12w. amplifier.

The 50 yard speaker run is furnished at one end with a 10 pin plug to fit a corresponding socket in the rear of the 40w. amplifier. Its other end connects into the terminal block on the cross over unit already described above in connection with the fitting up of the speaker tower.

The Monitor speaker is housed in a case attached to the top shelf of the amplifier rack and has a lead terminating in a two pin socket which fits a corresponding two pin male recessed socket in the rear of the 40w. amplifier.

In case of a failure of the 40w. amplifier, it can be disconnected from the 12w. stage by pulling out the connecting plug, and the stage speaker 10 pin plug plugged directly into the 12w. amplifier instead. The Monitor speaker two pin socket can be similarly plugged into a corresponding 2 pin recessed male socket in the back of the 12w. amplifier.

Note. It is essential that all connections be made before trying to test the amplifier, since, in order to avoid damage due to overloading of the output stage such as might arise were the stage speakers disconnected, the amplifier circuit is so arranged that it is broken if the stage speaker plug is withdrawn.

OPTIONAL EXTRAS

1. **"Non-Synch".** This is supplied complete with 12ft. of single screened cable and a Jack Plug, to fit a socket provided in the front of the 12 watt stage. Remove cover at rear of case exposing two terminal blocks. Connect the free end of the screened cable into the 2 way block marked P/U, the braided screen of the cable being wired to the terminal marked "E." Provide a 2 core and earth mains lead and connect it into the 3-way block marked "Mains."

WARNING. The motor is wound for A.C. only. It is

sent out set for 200/240 volts but can be reset for 100/120 volt. To reset, detach motor board from case by removing retaining screws through side of case and remake connections within moulded motor terminal box in accordance with instructions moulded thereon.

Note that the turntable "Start-stop" switch is actuated by the pick-up arm.

2. **"Mike".** This comprises a M/C Microphone and a transformer supplied assembled together on a mounting bracket wired complete with lead and jack plug. The assembly mounts inside the Monitor box behind the perforations and is secured by the two screws already in place. The jack fits the socket in the front of the 12 watt stage. Note: always switch off the Monitor speaker **before and while** the mike is plugged in.

Note. Plugging in of either Non-Synch or Mike automatically cuts out "Sound on Film."

3. **Slide Lantern and Title Lens Attachment.** This comprises a hand-fed scissors arc in a special lamphouse complete with condenser, slide magazine and manual shutter and a separate focusing fixture to carry a slide projection (title) lens. For corresponding picture size this lens should have a focal length about four times that of the lens of the projector.

The slide lantern is mounted alongside the projector lamphouse (usually of No. 1 machine) on its non-operating side. To carry it one of the angle bars beneath the lamphouse is replaced by a special extended one and an extra flat bar provided. The lens attachment has a foot which bolts on to a facing provided on the detachable rear cover of the projector and has adjustments to align and focus the lens.

Recommended carbon-current combinations are:—

DC—12 to 14mm "White Flame" equal carbons at 25/30 amps.

AC—a special inductor is required: use 12mm "White Flame" equal carbons at 35 amps.

STARTING UP

IMPORTANT. Before running the equipment, lubricate all oiling points of the projector mechanism and fill the oil bath of the intermittent unit to the level of the centre of the sight window, as detailed under "Cleaning and

Lubrication—Weekly (3)", below, and check that the mechanism turns over freely by hand.

The Arc Lamp. Insert the mirror in its holder retaining it in place by the clips on the holder rim. Fit up the lamp with carbons, setting the forward (positive) carbon so that its end is in line with the bright polished indicator in the back of the lamphouse. Adjust the position of the mirror holder along its guide rails so that the centre of the mirror is about $4\frac{1}{4}$ " from the end of the positive carbon.

With the projector mechanism running without film, strike the arc as instructed under "Operation—Arc Lamp" below. Let the arc burn for a few moments to establish a proper crater, switching on the automatic feed motor and adjusting its speed to maintain the arc gap.

