INSTRUCTION BOOK
No. 1665

Supa — Mk. 2
CINEMA PROJECTOR

Operator's Handbook

THE BRITISH THOMSON-HOUSTON CO., LTD.,
RUGBY, ENGLAND.

EDITION A

50/0350

IMPORTANT.

The apparatus described in this Instruction Book was designed, manufactured, and tested with care and, with proper attention, should give the purchaser the service which he may reasonably expect.

The purpose of this Instruction Book is to explain the function of the apparatus, and the manner in which it should be adjusted and maintained.

If these instructions are not clear, or appear incomplete in any particular, and you desire further information, this will be promptly supplied upon request.

Please address such enquiries to the Company's nearest District Office, or Local Representative, mentioning the particulars stamped upon the apparatus nameplate.

NOTICE.

BEFORE RETURNING APPARATUS FOR REPAIRS OR OTHER REASON, PLEASE COMMUNICATE WITH HEAD OFFICE, NEAREST DISTRICT OFFICE, OR LOCAL REPRESENTATIVE—QUOTING SERIAL NUMBER—WHEN THE NECESSARY INSTRUCTIONS WILL BE SENT.

COMPLIANCE WITH THIS REQUEST WILL AVOID DELAY AND INCONVENIENCE.

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SUPA MARK 2

CONTENTS

LIST OF DIAGRAMS AND ILLUSTRATIONS

FOREWORD

Mark 2 is a simplified version of S/U/P/A, intended for use in the smaller type of cinema. It has been designed to provide, in its simplest form, an equipment, complete in every detail, that is capable of being fitted in small projection rooms, and with this object in view the amplifier and projector units have been separated to enable them to be installed in the most suitable manner.

A complete installation consists of two identical stands each mounting a S/U/P/A pattern mechanism with conventional round spool boxes and a high efficiency arc lantern; an input switch box, wall mounted adjacent to each stand, to give convenient control of sound change-over and volume; an amplifier and an exciter lamp supply unit mounted in a steel cubicle, and a single or twin non-synchronous turntable unit fitted with light weight magnetic pick-ups and non-magnetic turn tables.

An attachment, to the lantern, for projecting lantern slides is available.

Adjustments can be made to the stand to accommodate different porthole heights and angles of projection, the range covering extreme dimensions as ascertained during a recent detailed survey of cinema projection rooms.

The high light efficiency is due to a combination of improvements in design of:-

(a) The arc lantern which is fitted with a 12" mirror and gives a larger aperture (f2) than previously obtained.

(b) The new range of Taylor, Taylor & Hobson 'Aperful' lenses, designed to take full advantage of the large aperture.

(c) The flicker shutter, a high ratio being obtained between the diameter of the flicker shutter and the diameter of the light beam at the point of cut-off.

For convenient operation an automatic feed device is provided for the carbons and this has an additional refinement which enables the feed rate of both positive and negative carbons to be individually matched.

Increased picture steadiness and freedom from buckling and distortion have been obtained by using an improved type of curved gate, and flicker is reduced to a minimum by the use of a dish-type shutter.

An adequate audio output of 30-watts, enables signal input "peaks" to be handled without overloading whilst frequency and harmonic distortion are reduced to negligible proportions by

FOREWORD (Cont'd)

the use of negative feed-back. The signal-to-noise ratio is improved as a result of the specially designed sound optical system and input circuit.

The amplifier cubicle with the front cover removed is shown in Fig.3; the main amplifier is on the top tray, 6, the amplifier rectifier and deaf aid amplifier on the centre tray, 5, and the exciter lamp supply unit at the bottom, 4.

The ability to tilt the amplifier and amplifier rectifier units without disconnection of the leads when they are withdrawn on their runners greatly facilitates inspection and Service.

Varying degrees of H.F. and/or L.F. boost can be applied in the pre-amplifier circuit to suit local acoustic conditions, thus obviating all possibility of misuse of a manually operated tone control.

DESCRIPTION OF EQUIPMENT

GENERAL

The overall dimensions of each equipment when in the normal position are:-

Projector Unit

Length from back of lantern to forward end of the base:- 5 ft. 1-7/8 in. (157 cm)

Maximum width:- 2 ft. 1-7/8" (66 cm)

Height from the floor to the top of the top spool box:- 5 ft. 10-1/2 in. (179 cm).

Weight:- 694 lbs. (315 kg)

Maximum upward rake:- 10°

Maximum downward rake:- 25°

Amplifier Unit

Maximum height (floor mounted):- 4 ft. 0-13/16" (124 cm)

Width:- 1 ft. 11-5/8" (60 cm)

Depth:- 1 ft. 2-1/8" (36 cm)

Weight:- 190 lb. (86.18 kg).

MECHANICAL ASSEMBLIES

MECHANISM BOX

The conventional mute and soundhead have been replaced by one mechanism, a feature of which is the use of ball bearings throughout. Fig.5 shows the interior of the mechanism box with the drive motor removed and Fig.6 the mechanism box interior without the sound drum or drive motor. The mechanism box is primarily a casing containing various sub-assemblies, described in detail below, each of which is removable as a unit.

The Gear Drive Assembly, 16, Fig.6, is spigoted to the main casting and contains all the gears necessary for the drive transmission including bevel drive gears and a differential gear for compensating framing displacement in relation to the flicker shutter.

MECHANICAL (Cont'd)

The Drive Motor Assembly comprises:-

(a) A support assembly made up of two cylindrical brackets resiliently coupled, the inner bracket being fixed in the motor support plate, 15, Fig.5.

(b) A 240 volt, 1440 rpm. capacitor motor type BC.2406 fitted to the outer resilient mounting bracket.

(c) A flexible drive coupling.

The Sound Drum Assembly, 11, Fig.5 consists of the sound drum, flywheel and motor disc mounted in ball-bearings on a single spindle. The special type motor incorporates an induction disc about which the driving units are symmetrically disposed.

Drum speed control is by the injection of D.C. into the driving unit and the resultant eddy currents produced provide braking and a second order damping offect. The D.C. potential is obtained from a rectifier and pre-set potentiometer.

The sound drum being motor-driven avoids wear on the film, prolongs its life and enables a large flywheel to be used, which in conjunction with the resilience of the film forms a very efficient filter system.

Electrical connection is by plug and 3-core cable 12, Fig.5, from a socket mounted at the bottom of the mechanism box.

The Intermittent Mechanism, 17, Fig.6 is a sealed unit. It is completely self-contained and its essential components, the Maltese Cross and Geneva Cam, run in oil. The mechanism is driven directly by the motor through a flexible coupling. The motor shaft is mounted co-axially with the Maltese Cross spindle and engages the Cam and flywheel spindle through a one-to-one gear, the object of this arrangement being to couple the two high speed units (i.e. the motor and the intermittent mechanism) directly together, avoiding the use of a long gear train.

The Framing Assembly, 18, Fig.6, has a control shaft carried between two thrust bearings in a flanged support casting. To the end of this shaft is fitted a clutch boss assembly, inner clutch and compression spring. A projection on the clutch boss assembly forms the actuating arm to which the framing link, 20, Fig.6, is resiliently coupled.

The Inching Assembly, 22, Fig.6, performs a dual function. Its shaft is eccentrically carried in a 2-bearing housing, and, with a chain sprocket, provides tension adjustment for the sound feed and bottom sprocket drive chain in addition to its function as an

MECHANICAL (Cont'd)

inching device.

The Film Sprocket Drive Assembly, 24, Fig.6, consists of a two-ball-bearing housing and drive shaft to which chain sprockets are fitted. Two chains are used, one to drive the top sprocket assembly, 26, and the other the sound-feed sprocket, 23; bottom sprocket, 21; and inching assembly, 22.

The Picture Gate Assembly, Fig.8, is in two sections and is curved to ensure more even distribution of light over the entire picture area. The resultant film path prevents buckling in the gate. Flexible spring skids, 31, are used in the fixed part of the gate. Tension of these skids is adjusted by a small screw, 35, at the top of the gate. Three heat reflectors, 28, of conventional type are fitted behind the gate. The framing aperture, 32, is situated at the top of the gate and is illuminated by a standard 6v. lamp of the miniature-screw type, connected in parallel with the intermittent inspection lamp.

The Lens Holder Assembly, 34, Fig.8, is designed for use with "Aperful" lenses developed by Messrs. Taylor, Taylor and Hobson Ltd., but other lenses may be fitted by use of a standard range of adaptors. The lens carrier is mounted in a casting which can be hinged upwards and retained in the raised position by a spring catch. (It is shown in this position in Fig.8). Focusing is by axial movement of the lens, coarse and fine adjustment being provided.

The Changeover Shutter, 36, Fig.9, is fitted to the main frame. It is mechanically operated and is connected by cable to the shutter of the other machine.

The Flicker Shutter, 38, Fig.10, consists of a sheet metal dish which projects through the mechanism box at an angle. Apertures are cut in the conical side of this dish so as to leave two diametrically-opposed shutter blades. Adjustable extension pieces, 37, are fitted at the edge of each blade and a vane is formed at the outer edge of each extension piece to render the transmission of "light" to "dark" less abrupt and so to reduce flicker.

The Fire Shutter, 40, Fig.10, is mounted on the boss of the flicker shutter shaft. An eddy current disc fixed to the flicker shutter rotates in the gap of a permanent magnet on the fire shutter assembly and so opens the fire shutter; it closes by gravity.

The Light Tunnel, 29, Fig.8, is simply a metal shield enclosing the flicker and changeover shutters.

The Sound Optical Assembly, Fig.11, comprises the sound optical

MECHANICAL (Cont'd)

system, 44, a twin exciter lamp turret and the P.E. Cell mounting, 43, with top and bottom sound drum rollers, 42, and guide rollers. The sound optical system is in two sections. Light from the exciter lamp is projected, in the form of a rectangular spot, on to the sound track; an image of the sound track is then magnified, focused on a mechanical slit and thence transferred to the P.E. Cell cathode.

The Film Sprockets and Stripper Plates are of conventional design and function. The top sprocket is of the 6-picture type and the sound-feed and bottom sprockets of the 8-picture type.

The Pad Roller Assemblies, Fig.12, have provision for tension adjustment. The top pad roller assembly, 45, contains a single roller, whilst the sound-feed and bottom assemblies, 47 and 48, each contain two rollers. At the intermittent sprocket, 57, film guide pads, 46, are used.

The Spool Boxes are of the conventional round type with a deep lid so that on opening the film spool is completely exposed for ease of handling. On leaving the top spool box and entering the bottom spool box the film passes through efficient fire traps fitted in each case to the fixed portion of the spool box.

The Stand forms a rigid mounting for the projector over a wide range of porthole heights and projection angles.

The base is provided with four screw jacks, the ball ends of which fit into cupped feet, spaced to ensure stability over the complete range of projection angles. These screw jacks also provide a means of levelling the base and a fine adjustment for projection height.

PROJECTOR LANTERN TYPE L

The projector lantern is designed to operate with high-intensity copper-coated carbons. It is of the mirror arc pattern i.e. the light system includes a mirror having two fixed focal points, the arc crater and the picture gate. The best results therefore are obtainable only when the mirror arc, crater and gate occupy their correct relative positions. The mirror is 12" (30.5 cm) diameter, and is designed to operate with a projection lens of f2.

The use of a self-stabilising type of arc rectifier is normally recommended. Alternatively a D.C. supply voltage of 60 to 80 volts may be used with an external stabilising resistance of the correct value to provide the arc voltage specified in the operation section of this Instruction Book. Higher voltages can of course be used but would result in lower operating efficiency due to the additional losses in the external resistance.

PROJECTOR LANTERN TYPE L (Cont'd)

The lantern is simple to erect, operate and maintain. It is easily accessible and all the main components can be clearly and quickly separated and re-assembled without the use of special tools. By removing the mirror and its adjusting knobs, the complete chassis can be withdrawn from the body, exposing all the working parts for inspection and cleaning.

The negative carbon is provided with an external adjusting knob, 53, Fig.14 to enable the tip to be raised, lowered or slewed sideways so that correct burning of the crater can be accomplished. Quick release devices are fitted to both carbon carriages for resetting purposes.

Provision is made for tilting the mirror so that the light beam can be correctly lined up on the gate. An image of the positive and negative carbons is projected on to a plate, 58, Fig.14, attached conveniently to the lantern body so that the correct position of both carbons can easily be checked and maintained.

A Heat Resisting Nose Glass is fitted to the lantern as its use is definitely specified in some areas by local regulations, to form a permanent shield between the arc and the film. It is removeable, but as its insertion conduces to a cooler gate and reduces flicker due to draughts, its permanent use is recommended.

In the event of breakage, ordinary glass must not be used but only the special heat-resisting glass supplied for the purpose.

The Automatic Feed Mechanism, Fig.17, is driven by a Type BB314 40v D.C. motor, 65, Fig.15 through a worm and worm wheel. The worm wheel shaft carries an eccentric, which, as it rotates, causes a rocker arm, 90, to oscillate about a pivot, placed above and between the positive and negative carbon feed shafts. To one end of this arm is attached a pawl, 89, which engages in a ratchet, 87, on the positive carbon feed shaft. The other end of the rocker arm acts on a secondary rocker pivoted about the same pivot point, and held by a spring against the main rocker arm is attached another pawl, 88, which engages in a ratchet, 86, on the negative carbon feed shaft. The rate of negative carbon feed can be altered by means of an adjustment knob, 91, which controls the number of negative ratchet teeth, engaged by the negative pawl, for each complete revolution of the positive lead screw. This device enables the feed rate of the negative carbon to be varied, with relation to the positive, between the ratios of 1:1.5 and 1:33.

Motor speed control is effected by a potentiometer in the field circuit.

PROJECTOR LANTERN TYPE L (Cont'd)

To enable adjustment to the feed of either carbon to be made by hand, the feed shafts are brought out to conveniently placed knobs, 54 and 55, Fig.14, and the automatic mechanism is connected to the feed shaft, in each case, through a friction clutch.

The Slide Attachment, Fig.18, can be supplied, where required, for projecting lantern slides; it uses the lantern arc as the source of illumination. This device is attached to the left hand side of the lantern (viewed from the rear) and is internally coupled to the front shutter lever. The shutter handle, 60, Fig.14, is spring-biased to suit normal film projection; operation of the handle opens and closes the shutter and operates the mirror shield.

The optical system comprises a swinging mirror, 102, a negative lens, 101, and two preset mirrors, 99A and 99B, in the slide attachment, the beam finally passing through a condenser lens, 95, immediately behind the slide carrier.

The beam, from the slide lantern, is parallel to the main projector beam and at distances of 11-1/4" horizontally and 4" vertically from it. The porthole must be large enough to accommodate both beams, or a periscopic arrangement is available to translate the slide beam, where the porthole cannot be enlarged.

ELECTRICAL SYSTEM

Supply

The equipment is designed for an input of 240 volts, 50 cycles per second, single phase. For voltages other than 240, an auto-transformer is supplied.

The amplifier and associated units are designed to operate on frequencies of 40 to 60 cycles per second without modification, but modifications to the mechanism are required when the frequency is other than 50.

A special governor-controlled rotary converter is supplied when it is desired to operate from a D.C. supply.

Inter-unit Wiring

The supply is brought in from the main switch to the bus bars in the amplifier cubicle. All sub-circuits taken from the bus bars are separately fused.

All wiring between the amplifier cubicles, stands and

ELECTRICAL SYSTEM (Cont'd)

input switch boxes is run in multi-core P.V.C. insulated cable - or, for input signal circuits, in co-axial cable, - running in conduit.

The wiring from the mains and to the monitor, screen and P.A. speakers, and non-synchronous turntable A.C. supply is run in standard V.I.R. cable enclosed in conduit.

All wiring external to the reproducer units is installed by the electrical contractor.

Amplifier Cubicle

The cubicle is normally arranged for wall mounting but feet for floor mounting can be supplied.

All incoming and outgoing wiring in the cubicle is brought through the bottom. Terminal boards are provided at the bottom of the cubicle, and the sub-circuit fuses are mounted in the same position and are accessible from the front

The signal from the non-synchronous turntable unit is fed through a co-axial cable into a screening box mounted in the roof of the cubicle. This box contains the non-sync. transformer and its associated network.

The three units in the cubicle are fitted with slides for easy removal and the amplifier and amplifier rectifier units can be tilted so that the underside wiring and components are accessible by the service engineer after the bottom covers have been removed. Connections are made to the removeable units by means of spade terminals terminating on the wiring bunches.

Input Switch Box

The main volume controls, input selector switches, and the change-over push buttons are mounted in separate boxes, one for each stand. The boxes are designed for mounting on the front wall of the projection room and are suitable for conduit entry. A guard over the changeover push-button minimizes the risk of accidental operation.

Fig.23 is an illustration of the box.

Stand

The cables coming into the stand are brought up through

ELECTRICAL SYSTEM (Cont'd)

the centre column. The A.C. and control cables terminate on a terminal board, 3, Fig.2, on the non-operating side of the lantern table. The four-core cable to the P.E. Cell and Cathode Follower housing terminates in a 4-way socket which mates with a corresponding plug in the housing. The P.E. Cell signal co-axial also terminates in a plug and socket at the P.E.C. housing.

Leads from the lantern table terminal board are carried through into the mechanism box to supply the driving motor, sound drum motor, and framing and exciter lamps. The switch, 9, Fig.4, controlling the driving and sound drum motors, is mounted on the operating side of the lantern table.

Switches, 7, Fig.4, controlling the arc current, can be fitted in the lantern table, if desired. When this is done an arc volt/ammeter may also be provided in a position adjacent to the arc switches.
arrangements.

Sound System

The signal from the photo-electric cell is fed into a cathode follower mounted in the P.E.C. housing. The output from the cathode follower is taken through co-axial cable to the input switch which gives a choice of film or non-synchronous sound.

The sound output from the non-sync. turntable unit is fed into a separate first stage valve Type 6F11 in the amplifier, thereby enabling the non-synchronous sound level to be adjusted to match that from the film channel. The amplified N/S signal is taken through co-axial cable to the input switches.

The signals from each of the input selector switches are taken through separate first stage valves, Type V455, and the contacts of a small relay to a common second stage valve, Type 6F11. When the relay is de-energised, the 'B' channel is earthed, so that sound on the 'B' channel is passed to the power amplifier stages. When the relay is energised, the 'A' channel is connected to the second stage while the 'B' channel is earthed.

Sound change-over is effected to the 'A' reproducer by pressing the 'A' C/O push button which is connected so as to energise the C/O relay. If the 'B' C/O push button is pressed the relay is de-energised, because the 'B' button is connected to open the C/O relay coil circuit, thereby bringing in 'B' channel sound. The normally open contacts on the C/O push

ELECTRICAL SYSTEM (Cont'd)

buttons are shunted by resistances which are of such a value as to hold the relay closed when the 'A' push button is released.

An adjustable bass boost network is included in the grid circuit of the second stage valve. A preset volume control is also included at this point in order to set the average volume level.

An adjustable H.F. boost network is provided between the second and phase splitter stages; its output is fed into the power output stage. There are four valves, Type Pen 44, operating in push-pull-parallel (class AB1) in this stage. 30 Watts

The output transformer is mounted on the amplifier rectifier tray with the monitor attenuator and output switch. Negative feed-back is obtained by connection from the output transformer secondary through a potential divider into the cathode of the phase splitter valve, Type 6L19.

The output is designed to feed into a 500 ohm load, and a 500 ohm artificial load is provided on the amplifier rectifier tray and brought into circuit in the "test" position of the output switch.

The amplifier rectifier is a normal full wave type with capacity input filter.

The 10½ volt supply for operating the change-over relay is obtained by connecting the 6.3 volt and the 4 volt 8.4 amp filament windings in series. The supply is rectified by a half-wave rectifier mounted in the amplifier.

Amplifier Unit, 6, Fig.3

The amplifier is built on a conventional type of tray fitted with slides. The underside is normally protected by a detachable cover. As it is not necessary to remove the tray from the cubicle for servicing, connections are made to the tray by flexible leads terminating on a terminal board at the back of the tray. Components likely to be affected by vibration are resiliently mounted. The small panel carrying the meter and boost components is hinged to facilitate adjustment and servicing.

