

MANUAL FOR THE OPERATION OF
THE A/N TYPE 7570 35M.M
PORTABLE PROJECTOR FOR USE
IN SHORE ESTABLISHMENTS.

N O T E

1. For the purpose of identifying components all drawings have been given a letter and each part a number. References to components will combine both a letter and a number, e.g. B 3 would refer to figure B, item 3, which is the projector top driving sprocket. Each major figure has a series of component numbers.

2. Attention is specially directed to:-
 - (1) The regulation covering the performance of cinema exhibitions in H.M. Ships and establishments printed in the Appendix.
 - (2) The section dealing with the Automatic Fire extinguisher shown on page 21.

REGULATIONS FOR CINEMA PERFORMANCE IN
H.M. SHIPS AND ESTABLISHMENTS.

GENERAL

1. The following regulations with regard to Cinema Performances in H.M. Ships and establishments and the principle of the precautions to be observed in the handling and stowage of films, are to be observed strictly. Commanding Officers are, however, authorised to use their discretion in the application of these regulations to suit individual circumstances.

STOWAGE OF FILMS.

2. Films are on no account to be stowed in the Sound Reproduction Compartment or Cinema Projection compartment. They are to be stowed in a dry locker fitted in a position suitable for the stowage of inflammable materials.

PRECAUTIONS IN HANDLING OF FILMS.

3. No films are to be in the same compartment as, or, if on the upper deck, within 20 feet of the cinema projector whilst a film is being shewn. When, however, the reel of film which is being run through the projector approaches completion, the next reel may be brought to the vicinity of the projector. It is emphasized, however, that before a new reel of film is laced into the projector the previous reel must be removed from the vicinity.

REWINDING AND EXAMINING FILMS.

4. Films are not to be rewound, examined or otherwise unreeled in a compartment in which a cinema projector is in operation. Commanding Officers are to satisfy themselves that the compartment in which films are re-wound or examined is a satisfactory place for this purpose, taking into consideration the existence and position of radiators, wandering electric lamp leads, etc.

CINEMA PERFORMANCES ON THE UPPER DECK.

5. Instruction regarding Cinema performances on the "Upper Deck" (i.e. in the open air or under an awning) are left to the discretion of the Commanding Officer.

CINEMA PERFORMANCES BETWEEN DECKS.

6. No cinema projector is to be operated between decks unless it is an Admiralty Pattern Projector, a

"Gaumont-British Type 'N' projector or any type of projector fitted with the "Pyrene" Automatic (carbon dioxide) fire extinguisher.

If the Cinema projector is in the same compartment as the audience, the arrangements must be such that a clear space of at least 3 feet is maintained round the projector and the compartment can be evacuated within 30 seconds, by an exit or exits not within 25 feet of the Cinema Projector. Such exits are to be open, and the gangways kept clear during cinema performances. No cinema projector is to be operated in a compartment adjoining a "Dangerous Area", except as provided in clause 9 in relation to aircraft hangers.

A fire hose is to be rigged in the vicinity of the Cinema projector during performances. This is to be connected to the firemain at the point outside the compartment in which the cinema projector is operated.

CINEMA PROJECTORS NOT FITTED WITH THE "PYRENE" AUTOMATIC FIRE EXTINGUISHER - SPECIAL INSTRUCTIONS.

7. Cinema Projectors not fitted with the "Pyrene" Automatic fire extinguisher are not to be operated between decks unless a drencher system is fitted over the cinema projector. This restriction includes Sound Reproduction Compartments and Cinema Projection Compartments. The drencher should preferably be connected to the fresh water system to avoid possible damage to the cinema projector by the action of salt water, but if suitable fresh water supply with adequate volume and pressure of water is not available in the vicinity a salt water drenching system must be used. The drencher must be adequate to spray water on to the cinema projector and articles in the immediate vicinity so as to localise the fire to the cinema projector.

SMOKING.

8. Men engaged in operating the cinema projector and handling, carrying or re-winding films are forbidden to smoke. Otherwise no restrictions on smoking are necessary other than those laid down in clause 9 of this order in connection with aircraft hangers and catapult decks.
9. No relaxation, however, is to be made to the existing regulations (Pamphlet Supplementary to O.U.5408 (Naval Magazine and E.R. Section IV) prohibiting smoking on the flight deck or in the hanger.

The following additional precautions are to be observed:-

- (a) The hanger in use as a cinema auditorium is to be clear of aircraft, fabric spares, and inflammable stores. (The term hanger shall include a section of a hanger which is isolated from the remainder of the hanger by a metal fire screen, provided the screen is kept down).
- (b) The hanger is to be swept out before use.
- (c) The petrol system is to be drained.

THE "PYRENE" AUTOMATIC FIRE EXTINGUISHER.

10. This consists of a small cylinder of CO² fitted on the cinema projector. If the film in the projector catches fire a fuse in the projector releases the CO₂ into the projector, this immediately extinguishing the fire.

In order to ensure that this fire extinguisher is in the "ready" condition at each cinema performance, the Cinema Operator is to report to the officer in charge "Cinema Fire extinguisher loaded with a charged cylinder, mechanism cocked".

The mechanism of the "Pyrene" automatic fire extinguisher is to be tested monthly.

ELECTRIC CIRCUITS FOR THE PROJECTOR.

11. In order to ensure that flexible leads, connections, resistances and fuses are in proper working at each performance, the operator is to examine all such apparatus and when reporting as regards the Pyrene extinguisher is to include in his report "All leads, connections, resistances and fuses examined and found in working order".
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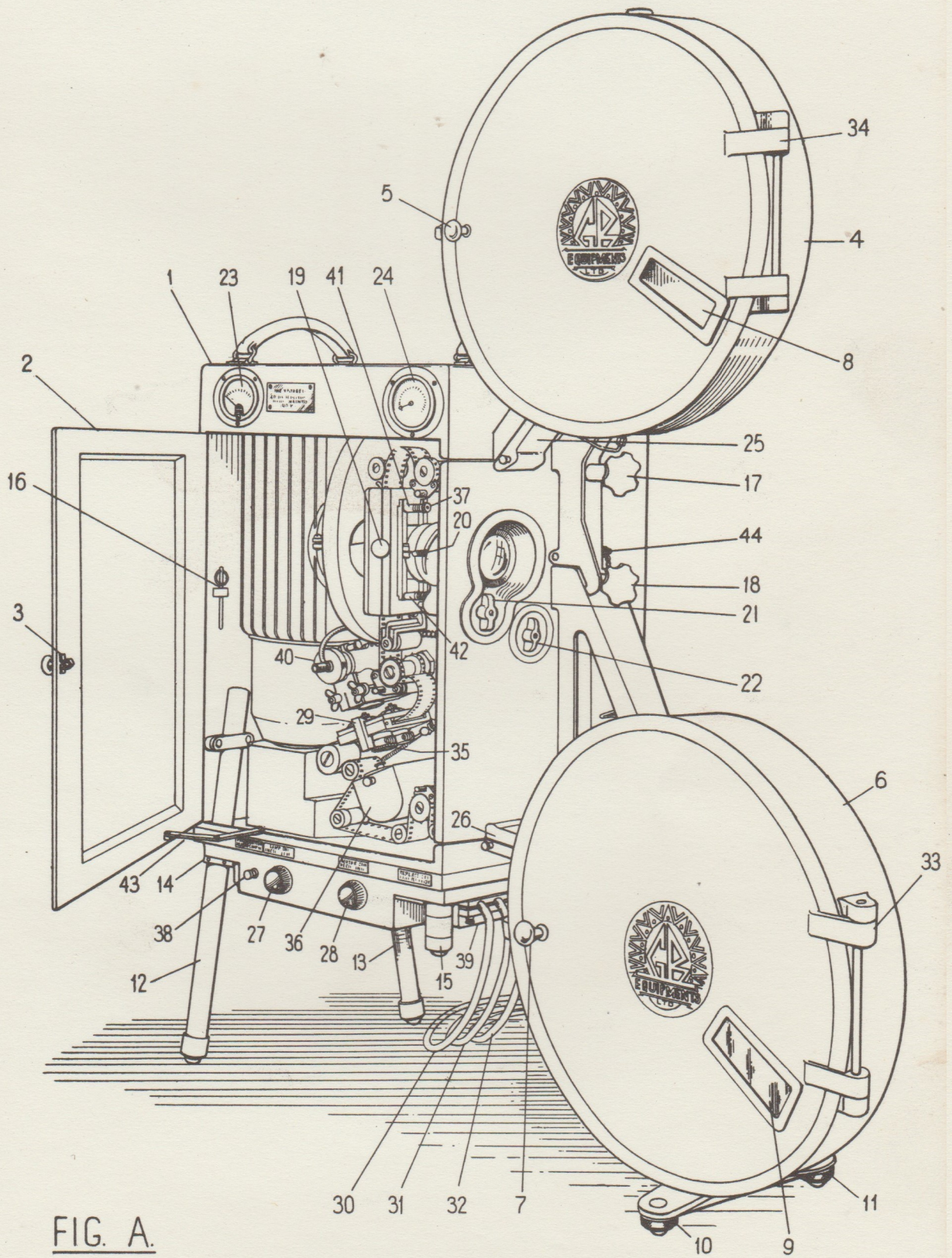


FIG. A.

GENERAL DESCRIPTION.

PROJECTION MECHANISM.

For the purpose of identifying parts it is intended that each drawing shall be given a letter and each part a number. The letter and number shall then be combined the letter in all cases preceding the number. Thus B3 would refer to drawing B component 3 which upon examination will be found to be the top positive driving sprocket. At the end of the chapter an appendix of all parts will be found.

NOTE:

It is essential when ordering spare parts that the drawing letter and number be given.

GENERAL LAYOUT OF MECHANISM.