Check that the positive carbon crater is in alignment with the indicator already referred to in the back of the lamphouse. Focus the projection lens so that the film aperture is in sharp focus on the screen. Adjust the mirror bracket backwards or forwards on its slide rails to the position corresponding to brightest illumination in the centre of the screen. Note that this setting is very critical, quite small movement making considerable difference in screen brightness. Having found the best position for central brightness, tilt the mirror by means of the two levelling screws behind it to get the most even possible illumination across the screen. Having obtained this, recheck that the mirror is in the optimum longitudinal position. Tilt the periscope mirror to bring the arc image into coincidence with the latitude markings on the card.

Care should be taken not to disturb the above settings once they have been established, but they should be re-checked whenever the mirror is disturbed in its holder.

Check that the projector is tilted and positioned so that the illuminated area properly fills the screen when the lamp flue can be connected up to the booth vent and the damper adjusted to give just sufficient draught for adequate ventilation. Avoid excessive draught since this will cause flickering of the arc.

The Soundhead. The Exciter Lamp is fed with super-sonic current from the amplifier, and accordingly the amplifier must be connected up and switched on and the change-over switch appropriately set before soundhead adjustments can be made. Note that the brightness of the exciter lamp

is controlled by the sound balance potentiometer in the front end of the soundhead.

Pull out the bell shaped cover fitted into the end of the sound drum and insert photoelectric cell. Note this should not be exposed to bright light more than is necessary. A special hook shaped tool is provided with the equipment to facilitate its removal. When replacing the bell cover watch that the extended skirt does not obscure the scanning aperture.

The exciter lamp is mounted in a detachable holder incorporating focusing adjustments. A spare lamp and holder is provided per pair of projectors which should be kept set up ready for immediate interchange, in case of a lamp failure during a show. Such failure should be very rare, since the lamp is deliberately under-run to ensure long life.

The special bayonet type holder is provided with a spring clip which holds the lamp lightly but firmly against vibration. Push the lamp well down against the thrust of the central spring contact and twist it a full quarter turn, allowing it to rise so that its pins are engaged in the retaining notches. Occasional difficulty in pushing a lamp fully home may be due to a blob of solder on the lamp cap which should be carefully filed off.

Check that the aperture in the sound drum is free from grease and dirt and that the lenses of the optical slit system are clean. Remove the bell shaped cover enclosing the photoelectric cell and examine the patch of light formed on the cell cathode with the Exciter lamp switched on. Position the exciter lamp by means of adjustments provided to obtain a bright patch of light. The correct setting is that corresponding to maximum **uniform** brightness across and along the patch which should be without colour fringes. Having established this setting, lock the stops locating the lamp holder, thus enabling it to be withdrawn and replaced without disturbance of its adjustment.

The sound optical slit system is accurately preset in focus and azimuth, locked and sealed and its adjustment should not be disturbed.

Having adjusted the exciter lamp, thread up and run the equipment with any convenient representative film. Set the sound balance potentiometer on the front end of the soundhead to give maximum exciter lamp brightness and with the volume control set between 3 and 4, adjust the cell polarisa-

tion potentiometer—knob at rear of 12w. amplifier—to give an adequate volume of sound.

Having adjusted both machines to satisfactory sound, proceed to balance the sound levels as follows:—

1. Set treble control which is on the front panel of the 12w. amplifier to "Max."
2. Set the volume control of Monitor speaker to "Max" and turn up exciter lamps to full brilliance.
3. Compare the cell "hiss" from the two soundheads by switching quickly from one to the other and dim the exciter lamp of the "high" machine to equalise the "hiss" level.

Speakers. The Cross-Over Unit is fitted with a "normal—emergency" switch which serves to cut out the HF Speaker in case of breakdown, the full frequency range being handled by the LF Speaker. With switch set at "normal" check phasing of speakers. If these are incorrectly connected into the cross over unit, it will be apparent that the sound is coming from two sources. Correct if necessary, by reversing the connections of one Speaker.

Check the sound distribution in the hall, adjusting the angling of the HF horn and the setting of the tower to obtain the best results. Satisfactory upper frequency coverage requires very accurate location of the HF horn in the vertical plane.

Amplifiers. The bass and treble controls on the front panel of the 12w. amplifier have each 3 positions to give the best combination to suit the effective acoustical characteristics of the hall. Both controls are at Max when turned fully clockwise.

OPERATION

Lace up with film in accordance with the lacing chart exhibited on the projector. Take care to thread the film so that the gravity roller arm above the sound drum which serves to tension the film rides in its mid-position, since poor sound will result if this arm is working at either extreme of its movement.