The balanced potentiometer network components required for the P.E. Cell excitation are mounted in the amplifier tray. The H.T. supplies for the P.E.C. Cathode Followers are also obtained from the amplifier tray.

Fig.25 is an underside view of the amplifier.

ELECTRICAL SYSTEM (Cont'd)

Amplifier Rectifier Unit, 5, Fig.3.

The rectifier is built on a tray similar to that for the amplifier. The rectangular hole on the right hand side, normally fitted with a cover plate, takes the deaf aid amplifier, when the latter is required.

The 6.3 volt, 1.5 amp, and 4 volt, 8.4 amp, filament windings, which are connected in series in order to provide a 10½ volt supply source for the change-over relay, are earthed through a small 25-ohm potentiometer; this is set to obtain minimum hum.

Fig.26 is an underside view of the rectifier.

Exciter Lamp Supply Unit, 4, Fig.3.

This unit supplies two 10 volt, 5 amp, exciter lamps and also the framing and intermittent inspection lamps. It has two bridge-connected rectifiers fed from independent transformers mounted on a conventional tray. This tray does not tilt as the servicing required on this unit is very small.

Deaf Aid Amplifier, 5, Fig.3.

This unit is built up on a flat plate. It uses a single pentode, Type Pen 45, which is fed from the 500 ohm output through the output switch. The deaf aid sound level can be controlled from a volume control mounted on the plate.

The supply for the pentode is obtained from a Type UU5 rectifier fed from a transformer mounted on the same plate.

Stand-by Amplifier Arrangement

When stand-by facilities are required a second amplifier cubicle is supplied. This houses an amplifier and amplifier rectifier (also deaf aid amplifier if required) identical with those in the main cubicle.

In the position normally occupied by the exciter lamp supply unit a change-over switch panel is fitted. This incorporates three change-over switches; one for the input circuits; the second for control circuits; and the third for the output circuits.

ELECTRICAL SYSTEM (Cont'd)

Loudspeaker Arrangement

The Supa Mark 2 Loudspeaker System consists of two Type G7A L.F. Speaker Units mounted on a Type G8A L.F. Horn and a single Type E5A H.F. unit with a single throat casting CY109887 mounted on a Type B2B H.F. Horn. The complete system is shown in Fig.31.

The Type G7A Permanent Magnet L.F. Speaker Units have a speech coil impedance of 10 ohms, and the two speech coils are connected in parallel. The weight of the units is approximately 26 lb.(12 kg) each. Fig.32 shows the size of the L.F. unit.

The Type E5A Permanent Magnet H.F. Speaker Unit has a speech coil impedance of 8 ohms. The weight of the unit with throat casting is 18 lb.(8 kg) Fig.33 shows the size of the H.F. unit.

Both the horns are designed for sling mounting.

The weight of the complete L.F. Horn with units is approximately 117 lb.(53 kg) and that of the complete H.F. horn with unit is approximately 30 lb. (14 kg).

L.S. Filter Unit

Full frequency range is fed from the amplifier, via the speaker selector switch on the amplifier rectifier unit. Dual channel output is obtained from the filter circuits which are arranged to have a cross-over frequency of 500 c.p.s. The type reference for the unit is D.I.A.

A selector switch is provided so that the full frequency range can be applied to the L.F. Speakers in an emergency.

Non-synchronous Turntable Unit

This unit incorporates two turntable units and light weight pick-ups mounted in a sheet steel cabinet so that a continuous programme, reproduced from gramophone records, can be given.

The A.C. model uses Type BYC.1505 capacitor motors which have integral worm reduction gears. The standard motors are only suitable for 50 cycle operation.

As the pick-ups are sensitive to variable magnetic fields in their vicinity, non-magnetic turntables are used.

A fader having a resistance value of 400/0/400 ohms

ELECTRICAL SYSTEM (Cont'd)

is fitted. This enables a smooth fade to be made from one record to the other.

A separate scratch filter is not required because the combination of the pick-up circuit and the special non-sync. transformer and its network has, intentionally, a sharp H.F. cut off.

An illustration of the unit is shown in Fig.35.

Microphone Input

When it is desired to use a microphone on the system, a special switch-plate assembly can easily be fitted. This includes a selector switch giving choice of non-sync or microphone, using a common transformer but coupling in at different points in the correcting network.

INSTALLATION

Ventilation

A ventilating system must be provided to carry exhaust gases out of the operating room. This exhaust system should be designed so that it is free from down draught and will extract the fumes under all weather conditions.

The carbon consumption rate will vary with the amount of air drawn through the lantern, and a cowl over the lantern is preferable to the alternative method of solidly connecting the ventilating duct. The use of the cowl ensures that the carbon consumption will not be accelerated by extra air drawn through the lantern due to the exhaust draught.

Wiring of Projection Room

The wiring is run throughout in solid drawn screwed conduit using square boxes at tee joints. All cutting away of floors should be completed and as much as possible of the external wiring installed before commencing to assemble the equipment.

Where Supa Mark 2 is superseding older equipment in the projection room, the existing arc, deaf aid, mains loud-speaker and non-sync. conduits may be utilised if they are in a satisfactory condition for further service.

Conduit coming into the stands terminates in boxes under the centre column. Flexible conduit is then carried from these boxes to the stand terminal boards and to the P.E.C. housing.

The conduits should be all bonded together at the amplifier cubicle between clips on each conduit and the bonding must not depend on the possible contact between the conduit nuts and the cubicle bottom, since the latter is paint finished. The main earth should be carried away from the conduit bond.

The cubicle should also be solidly earthed to the conduit bond point. A cable thimble is provided on the inside of the cubicle bottom for this earth lead.

The stands should be solidly earthed to the mains supply conduits at each stand - not to the audio signal conduits.

Arc current control resistances may have been supplied with the equipment or existing resistances can be used provided their values and rating are suitable. The wiring to the arc

INSTALLATION (Cont'd)

resistances will depend on these circumstances and on the location of the arc control switches which can be fitted on the Stand, 7, Figure 4, or on a separate arc control panel.

The external wiring in general is carried out in accordance with the B.T.H. "Specification of Electrical Contractor's Work for the Installation of Supa Mark 2 Equipment".

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OPERATION

Closing of the main switch energises all the units in the amplifier cubicle and stand except the main driving and soundhead motors. The latter are switched on by the operation of the motor switch, 9, Fig.4, on the stand. After switching on the supply the 'B' Sound channel is initially energised. It is therefore necessary to depress the 'A' change-over push button to bring in the 'A' sound channel if the show commenced on 'A' machine.

Fitting the Carbons

The following carbon combinations are recommended, the carbons being of the high intensity copper coated type. Those quoted below are the Morgan Crucible Co's standards, but equivalents in other makes can of course be used.

Current	Arc Volts	Carbon Type	Carbon Sizes
40-45	32-35	HRS7 HIN6	7 mm positive x 12" (30 cm). 6 mm negative x 8" to 12" (20 to 30 cm).
50	36	HRS8 HIN6	8 mm positive x 12" (30 cm) 6 mm negative x 8" to 12" (20 to 30 cm).

The carbon movements are controlled by the automatic feed mechanism located in the back of the lantern chassis and by the hand adjusting knobs at the back of the lantern. The left hand knob, 54, Fig.14, controls the negative and the right hand knob, 55, the positive.

To insert a positive carbon, the door on the right hand side should be opened, and the positive carriage, 69, Fig.15, tilted and moved forward to the nose of the lantern. Rotate the knob, 70, on this carriage to open the carbon clamp and put the positive carbon in the vee with the crater end extending about 1" (25 mm) beyond the positive guide, 73, then clamp the carbon in the moving head.

To insert a negative carbon, open the rear door, and, using the left hand, tilt the negative carriage, 77, and pull it backwards; rotate the carbon clamp handle, 93, Fig.17 anti-clockwise and push the carbon through the clamp, re-tightening the latter when the arc gap is about 1/4" (6 mm).

Arc Striking

The arc switching arrangements should be such that approximately two-thirds of the normal operating current is available for arc striking, except where a self stabilising type of rectifier is used which provides full load striking without

OPERATION (Cont'd)

undue current surges.

Before switching on the supply make sure that the motor control switch 83, Fig.16 is off, that the mirror shield is in the forward position and that the front shutter is closed. It is assumed that the slag tray, 74, Fig.15, motor fuses, 64, mirror etc. are already in position. Check that the carbon gap is a nominal 1/4" (6 m.m.), and when ready, strike the arc by gently pushing forward the negative feed knob, 54, Fig.14, releasing it immediately after the carbons touch. Close the motor switch 83, Fig.16 and apply full arc current. Start the projector (switch 9, Fig.4) and operate the front shutter handle, thus obtaining light on the screen. Adjust the crater position to give the best overall illumination, using the right hand feed knob, 55, Fig.14 for this purpose. Any crater adjustments must be followed up with suitable adjustments to the negative carbon in order to obtain the correct arc gap. Also set the arc image card, 58, so that it lines up with the projected image of the crater.

Arc Adjustments

To obtain the best possible light on the screen, the crater of the positive carbon should burn so that it is always square with the mirror. This condition can be definitely maintained by correct setting of the negative carbon.

The knob, 53, Fig.14, provides universal adjustment of the negative carbon tip allowing it to be raised, or lowered, or moved sideways.

Arc Feed Adjustments

Set the speed control rheostat so that the positive carbon feeds correctly at the selected operating current. Clockwise rotation of the rheostat knob, 84, Fig.16, increases the feed rate; correct adjustment will be indicated by the fact that the crater position remains constant as indicated on the arc image card.

Having set the positive feed rate correctly, attend next to the negative feed. Immediately above the feed rocker arm 90, Fig.17 at the rear of the chassis is a knob, 91 and a small anti-clockwise movement of this knob will increase the negative feed rate and vice versa. It should be explained that this patented differential device is designed so that although the positive feed pawl, 89, (right hand) operates 1 ratchet tooth per stroke of the rocker arm, the negative (left hand) pawl, 88, follows a rhythmic change of stroke, comprising several strokes each moving 1 tooth, followed by a sequence of strokes each moving 2 teeth. Typical settings might therefore give the following results -

OPERATION (Cont'd)

18 strokes - 1 tooth, 4 strokes - 2 teeth, 18 strokes - 1 tooth etc.
or
10 strokes - 1 tooth, 12 strokes - 2 teeth, 10 strokes - 1 tooth
and so on.

It will be seen that the second example gives the higher feed rate, having a higher content of 2-tooth strokes.

This detailed information is given for the interest of the user; adjustment of the knob, 91, is all that is required to set the feed rate correctly.

It should be particularly noted that the settings so made are for one current rating only. Should it be desired to run subsequently at, for instance, a higher current rating, a small increase in the positive feed, by means of the rheostat, and adjustments of the negative feed will be required. Remember however, that the positive setting should always be obtained first.

The Slide Attachment

Close the lantern shutter by means of the handle, 60, Fig.14, then push this handle in and turn anti-clockwise. This swings the slide mirror into position and retracts the mirror shield but leaves the shutter closed to prevent light passing into the projector. If the slide attachment has been correctly set up and aligned as detailed in an earlier section of this book, it is now set up for slide projection.

Threading the Film

Fig.43 illustrates the film path through the mechanism, and the appearance of the film when correctly threaded may be seen in Fig.12. Put the loaded spool on the top spool box spindle - (to rotate anti-clockwise). Draw off about 6 feet of film and thread through the fire-trap on to the top feed sprocket. Leaving a 4-frame loop from the top feed pad roller, thread the film through the gate on to the intermittent sprocket which must be in the locked position. Close the gate and frame the film. Close the intermittent film pad assembly. Leave a 6-frame loop between the intermittent and sound feed sprockets; lead the film over the guide roller, insert it between the drum pressure roller and the sound drum and over the drum take-up roller. The correct appearance of the film when threaded through the sound optical system is shown in Fig.44. Thread the film over the bottom sprocket and through the bottom fire trap, pull taut and then release two sprocket holes from the bottom sprocket and distribute the loop above and below the sound drum. Feed the film on to the bottom spool in an anti-clockwise direction.

OPERATION (Cont'd)

Pick Ups

The pick ups are of a new light weight type with semi-permanent needles. Careful handling of the pick up is essential and the following points should be watched:-

1) When not "playing" pick ups should be placed carefully on their rests.

2) Needle points should not be allowed to come into contact with anything but record grooves, and should be lowered gently on the records.

3) Needles should not be moved in their holders or excessive record wear may result.

4) Needles should be changed when appreciable wear is observed at the point. The needle will be suitable for approximately 2000 playings of 10" commercial records. Fig.47 shows the light weight stylus.

The needle can be changed by gripping the aluminium needle collar and gently but firmly pulling the needle out of its spring steel sleeve. The new needle can then be pushed in taking care not to damage the point, or push too far in, thus straining the rubber mounting.

Picture Gate

Clear emulsion and dirt from gate regularly, after each reel if necessary. A small brush or a thin piece of soft brass should be used for this purpose. This is particularly necessary when using new film.

DAILY ROUTINE

It is obviously essential to keep all parts of the mechanism as clean as possible.

Lenses and Mirrors

Both faces of the picture lens should be cleaned, preferably using a piece of lens tissue, which should be discarded after use on each surface.

Where a slide lantern is fitted, its projector lens and the accessible faces of the condenser and negative lenses together with the swinging mirror should be cleaned.

Clean the lantern nose glass and mirror. Remove the mirror and, if of the glass type, with a soft cloth remove any small carbon spots, then wipe over with a mirror cleaning compound. Allow to dry and then brush off. Do not wet the back of the mirror. If the mirror is of the metal type, carefully remove all dust and apply a suitable cleaning compound, such as the finer types of polish used for cleaning silver.

The outside surfaces of lenses in the sound optical system should be carefully polished as any dirt on this system will cause loss of sound volume.

Lantern Slag Box and Carbon Holders

The slag box, 74, Fig.15, should be emptied and the carbon holders cleaned.

WEEKLY ROUTINE

Sound Drum

The periphery of the sound drum should be carefully wiped with a cloth moistened with methylated spirit.

Lantern Chassis

Clean all chassis working parts and wipe surplus oil off the bearings. Remove dust from lead screws 118 and 121, Fig.46, and clean the smooth unthreaded surfaces. Then apply a light coating of graphite powder. Give the inside of the lantern a complete dusting out.

LUBRICATION

DAILY ROUTINE

Oil the bearings only of the lantern gear box and lead screws. Oil cups are located as follows:-

2 in front end of chassis casting, 107 and 108, Fig.45
2 in rear end of chassis casting 111 and 112, Fig.45
and 1 in gearbox bearing 113 , Fig.45

WEEKLY ROUTINE

1) The top and bottom spool box spindles should be lubricated with one or two drops of Asteroil AA.

2) The ball race on the lantern gear box spindle should be lightly oiled with Asteroil AA.

MONTHLY ROUTINE

1) Check the oil level in the intermittent mechanism and, if necessary, top up with Asteroil AA having first adjusted the rack to bring the marks, on the framing handle hub and bearing, into line. The oil level should be brought up to correspond with the mark on the sight glass.

2) Add two spots of Asteroil AA to the soundhead coil and bearing through the lubricator, 14, Fig.5, provided inside the mechanism box.

3) Both chains should be lubricated with a few spots of Asteroil AA.

THREE-MONTHLY ROUTINE

1) Drain the intermittent mechanism box. Swill out with a full box of clear oil, then replace the oil with 25 c.c. of clean Asteroil AA.

2) Lightly smear the teeth of all gears with Crimsangere No.1 grease.

3) Lightly oil the joints of the moving parts in the lantern body mechanism, including the door hinges, also spool box door hinges and catches, moving gate and take up roller pivots, lens holder and moving gate catches, framing spindle, exciter lamp turret pivot and lens focusing adjustment, if necessary.

All other parts of the mechanism have been lubricated for life before leaving the factory and should not be oiled.

ROUTINE MAINTENANCE (Cont'd)
ELECTRICAL

DAILY ROUTINE

The valve currents should be checked on the meter on the amplifier unit. Any falling off of valve currents should be watched and the faulty valves replaced.

The nominal valve currents are as follows:-

Valve	P.E.C. Cathode Followers	V3	V4	V6	V7 (per anode)	V8 V9 V10 V11
Current in ma.	4.8	1	1	2.8	2.5	60 each valve.

4·0 1 ·85 2·0 1 = 1·02 - 1·6

The above currents will vary with individual valves as much as ± 20%.

VALVES

Valves are numbered as shown in the following table:-

V1) Photo-Electric Cell Cathode Followers Valves.
V2) One in each machine.

V3 'A' Channel Input Valve.
V4 'B' Channel Input Valve.
V5 Non-Synchronous pre-amplifier valve.
V6 Second stage voltage amplifier valve.
V7 Phase splitting valve.
V8)
V9) Power output valves
V10)
V11)
V12) Amplifier rectifier valves.
V13)
V14 Deaf Aid Amplifier rectifier valve.
V15 Deaf Aid Amplifier valve.

FUSES

The two types of fuses are rated as follows:-

7 amp., using .009" tinned copper, 18A and 26A, 18B and 26B.

2 amp., using .0164" 63/37% lead/tin alloy
18J and 26J, 18M and 26M, 18R and 26R, 18V and 26V
18Y and 26Y.

Also those in the lantern feed motor, and the non-synchronous turntable unit.

SERVICE MAINTENANCE (Cont'd)

Filter Unit

When the emergency switch is not operated for a long period there is a danger of faulty contact trouble developing when used. As a precaution therefore the switch should be operated a number of times each month.

Non-Synchronous Turntable Unit

Motors

The Type BYC1505 Gramophone Motor is provided with oil holes at each end of the frame and a few drops of oil should be put in at these positions once every six months.

Slotted adjusting screws and lock nuts are provided at the ends of the worm and worm wheel shafts so that the shaft end play can be adjusted.

When the motor is cold, the end play on the worm shaft - the horizontal shaft - should be between 0.001" and 0.003"; this end play allows for expansion of the shaft when the motor is hot. There should be a minimum of end play when the motor is hot.

The vertical worm wheel shaft is not likely to need end play adjustment as the end play is approximately 1/16".

STANDARD EXTRAS

The following are standard extras to the equipment:-

(1) Single or twin turntable non-synchronous gramophone unit.

(2) Quick action slide attachment.

(3) Stand-by amplifier.

(4) Deaf-aid amplifier and lorgnette type earphones.

(5) Microphone.

(6) Arc switches and/or meter mounted in stand.

(7) Twin L.F. baffle, Type F7A, for use in larger halls, up to 1250 seats.

APPENDIX I.

LIST OF SPARES.

(Note: These spares are consumable and should be kept at the Theatre).

MECHANICAL

ITEM NO.		DRAWING NO.
1	Film Guide Runner (L.H.)	Y.1909270-1
2	Film Guide Runner (R.H.)	Y.1909270-2
3	Spring Skids.	SK.1904167-1
4	Drive Motor Pinion (Bonded Fabric).	SK.1747478-1
5	Motor Coupling Insert.	SK.1784673-1
6	Intermittent Mechanism Lead Washer.	Z.1755804
7	Bottom Spool Box Clutch Washer.	CR.17742
8	Intermittent Sprocket.	SK.1775824-1
9	Bottom Spool Box Drive Ball.	SK.1150902-1

LANTERN

10	Mirror (where glass mirrors are used).	LSK.1683258-1
11	Side Window.	Z.980902
12	Nose Glass.	LSK.1379528-1
13	Fuse (2).	LSK.980907-2
14	Periscope Lens.	Z.1683224

ELECTRICAL

15	Coaxial Plug.	SK.1892060-1
16	Change Over Switch.	SK.1891854-1
17	Input Switch.	SK.1891794-1
18	Relay.	M.1738012-1
19	Fuse 500 m/a MAGNICKEL	SK.1753664-2
20	Fuse.	SK.1132484-2
21	Condenser.(0.01 microfarad).	SK.1754065-4
22	2 amp. Fuse Wire.	SK.1819096-1
23	7 amp. Fuse Wire.	SK.1891839-5
24	Type 6F11 Valve.	
25	Type V455 Valve.	
26	Type 6L19 Valve.	
27	Type PEN.44 Valve.	
28	Type UU5 Valve.	
29	Type PEN.45 Valve (where deaf aid is used).	
30	Type PE50 Photo-Electric Cell.	
31	Type SUPA2 Exciter Lamp.	