Figure "A" shows the complete projector set up for operation. The main projector is housed in the metal case A1, whilst the spool boxes A4 and A6 are detachable, and fixed to the projector case by means of three hand screws A17, A18 and C3. The spool box assembly may be separated by withdrawing the pin A44. Each spool box has a hinged door which swings about the points A33 and A34, and a window A8 and A9 for observation purposes. The case has four elevators A10, A11, A12 and A13 the main adjustment being on the back legs A12 and A13. These are locked by means of two collet clamps A14 and may be loosened by means of a tommy bar A16 which will be found in a clip inside the projector. The front feet A10 and A11 have only screw adjustment. The exciter rectifier unit, switches, and lamp and motor controls are to be found in the base of the case. A single stage sound head amplifier is housed in the bottom

of the main case, and is easily accessible from the side of the case. Picture focus is by means of the large knob A21 whilst picture racking is adjustable by the knob A22. A revolution counter A24, a voltmeter A23 for measurement of projector lamp supply voltages are also incorporated. The voltmeter normally out of circuit is actuated by means of push button A38. The components contained in the base will vary according to whether the projector is to be used on A.C. or D.C. supply, and are clearly shown in figures O(a) for D.C. supply, and O(b) for A.C. supply. These will be dealt with more fully under the heading "Motor fitting".

FILM PATH.

Figure "B" shows the operating side of the mechanism. The spool boxes A4 and A6 are detachable and fitted to the front panel of the mechanism case by means of three hand screws C1, C2 and C3.

Film is drawn from a spool or bobbin B1 fitted to spindle M22, through fire trap B2 and then round the under side of the top positive sprocket B3. A retaining cradle B90 which may be opened by pressing the lever B16 downwards serves to keep the film in contact with the sprocket teeth B3.

A loop called the "top loop" is then made before the film enters the picture gate B4. The gate may be opened by pulling the knob B22 towards the operator. The film should be carefully laced between the pressure pad and the fixed back plate before closing the gate. The action of the picture gate is explained more fully under "Picture Gate Assembly". The film emerges from the gate past the racking roller B18 (see "Racking Roller"), round the underside of the intermittent sprocket B6, i.e., between the sprocket B6 and sprocket retaining cradle B89, the cradle may be opened by pressing upon lever B17.

A bottom loop is now made, the size of which is very important as it decides the "sync" distance between sound and picture (see "Sound Head"), after which the film passes

through the sound gate B7 (which may be opened by pressing upon the lower end of the catch lever), round the flywheel rough roller B8, the jockey assembly roller B9, and underside of the two idle rollers B10 and B11 and thence on to the bottom positive sprocket B12, between sprocket and retaining cradle B91. From this sprocket the film travels beneath the idle roller B13 through the slot in the case and fire trap B14, which may be opened by pressing upon the lever B79, and thence to the take up spool B15. The film is fed off from the take off spool in a clockwise direction whilst it winds on to the bottom take up spool similarly.

The precise functions of the various sections in the film path will be dealt with more fully under their various headings.

LENS MOUNT

Figure "D" shows the lens mount with lens removed. The standard barrel diameter of 52.5 mm. is employed, and any focal length from 1 $\frac{1}{8}$ " upwards can be used. If smaller diameter barrels are employed, say 42.5 mm an adaptor sleeve is supplied. Lens adjustment is obtained by turning large knob D5 on the outside of the case. Upon turning this knob the complete carriage D1 moves along the rod D7 which is fixed to the casting D6. When turning in an anticlockwise direction the release spring D9 pushes the carriage back. The lens is slid in to the focussing tube D4 and is locked in position by clamping screw D8. With short focus lenses it is necessary for the rear lens face to be in close proximity to the film plane in the gate. This would not permit the opening of the gate unless provision was made to slide the lens mount forward. It will be noted that there is a helical slot D2 in the lens casting with a short lever D3

attached to the inner sleeve D4. Thus when the gate is to be opened it is necessary to push the lever D3 from the bottom of its slot to the top, which will allow clearance between lens and picture gate.

DRIVING LAYOUT.

The projector can be readily fitted with either of two types of motors (see "Projector Motors"), one for working off 230 volts A.C., and the other for 110 volts D.C. The motor runs at 1440 R.P.M. and drives a horizontal main shaft C55, through a readily detachable coupling C29. This shaft passes through the crossbox C111 emerging on the opposite side. A skew gear on this shaft, inside the cross box (see "Cross Gearbox"), drives the pin wheel shaft at right angles to it. This in turn rotates the intermittent or cross spindle with sprocket attached B6.

The horizontal main shaft C55 has on its emerging spindle, a skew gear C19 driving the vertical drive shaft C6, this by means of a 2 to 1 reduction gear C18 rotates at 720 R.P.M. The vertical shaft C6 drives the top C73 and bottom C45 sprockets through a further reduction to 360 R.P.M.

A small auxiliary drive C74 steps up the speed of the flicker or shutter spindle C13 again to 1440 R.P.M.

Four picture sprockets are used throughout, i.e. 16 teeth; as each picture frame employs four holes, each sprocket passes four pictures per revolution. Standard "talkie" speed being 24 pictures per second, it follows that 1440 pictures per minute are passed. This represents 90 feet of film per minute.

PICTURE GATE.

The main function of the picture gate is to provide a means of firmly holding the film before a light source.

It is essential that the film is held perfectly taut as it would otherwise be impossible to maintain a good focus on all parts of the screen. The gate assembly is clearly seen in figure "E" which shows it open with the part embracing the pressure pads removed for cleaning. It consists of two castings hinged at the points E7 and E8. The left hand portion or fixed back plate consists of a metal casting with a highly polished stainless steel backplate E3. The aperture E9 is to allow the light from the projector lamp to fall on the film. It will be noticed that there are two ribs to the backplate E11 and E12 the purpose of these being to raise the film from the backplate and thus prevent scratch on the picture. There is of course, possibility of scratch on the edge of the film, but this does not matter very much as that part of the film contains the perforations and is not projected upon the screen. The right hand portion of the gate in Figure "E" consists of a metal casting E1 and two long sprung runners E2 and E15. These are held in position by means of two screws B37 and B38, two leaf springs A41 and A42 and two pressure adjusting springs B139, one of which is shown.

As little pressure as is necessary to maintain a steady picture should be put on the film, and this should be constant at top and bottom of the gate. If excessive pressure is applied (1) film scratch will increase (2) the sprocket hole perforations will be stretched by the intermittent sprocket (3) mechanism noise will increase appreciably. If too little gate pressure is applied the film will tend to float about in the gate and focus will be difficult to maintain. For cleaning purposes the gate may be separated as shown in Figure "E". E4 is a spring loaded catch for keeping the gate closed. The gate backplate is reversible so that front or rear projection may be used. For

this purpose two pins E17 and E19 and two slots E16 and E18 are provided. To change this plate it is only necessary to press the backplate in an upwards direction and withdraw it. This changeover is necessary as the picture on the film is offset to allow for the sound track, and it is of course not desirable to project the sound track on the screen. It is impossible to over emphasize the importance of cleanliness and keeping the runner faces free from caked emulsion or scratches. Do not remove emulsion from the runners with a metal scraper or the runners will become pitted and emulsion deposits increase, a wooden scraper does the job much better and does not damage the runners. The aperture E9 should be kept free from dirt and fluff as this will be visible on the screen.

PROJECTION OPTICAL SYSTEM.

PROJECTOR LAMP.

This comprises a lamp, condenser lens, film plane or aperture, and projection lens. The lamp is a 100 volt Class A1 Monoplane lamp of 1000 watts, with a G.E.S. cap (Goliath Edison Screw), the bulb is of the standard dimensions, and the filament centre height is the accepted standard of 120 mm from the centre contact cap. No reflector mirror is necessary.

The lamphouse has a readily detachable cover, secured by two spring clips B100 and B101.

Below the cover is a cowl containing an adjustable lamp holder, and a centrifugal blower with high speed motor B29. This motor has a separate switch O(a)3 and is also linked with the lamp-switch O(a)4, the action of switching on the lamp also starts the blower B29. On no account attempt to disconnect this blower or run the lamp without it or the

life of the lamp will be greatly diminished. The blower also serves to cool the whole mechanism. A current of air is drawn from outside the case by a fan within the driving motor; this circulates round the passage between bedplate and case, and is then exhausted via the lamphouse grill B184.

The lamp may be readily adjusted by means of lever B26 and nut and screw B47. To set up the projector lamp for maximum efficiency the following procedure should be adopted.

Firstly examine the 1000 watt projector lamp and make sure that it is of the correct voltage. Screw this right down in the holder, but do not force it. The lamp should be twisted, so that the filament assembly is at right angles to the mechanism bedplate or parallel to the film. The filament supports should be away from the condenser lens B102. Slacken lamp holder clamping screws by inserting a screwdriver through the hole in blower cowl B25, it is of course necessary firstly to remove the screw B25; the holder should now be raised or lowered to ensure the filament assembly is in a line with an imaginary centre line passing through the centre of condenser, gate aperture and projection lens. Replace cover and remove any film, run up mechanism and switch on light, direct machine towards screen: raise or lower mechanism by rear tubular legs until a flood of light overlaps the screen; uneven streaks of light will denote filament image. It should be seen if the image covers from top to bottom, if not, raise or lower lamp holder in clamp ring to suit. With lever B21 at bottom of helical slot, rotate knob B20 until a sharp outline of the gate aperture appears on the screen. More than likely the screen will be unevenly illuminated, rainbow tinges or dull patches in places; this can be corrected by either forward or backward movement of the lamp, by means of knurled screw B47 or by sideways movement using lever and clamp screw B26. By unscrewing knurled screw B26, levers B98 & B99 spring together and may be easily moved in their adjusting slot. A combination of various positions should be tried until

a pure white even illumination results, then lock up clamp on lever B26 and screw up holder clamp ring B25. If colouration still persists, try rotating lamp filament about 10° out of right angle plane.

CONDENSER LENS.

This is known as Aspherical : the rear surface is convex and the front, or gate side, is parabolic. By means of the much shorter focal lengths and only one lens, very much more light is transmitted than is possible with the usual double combination of lenses. It is essential that this is kept perfectly free from dirt or grease or loss of light will be experienced.

PROJECTION LENS.

The standard barrel diameter 52.5 mm is employed and any focal length of lens from $1\frac{1}{8}$ " upwards can be used. If smaller diameter barrels are employed say 42.5 mm an adapter sleeve is supplied. For table of lens sizes for varying screen sizes and different lengths of throw see Figure "Q".