The gate is hinged to open like a book for easy threading, the lens having been first swung up out of the way. Notice the gravity latch locking the pad rollers on the bottom hold-back sprocket of the soundhead. This must be lifted to open the rollers. Watch that it is fully re-engaged

when the rollers are again closed.

The picture gate has a second aperture above the picture aperture proper to facilitate threading in the frame. Framing during operation is made by means of the racking knob situated below the light cone.

The Arc Lamp.

1. Adhere strictly to the carbon/current combinations recommended below.

D.C. Carbon Current Combinations.

Carbons ("Ship")	Positive m/m	Negative m/m	Current Amps.	Arc Volts
SUPREX	6	5	30-35	30-33
	7	6	40-45	35-38
	8	7	50-60	37-41
SUPREXA	6	5	35-40	33-37
	7	6	45-55	37-40
	8	7	55-65	39-41
HILUX*	8	6	35-45	33-34
	9	6	45-55	34-35
	10	7	55-65	35-36
HILO*	7	6	40-45	- 35
	8	7	50-55	- 38

* Lamps for D.C. operation are supplied geared for Suprex/Suprexa carbons with a loose gear to enable adaption to Hilux/Hilo range in accordance with the instructions below.

A.C. Carbon Current Combinations.

Carbon (Alternalux) m/m	Current Amps.	Arc Volts.
6	60	26
7	65-75	26
8	80-90	26
9	95-105	26

2. The carbons should be firmly but only lightly clamped in their holders since they crush readily. The jaws of the carbon holders should be kept clean and bright to ensure good electrical contact: when it is sufficient if the clamping screws are only finger tight.

3. Set up the forward (positive) carbon so that its end is aligned with the index on the inside of the back panel of the lamphouse (i.e. approximately $4\frac{1}{4}$ " in front of the back of the mirror).
4. Check that the end of the rear (negative) carbon is correctly centred, adjusting as necessary by means of the screws provided, which tilt the carbon holder. The end of the negative carbon should be in the same vertical plane as that of the opposing one, but with its centre about $1/32$ " lower.
5. Keep the lamp dowsers closed when striking the arc in order to protect the mirror from splashes—an internal protector shield is linked mechanically with the external lamp dowsers. Do not keep closed while the lamp is burning since the heat will soon destroy the shield.
6. The carbons can be fed manually by means of the two large knurled knobs projecting at the rear of the lamphouse. Rotation of the upper knob feeds them simultaneously to open or close the gap. This knob can be pulled back and then operates the rear (negative) carbon only. When so withdrawn the lower knob operates the forward (positive) carbon. For setting, the carbon holders can be disengaged from their feed screws by depressing the finger keys provided at each holder.
7. To strike, it is preferable to move the rear (negative) carbon only. Pull back the upper feed knob to its full extent: rotate clockwise to feed the carbon forward to strike the arc, then anticlockwise to open the gap. After striking, adjust arc position and gap as necessary to bring its image into coincidence on the lines marked on the image card.
If the equipment is correctly set up in the first place as described above, it should not be necessary to re-set the mirror.
8. Switch on the feed motor and adjust the feed control potentiometer as necessary to maintain the arc gap. The potentiometer setting corresponding to any particular carbon current combination should not vary.

To alter gearing of DC lamp to Hilux/Hilo range.

1. Remove chain guard and chain transmitting motor drive to positive carbon feed screw.
2. Remove grub screw retaining sleeve on end of negative carbon feed screw and withdraw Negative Feed Knob

assembly complete. Take care not to lose Woodruff key from spindle. Free grub screw retaining gear on end of feed knob assembly, and remove gear, replacing by Hilux Gear supplied with lamp.

3. Free clamp screw which locks the Positive Feed Knob on the screwed end of Positive Feed Screw. Unscrew knob and withdraw spring, clutch and chain wheel. Remove Compound Gear retained by grub screw.
4. Reassemble with Compound Gear reversed and Hilux Gear supplied with lamp, replacing Suprex Gear on sleeve of Negative Feed Knob as instructed in (2) above.