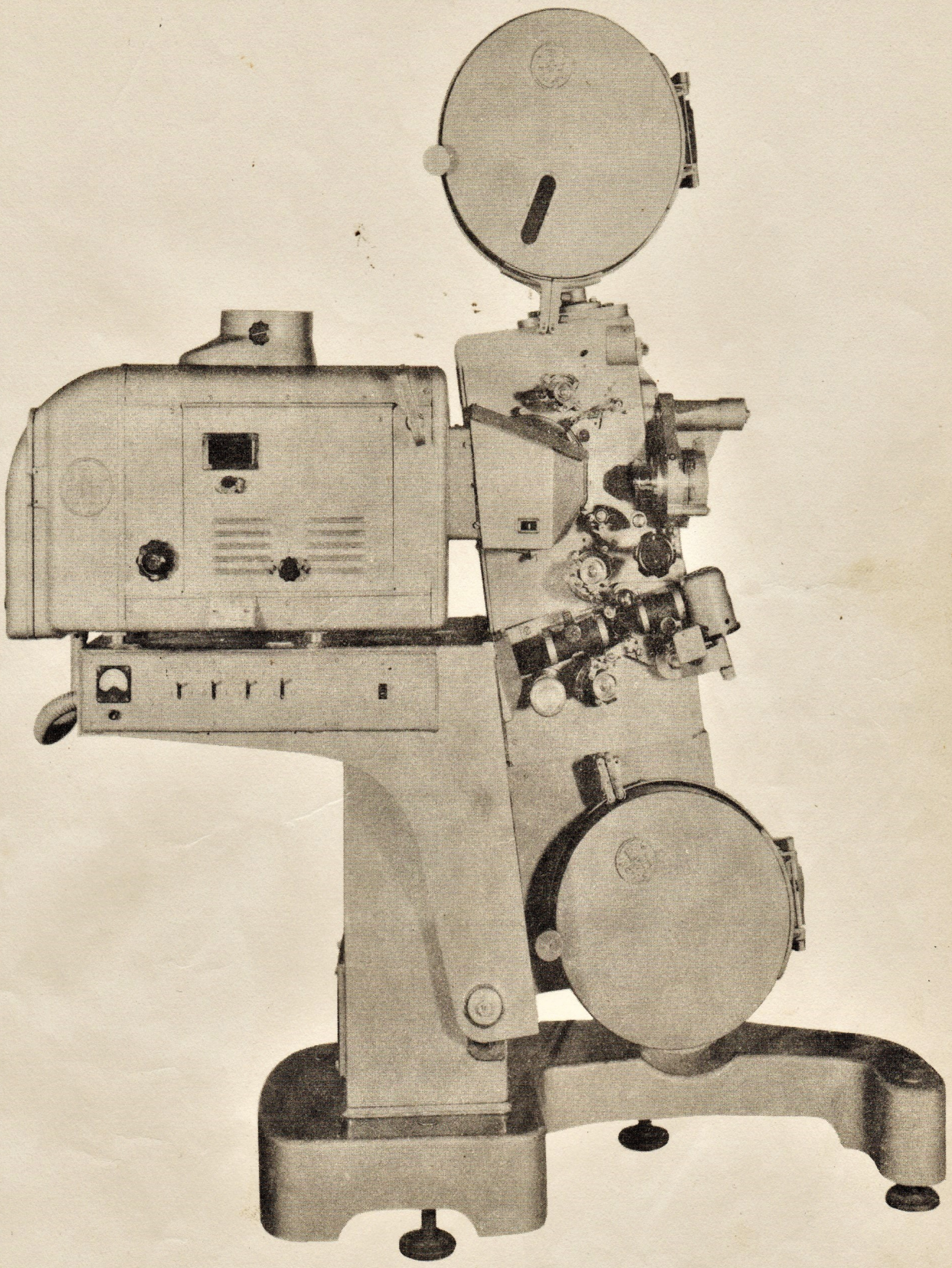


FIG. 1

PROJECTOR - OPERATING SIDE

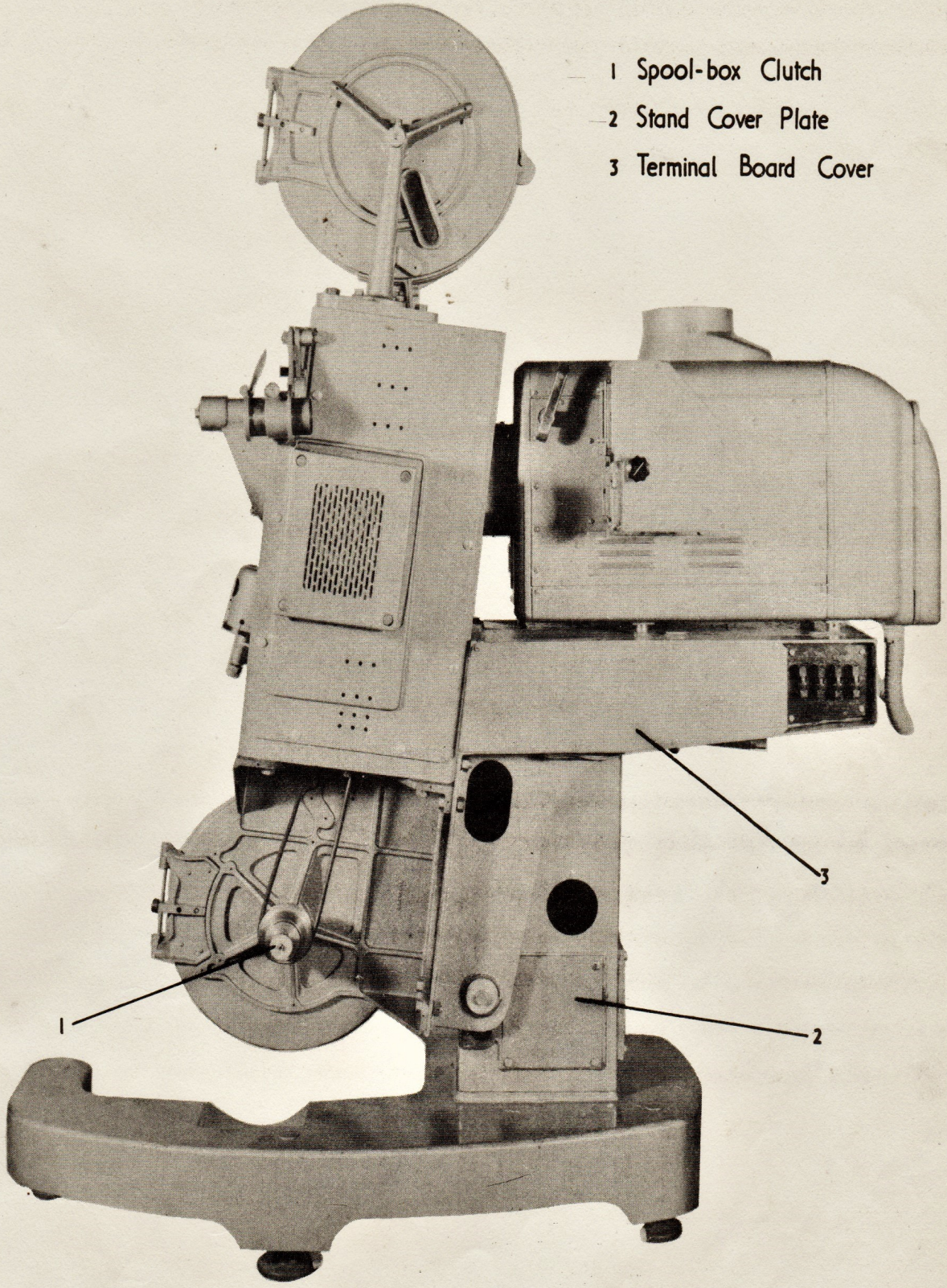


FIG. 2

PROJECTOR - NON OPERATING SIDE

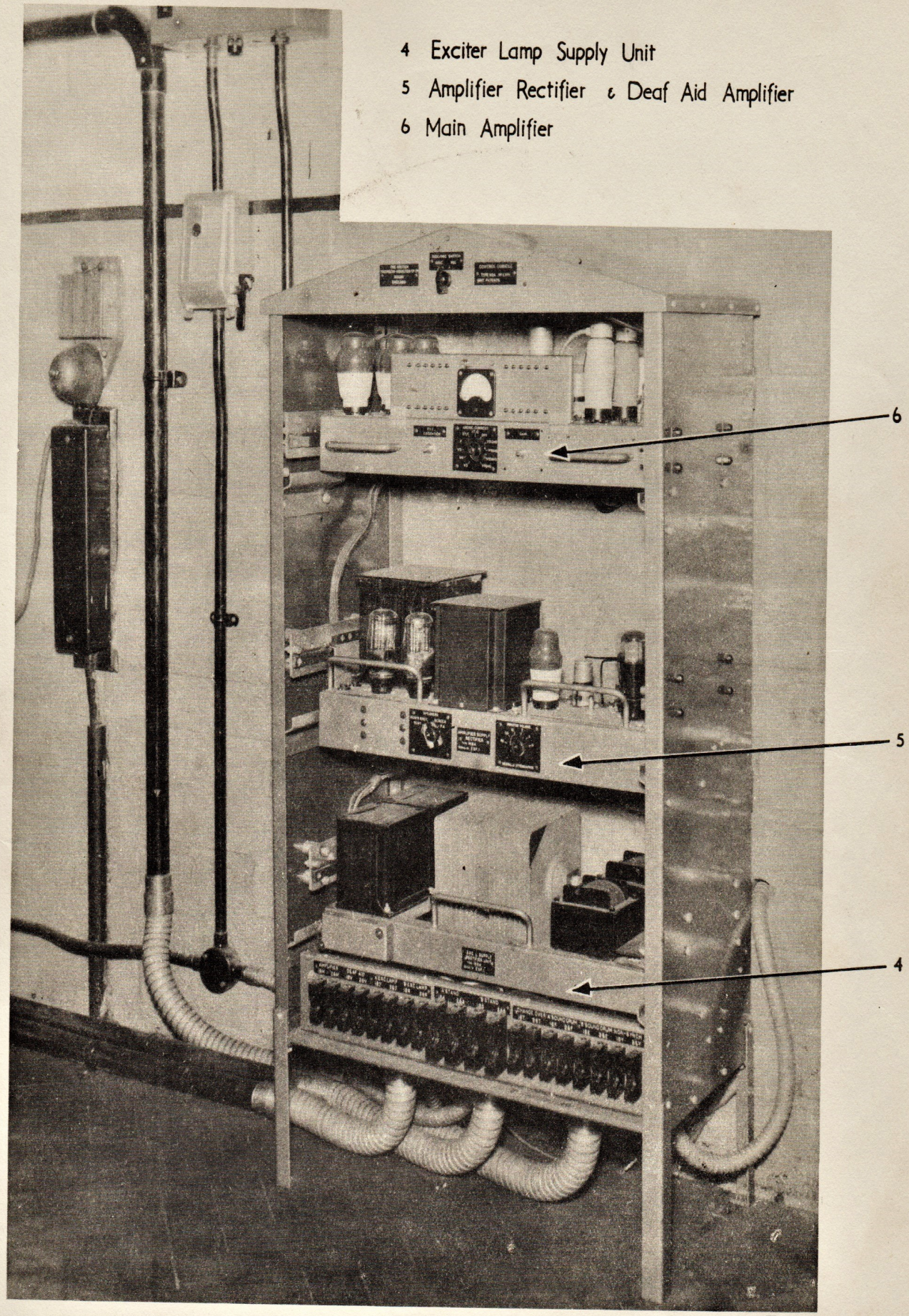


FIG. 3
AMPLIFIER CUBICLE - COVER REMOVED

7 Arc Resistance Switch Panel

8 Stand Cover Plate

9 Drive Motor Switch

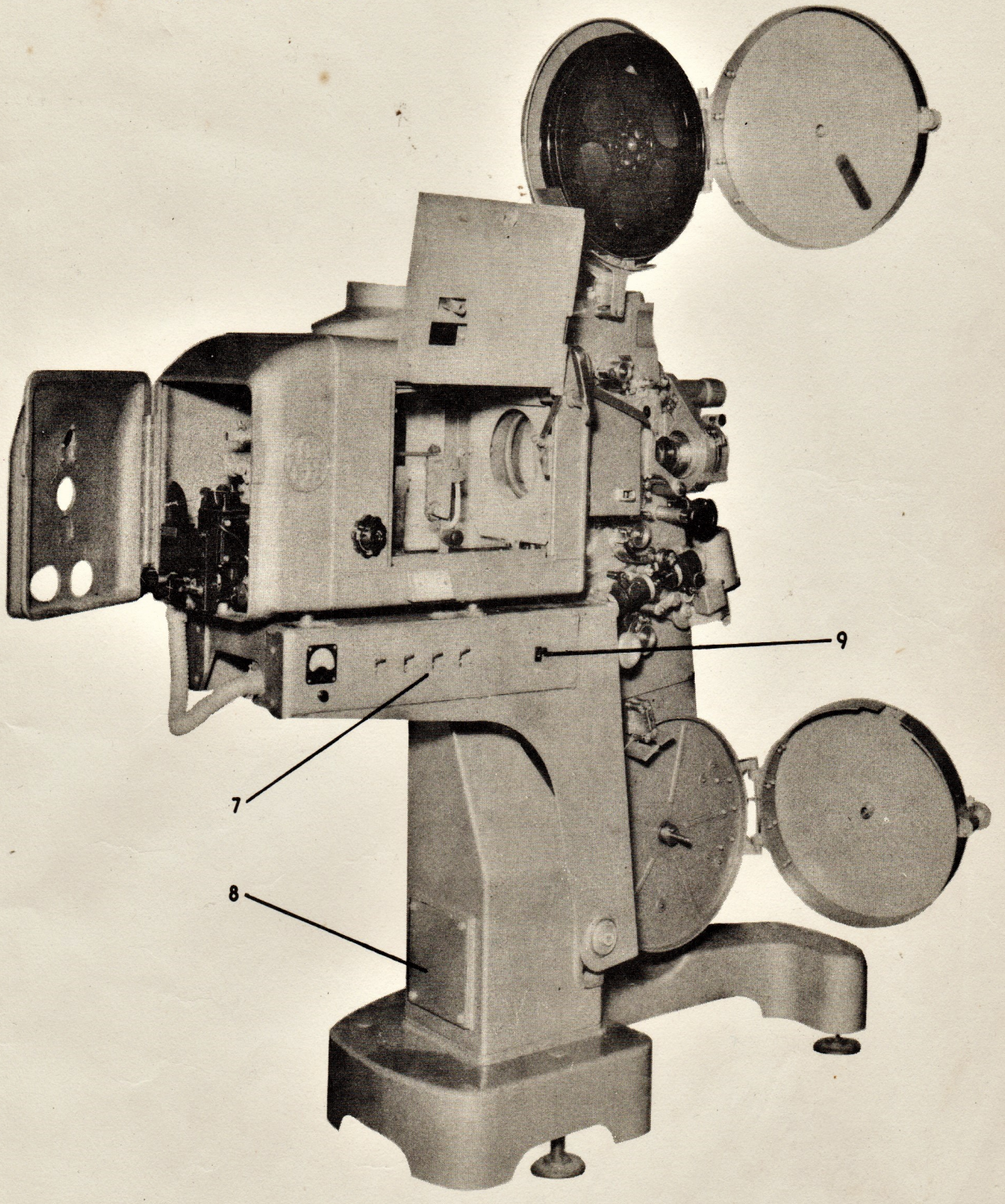


FIG. 4

PROJECTOR - ¾ REAR VIEW OF OPERATING SIDE