TAKE UP DRIVE.

If the take-up spool were to be directly coupled to the mechanism driving shaft, it would travel at constant speed. Due to the varying diameter of the film when wound on spool it is therefore necessary that a slipping clutch should be incorporated. This is fitted to the rear of the bottom take up spool and is coupled to the mechanism by means of a hexagonal telescopic take up drive situated when not in use in the back of the projector case. When required insert hexagonal head through aperture in case into bevel wheel socket and fit opposite tubular and over hexagonal steel spindle on spool arm boss. C4 shows the coupling in position. The take-up gearbox is more clearly shown in Figure "G" which

gives a sectional view. G1 is a cast metal container and G16 is the end to which the telescopic coupling is fixed. It pushes over the solid shaft G16 and is kept in position by means of a ball catch G20. The gear wheel G18 is pinned to the shaft G8 and is suspended in two "Oilite" bushes. G21 is a solid shaft threaded at one end to take the adjusting nut G6 which is locked by grub screw G15. G4 is a metal disc whilst G3 is a felt washer for frictional purposes. The gear wheel G2 is in no way fixed to the shaft and relies upon friction between itself, felt washer G3 and metal disc. G17 is a pin for locating in the spool whilst G13 is pivoted about the point G19 to allow the spool to be pushed into position. A sleeve G10 is slipped over the shaft G21 and fixed by means of a screw G14, the purpose of this being to allow use of two size spool centres (i.e. $\frac{3}{8}$ " & $\frac{1}{2}$ "). Adjusting spring G5 is controlled by the knurled nut G6. It is important that the clutch should not be adjusted too tightly or damage to the film perforation will take place at the take-off sprocket.

SOUND OPTICAL SYSTEM.

This is of short focal length and a certain amount of care is necessary in accurately adjusting for best results. It comprises, exciter lamp and holder H2 and H5, condenser lens H9, objective lens H20, bridge H35 and photo electric cell H25. The precise details of the optical assembly are of little interest, the function being to concentrate a light source H2 on to the film through the gate aperture H40, the track is then focussed by means of the objective lens H20 on to the bridge H35 and thence to the photo electric cell H25.

The passage of the film sound track past this light bridge or slit modulates the light falling on the cell. It is essential to have this light slit at right angles to the edge of the film and sharply focussed, also the exciter lamp must be adjusted to give the maximum light possible.

The sound optical system consists of three main castings, all of which may be readily removed. H1 is the exciter lamp housing which also carries the condenser lens H9. The exciter lamp is rated at 6 volts 1 amp. and has a single pole base. It is housed in a metal bayonet cap holder H5 with an insulated knurled cap. This holder is eccentric so that an allowance can be made for slight differences in filament position in individual exciter lamps. The two alternative positions of the lamp in its holder will result in two different distances between filament and condenser. One position will be found to give more volume than the other. The casting is held in position by two clamping screws H3 and H4.

For rear projection it is necessary to withdraw the exciter lamp holder H5, remove the two clamping screws H3 and H4, turn the complete casting over and insert exciter lamp holder and clamping screws in the other end. The casting is designed so that it is unnecessary to alter the position of the condenser lens H9. When refixing make sure the casting is securely clamped by screws H3 and H4 and that no dirt is beneath the machined face and its bedplate.

The second casting contains the sound gate H11 and objective focussing lens H20. The lens is clamped in the holder H19 by means of a screw H23, and when used for rear projection is changed over to the holder H21. The remainder of the casting contains the sound gate which consists of a polished fixed runner H14 and a similar spring runner H37. These are sprung by means of two leaf springs H17 and H18 and are adjustable by two knurled nuts H15 and H16. The gate is opened by pressing the right hand end of the lever H12 which is pivotted by the pin H44 and contains a spring for return. The gate contains two sound apertures H39 and H40 so that it is unnecessary to remove it for rear projection.

The third unit H24 contains the bridge and photo electric cell. The cell housing is held in position by pins and can therefore be readily removed from the panel. By slackening the two knurled screws H28 and H29 it is possible to alter the width of the slit as the masks H30 and H31 will then become loose and may be slid horizontally in their slots. To change from front to rear projection it is necessary to withdraw the two screws H26 and H27 and revolve the complete plate H33 about its centre through 180 degrees, so that the hole for screw H26 will then be used for screw H27. The cell is purposely made long so that its sensitive surface is available for front or rear projection without changing the cell position. To change the photo cell it is necessary to withdraw screws B194, B195, B196 and remove the cover B19.

FOCUSSING SOUND OPTICAL SYSTEM.

First adjust exciter lamp for maximum brilliance on the soundgate aperture, this can be done by slackening the clamping screw H7 and gently rotating the exciter lamp holder H5 until maximum light is obtained on the condenser lens. If the patch of light on the gate aperture is too large and floods it, light is being wasted and the condenser lens H9 needs adjustment. This may be done by slackening off the screw H8 and rotating the condenser lens H9. Now lay a piece of frequency test film, track towards you: emulsion side up if for front projection, but track away from you, emulsion side down if for rear projection, in the soundgate. Close the gate and slacken off clamping screw H23. Adjust objective lens H20 until a clearly defined image of the sound track is visible on the cell housing aperture H35. Slacken off screws H28 and H29 and adjust the bridge masks H30 and H31, until only the complete width of the sound track is visible on the aperture. The alignment of the slit with relation to the film track can be adjusted by slacken-

ing off screws H38 and H39 but this should not be necessary once it has been set at the factory. Change from front to rear projection should not affect this providing the cell housing H24 is pushed right into its socket on the mechanism panel.

The method of focussing described above is one which if properly carried out cannot fail to give the desired results. An alternative method described below may be used, and be thought simpler and quicker.

Set up projector on the edge of a table with amplifier and speaker as for normal reproduction, but do not fit spoolboxes to projector. Set fader at approximately mid position.

Take 8 feet of focussing film (8000 cycles constant frequency and amplitude) and cement the two ends to form an endless loop. Lace film loop in machine with that portion which is outside machine hanging freely over the front edge of the table or other support upon which the machine has been placed, and start the motor. For this test the film should be taken over instead of under the final roller adjacent to the bottom exit of the case.

If the optical system is correctly focussed a thin high pitched whistle will be heard from the speaker, but this whistle inevitably will be accompanied by 'mush' of an intensity which will depend upon the age and cleanliness of the film. Even with new unworn film the mush will be comparable in strength to the whistle. If the optical system is out of adjustment, the whistle will be either faint or non existent. Slacken the clamp ring H19 on the objective lens and slowly rotate the knurled cap H20. When the whistle is at maximum intensity lock clamp ring.

It may be found that adjustment of the objective lens will not produce the whistle. This can be due to either bad adjustment of exciter lamp or to the light "Bridge" not being at right angles to the edge of the film. These may be adjusted as explained earlier in this paragraph. If a motor boating sound is

heard the light bridge is too wide and light is being transmitted through the film sprocket holes on to the cell. Adjustment of the bridge masks will cure this.

ADJUSTMENT OF EXCITER LAMP FOR MINIMUM MICROPHONIC NOISE.

Remove the film loop and with fader setting as before, run projector. (when running without film the cradle rollers should be lifted from the three film sprockets.) Slacken clamp screw H7 of exciter lamp holder and very slowly rotate until microphonic noise heard in speaker is at a minimum. The position is critical and the noise will be found to increase rapidly either side of the mid point. The position will be found to coincide with maximum light on cell and maximum response from sound film.

FRONT TO REAR PROJECTION.

REAR PROJECTION.

This term applies when, for lack of height, or distribution of audience, it is impossible to "shoot" over their heads: for daylight projection; or from a mobile truck.

In this case, the picture is shown through a translucent screen; if ordinary straight projection were used, all action and titles would appear reversed. Therefore the film has to be reversed; in effect, the emulsion now faces away from the light, and the sound track is away from you, or on the side nearest the bedplate.

If the picture gate aperture plate E3 is examined, it will be noticed that the aperture is off centre in relation to the film channel.

This is in order to prevent the sound track being projected on the screen.

The aperture or "mask", being exactly the same width as the film picture area and occupying a common centre line, the sound track, is in consequence, blanked or masked out.

It will therefore be seen that when film is reversed for rear projection (as previously explained) the aperture must correspond to the new lateral position, occupied by the film picture.

Consider for example it is required to change from "front" to "rear" projection. Referring to Figure "E" it will be noted that the aperture plate is held in position by the two flat headed pins E17 and E19, which fit into the slots of the "buttonholes" E16 and E18 in the gate frame. Thus by sliding the plate upwards the latter may be withdrawn, rotated through 180 degrees and replaced, when the picture gate will now be set for rear projection.

It should be remembered that for rear projection the aperture is off set away from Projector bedplate. Figure "E" shows the gate set up for front projection.

The sound optics are easily adapted, by reference to Figure "H". It will be seen that by slackening clamping screw H7, the exciter lamp holder may be withdrawn and if the two pillar screws H3 and H4 are removed the whole casting may be inverted. Reverse this casting, replace pillar screws and exciter lamp holder as shown in right hand illustration "H". Release clamping screws H23 and H22 and transfer objective lens H20 from clamping ring H19 to H21. Remove screws H26 and H27 and rotate the complete plate H33 about its centre through 180 degrees so that screws H26 and H27 may be changed over.

Place a piece of 8000 cycles constant frequency film in the sound gate as explained under "Focussing Sound Optical System" and refocus objective lens H20 and tighten screw H22. Due to the changing over of the emulsion side of the film it will be found that the focussing position is changed by .005

ins. by reason of the film thickness intervening.

RACKING ROLLER B18.

Below the picture gate will be found a swinging idle roller B18, this is known as the racking roller, and is capable of being set in any given position by means of a knob B88. If through incorrect lacing, or badly joined film, the part of one picture and that of another, with a dividing frame line between appears on the screen, the picture is said to be "out of rack". This can be corrected by movement of this roller creating a loop which has the effect of lengthening the section of film between aperture and intermittent sprocket. Correct operation and lacing should obviate the need for using this device, and this is described under "Operation".

CROSS MOVEMENT.