CLEANING AND LUBRICATION

Regular cleaning and lubrication are important but do not over oil and always wipe off any excess. Use Kalee Super Oil only, since this has been specially selected as best suited to the operating requirements of the projector mechanism.

Never clean the equipment while it is running since a rag caught in a moving part may result in personal injury or in damage to the equipment.

Daily.

1. Clean the projector gate and mask plate carefully removing any film emulsion or dirt. The gate is readily detachable. Swing the lens up out of the way, open the gate, then release it by means of the cam lever on the face of the machine, when it can be lifted out of its hinge. The mask plate fits freely in slots in the gate bracket from which it can be simply lifted out.

An old tooth brush is a convenient cleaning tool. The end of its handle can be filed up square for use as a scraper to remove any hard deposit. Never use a steel scraper, since scratches are liable to cause emulsion build up and consequent film damage.

2. Wipe the arc mirror with a soft dry rag, taking care not to scratch its surface.
3. Apply **1 drop** of oil to each of the following oiling points:
 - (a) The seven points grouped in a block on top of the projector frame.
 - (b) The three points grouped in a block on top of the soundhead behind the projector.
 - (c) The oil pipe from the adaptor gear which is brought out into the side of the shutter housing behind the projector.

- (d) The oiling points at top and bottom spool box spindles.
- (e) The feed screw bearings of the arc lamp.
- (f) The bearings of the driving motor.

Weekly.

1. Clean all sprockets, especially their teeth, also all pressure and guide rollers and top and bottom fire traps. Use a tooth brush as brush and scraper, as described above, to remove any accumulated deposit, taking care not to damage the sprocket teeth. If necessary, a little paraffin or carbon tetrachloride can be used to facilitate removal of dirt. This should be used sparingly, carefully wiped off and any rotating part so cleaned, carefully relubricated.
2. Lubricate sparingly all guide and pressure rollers: be particularly careful to wipe off any excess oil which might get on to the film.
3. Remove the rear cover from the projector. This is secured by a single captive screw with a large knurled head. Check oil level in cross box oil bath. This should be visible in the sight glass when the box is turned into the vertical position. Replenish as necessary using Kalee super oil only. It is most essential to use clean oil since any grit will ruin the precision mechanism.
4. Before replacing the rear cover, give two drops of oil to each bearing of the yoke which rides on the shutter shaft. Give also a drop of oil to the teeth of each gear train and wipe out any oil collected inside the base of the machine.
5. Thoroughly clean down the whole equipment including the inside of the lamp, wiping all bright parts with an oily rag, giving special attention to the guide bars and feed screws inside the lamp.
6. Clean the projection lens, taking care not to scratch or fingermark the glass surfaces. Do not take the lens out of its holder, since it would necessitate refocusing and do not attempt to dismantle it. Carefully remove any dust with a clean camel hair brush. Any grease can be removed with a pad of cotton wool moistened with alcohol, but a minimum of solvent should be used, lest this get inside the lens. The glass can be finally wiped with a damp chamois leather finishing with a piece of clean

well laundered linen or silk, but should not be cleaned more than necessary.

7. Clean out any dirt which may have collected in the aperture in the sound drum, and carefully wipe the front lens of the optical system with a piece of clean well laundered linen or silk.

Annually.

Remove rear cover of mechanism and withdraw the intermittent unit as described below. Dismantle the projector gear train as far as this is readily demountable. Thoroughly wipe down with clean paraffin, relubricate and reassemble the train. Drain out old oil in the intermittent unit, rinse this out with clean paraffin or carbon tetrachloride, thoroughly drain out the solvent and refill with Kalee Super Oil, replacing the unit as described below.

Similarly strip down and thoroughly clean and relubricate the lamp mechanism, repacking the gear box with fresh grease.

POSSIBLE FAULTS

MECHANISM.

1. **Fireshutter Sluggish.** Flag rises too high fouling shutter casing:—reset arm. Governor mechanism sticking due to dirt or oil:—remove rear cover, examine mechanism, wash with paraffin and relubricate sparingly.
2. **Noisy running.** Film loops too large. Faulty adjustment of pad rollers—these should be set to clear sprockets by twice thickness of film. A pronounced high seed clicking suggests lack of oil or consequent wear in the intermittent unit. Fill up with clean oil but do not attempt to adjust. Refer to nearest Service Depot.
3. **Film Damage.** Damaged spools (bent flanges). Machine carelessly threaded. Excessive loops—e.g. lower loop in soundhead rubbing in bottom of case. Emulsion build up on mask plate or guide rollers or dirty sound drum. Pad or guide rollers sticking due to dirt or lack of oil or may be too much oil.