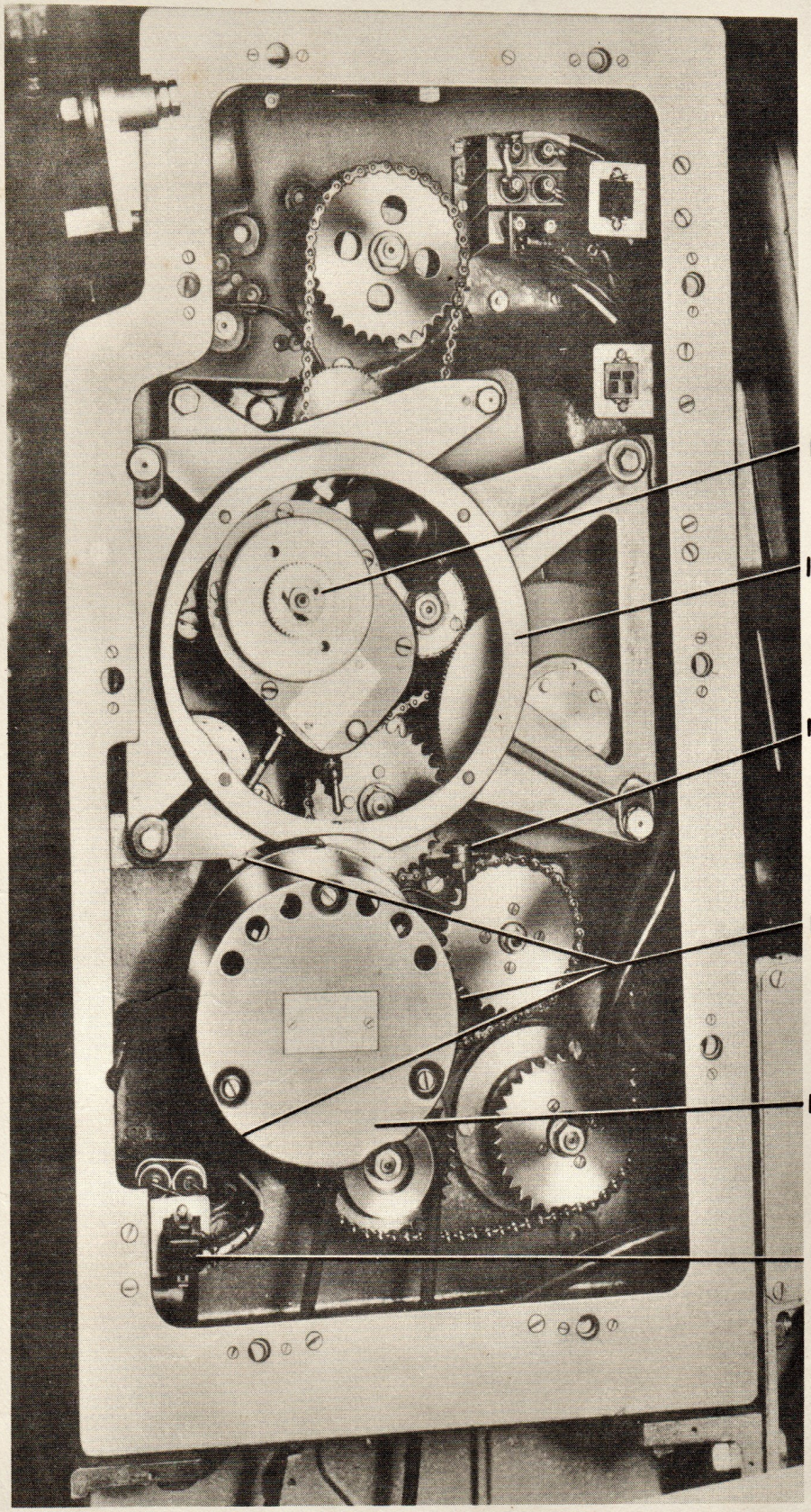


FIG. 5
MECHANISM BOX

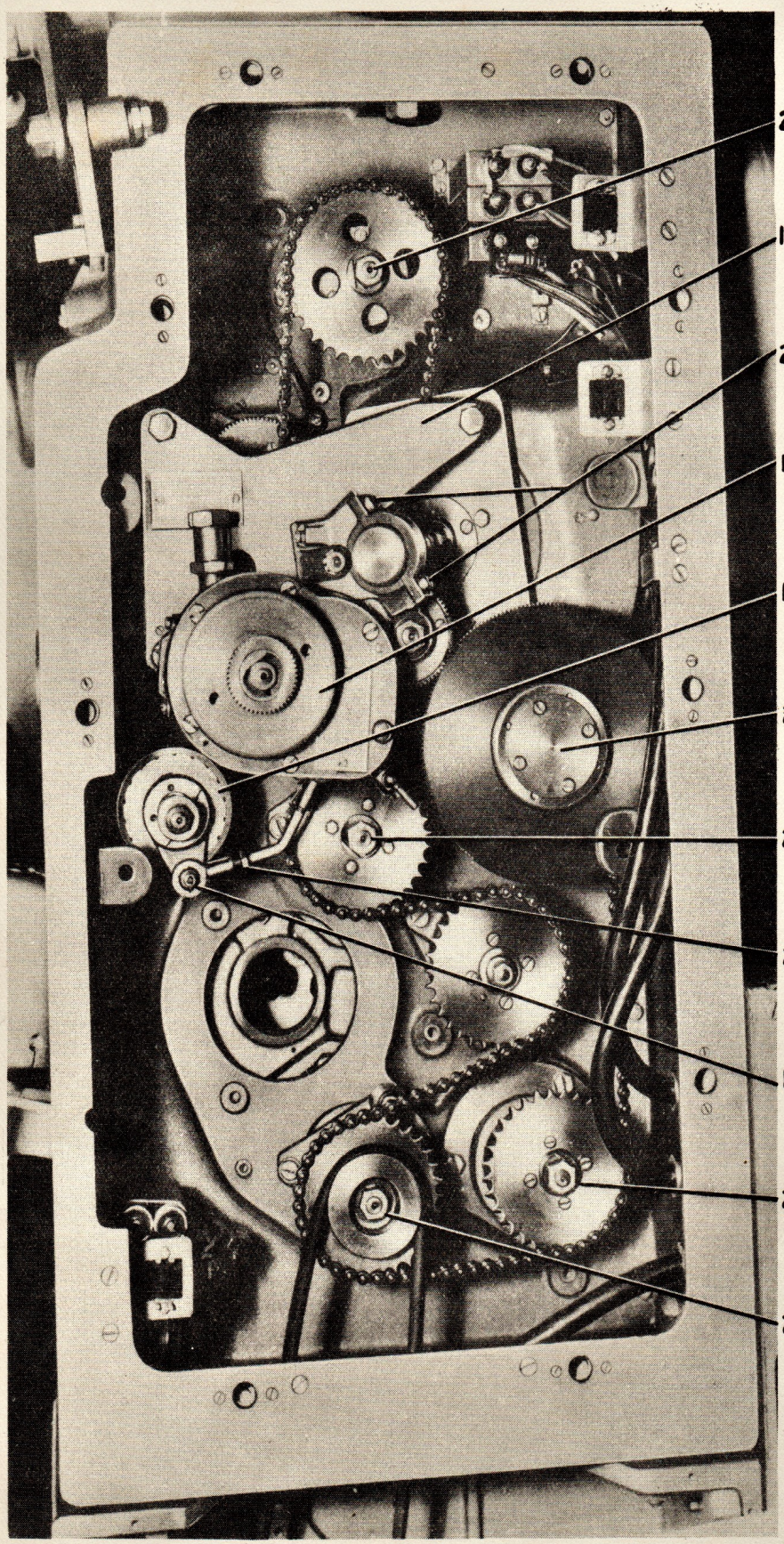
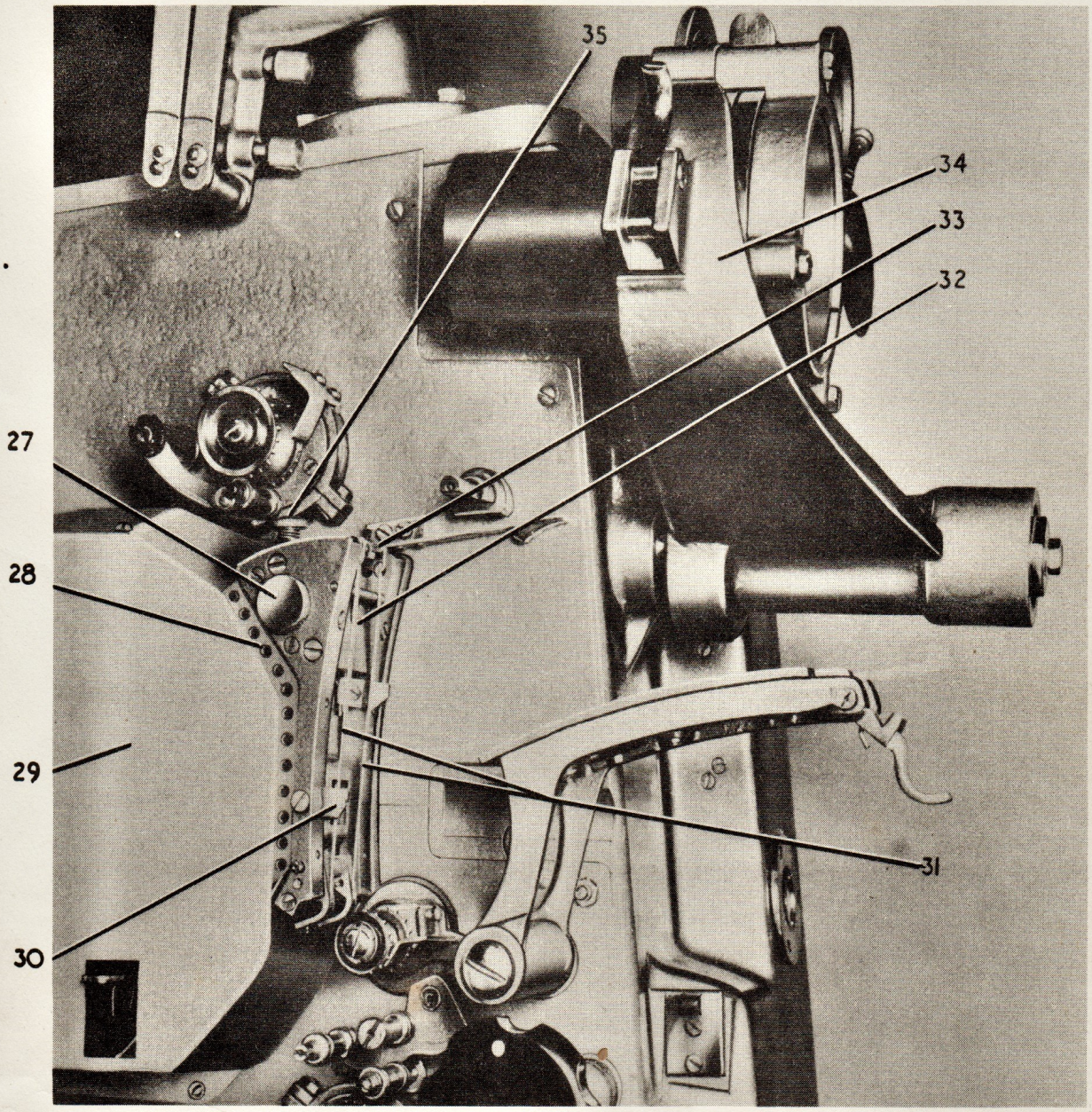


FIG. 6

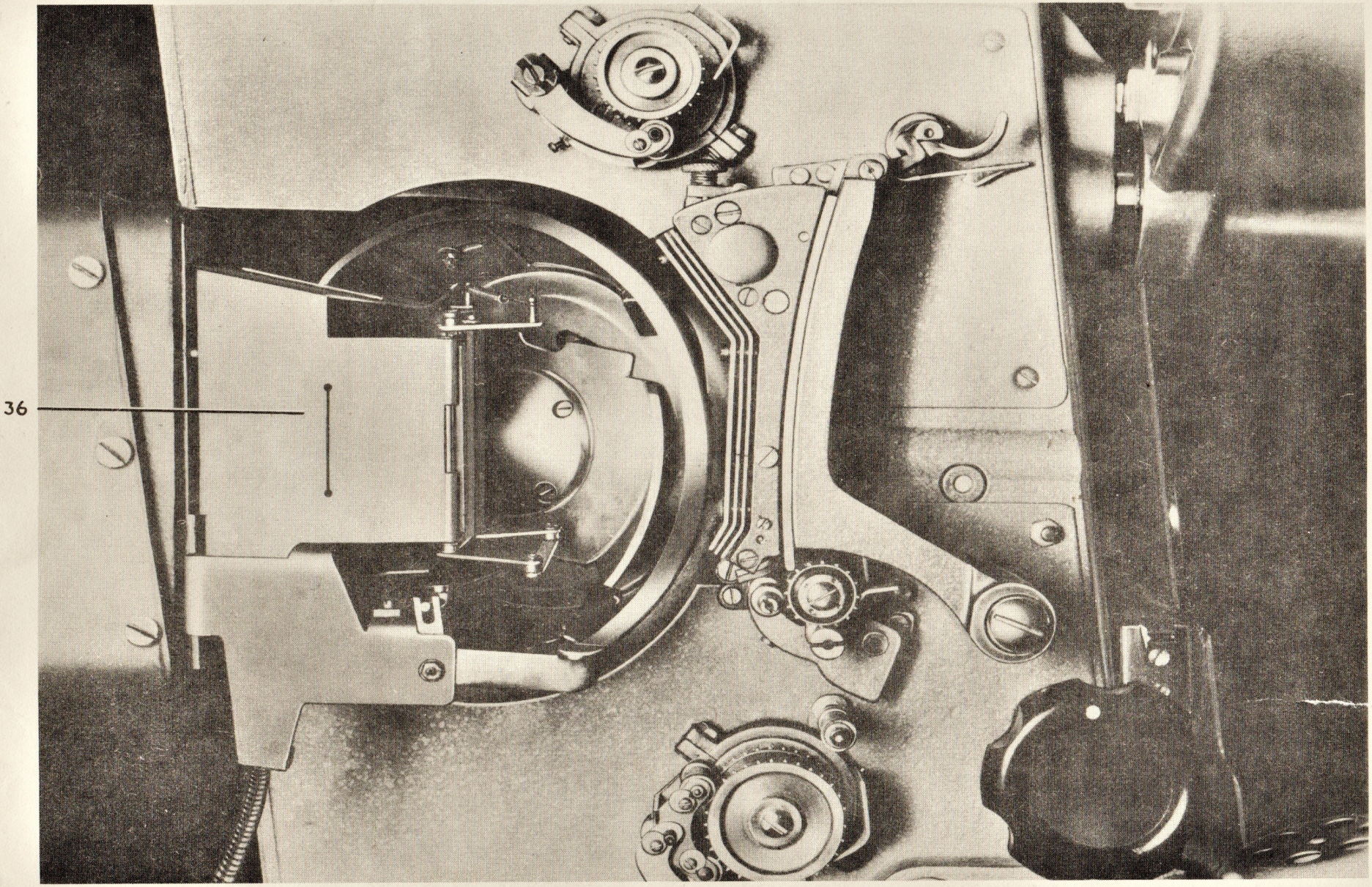
MECHANISM BOX



27 FRAMING LAMP
28 HEAT SHIELDS
29 LIGHT TUNNEL
30 LOWER GUIDE PELLET
31 FLEXIBLE SPRING SKIDS
32 FRAMING APERTURE
33 SPRING SKID PIVOT
34 LENS HOLDER ASSEMBLY
35 TENSION ADJUSTER FOR SPRING SKIDS