This piece of mechanism is the most intricate in the projector, and upon its correct functioning the performance of the machine will largely depend. Figure "J" shows a schematic layout of its arrangement. A cast metal container J17 houses the parts, all of which run in a bath of oil J23. Suitable oil must always be used, and a level kept of half-way up the observation window J21 which is more clearly shown in C24.

It will be seen from Figure "J" that the main motor shaft J14 drives the pin wheel shaft J2 which carries a cam J22 and striking pin and roller J9. This in turn drives the Maltese cross J8 and its shaft J3 which carries the intermittent sprocket J4.

Once every revolution, the pin roller J9 engages a slot of the Maltese cross J25, entering and revolving the cross

shaft one quarter of a turn, thus the intermittent sprocket J4 pulls one picture through the gate.

On the pin roller leaving a slot J25, the cam J22 engages the concave radius of the cross J24 and locks it, thus causing the picture to be stationary, meanwhile the pin wheel J20 is turning over prior to engaging the subsequent slot when the entire process will be repeated. It is thus obvious that the picture will move through the gate in a series of jerks, it being stationary whilst the cam engages the concave radius of the cross, and moving whilst the pin roller engages a slot of the cross. For further details see "Adjustments and Running Maintenance".

THE INTERMITTENT SPROCKET.

The intermittent sprocket J4 is fixed to the end of the Maltese Cross shaft by means of a screw J5 and has 16 teeth on either side of the sprocket. As each picture frame employs four holes, the sprocket will pass four pictures per revolution. Standard talkie speed being 24 pictures per second, it follows that 1440 pictures per minute are passed. This represents 90 feet of film per minute. If the film is threaded through the projector and the mechanism slowly turned over by means of the "inching knob" see Figure C5, the intermittent action of the sprocket will be clearly seen.

CENTRIFUGAL SHUTTER "F2".

The purpose of this is to cut off light from the picture gate should the mechanism stop, and so prevent firing of the film.

A drum, adjacent to the shutter flange K7 carries an arm and blade F2 which at slow speeds slips freely in relation to the shutter spindle F3.

Inside the drum is a disc K18 fixed to the spindle K2, the disc carries two small pawls K3 and K4 having a fractional substance on their tips K5 and K6. Centrifugal force causes these pawls to fly outward with increasing pressure, as speed increases; this friction in turn, drags round the drum and lifts the shutter. This action is particularly reliable and long lived, but in the event of sluggishness in lifting, the interior should be inspected by removing the screw K17 when the drum and blade arm can be bodily withdrawn. Screws K10, K11, K12 and K13 secure the blade arm. The trouble may be found due to either worn material on the tops of the pawls sticking on the pins. Small pieces of leather boot lace can be used to replace the tips, and a thin oil to free the pawls. Oil in the friction mechanism of the centrifugal shutter will cause slip. The drum and the friction tips must be kept free of oil. Sometimes it may be necessary to wash them free of oil with carbon tetra chloride or petrol. Before access can be obtained to interior, it is necessary to remove the flicker shutter which entails removing the two bearings C12 and C14, unpinning Tufnol Gear C11, and dropping the Tufnol gear on its shaft.

FLICKER SHUTTER.

This is of the two-bladed type, and is held in correct relation to the cross movement by being clamped between a flange and a cheek.

Either of the two blades may be utilised in setting up, as they are 180 degrees apart.

If "Ghosting" appears on the screen, i.e., the lettering of titles appears to have a shadow effect, in spite of sharp focussing, this indicates that the shutter blades have slipped.

The action of this flicker shutter is to completely cover the picture gate aperture whilst the film is in motion at

that point. The opposite blade plays a minor part and merely reduces flicker.

To adjust for "ghost" remove guard B142 by loosening screws B40 and B119 and raising guard, and slacken three screws K14, K15 and K16 passing through flanges and check at centre of blade. Hold up centrifugal shutter F2.

The mechanism should now be rotated by pin-wheel flywheel F15 until the intermittent sprocket is just unlocked, and starts to rotate. Hold in this position and with lamp on; rotate the shutter blade until it just entirely cuts off the light rays to the gate aperture.

Lock up the three flange screws K14, K15 and K16 tightly and check up that the blade is held rigidly in relation to its spindle F3.

It will be found that by moving the shutter in one direction with respect to the shaft, top ghosting is obtained; whilst movement in the opposite direction will produce a bottom ghost. When set in its correct position no ghost will be apparent and titling will be perfectly clear cut providing the picture is correctly focussed. If a blurred picture is still obtained examine projection lens for dirt or grease.

SOUND HEAD

This is not as usual a separate unit but integral with the mechanism. This embraces soundgate B7, rough roller or flywheel roller B8, sound jockey B9, idle rollers B10 and B11, take off sprocket B12 and cell housing B19 which incorporates the "Bridge and Masks" H28 and H29, all closely inter-related to each other.

After leaving the intermittent sprocket, the film possesses a "flutter" due to the intermittent action of the sprocket. For good reproduction the film must travel at an absolutely uniform

speed past the aperture in the sound gate. This is partly achieved by the sound gate H11 itself due to the pressure between the back plate or skid H14 and the spring loaded pressure pad H37. The rough roller B8 due to the weight of the flywheel tends to oppose the pull of sprocket B12 and the loading of sound jockey B9.

The most perfect of motors cannot be relied upon to maintain uniform speed, even time controlled frequency supply, varying between any instant. This is where the combined function of the rough roller and flywheel, with the jockey become apparent: this tends to oppose any sudden acceleration, and conversely releases kinetic energy on sudden deceleration occurring.

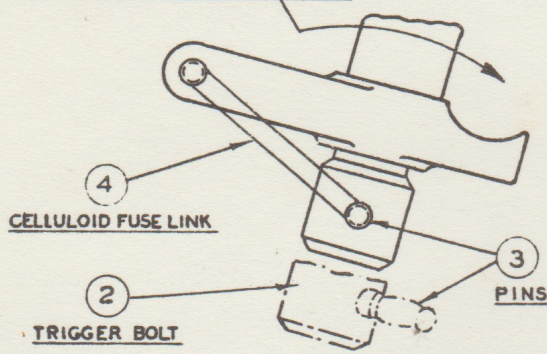
The jockey serves to maintain a flexible tension on the film within certain limits and ensures constant film adherence to sound gate, rough roller and idle rollers. It should be realised the linear speed variations we are controlling, are often quite minute but sufficient to spoil good reproduction. The jockey tension is controlled by the spring B35 and may be adjusted by means of the knurled nut B36.

The pressure pad tension in the sound gate may be adjusted by means of two knurled nuts B53 and B54. As little tension as necessary for good "Flutterless" reproduction should be applied: excessive pressure in the sound gate will cause film scratch and a tendency to split or enlarge the perforations in the film at the bottom positive take up sprocket. Too little pressure in the gate will cause "Flutter" on the sound and will allow the film to go in and out of focus.

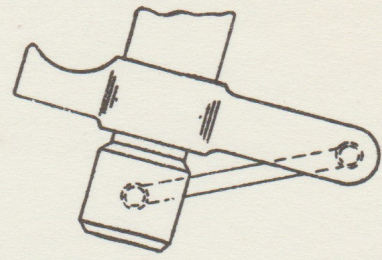
"PYRENE" AUTOMATIC FIRE EXTINGUISHER.

The "Pyrene" Automatic Fire Extinguisher Unit housed in the top portion of the projector case, is so designed that the

AFTER PLACING CELLULOID FUSE LINK IN POSITION, ROTATE TRIGGER BOLT.

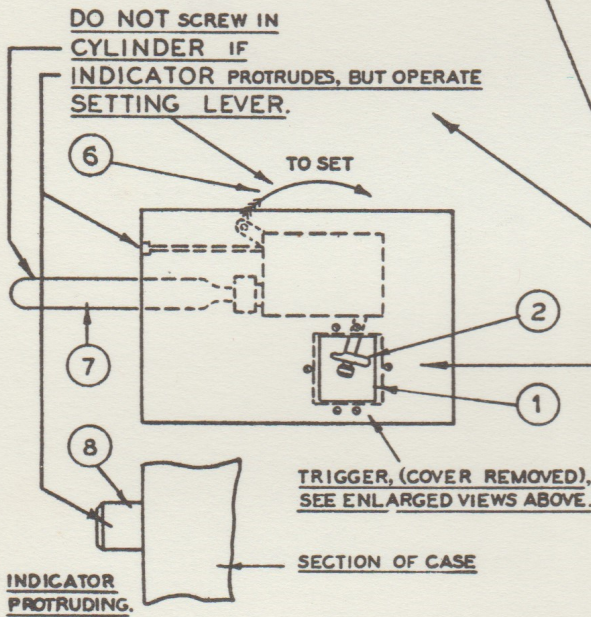
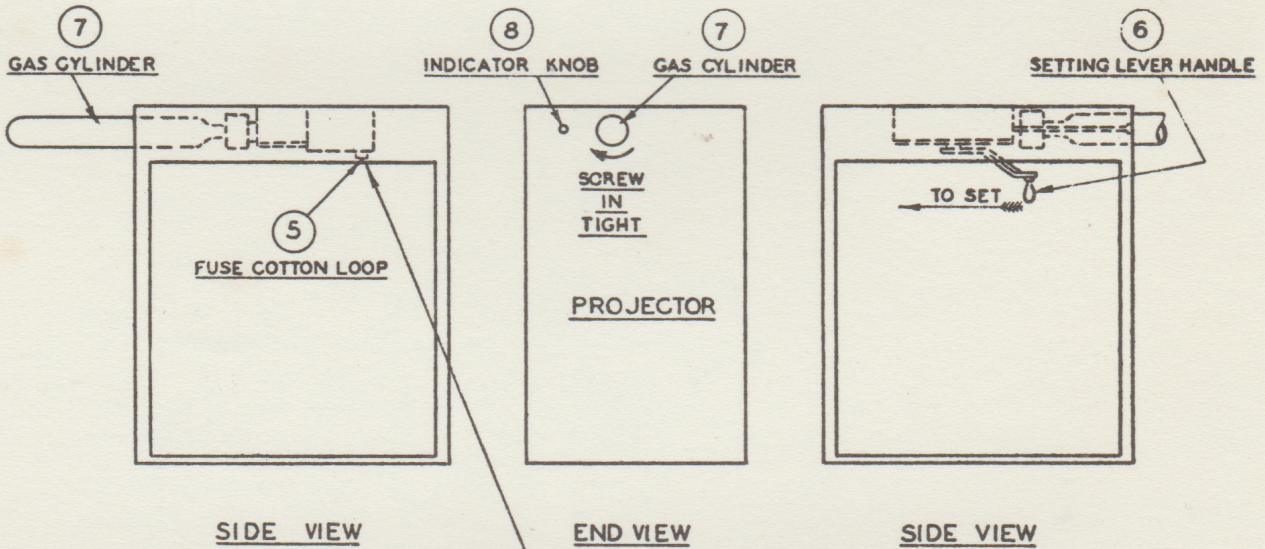


VIEW SHOWING TRIGGER HEAD WITH PINS FACING UPWARDS, AS WHEN SETTING MECHANISM.