LAMP.

1. **Fails to feed.** Motor fuse blown. Check mechanism which should be very free, cleaning and lubricating feed screws and slides. Replace fuse with spare which will be found under marked cover at rear of control unit. Fuse used is standard $1\frac{1}{4}$ " tubular 2 amp.

2. **Feed erratic.** Check that mechanism is very free, cleaning and lubricating as above. Drive clutch may be slipping: release the screw locking the positive feed knob on the threaded end of the feed screw spindle and screw up to increase tension of clutch spring.
3. **Arc Unstable.** Excessive draught—adjust damper. Wrong carbon/current combination. Note that, due to mains voltage variations, settings shown on Inductor instruction plate are approximate only, and slight adjustment of tapping up or down may be necessary to obtain optimum conditions. Wrong polarity (on D.C. only):—the rear carbon, i.e. the one projecting through the mirror must be connected to the negative of the supply.
4. **Poor Crater formation.** Excessive obliquity:—mal-alignment of carbons, Spindling of carbons:—excessive arc current. Mushrooming of negative:—arc gap too small. Splutterings and disintegration at crater lip:—damp carbons.

PICTURE.

1. **Jump.** Poor or worn film. Faulty adjustment of intermittent sprocket pad roller: Roller should be set to clear sprocket by twice thickness of film. Gate tension incorrect: too much or too little. Tension should be minimum consistent with satisfactory projection, since excessive tension causes rapid wear of both machine and film. The tension is determined by light spring fingers in the gate, which are set to suit ordinary operating conditions and are not adjustable but can be reset or replaced. When cleaning take care not to damage these. Teeth of intermittent sprocket worn. Remove as instructed below and examine with a magnifying glass. The sprocket can be replaced reversed on the spindle, thus securing extra lease of life. Bent intermittent spindle. Do not attempt to straighten, but refer to nearest Service Depot.
2. **Weave.** i.e., sideways motion of pictures. Poor or worn film. Film guide roller at top of gate misplaced or sticking due to oil or dirt. Guide roller or mask plate worn. Note the guide roller is split and one flange is spring loaded. Alignment of the fixed guiding flange with the gate is very important. If this is disturbed it should be realigned to a steel rule inserted in the gate.

3. **"Ghost,"** i.e., a shadow effect especially noticeable at either top or bottom of lettering. Due to faulty timing of shutter. To correct loosen flange retaining shutter and very slightly advance or retard shutter.

SOUND.

Note: Plugging in of Non-Synch or Mike automatically cuts out "Sound-on-film."

Exciter Lamp "out".

1. If other exciter lamp lights up when amplifier change-over switch is thrown over, lamp has blown. Always keep spare lamp ready set up in extra mount supplied with equipment.
2. If both lamps dead check that amplifier is switched on. Turn up volume control on amplifier and Monitor speaker and listen for background noise. If audible suspect and replace No. 3 valve (6V6 or 6V6GT) in 12 watt stage.
3. If no noise audible check that Monitor speaker is plugged in and switched on and check all plug and socket connections including connections to stage speakers.
4. If no fault discovered recheck with 40 watt stage disconnected and Monitor and stage speakers plugged into 12 watt.
5. Suspect and replace fuse in faulty amplifier stage. A spare will be found in a clip behind the grille of each amplifier.
6. If repeated fuse failures and amplifier mains settings are correct:—

12 watt stage (standard $1\frac{1}{4}$ " tubular 2 amp fuse).

- (a) Suspect and replace No. 6 valve (5V4G, 5U4G or 5T4).
- (b) Suspect and replace valves Nos. 4 and 5, (6V6 or 6V6GT).
- (c) If trouble still persists refer to Service Depot.

40 watt stage (standard $1\frac{1}{4}$ " tubular 3 amp fuse).