FIG. 8

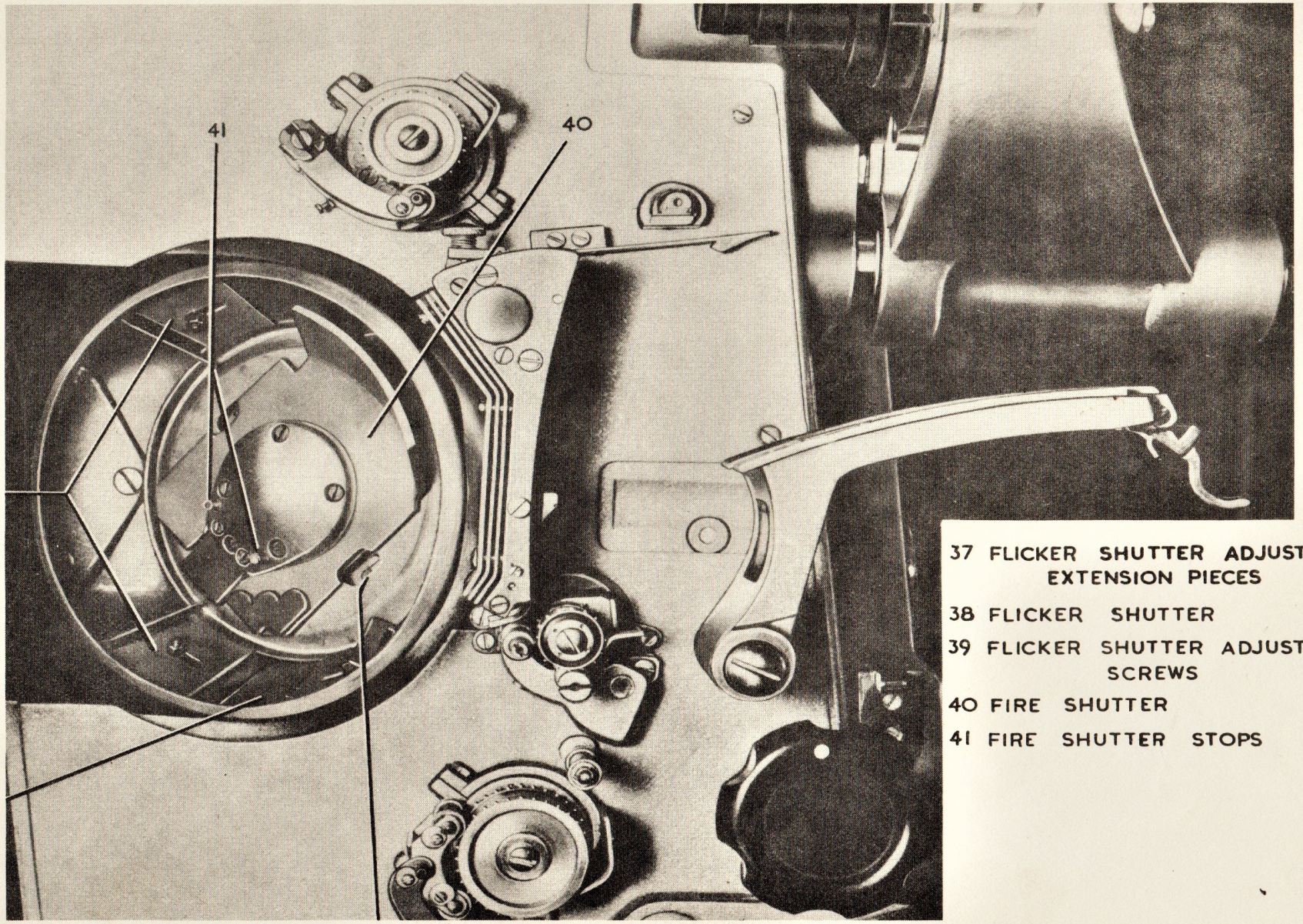
PICTURE GATE AND LENS HOLDER ASSEMBLIES



36 CHANGEOVER SHUTTER

FIG. 9

CHANGEOVER AND FLICKER SHUTTER ASSEMBLIES



37 FLICKER SHUTTER ADJUSTABLE EXTENSION PIECES

38 FLICKER SHUTTER

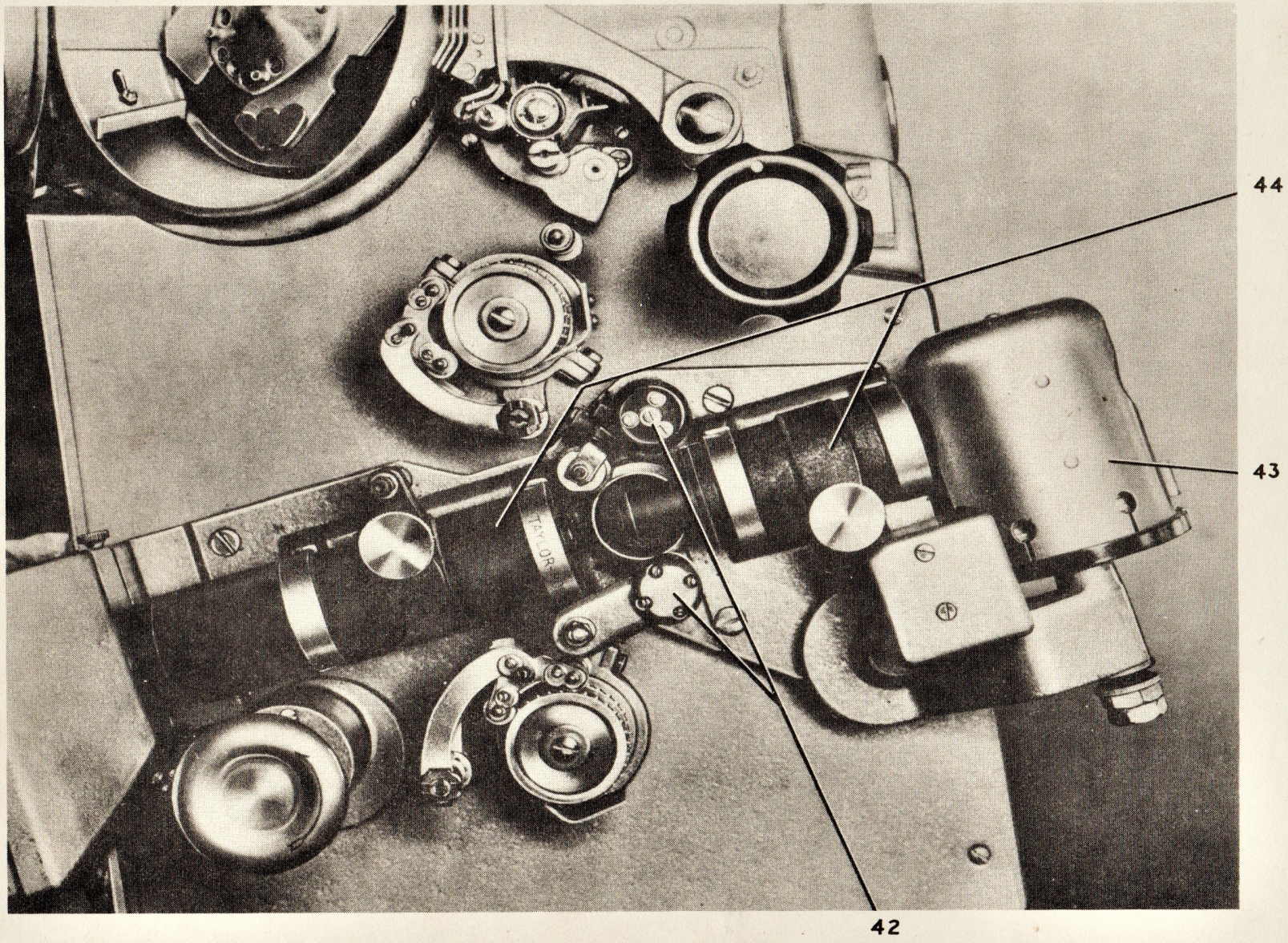
39 FLICKER SHUTTER ADJUSTING SCREWS

40 FIRE SHUTTER

41 FIRE SHUTTER STOPS

FIG. 10

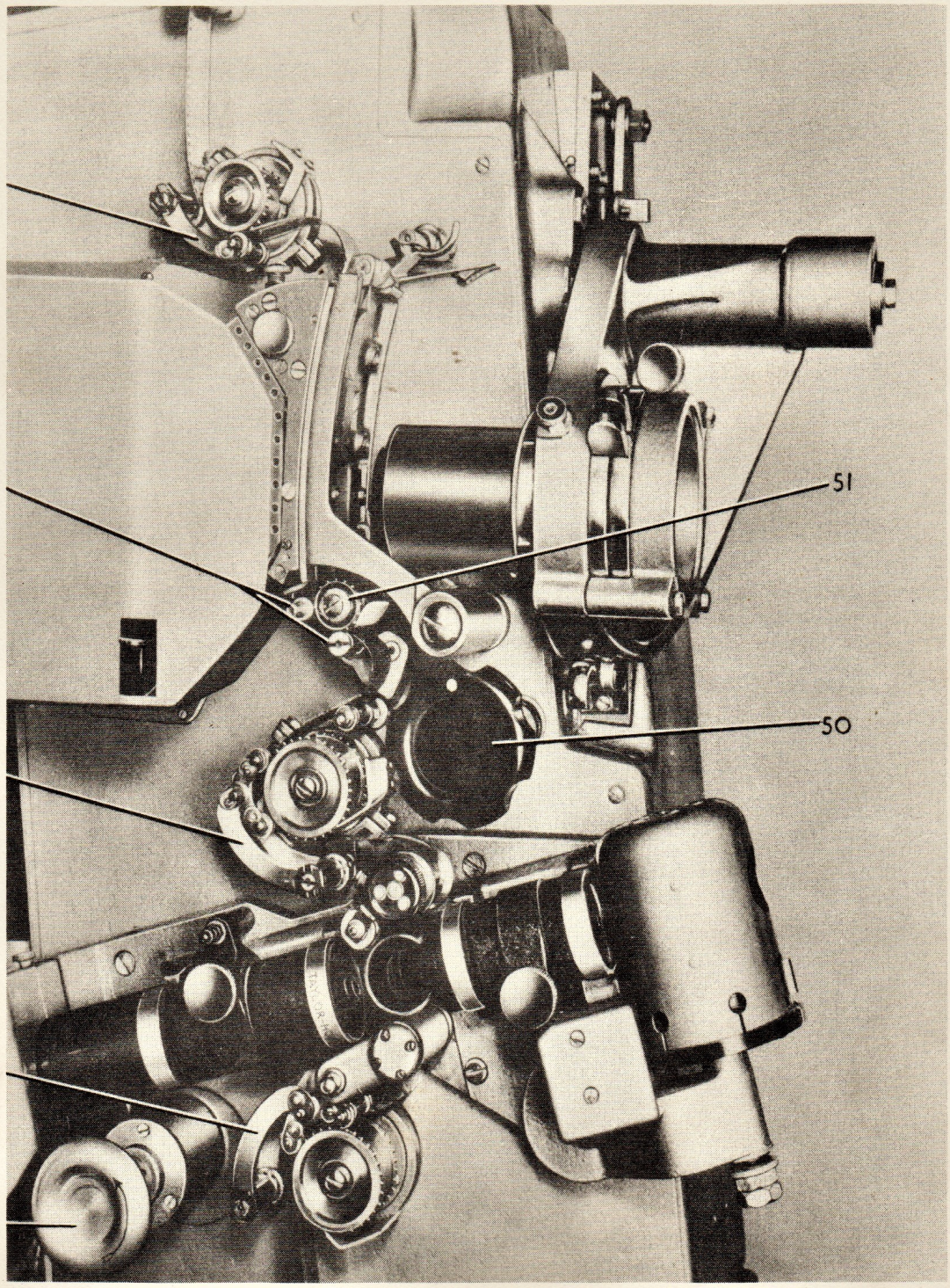
FLICKER SHUTTER-FIRE SHUTTER ASSEMBLY



42 SOUND DRUM ROLLERS 43 EXCITER LAMP HOUSING 44 SOUND OPTICAL SYSTEM

FIG. 11

SOUND OPTICAL ASSEMBLY



45 TOP PAD ROLLER ASSEMBLY
46 FILM GUIDE PADS
47 SOUND FEED PAD ROLLER ASSEMBLY
48 BOTTOM PAD ROLLER ASSEMBLY
49 INCHING HANDLE
50 FRAME HANDLE
51 INTERMITTENT SPROCKET

FIG. 12

MECHANISM BOX - OPERATING SIDE

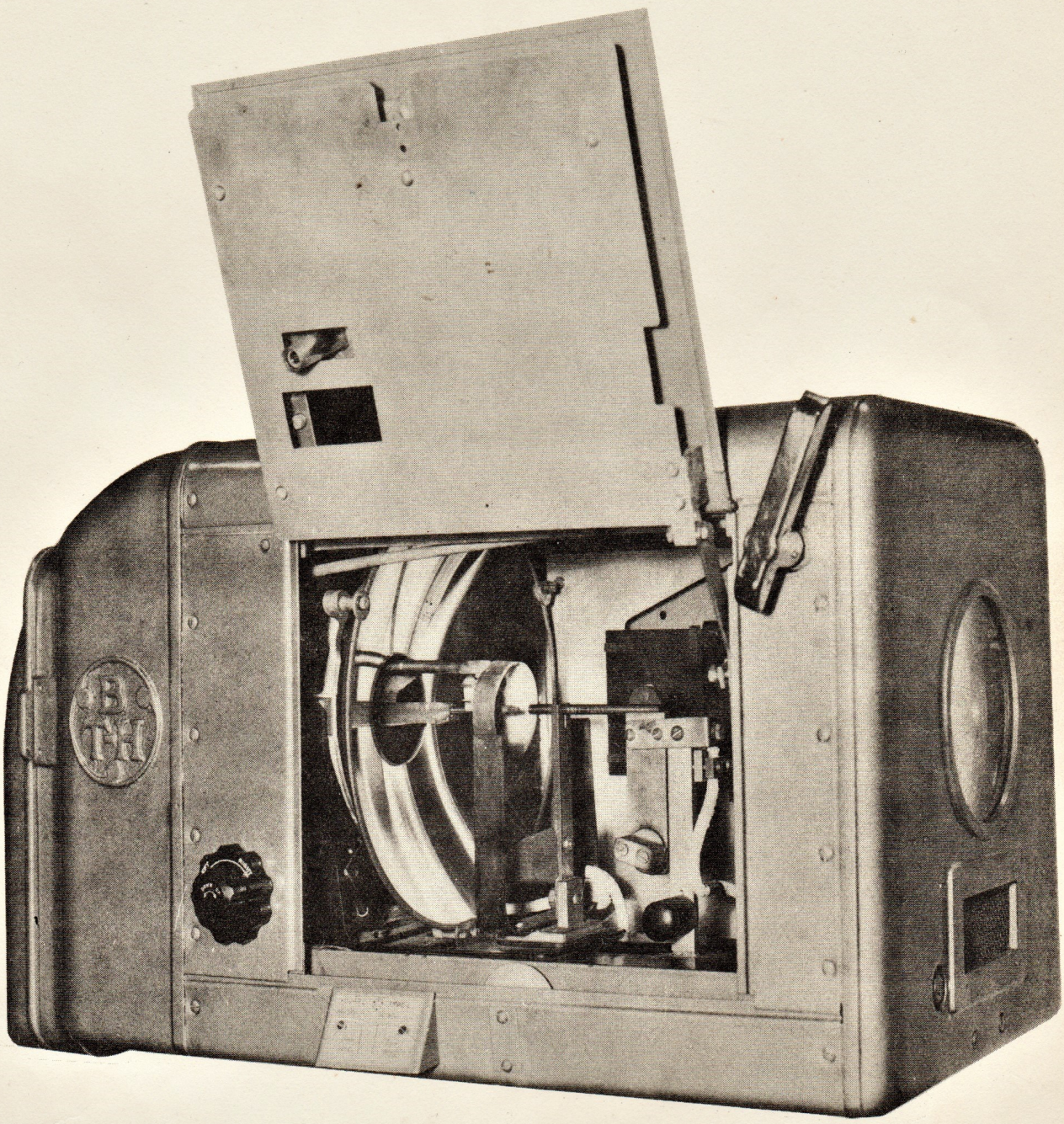
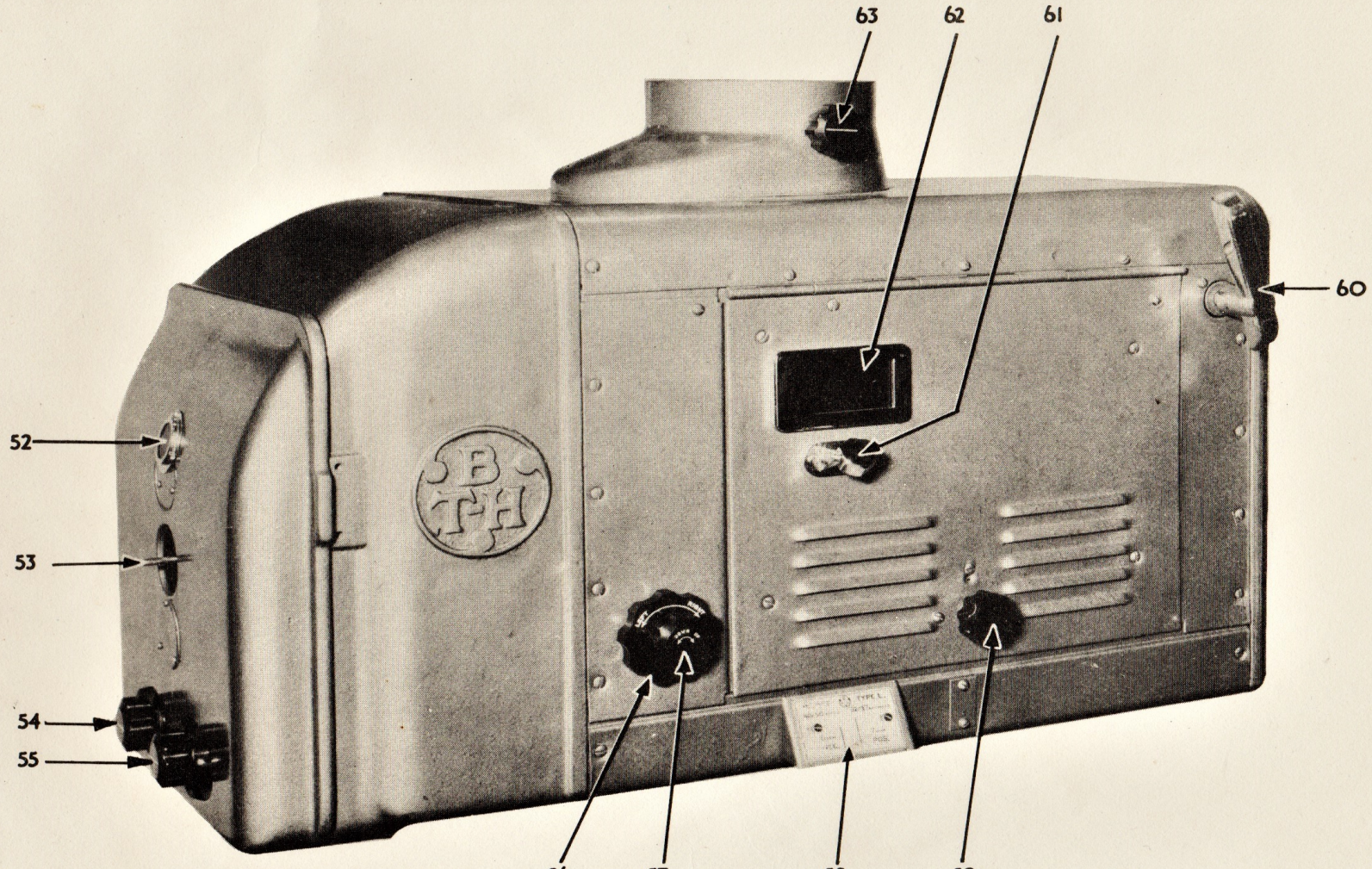


FIG. 13

OPERATING SIDE OF LANTERN



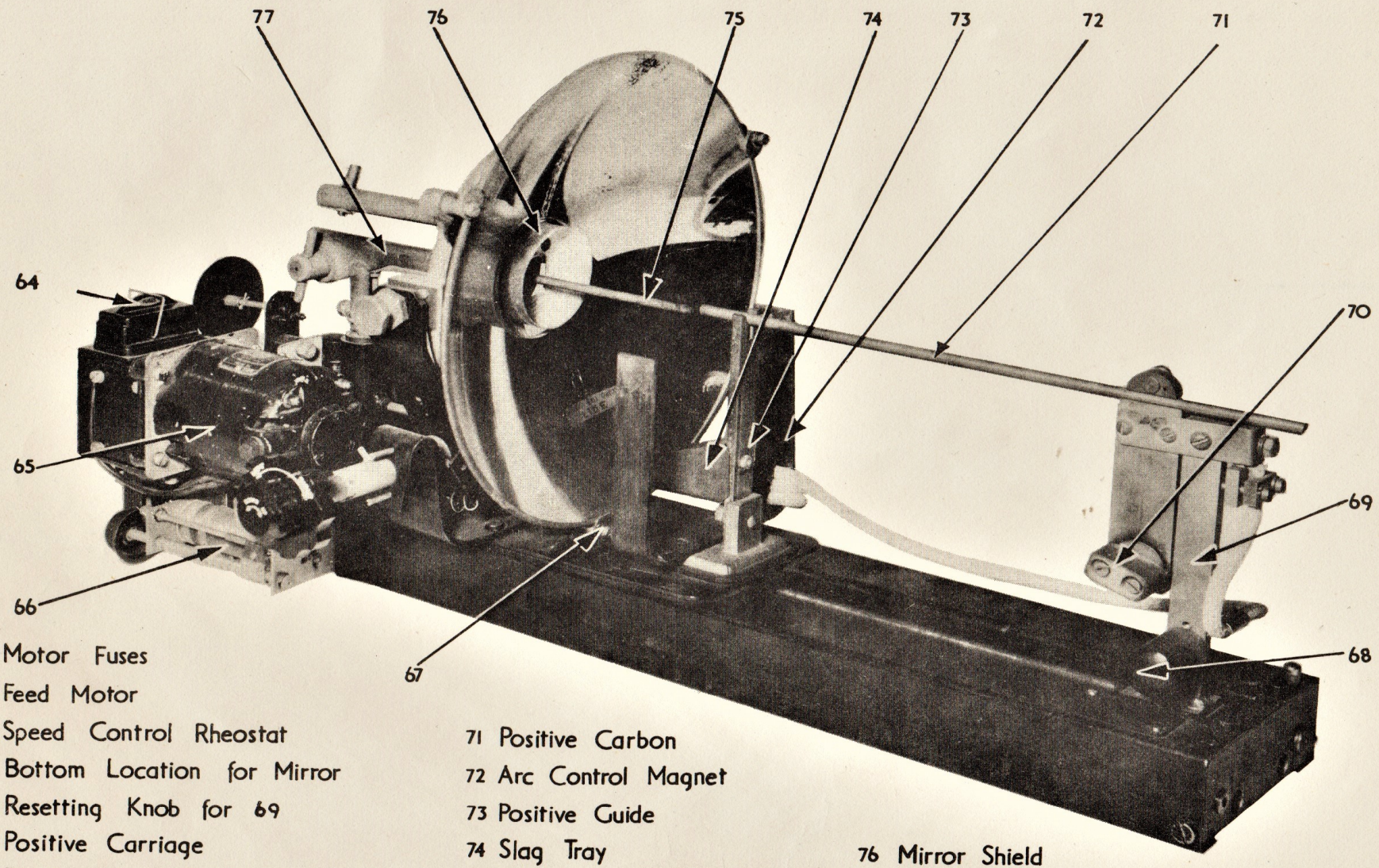
52 Crater Inspection Window
53 Negative Carbon Adjusting Knob
54 Negative Feed Knob
55 Positive Feed Knob

56 Mirror Slewing Knob
57 Mirror Tilting Knob
58 Arc Image Card
59 Door Knob

60 Front Shutter Handle
61 Arc Image Periscope
62 Side Inspection Window
63 Flue Damper Knob

FIG. 14

EXTERNAL VIEW OF LANTERN SHOWING MAIN CONTROLS



64 Motor Fuses
65 Feed Motor
66 Speed Control Rheostat
67 Bottom Location for Mirror
68 Resetting Knob for 69
69 Positive Carriage
70 Positive Clamp Knob
71 Positive Carbon
72 Arc Control Magnet
73 Positive Guide
74 Slag Tray
75 Negative Carbon
76 Mirror Shield
77 Negative Carriage

FIG. 15

LANTERN CHASSIS, MOTOR & CONTROL UNIT

78 Wing Nuts
79 Terminal Studs
80 Contact Strips
81 Chassis Locating Pins
82 Chassis Locking Handle
83 Feed Motor Switch
84 Speed Control Knob
85 Mirror Shield Operating Link