VIEW SHOWING TRIGGER HEAD SWIVELLED, WITH CELLULOID FUSE LINK UNDERNEATH IN OPERATING POSITION.

PLAN VIEWS OF TRIGGER HEAD



IT IS ESSENTIAL THAT:—

FUSE COTTON LOOP SHOULD BE IN POSITION.

TRIGGER SHOULD BE IN SET POSITION.

INDICATOR KNOB SHOULD NOT PROTRUDE. —

— WHEN AFFIXING GAS CYLINDER.

PLAN VIEW

FIG. N.

22.

danger of a serious fire, resulting from film jamming in "Picture Gate", etc., during projection is eliminated providing the unit has been correctly preset.

The nucleus of the apparatus is a cylinder of compressed CO² fire extinguishing gas N7, which in the event of a film firing in the picture gate during projection is instantly and automatically punctured. The released gas being conveyed by means of tubes to the most vulnerable points of the projector i.e., the top and bottom film loops, and the two spoolboxes. Simultaneously a gas operated plunger switches off both motor and projector lamp.

The functioning of the unit may be followed from Figure "M" (which shows a side and end elevation of the projector), and from Figure "N" where setting operations and details of the mechanism are fully illustrated. Situated above the picture gate will be seen a loop of fuse cotton N5 which issues from a small metal housing N1 inside the case. This housing contains a spring loaded plunger termed the "Trigger Bolt" N2 which is normally held in a depressed position by means of a small celluloid band N4 passed round the two pins N3. (In order to examine the trigger bolt, the housing cover M2 immediately above the housing on top of case should be removed.)

The object of the fuse cotton loop is to immediately convey any fire to the celluloid fuse link, which igniting, releases the trigger bolt and so operates the gas cylinder puncturing mechanism M6. Gas then flows through pipe M9 to cylinder M10, the piston of which actuated by the gas pressure pushes down bar M11 and returns switches to off position. Simultaneously gas enters the spoolboxes through pipes M13 and M17 and is also forced through nozzles B165 and B166 via pipes M14 and M16.

Should a cylinder be discharged it should be immediately replaced by the new one, and the unit reset, the procedure being strictly in accordance with the appended instructions.

MAINTENANCE AND REPLACEMENT OF PYRENE CO² GAS CYLINDERS.

Each gas cylinder supplied has its weight stamped on the top end of the cylinder close to the connection nipple, giving weight when empty and when full.

It is very important that the following observations be carried out :-

Check weight of CO² cylinders at monthly intervals. The 'gross' and 'tare' weights are stamped on the cylinders. The full cylinder should always weigh a minimum of 8 ozs. more than its 'tare' or empty weight.

TO SET THE EXTINGUISHER.

These instructions should be read in conjunction with Figure "N".

1. Remove the rectangular cowl N1 to be found on top of portable when the trigger bolt will be accessible.
2. Swivel the trigger bolt N2 so that the pins N3 are facing upwards.
3. Push the bolt in so that a celluloid fuse link N4 can be slipped over the two trigger pins.
4. Replace special fuse N5 through hole in trigger housing.
5. Swivel the trigger bolt so that it assumes its normal position with the celluloid link underneath.
6. Cock the piercing mechanism by pulling back the setting handle N6 to its fullest extent and release same. The red knob at the rear of portable should then be flush with projector casing.
7. Take the 8 ozs. cylinder of CO² gas N7, place same through hole provided at the rear of projector, and screw it firmly home.

8. NOTE:

Should the red knob N8 at the rear of projector be protruding at any time, this indicates that the extinguisher is not set.

Before attempting to screw in a cylinder of CO² gas it is essential the extinguisher be set and the red indicating knob at the rear of projector should not be protruding.

When dismantling, the 8 oz. cylinder of gas should be the first thing to be removed and the last thing to be fitted when setting the extinguisher.

WARNING: SHOULD A CYLINDER BE SCREWED INTO POSITION BEFORE EXTINGUISHER IS SET, UPON SETTING, THE CYLINDER WILL BE DISCHARGED.

SETTING UP FOR OPERATION.

Place the machine on its four rubber feet on a table or large case with the front near the edge of the table. Obtain the spool box assembly and by unscrewing the middle hand wheel, swing open the arms supporting the spool boxes.

Hold the assembly upright, the spool box with feet attached towards the floor.

Offer up to the front of the projector case, so that locating pins and hand screws register with their respective holes. Firstly screw up centre screw and then top and bottom screws.

Now draw back assembled mechanism and spools on to table so that the spool box feet rest thereon, and adjust feet so that machine stands firmly.

Open mechanism film side door and remove tommy bar A16 from its clip, insert in a hole of collet clamps A14 above rear feet, and loosen both so that they are free to rotate a few degrees either way.

Lift the rear of the mechanism case bodily until on approximately even keel, draw out both tubular legs, then with tommy bar, lock both collets in the direction as shown on the engraved plate on the projector.

Open opposite door and remove hexagonal telescopic take-up drive. Insert hexagonal head through aperture in case into bevel wheel socket C20 and fit opposite tubular end over hexagonal steel spindle on spool arm boss.

Fit appropriate cables to underside of projector case connecting main amplifier and source of mains supply. No possible mistake can arise as each socket has a different number of contacts Figure "M".

Connect up the rest of the installation, amplifier, speakers etc. It will be noticed to avoid confusion a system has been adopted of making :-

D.C. or A.C. to motor

3 pin (large)

A.C. to Head amplifier,
blower, etc.

3 pin (small)

Speech and H.T. circuit cable

4 pin.

Switch on motor on mechanism and allow to run for a few minutes. Film should now be laced in the projector carefully following the diagram in Figure "B".

IMPORTANT: The film should be laced up so that it is "in correct rack" with the racking roller just touching the film. By "correct rack" is meant that one complete picture is coincident with the framing plate of the gate. With the threading lamp on and by placing a piece of white card behind the gate, the picture can easily be seen. If part of one picture and part of the adjacent picture can be seen, re-adjust film on intermittent sprocket teeth, so that one complete picture is seen. The intermittent sprocket must be locked, i.e. cam J22 must be engaged with concave radius of cross J24. If this procedure is always followed it will never be necessary to use the racking movement, which places an additional strain on the film.

NEW FILM.

If new film is to be used, it is advisable to put a few drops of thin oil on the felt rollers B23 situated above the picture gate. Lace the film so that a larger loop than normal is made above the gate, thus permitting the film to rub against the felt rollers. If after use, the felt rollers have become worn or dirty, fit replacements which can be obtained cheaply from the manufacturers.

For the novice, preferably some spacing or stock of little value should be used.

Run this film, rewind, and run again until you are quite familiar with its operation. While the suitable focal length lens is sent when screen sizes and throw are known, reference to the table Figure "Q" will readily show the size to use.

The amplifier should next be put into commission in accordance with instructions under this heading. The cell housing B19 should be checked to see that there is a cell in position, similarly the exciter lamp holder. The fader should be turned about halfway up and a piece of wire flicked to and fro between the sound gate B7 and the cell housing. This should produce a pronounced 'plip-plop' sound from the speakers. Should this be so, you may be satisfied that all is ready for running. The amplifier fader should now be returned to zero.

The machine is now laced up with film, see the racking roller is swung right forward and adjust film on intermittent sprocket so that a frame registers in the aperture, the titles or the 10, 9, 8, etc., can be used for this.

Make sure bottom take-up spool is functioning and now run up machine until all titling, run up numbers, etc., are through and the first picture just about to pass through the top fire trap; now stop and await the requisite time to show.

To show, observe the following sequence: start motor turn amplifier fader up about half way, switch on lamp and sharpen up focus if necessary on lens focussing knob. While film is running, slight adjustment of fader may be required to control sound volume to requisite level.

After a few minutes run, inspect top spool box and if the spool begins to turn fairly fast, the end of the reel is approaching.

As soon as the last picture fades, be prepared to fade out sound just after the last note, switch off lamp and allow film to run out. Of course familiarity with the subjects will show the correct places to fade sound in or out.

If time permits, whip out runners in picture gate and examine for dirt or piled up emulsion, before replacing. When running mechanism without film always lift cradle rollers away from sprockets.

IMPORTANT - TROPICAL AND HIGH AMBIENT TEMPERATURES.

It is as well to bear in mind that one kilowatt of heat has to be dissipated and to do this frequent displacement of the heated air with cool air is necessary. This is difficult to attain when the air exterior to the mechanism is already at a high temperature.

If the machine is continually used under these conditions certain parts will become dangerously hot, particularly the picture gate and the exciter rectifier unit at the rear of the lamphouse.

If single machine working is employed, it is highly recommended that a few minutes pause be made after every fourth reel to enable the mechanism to cool off. Both doors should be left open and the hinged portion of the gate removed. The mechanism should then be run up without the projector lamp switched on.

With dual machine working, of course, ample time to alternately cool down the machine is available.

REAR PROJECTION.