- (a) Suspect and replace valves Nos. 3 and 4 (5V4G, 5U4G or 5T4).
- (b) Suspect and replace valves Nos. 1 and 2 (6L6G, or 6L6).
- (c) If trouble still persists refer to Service Depot.

(N.B.: Complete amplifier circuit diagram with component values will be found inside bottom cover of each amplifier).

Exciter Lamp "on" but no sound.

Check for background noise as described under 2 and 3 above. If amplifier dead:—

- (a) Recheck all connections.
- (b) Disconnect 40 watt stage and connect speakers into 12 watt as in 4 above.
- (c) If 12 watt "dead" suspect and replace valves 1 and 2 (EF37 or 6J7 and 6SL7 or ECC35 respectively). Note that as exciter lamp lights valves 3 and 6 must be functioning. Valves 4 and 5 are output valves in push-pull, hence some sound will be heard unless both fail together, which is unlikely.
- (d) If 40 watt "dead" suspect and replace valves Nos. 3 and 4 (5V4G, 5U4G, or 5T4). Valves Nos. 1 and 2 are output valves in push-pull, hence some sound will be heard unless both fail together.

If Amplifier "live".

- (a) Check exciter lamp adjustment by removing bell cover over photo-cell and examining light patch. Check that lens of slit system and scanning aperture in sound drum are clean and that skirt of bell cover has not been masking aperture.
- (b) Check connection photo-cell socket to amplifier.
- (c) Replace photo-cell. Note complete failure of photo-cell is extremely rare.

Inadequate Sound Level.

1. Turn exciter lamp potentiometer to Max. brilliance.
2. If on initial installation, check setting of amplifier mains transformers. Amplifiers are sent out set for 230/240 volts and must be reset for 200/220 or 100/120 volt supplies as described under "Connecting up—Amplifiers."
3. Check exciter lamp adjustment and cleanliness of optical system—see "Starting Up—Soundhead."
4. Check photo-cell polarisation setting—see "Starting Up—Soundhead."
5. Suspect and change photo-cell.

Distorted Sound.

1. Faulty threading of film around gravity tension roller above sound drum. This should work about its mean position as described under "Operation—Lacing Up," above.
2. Faulty alignment of sound track. This may happen due to an inaccurately printed film and results in "frame"

or "perforation" noise. Compensation is possible by means of a tracking adjustment provided on the spindle of the gravity roller arm.

3. Optical slit system out of azimuth or focus causing muffled sound due to loss of higher frequencies. To adjust see special instructions under "Miscellaneous Service Notes."
4. Unbalance in output stage of 12 watt (Valves No. 4 and 5) or 40 watt (Valves Nos. 1 and 2). Always replace these valves in pairs.

"Machine Noise," i.e., a ringing background noise persisting obtrusively with film is due to vibration of the image of the exciter lamp filament across the sound slit and can be eliminated by accurate setting of the lamp. It is always accompanied by colour fringes at top or bottom of the light patch on the photo-cell cathode. These must be avoided.

MISCELLANEOUS SERVICE NOTES

To Remove the Intermittent Sprocket.

1. Open and detach the gate. Take out the mask plate. Remove the stripper which encircles the hub of the intermittent sprocket and which is secured to the bottom of the gate bracket by a 2BA countersunk screw.
2. Remove the screw in the outer end of the intermittent spindle which clamps the intermittent sprocket. This should be done carefully, using only as much force as is necessary in order to avoid straining the intermittent unit or bending the spindle. Steady the sprocket with one hand against the twist of a screwdriver. Note the two washers interposed between the head of the screw and the boss of the sprocket, i.e. a spherical seated floating washer under the head of the screw and under this a key washer having a projecting square gib which engages a slot in the sprocket and in the spindle. Take care not to lose these. Remove the sprocket. This is a light push fit on the spindle and should be withdrawable by hand. Should it be necessary to prise it off, take great care not to bend or otherwise damage the spindle. Take care likewise not to drop the sprocket since the teeth being hard are also brittle. When replacing the sprocket make sure that the spindle, sprocket hole and shoulders are quite clean. Smear the spindle slightly with oil be-

fore pushing on the sprocket. It should go on rather stiffly. Avoid use of undue force which might damage the mechanism or bend the spindle, and watch that the key and seating washers are correctly assembled with the head of the screw bedding in its spherical seat in the corresponding washer.