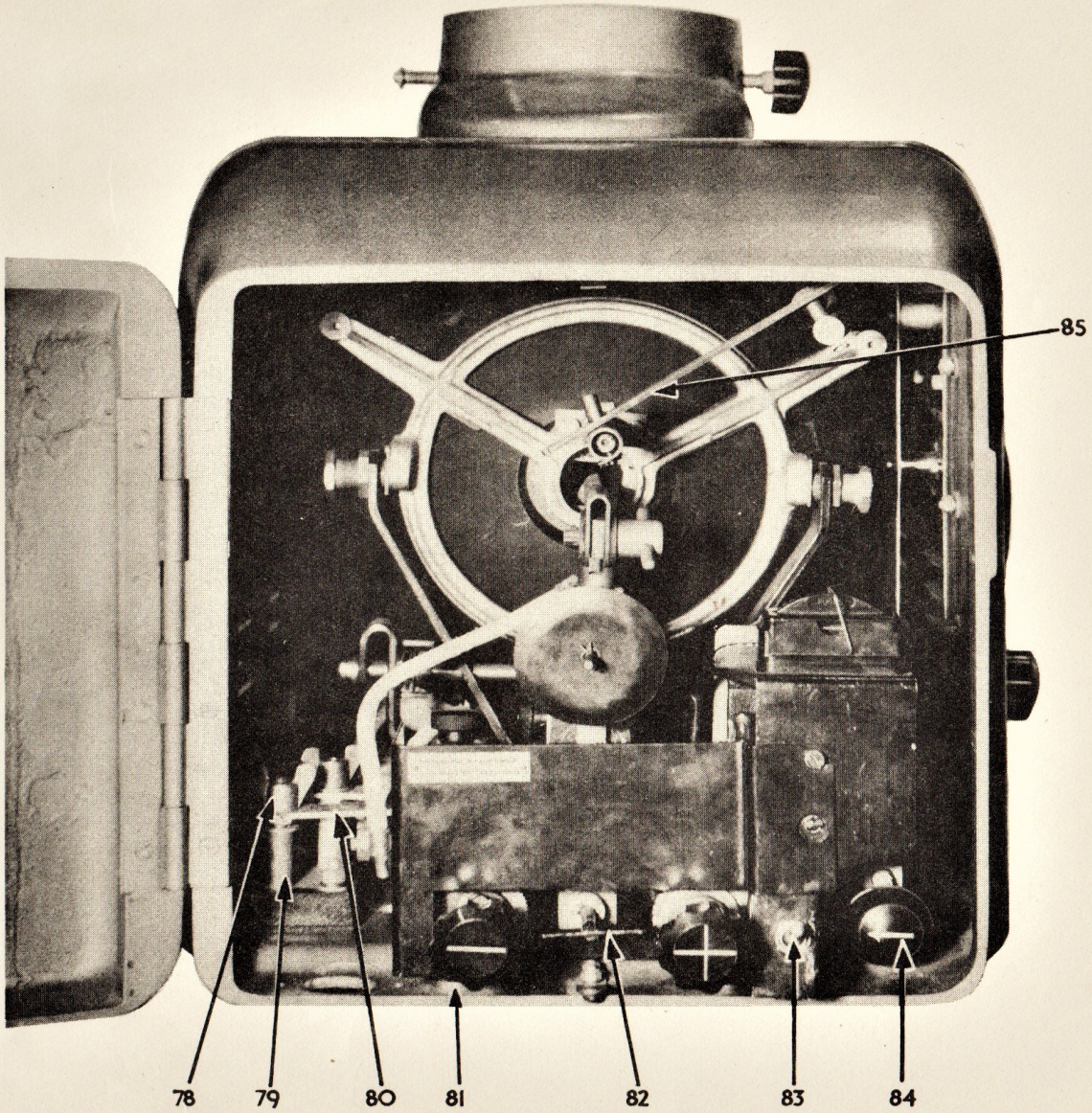
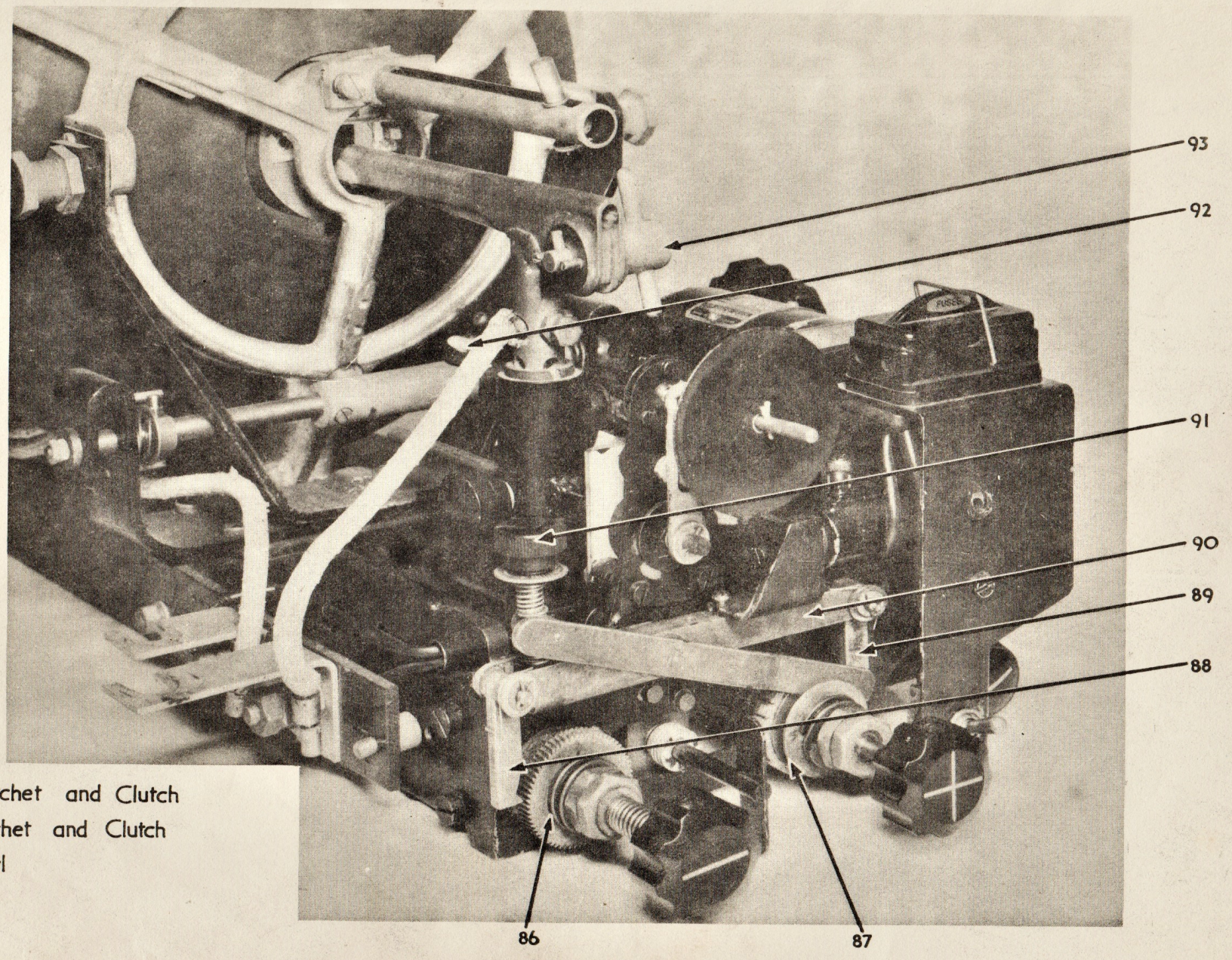


FIG. 16

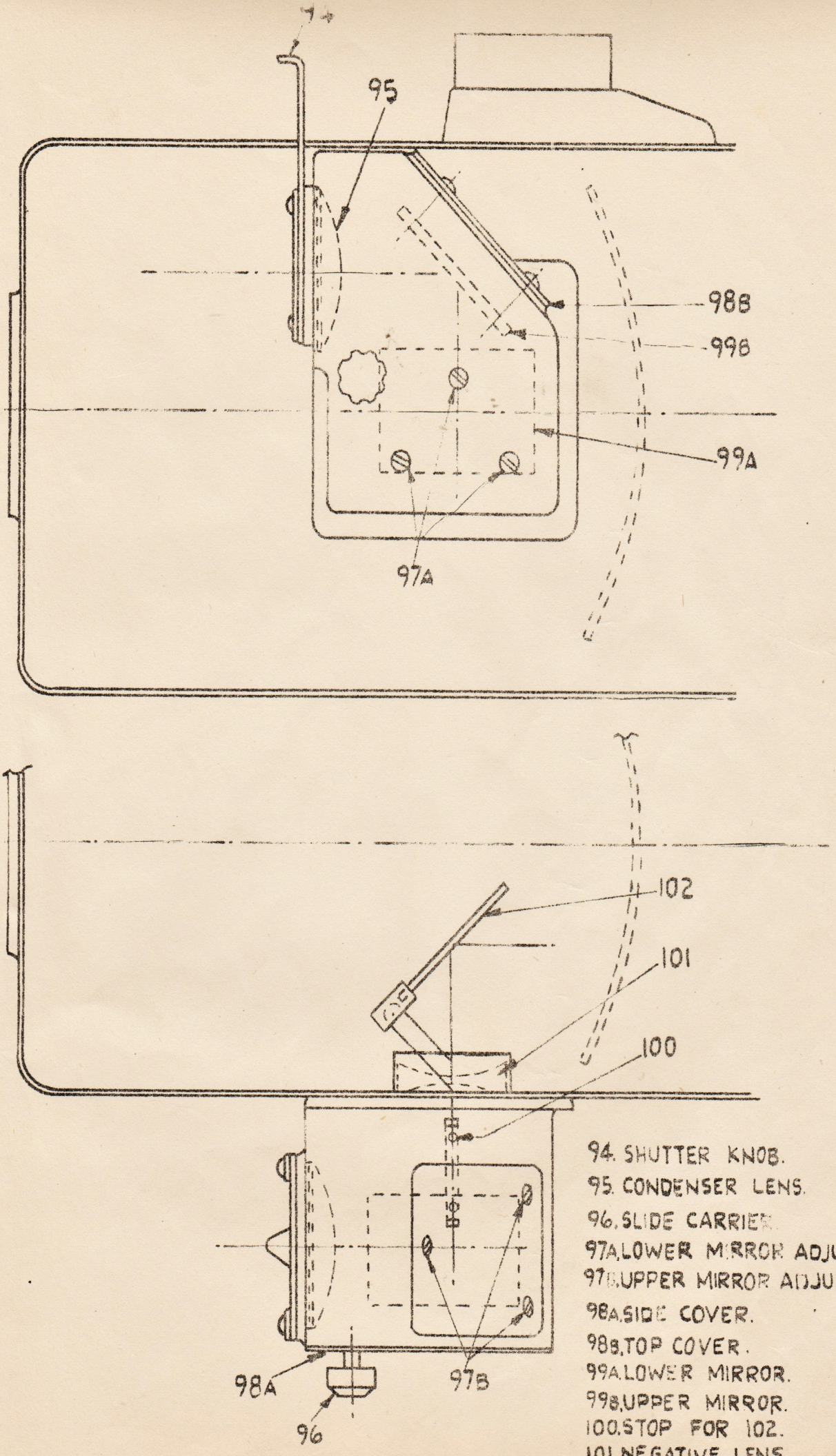
REAR VIEW OF LANTERN



86 Negative Ratchet and Clutch
87 Positive Ratchet and Clutch
88 Negative Pawl
89 Positive Pawl
90 Rocker Arm
91 Negative Feed Adjusting Knob
92 Mirror Knob Spindle Clamp Screw
93 Negative Carbon Clamp

FIG. 17

REAR VIEW OF LANTERN CHASSIS



94. SHUTTER KNOB.
95. CONDENSER LENS.
96. SLIDE CARRIER.
97A. LOWER MIRROR ADJUSTING SCREWS.
97B. UPPER MIRROR ADJUSTING SCREWS.
98A. SIDE COVER.
98B. TOP COVER.
99A. LOWER MIRROR.
99B. UPPER MIRROR.
100. STOP FOR 102.
101. NEGATIVE LENS.
102. SWINGING MIRROR.

FIG. 18.

SLIDE ATTACHMENT FOR TYPE L LANTERN.

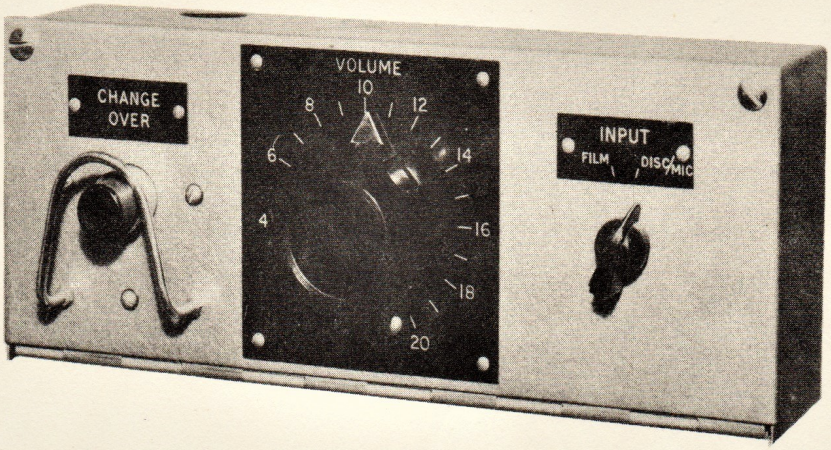


FIG. 23

INPUT SWITCH BOX

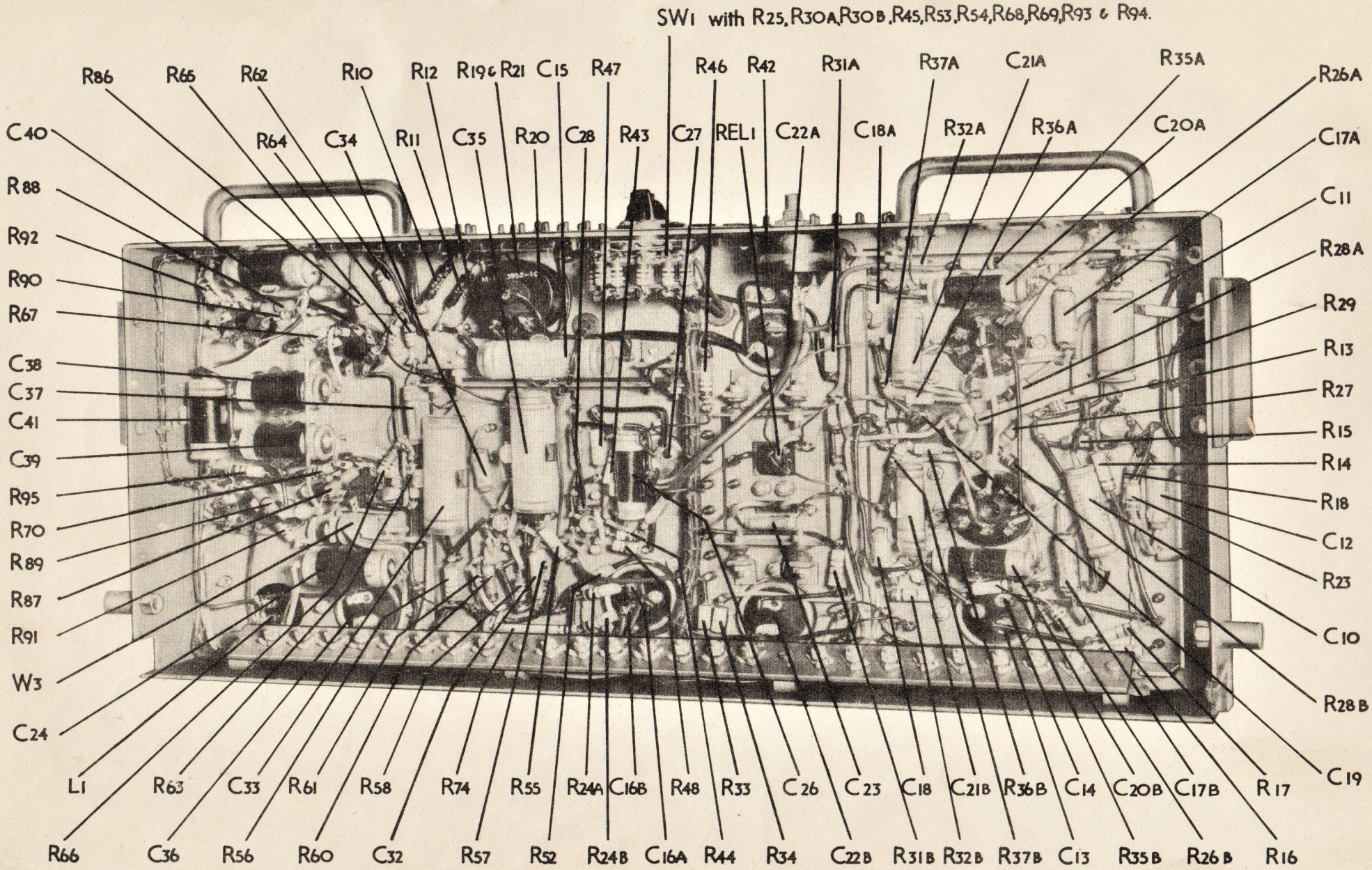
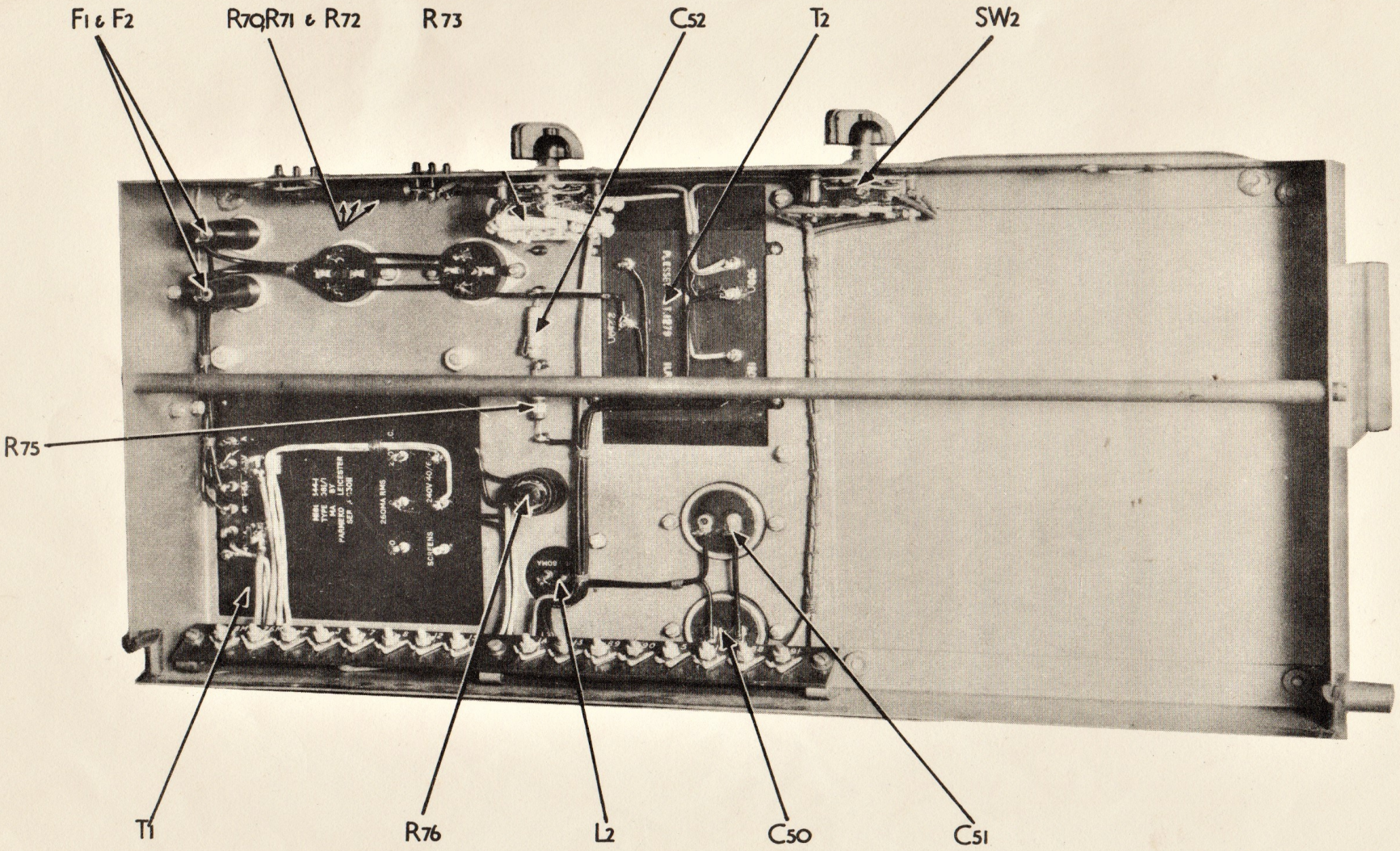