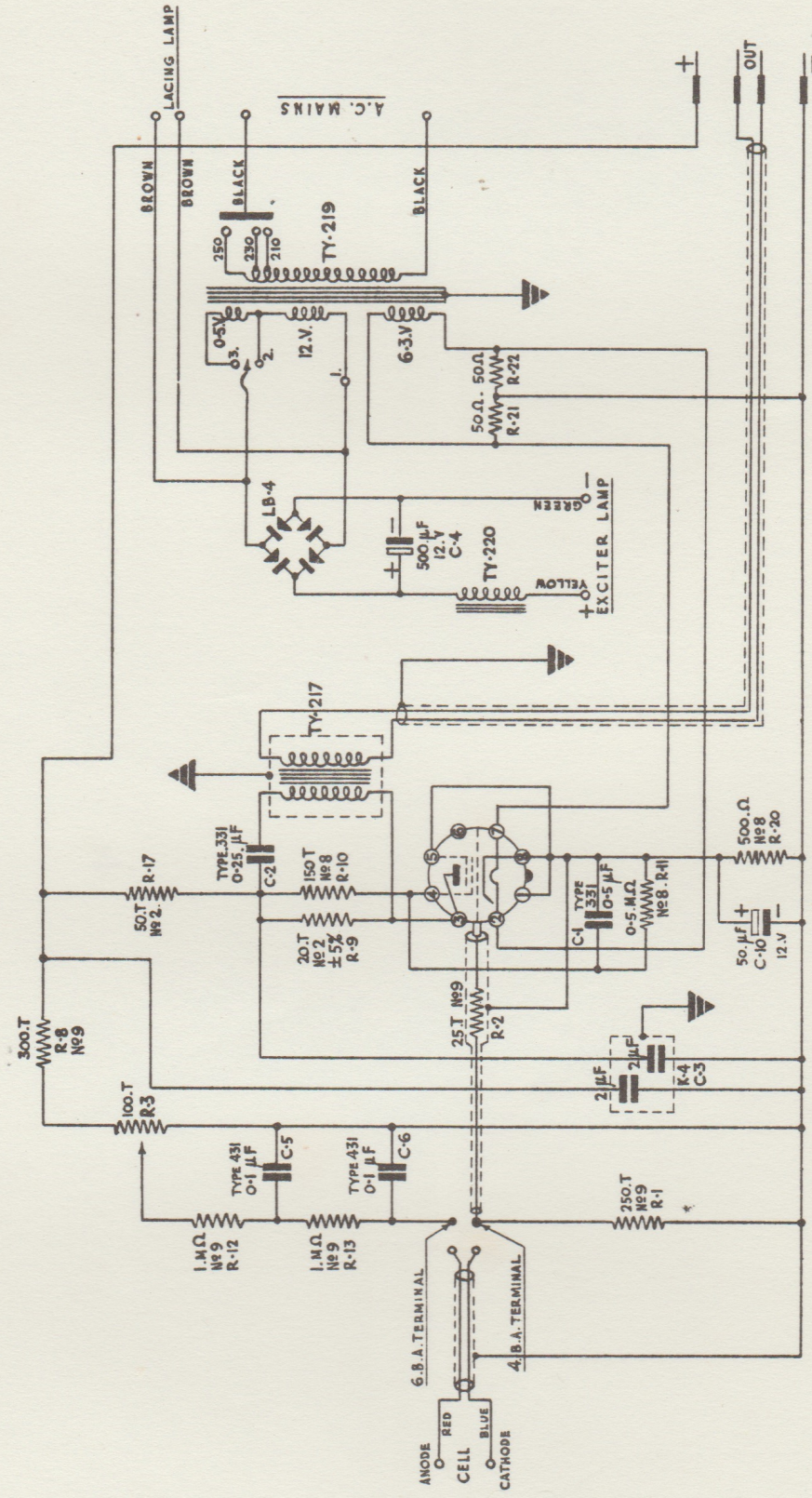
This term applies when, for lack of height or distribution of audience, it is impossible to shoot over their heads; for daylight projection, or from a mobile truck.

In this case, the picture is shown through a translucent screen, if ordinary straight projection were used, all action and titles would appear reversed. Therefore the film has to be reversed; in effect, the emulsion now faces away from the light and the sound track is away from you, or on the side nearest the bedplate. For further details see paragraph "Front to Rear Projection".

HEAD AMPLIFIER AND EXCITER SUPPLY UNIT.

The head amplifier consists of a single stage amplifier using a V312 valve and coupled to the main amplifier through a step down transformer. H.T. is obtained from the main amplifier

DRG. No MY-1959

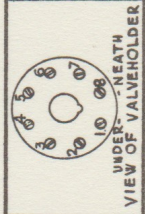


EF-36
6J7G
KTZ-63

⏚ DENOTES EARTH TO CHASSIS.

N.B. NO NEGATIVE RETURNS DIRECTLY CONNECTED TO CHASSIS

MODIFICATIONS



DRAWN	G. C. MOORE
CHECKED	
APPROVED	
DATE	19 JUNE .41

TITLE
HEAD AMPLIFIER - OCTAL
FOR SERIES 3
PROJECTOR

SPEC. No 597

DRG. No MY-1959

ML.35.

via a four cored cable which also carries the speech current. The filament supply is obtained from a small transformer incorporated in the head amplifier which also supplies the windings necessary for the type LB⁴ metal rectifier used for the exciter lamp current. The photo electric cell lead is brought out to two terminals, the anode being connected to the red wire and the cathode to the blue. It is important that no negative returns be connected directly to the chassis. Figure "P" shows the layout of the amplifier and components numbers are arranged to coincide with the numbers on the theoretical diagram "R". Voltages at certain points are also given which must be measured periodically.

IMPORTANT. All numbers shown in the head amplifier assembly diagram Figure "P" are reproduced in the theoretical circuit Figure "R", it is therefore possible to find the position of all components from the theoretical circuit. The values and characteristics of all components will be found in Appendix at back of manual.

REMOVAL OF HEAD AMPLIFIER AND SUPPLY UNIT FROM PROJECTOR CASE.

Should it be necessary to remove the head amplifier and supply unit, for replacement or repair, this is effected in the following manner :-

Lay the projector carefully on its near side. Remove the metal coverplate M128 and also fixing screws O(a) 23, 24, 25, 26 and 27 of plug panel O(a) 22.

Each of the 12 flexible leads from amplifier chassis may then be disconnected from the projector unit. These leads are clearly shown in Figure "P" along with their colour code and designations.

The small cover over cell lead connection on amplifier chassis is removed by slackening the two small terminal nuts.

and the cell lead detached from its terminals. Following this the exciter lamp leads are disconnected; green from projector frame, and yellow from exciter lamp holder terminal. To disconnect leads from plugs, remove the small screw in the side of plug, adjacent to large earth pin, raise plug panel and the ebonite insert can then be withdrawn, disclosing terminal screws. Finally disconnect leads from lacing lamp holder.

The 3 screws in the base of the projector (shown dotted M19, M20 and M21) are now withdrawn and the chassis removed.

When replacing the unit, care must be taken that the leads are connected in strict accordance with the colour codes and designations given in Figure "P".

"ADJUSTMENTS AND RUNNING MAINTENANCE".

CROSS BOX.

Unless a really competent mechanic is available internal adjustments to the cross box are not advised. However, if one is available the following procedure should be adopted:-

First remove the motor coupling C29 by slackening grub screws C31 and C32 and sliding one half of the coupling C27 along the shaft C55. Remove the four large headed screws B113, B114, B115 and B116 on the other side of the bedplate. These are unobstructed and centred about the intermittent sprocket.

The whole cross box and sprocket may then be removed intact.

With the cross box on a bench or held gently in a vice, first remove the two bolts J6 and J7 and drain out the oil. Now remove the flywheel J1 by slackening the centre nut C22 to the left and continuing to unscrew. This will automatically extract the flywheel off its spindle J2.

Remove all screws fixing the rear cover plate J30 and gently tap with a striking motion so that the plate leaves the dowel pins without strain.

Try for any rock or play between the two ends of the radius J24 and the cam. There should be no suspicion of play, if so, slacken the large hexagon nut J26 outside the cross box on the sprocket end of the cross shaft bearing, slacken the screw C108 at the side of the casting near bedplate edge and with a spanner fitting the flats on bearing, slightly revolve the whole bearing either way until play is taken up. Actually it should be adjusted till it just binds, and then slacken back till just free.

Tighten the side screws C108 which will prevent the bearing rotating from the setting.

Now check up the striking roller J9 in relation to the cross as shown in Figure "L".

A centre line through centre of pin wheel and roller is described and another line through centre of cross shaft and roller: with the roller just halfway into a cross groove, the angle between the two centre lines must be a dead 90 degrees, also there should be no rock between cross and roller on cam.

An error either side of 90 degrees will in turn cause a hammering on either side of the cross slot, which will necessitate renewal of the cross.

The correct position may be obtained by slackening the lock nut of the striking roller pin shaft which is eccentric, and a taper fit. The pin wheel shaft J2 should now be spun by the fingers, and the roller J9 should enter and leave the cross with a nice silky motion, free from jar or knock.

Should a pin wheel shaft J2 or cross spindle bearing be worn, or the spindles themselves, rebushing and renewal is necessary. Provided adequate clean oil is present, this should not be necessary for a few years.

The main shaft should be inspected for endplay which should not exceed .001 inches. Any correction necessary may be carried out by the insertion of a thin shim behind the hardened thrust washer J29.

When satisfied that all requirements have been attended to, replace the back cover making sure that it is up true, and oil tight.

It may be found that a slight alteration of the meshing between cam J22 and cross J24 has occurred. If so, slacken off side screw C108 and re-adjust bearing trying with the sprocket till the last suspicion of backlash disappears, and yet the pin wheel spins quite freely.

When set, tighten side screws C108 and lock up large hexagon nut J26, try movement once more to verify that bush has not shifted. If all appears to be well fill up with oil and replace flywheel.

SPROCKETS.

After many months wear, these may be inspected to see if wear or hooking is developing. This is evident on closely watching the film if a clinging action is apparent when the teeth leave the film. Examination of the teeth with a magnifying glass will show if an undercut or concave side to the teeth exists, if so the sprockets may be removed from their spindles and turned round. "Hooking" may also be caused by the sprocket teeth being damaged by a knock, thus causing the teeth to become burred, if this is the case, the burr can be readily removed with the aid of a stone or very fine file.