To Remove the Intermittent Unit.

1. Remove the sprocket as described above.
2. Detach the rear cover of the mechanism, thus exposing the gear train and the intermittent unit. The intermittent unit is secured by a post passing through a lug in the side of its body being clamped by a single $\frac{3}{8}$ " nut on the end of this post, and can be withdrawn backwards out of the machine after removing this nut. Take care that the spanner does not slip and strike or jam the fly-wheel.

WARNING. Under no circumstances should the intermittent unit itself be dismantled. In event of its requiring any adjustment or replacement it should be returned to the nearest Service Depot.

Replacing and Retiming the Intermittent Unit.

The operation of the intermittent unit must be accurately co-ordinated with the shutter so that film movement takes place only when the screen illumination is cut off. Faulty timing shows itself in the appearance of "travel ghost" in the projected picture.

To facilitate replacement of the intermittent unit in correct timing its flywheel is marked with a radial line. A similar line is marked on the flange clamping the shutter blade which is itself marked with a dot which should be in alignment with this line.

When replacing the intermittent unit the following procedure should be followed:

1. Set the masking knob central.
2. Turn the mechanism to bring the line marked on the shutter flange vertical.
3. Engage the intermittent unit in its mount but do not yet mesh its gears with those of the projector.
4. Turn the flywheel of the intermittent unit so that the line engraved on it is to the top and parallel with the rear edge of the projector frame. Maintaining this position, push the unit home engaging the gears and secure it with the clamping nut.

5. Replace the intermittent sprocket and stripper as described above.

It will probably be necessary to turn the flywheel slightly to get the gears to engage. Also since the gear teeth are spiral the flywheel will turn slightly as the unit is pushed home thus slightly disturbing the setting, and a few trials may be necessary to secure correct timing with the unit fully home.

Check by running the machine with film and examining the picture on the screen paying special attention to the top and bottom of lettering in titles which is where travel ghost is most evident if timing is faulty.

If necessary, final adjustment can be made by loosening the shutter flange and advancing or retarding the shutter.

If slight "ghost" is evident at the bottom of the lettering, turn the shutter slightly clockwise. If it the top anti-clockwise.

To reset Sound Optical Slit System in Azimuth.

The slit system is accurately preset in focus and azimuth, locked and sealed and its adjustment should not be disturbed. It can be detached as a unit by removing the cap of its retaining saddle when care must be taken not to disturb the setting of its locating ring. On replacement, the azimuth setting must be checked. This requires use of a loop of 6,000 cycle frequency film. Set treble and volume control of amplifier and Monitor speaker to "Max" and run equipment. Release lock ring of rear lens cell (i.e. next exciter lamp) and carefully rotate the cell by means of tommy holes provided to obtain maximum 6,000 cycle note. This adjustment is extremely critical and only very small rotation of the lens cell should be necessary.

To refocus Sound Optical Slit System.

Having set in accurate azimuth check the exciter lamp adjustment. Loosen clamp ring of front lens cell (i.e. next film drum). Run 6,000 cycle frequency film loop and screw the cell in or out to obtain maximum signal. Only small adjustment, not exceeding one complete turn, should ever be necessary and only following prolonged wear of the sound drum which can instead be detached and reversed to bring an unworn surface into use.

To determine suitable focal length for Projection Lens.

The focus to employ depends upon the size of picture desired and the length of throw. A table is given overleaf or the focus can be calculated as follows:—

$$\text{Focal Length (ins.)} = \frac{0.825 \times \text{Throw (feet)}}{\text{Picture Width (feet)}}$$

Thus, for a 15ft. wide picture at 100 ft. throw,

$$\text{focal length} = \frac{0.825 \times 100}{15} = 5\frac{1}{2} \text{ ins.}$$

Height to Projection Port at different angles of Rake.

The table below gives height (ins.) to centre of projection port (A) and distance (ins.) from front wall to front edge of pedestal (B) at different angles of rake from 5° up (+) to 20° down (—). These dimensions allow a 1 ft. clearance between the front wall and the foremost part of the equipment.