FIG. 25

AMPLIFIER TYPE M7A – UNDERSIDE VIEW



25R

FIG. 26

AMPLIFIER SUPPLY RECTIFIER TYPE M8A — UNDERSIDE VIEW

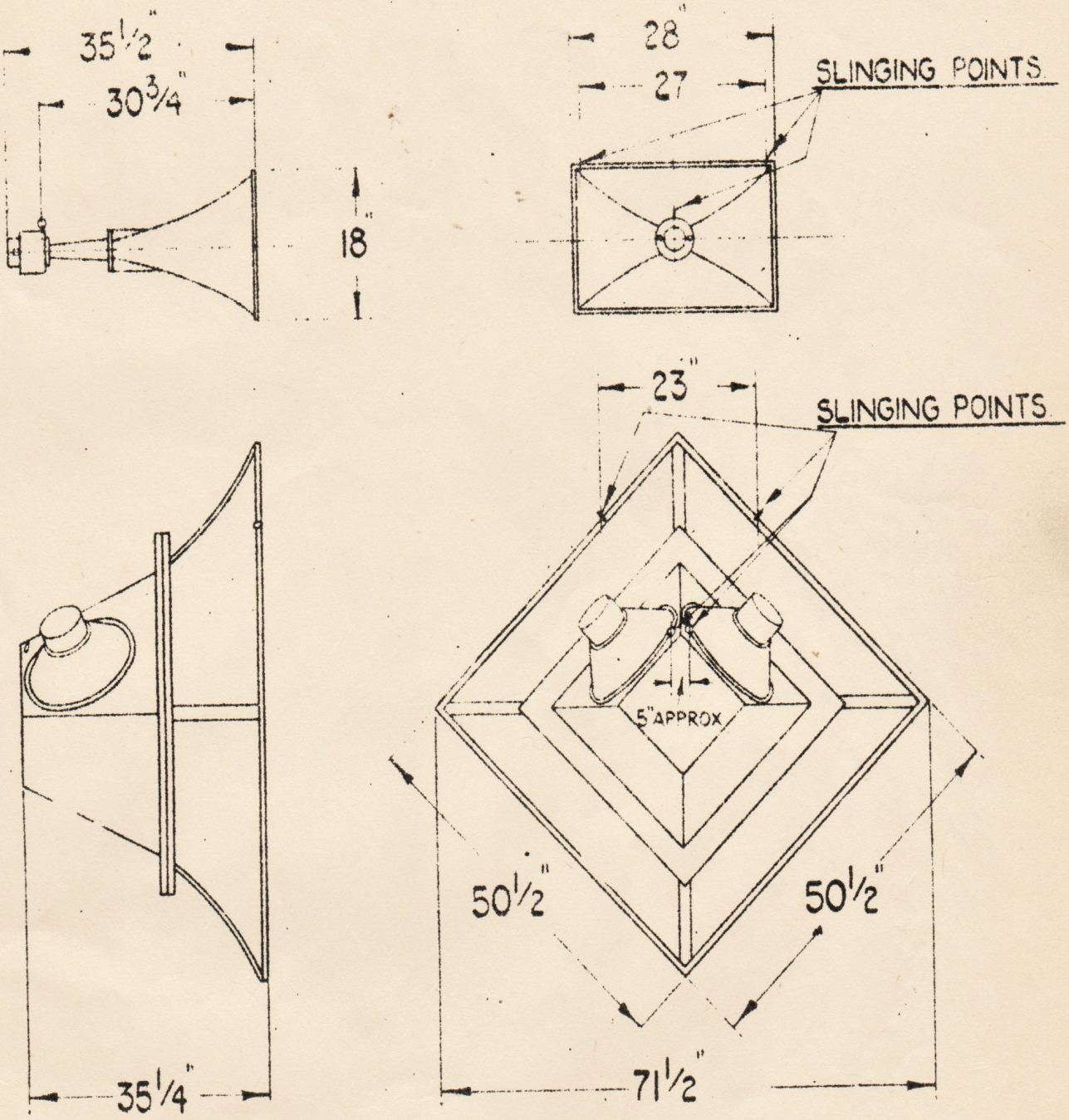


FIG. 31

LOUDSPEAKER SYSTEM

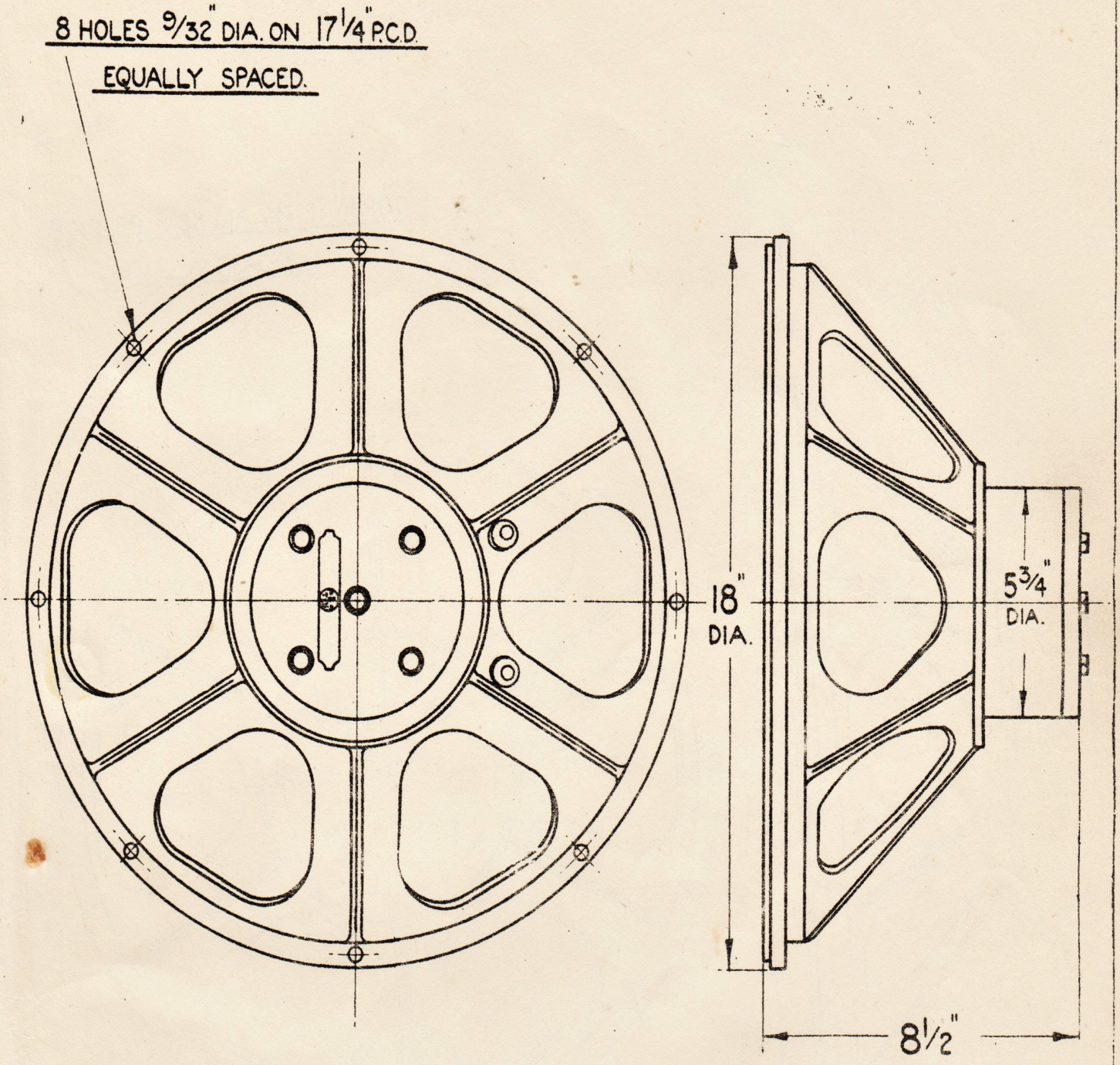


FIG. 32

L.F. SPEAKER UNIT

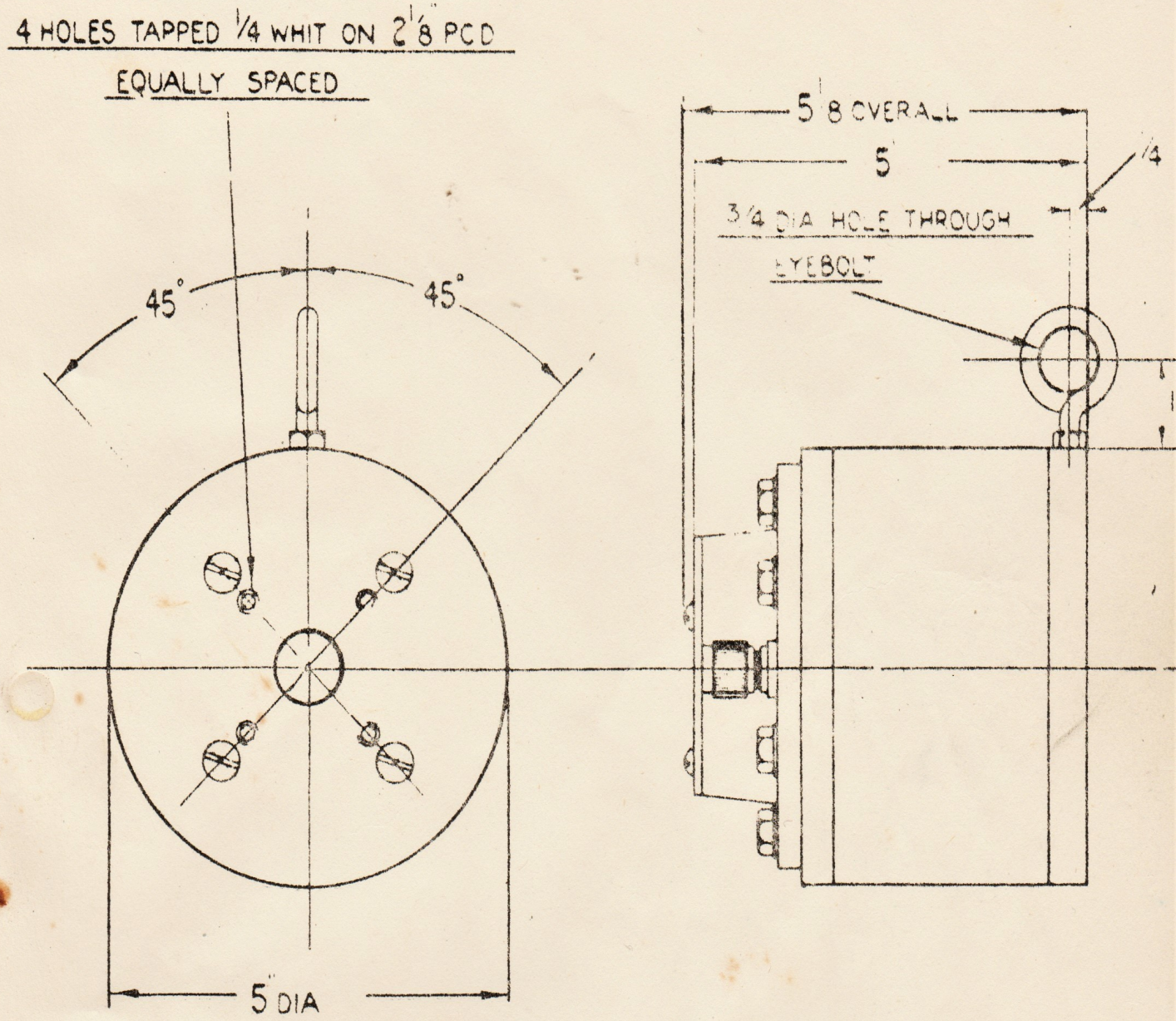
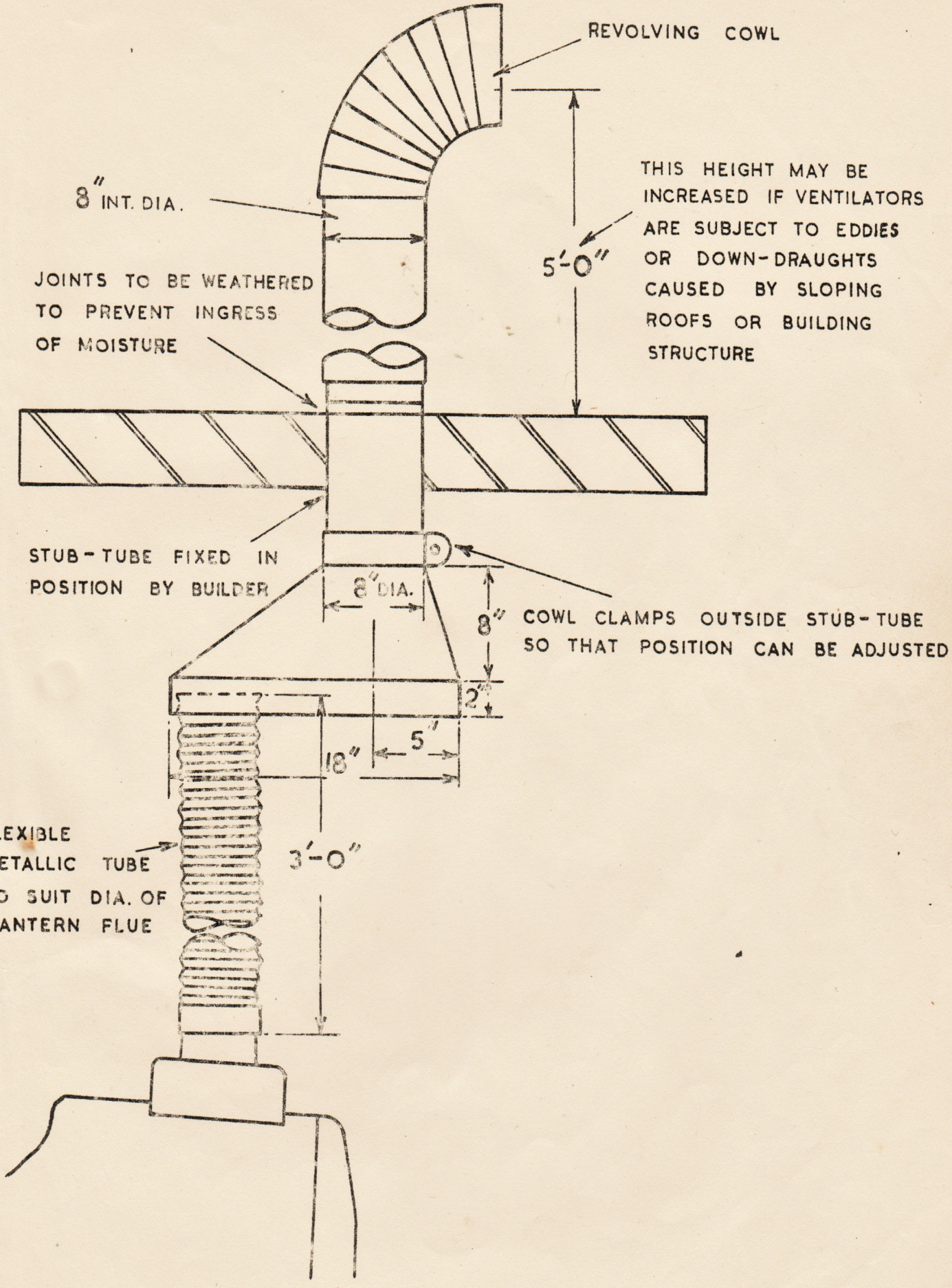


FIG. 33

H.F. SPEAKER UNIT

FIG. 35

NON-SYNCHRONOUS TURNTABLE UNIT



RECOMMENDED VENTILATING ARRANGEMENT

FIG. 37A

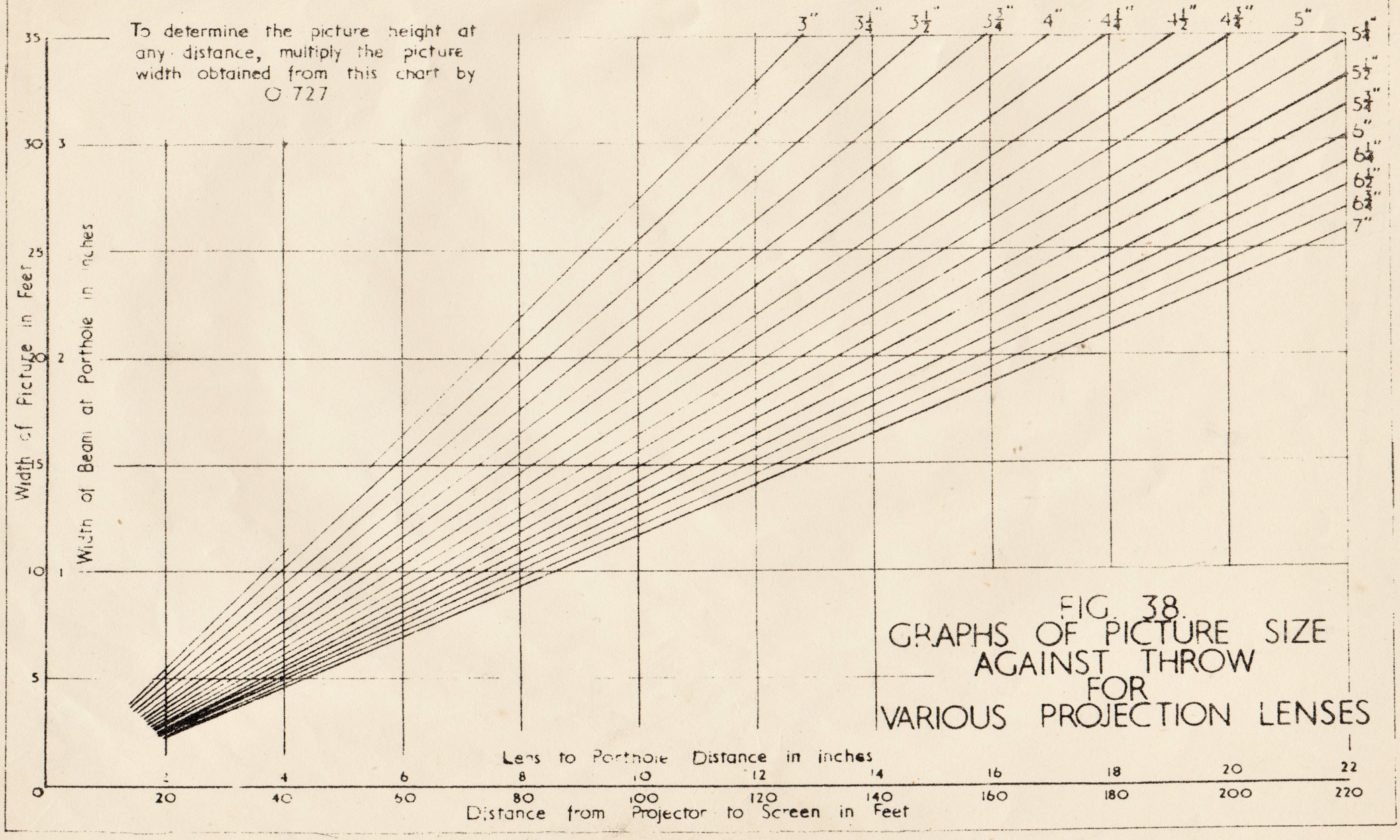
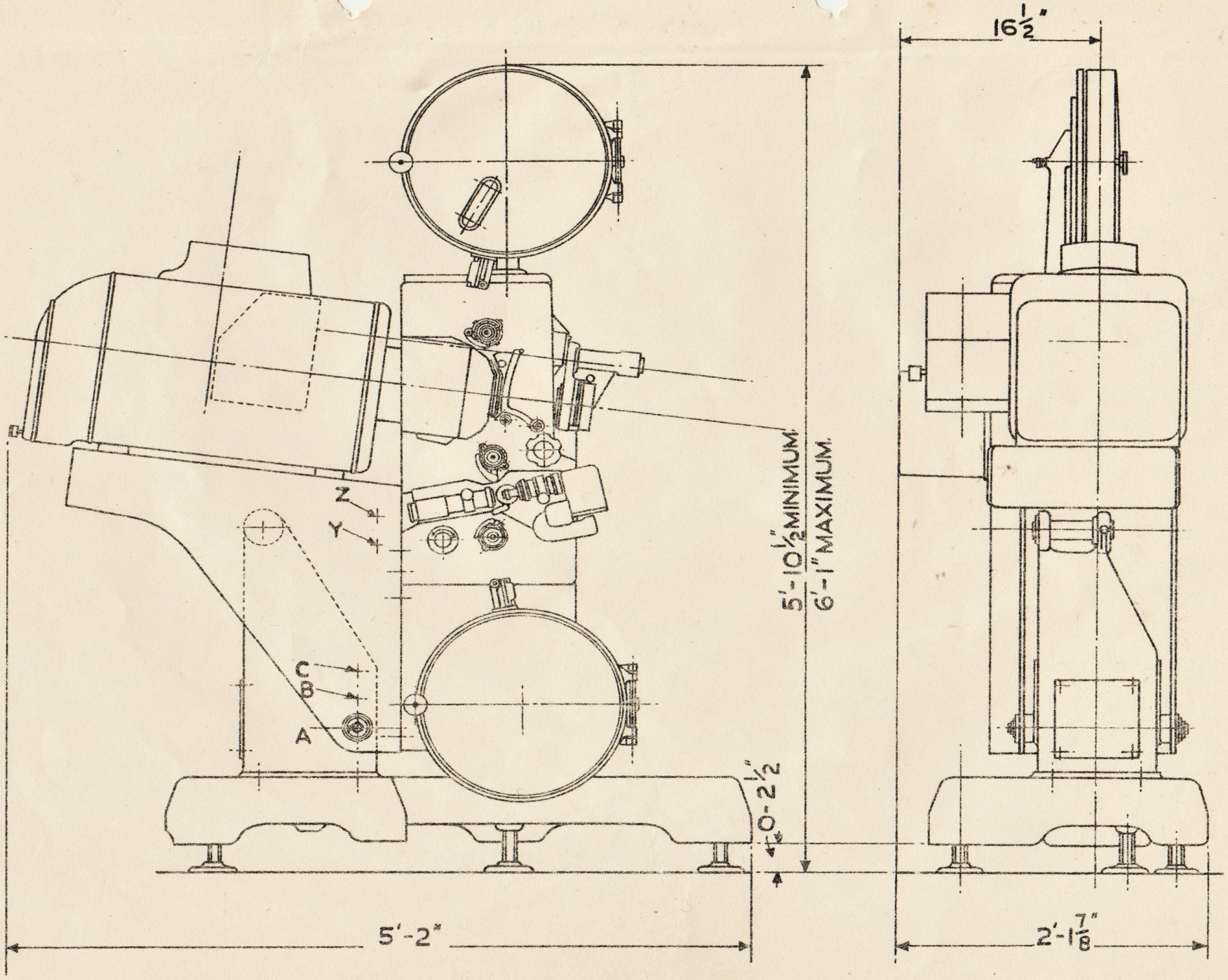


FIG. 38
GRAPHS OF PICTURE SIZE AGAINST THROW FOR VARIOUS PROJECTION LENSES



OUTLINE DIAGRAM OF PROJECTOR UNIT.