LUBRICATION

No piece of machinery will function for long if lubrication is neglected. A study of Figure "C" shows the back of the projector with the sound head amplifier removed.

Special "Oilite" bearings are fitted throughout the projector thus danger of seizure is practically non-existent. "Oilite" is a bronze of cellular structure impregnated with

lubricating oil in such a manner that the cells within the metal act as an oil reservoir, and at the same time meter a continuous film of oil to the surfaces by a combination of capillary and syphonic action. They maintain a continuous film of oil between the bearings surface and the moving member, the volume of the film adjusting itself automatically to suit varying conditions of speed, pressure and temperature in the bearing.

The oiling points to Figure "C" are as follows:- C74, C8 C73, C51, C52, C53, C50, C49, C45 and C48 all of which need very little light oil. C23 is the main filling cap for the cross box which should be occasionally topped up with medium bodied machine oil or a light grade car engine oil, to half way up the circular window C24, beneath pinwheel flywheel. The gears should be lightly smeared with an anti-centrifugal grease, such as Castrol "Unijoynt" or "Stayput" and oil or grease wiped away. Beneath the cross box are two drain plugs C25 and C26. The one nearer the bedplate should be removed about once weekly and a shallow tin allotted to catch the drainings. This is a drain sump for any oil that may work beyond the forward bearings of the intermittent shaft. The other plug drains the main reservoir and should be removed every six months, the box being drained and refilled with fresh oil. If the machine is used daily, more frequent changes will be beneficial.

Gears should be lubricated with Graphite grease.

Vaughans 310 oil should be used for the cross box.

MOTORS.

BLOWER MOTOR.

Series Wound 1/40 H.P.
230v 50 cps. single phase, 6500 R.P.M.

PROJECTOR DRIVING MOTOR

Two types of motors can be supplied for fitting to the projector, one for 230 volts A.C. operation and the other for 110 volt D.C. operation.

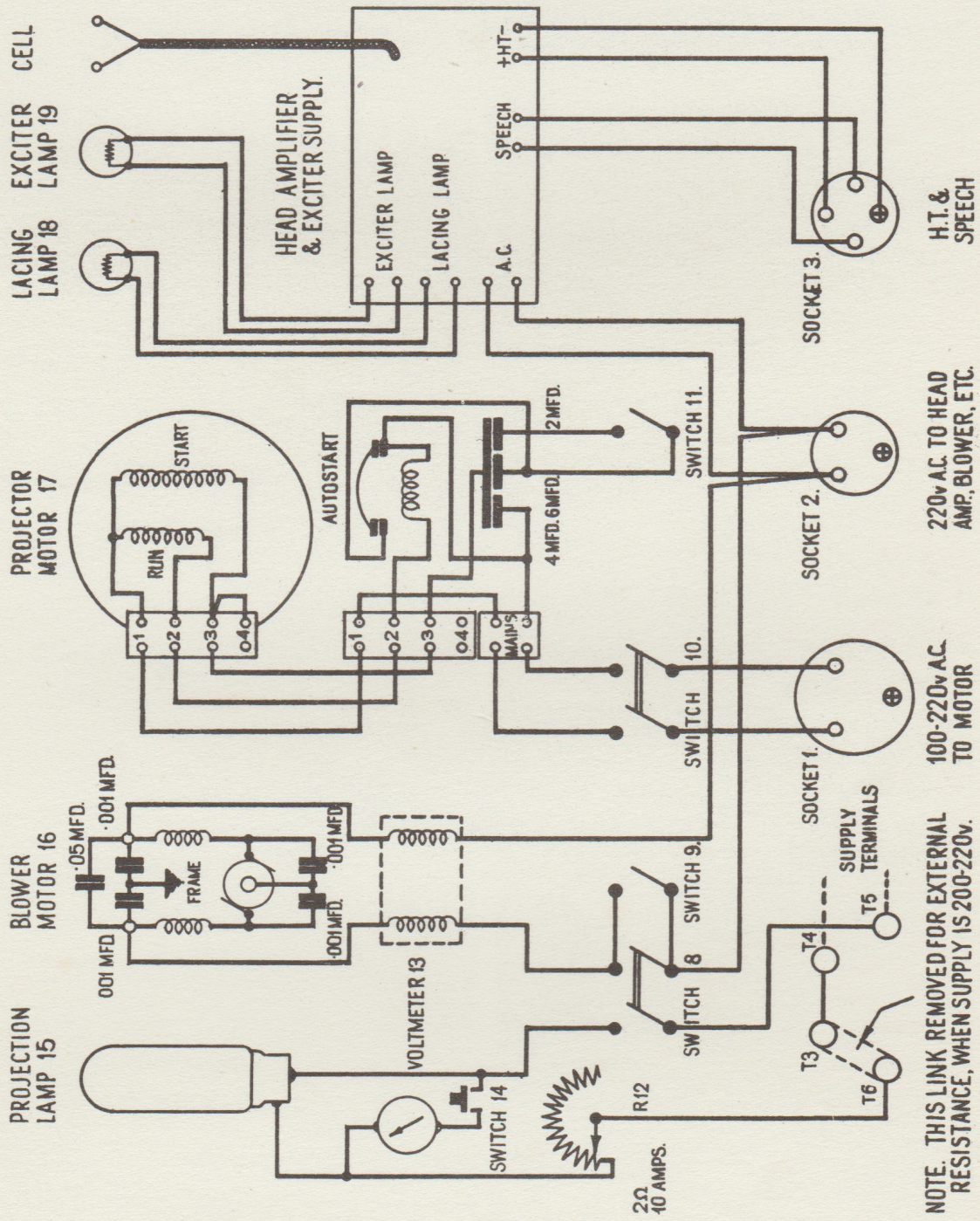


FIG. 5.

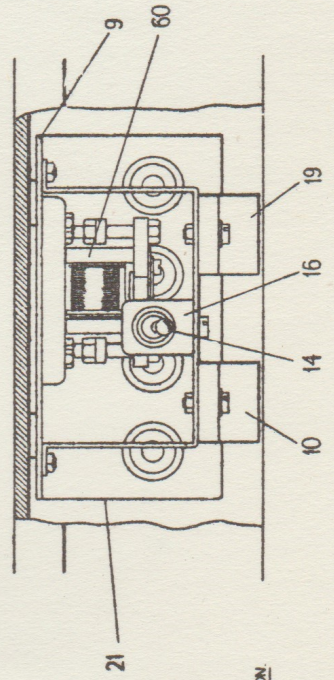
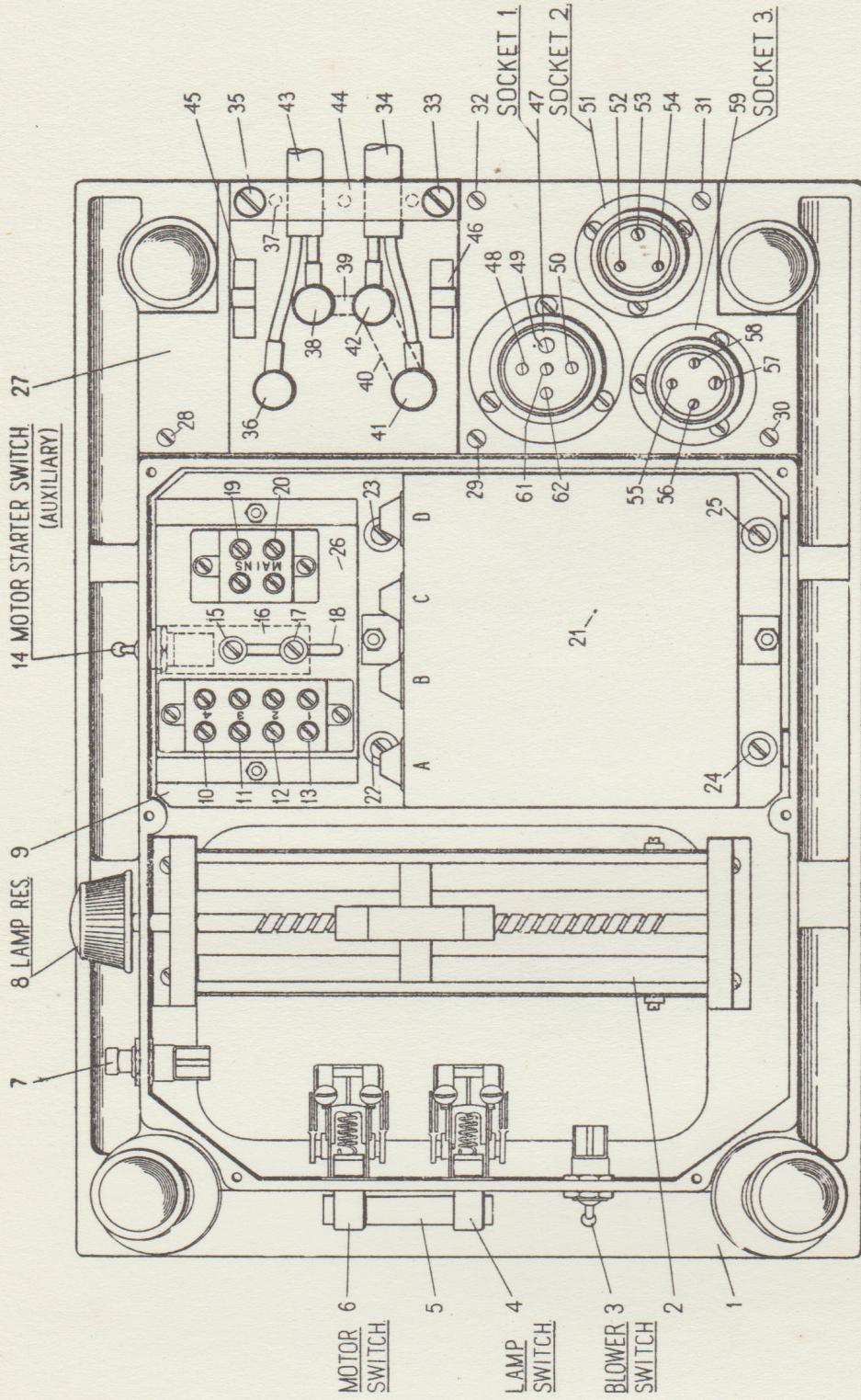


FIG. 0(b).