Rake...degs.	A...ins.	B...ins.
+ 5	47½	21
0	44½	21½
— 5	42	24
— 10	38½	27
— 15	35	29½
— 20	32½	30

PROJECTION TABLE FOR CINEMATOCGRAPH LENSES

SHOWING WIDTH OF SCREEN PICTURE AT DIFFERENT DISTANCES WITH LENSES OF DIFFERENT FOCAL LENGTHS
 "TALKIE" MASK APERTURE 0.825 in. WIDE.

Distance Lens to Screen. Feet.	FOCUS OF LENS IN INCHES																							
	3 in.	3½ in.	4 in.	4½ in.	5 in.	5½ in.	6 in.	6½ in.	7 in.	7½ in.	8 in.	9 in.	10 in.	11 in.	12 in.	13 in.	14 in.	15 in.	16 in.	17 in.	18 in.	19 in.	20 in.	
	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.
20	5	5	0	4	7	4	3	3	7	3	4	3	2	3	0	3	8	3	6	3	4	3	2	3
25	6	9	6	3	5	9	5	5	1	4	9	4	3	4	0	3	10	3	8	3	4	3	10	3
30	8	2	7	6	7	0	6	6	1	5	9	5	1	4	10	4	7	4	5	4	2	4	0	3
35	9	6	8	9	8	2	7	7	1	6	8	6	4	0	5	8	5	5	5	2	4	4	0	3
40	10	1	10	1	9	4	8	8	2	7	8	7	3	6	10	6	6	2	5	5	5	5	5	
45	12	3	11	4	10	6	9	9	2	8	7	8	2	7	8	7	4	7	0	6	4	6	1	
50	13	8	12	7	11	8	10	11	0	2	9	7	9	1	8	7	8	2	7	9	7	5	7	
55	15	0	13	10	12	0	11	10	0	3	10	7	10	0	9	5	9	0	8	6	8	2	7	
60	16	5	15	1	14	0	13	1	12	3	11	6	10	1	10	4	9	9	4	8	1	8	6	
65	17	9	16	5	15	3	14	2	13	4	13	6	12	9	12	1	11	5	10	5	9	1		
70	19	2	17	8	16	5	15	3	14	4	13	6	12	9	12	1	11	5	10	5	9	1		
75	20	6	18	1	17	7	16	5	15	4	14	5	13	8	12	1	11	5	10	5	9	1		
80	21	1	20	2	18	9	17	6	16	5	15	5	14	7	13	9	13	1	11	5	10	5		
85	23	3	21	6	19	1	18	7	17	5	16	5	15	5	14	8	13	1	11	5	10	5		
90	24	8	22	9	21	1	19	8	18	5	17	4	16	5	15	5	14	8	13	1	11	5		
95	26	0	24	0	22	3	20	9	19	6	18	4	17	4	16	5	15	5	14	8	13	1		
100	27	5	25	3	23	6	21	1	20	6	19	4	18	3	17	5	15	5	14	8	13	1		
105	28	9	26	7	24	8	23	0	21	7	20	6	19	4	18	3	17	5	15	5	14	8		
110	30	2	27	10	25	10	24	1	22	7	21	3	20	1	19	0	18	0	17	2	16	5		
115	31	6	29	1	27	0	25	2	23	7	22	3	21	0	19	10	18	0	17	2	16	5		
120	32	1	30	4	28	2	26	3	24	8	23	2	21	1	20	9	19	8	18	9	17	1		
125	34	3	31	7	29	4	27	5	25	8	24	2	22	10	21	7	20	6	19	8	17	1		
130	35	8	32	1	30	6	28	6	26	8	25	1	23	9	22	6	21	4	20	4	19	5		
135	37	0	34	2	31	9	29	7	27	9	26	1	24	8	23	4	22	2	21	1	20	5		
140	38	5	35	5	32	1	30	8	28	9	27	1	25	7	24	2	23	0	21	1	20	5		
145	39	9	36	8	34	1	31	9	29	10	28	0	26	6	25	1	23	10	22	8	21	8		
150	41	2	38	0	35	3	32	1	30	10	29	0	27	5	25	1	24	8	23	6	22	5		

Width
of
Picture

The height of the picture is approximately $\frac{3}{4}$ the width.

Kalee Projectors and Projector Lenses are
Designed and Manufactured throughout
by A. KERSHAW & SONS LTD., Leeds

for

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32