FIG 39.

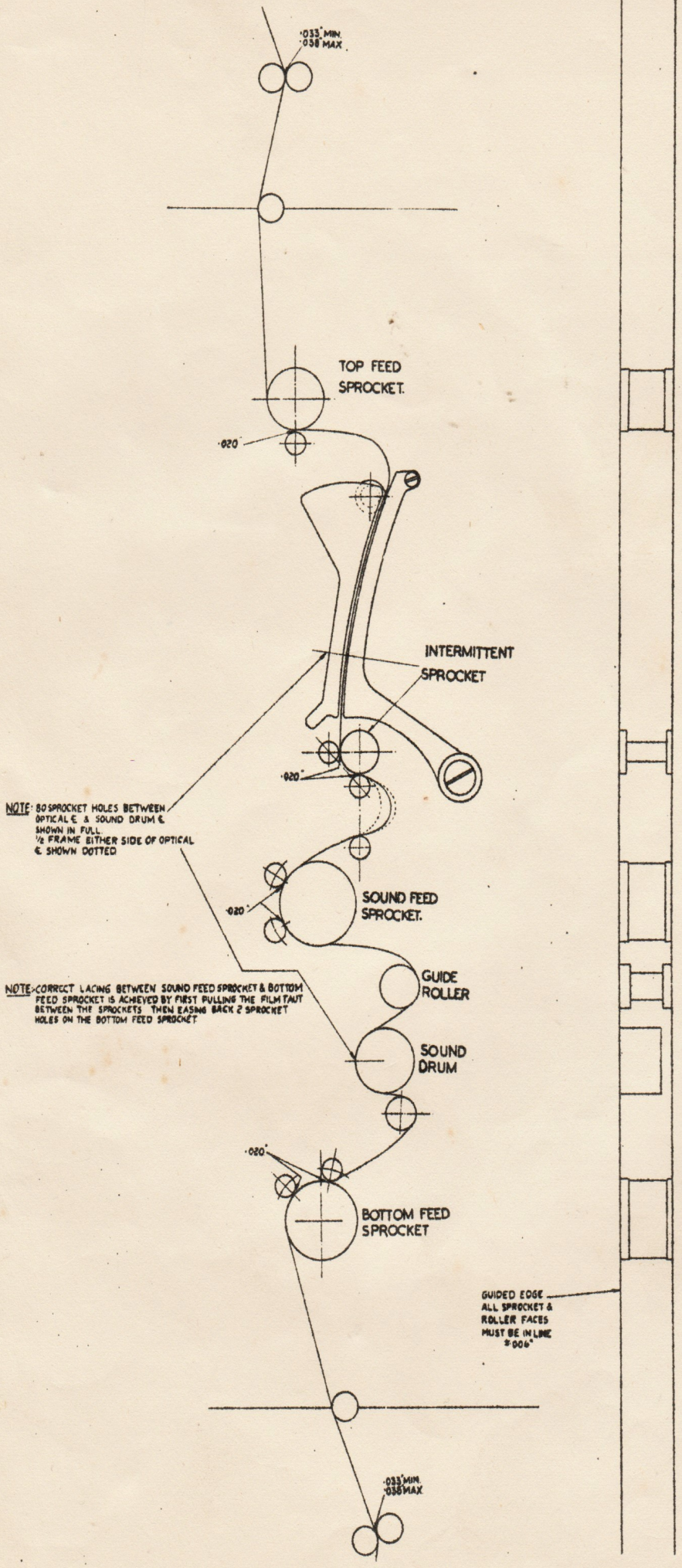


FIG 43

FILM THREADING DIAGRAM

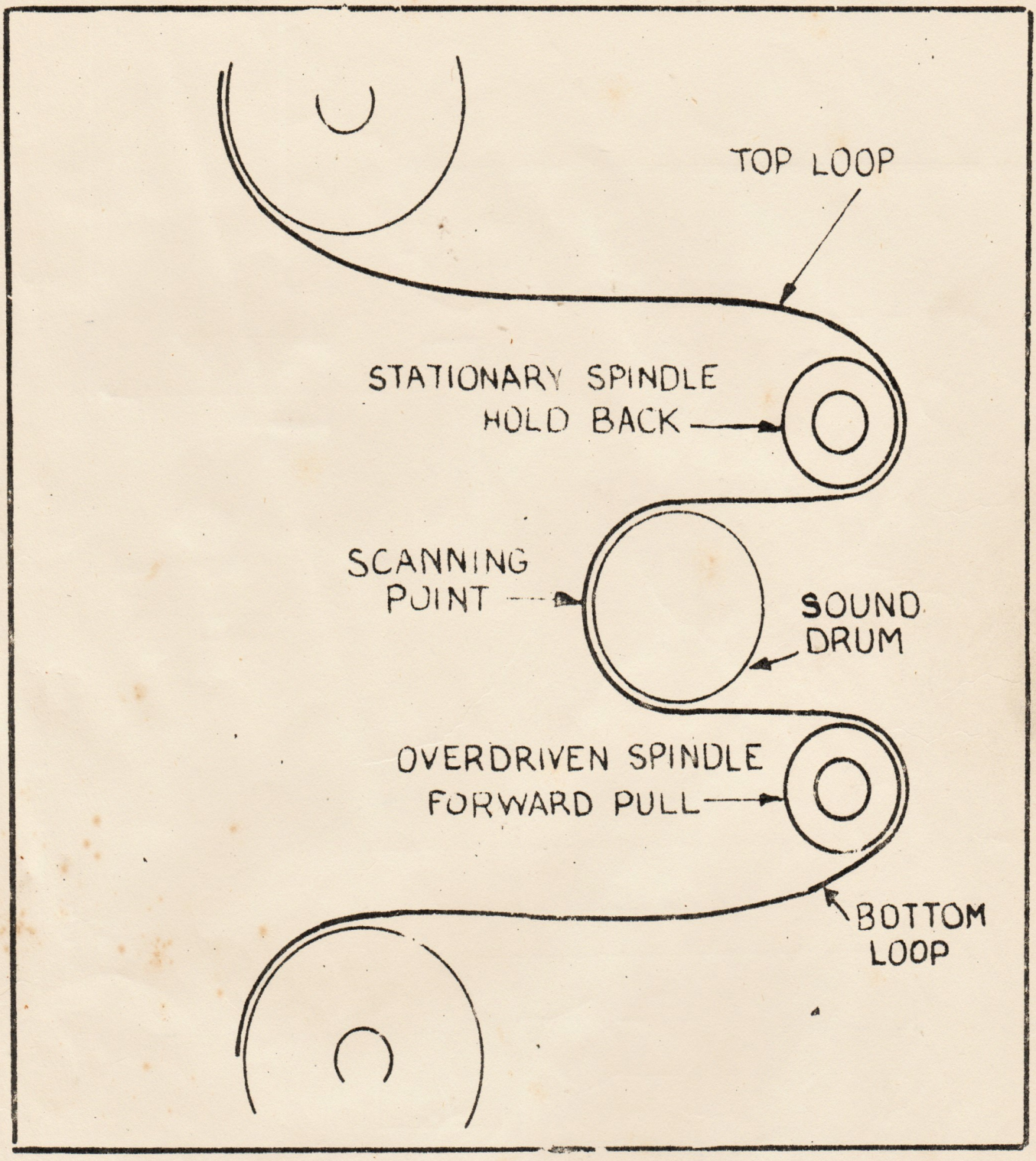


FIG. 44

FILM PATH THROUGH THE SOUND OPTICAL SYSTEM.

107 Front Bearing of Positive Lead Screw

108 Front Bearing of Negative Lead Screw

109 Mirror Tilting Adjusting Screw

110 Access Cover to Negative Lead Screw Nut

111 Rear Bearing of Negative Lead Screw

112 Rear Bearing of Positive Lead Screw

113 Gear Box Bearing

114 Mirror Slewing Adjusting Knob

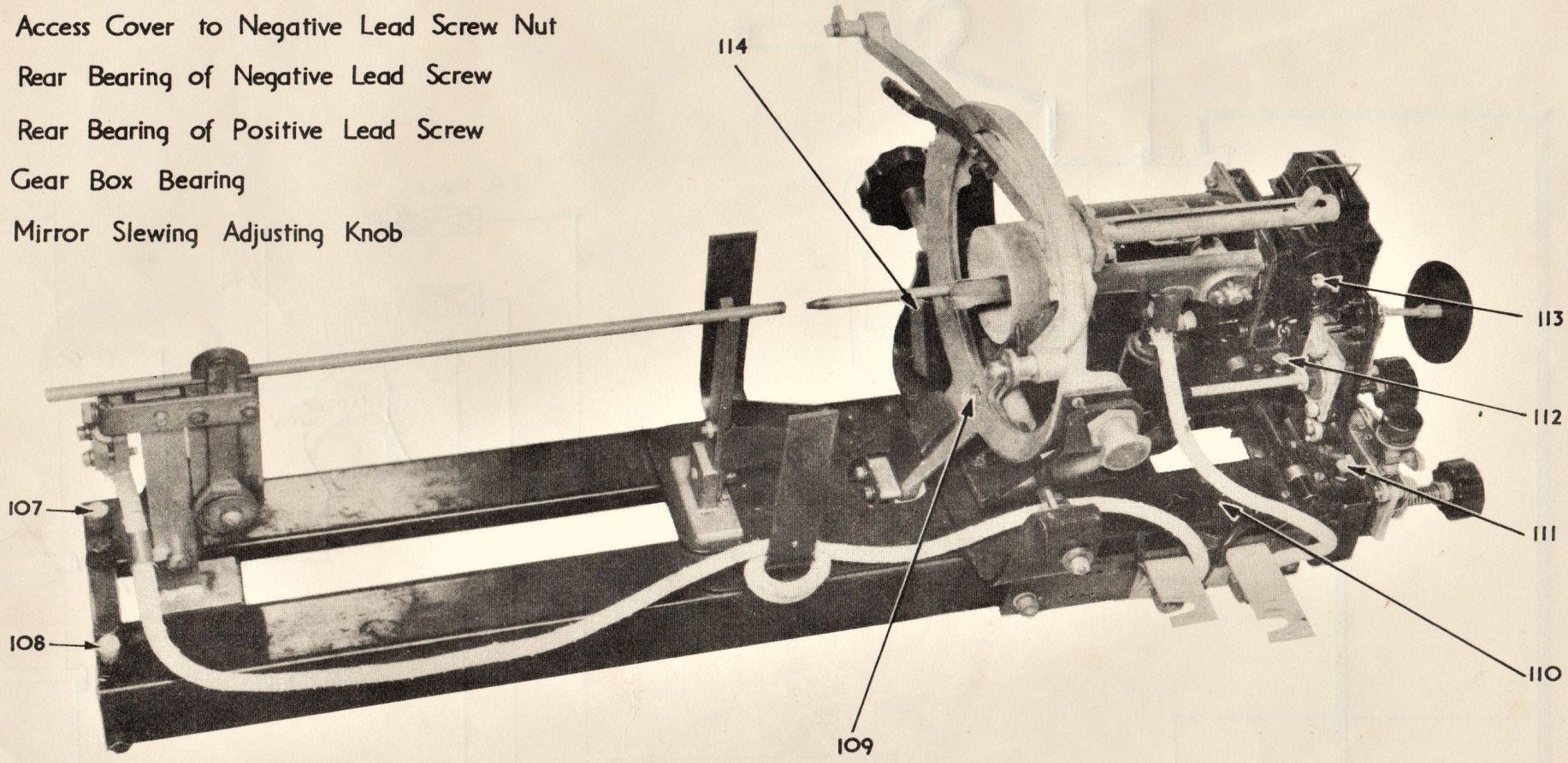
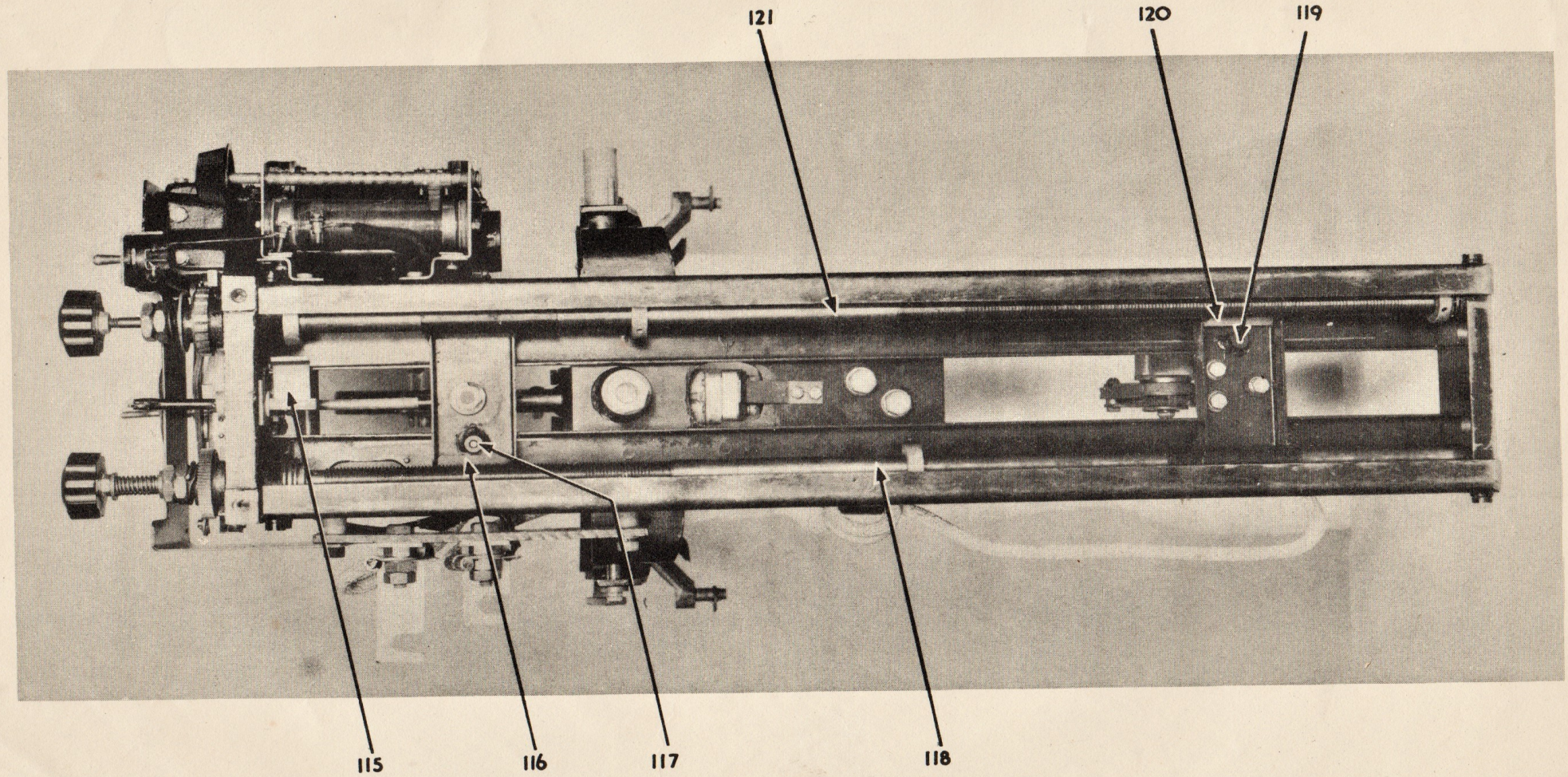


FIG. 45

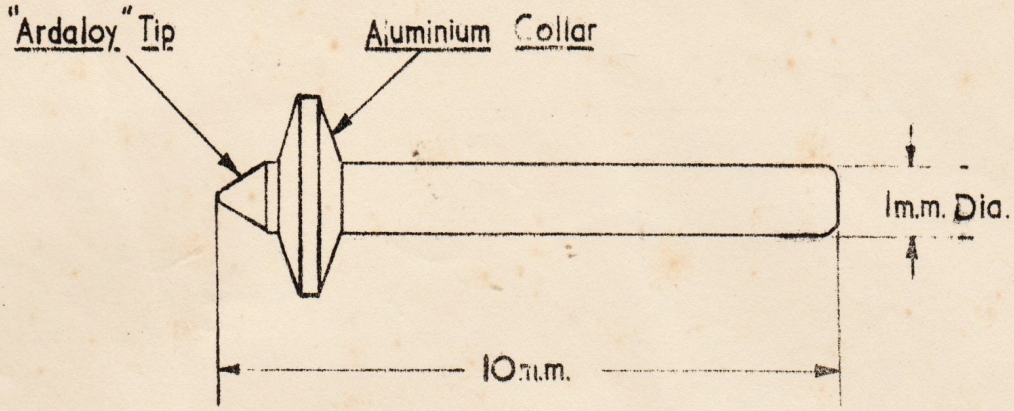
LANTERN CHASSIS LUBRICATION POINTS



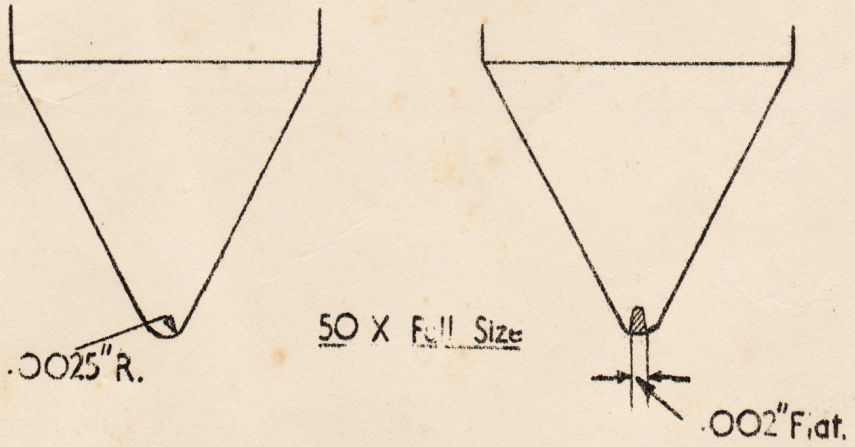
115 Chassis Locking Plate.
116 Negative Lead Screw Nut.
117 Spring Plunger for 116
118 Negative Lead Screw.
119 Spring Plunger for 120
120 Positive Lead Screw Nut.
121 Positive Lead Screw.

FIG. 46

UNDERSIDE VIEW OF LANTERN CHASSIS



10 X Full Size



Unused Stylus.

Side View of Used Stylus.
Shading Indicates Wear.

FIG. 47.

LIGHTWEIGHT PICK-UP STYLUS

Supa
Mk. 2