PROJECTOR BASE SET UP FOR A.C. OPERATION.

A.C. DRIVING MOTOR.

1/8 H.P. single phase capacitor type
1440 R.P.M. 230v. 50 cps.

D.C. DRIVING MOTOR.

1/8 H.P. Compound Wound for 90 volt line
condenser in each line housed inside
motor frame 1440 R.P.M.

The A.C. Driving motor is a single phase capacitor type, condensers are used both for starting and running, a somewhat larger capacity being used for starting than for running. There are two winding, running and starting and both are always in use when current is applied. Switching arrangements provide for a capacity of about 12 mfd. to be placed in series with the starting or auxiliary winding, and when the motor attains full speed, the capacity is reduced to about 4 mfd.

PROJECTOR BASE (LAYOUT FOR A.C. OPERATION).

Figure O(b) shows the base of the projector with the metal baseplate cover removed. The components are as follows:-

- O(b) 2 Variable slider resistance for adjustment of projector lamp voltage.
- O(b) 3 Blower motor switch.
- O(b) 4 Projector lamp switch.
- O(b) 5 Plunger bar coupling projector lamp and motor switches for Pyrene attachment.
- O(b) 6 Motor starting switch.
- O(b) 7 Press button switch for voltmeter reading.
- O(b) 14 Auto start switch for increasing capacity across starting winding of motor.

PROJECTOR BASE (LAYOUT FOR D.C. OPERATION).

The layout for D.C. operation is similar to that for A.C. operation except that the centre portion of the base containing the auto start and connecting blocks are removed and in its place is fitted variable resistance O(a) 11 for controlling the motor speed.

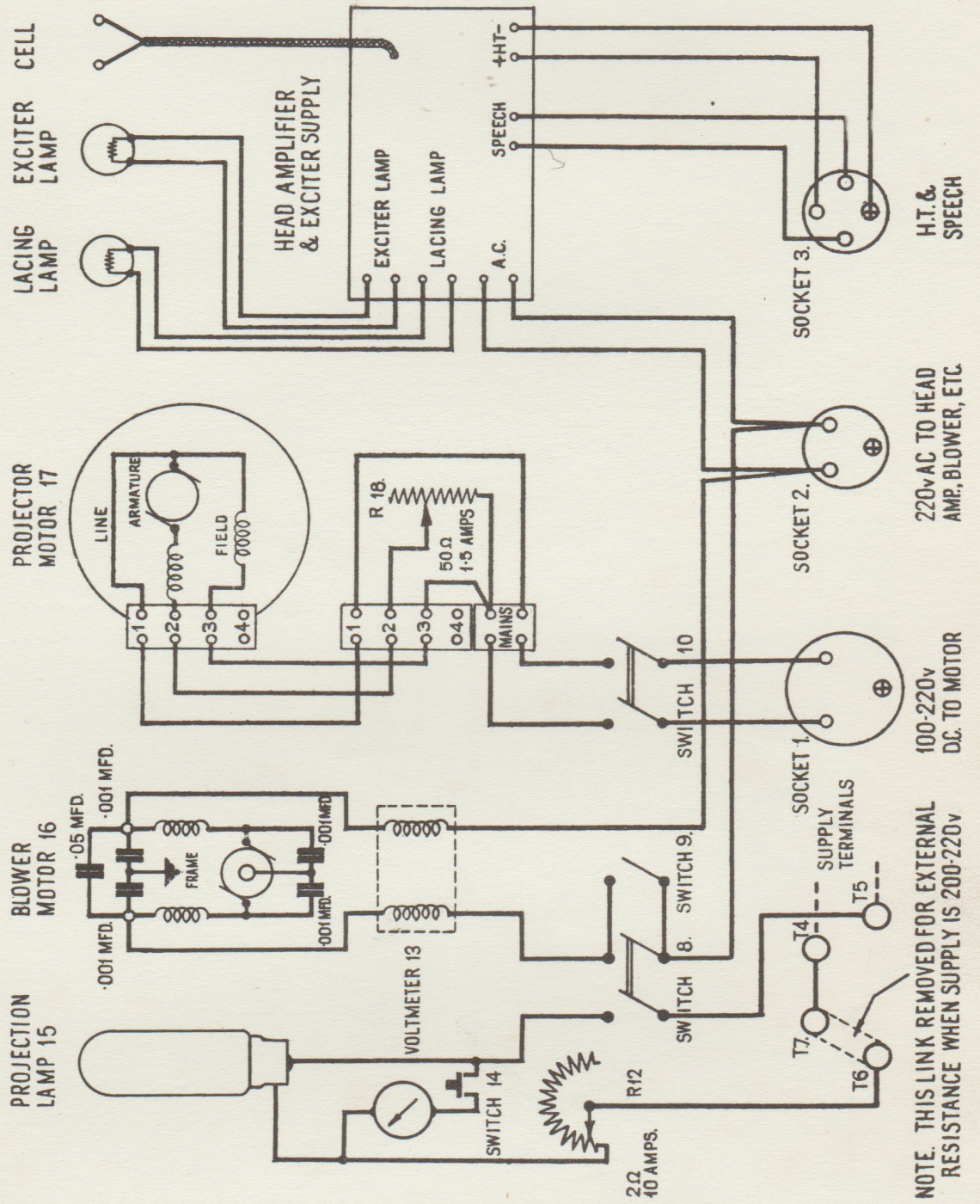


FIG. U.

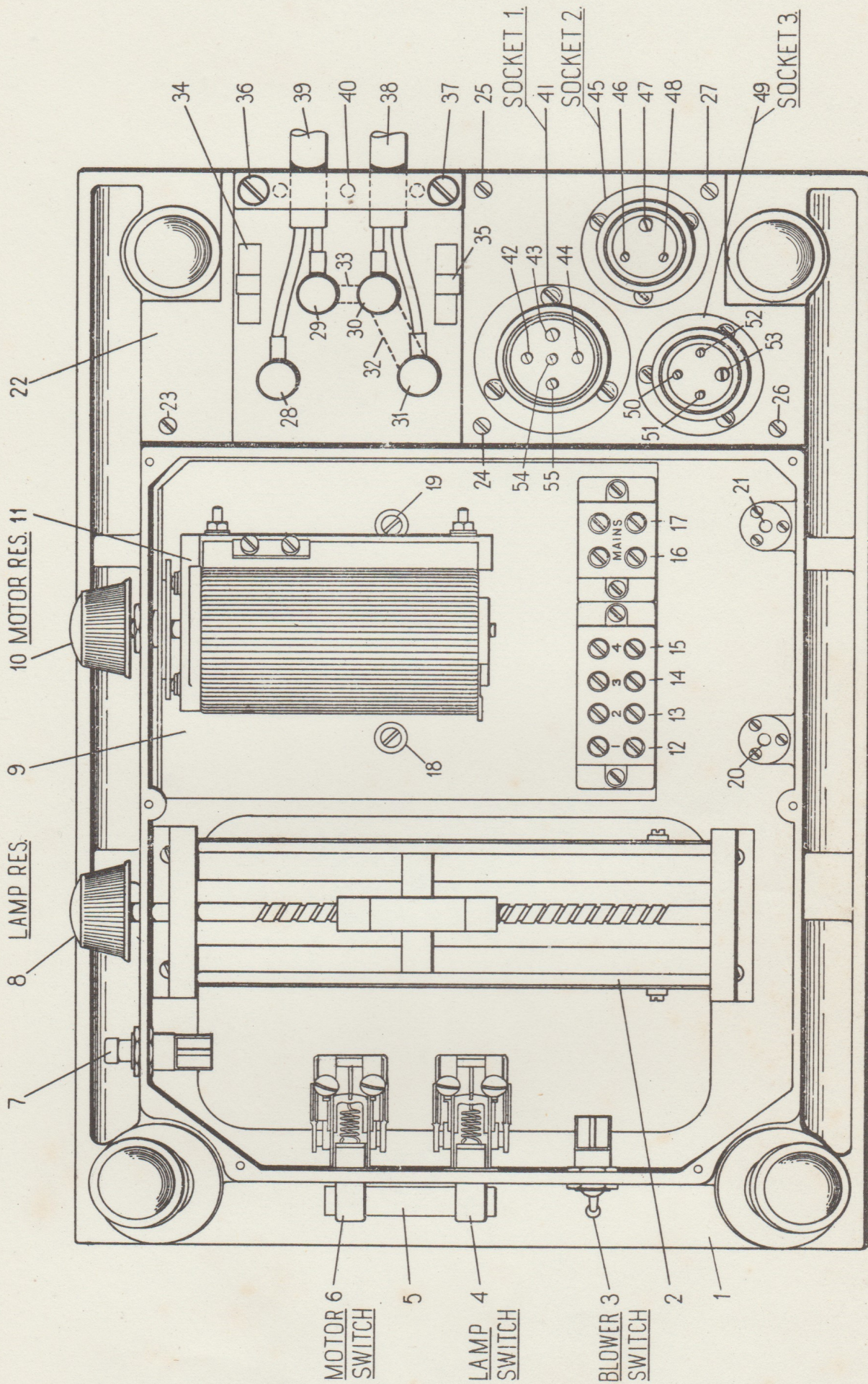


FIG 0(a)

PROJECTOR BASE SET UP FOR D.C. OPERATION.

CHANGE OVER FROM A.C. TO D.C. (BASE LAYOUT).

Disconnect wires from connecting blocks O(b) 10, 11, 12, 13, 19 and 20: slacken off two screws O(b) 15 and O(b) 17 and slide auto start switch towards back of machine. Withdraw screws O(b) 22, 23, 24 and 25 and lift complete unit out of case. Replace with D.C. unit first inserting motor control spindle through base casting, replacing nut and control knob. Fix panel by means of screws O(a) 18 and O(a) 19 and connect wires to connecting blocks taking care that similar colours are opposite each other. Replace the two screws O(a) 20 and O(a) 21 so that they may be used on A.C. if required.

FITTING PROJECTOR MOTOR.

Figure "C" shows the projector driving motor in position fixed by four hexagonal bolts C34, C35, C36 and C37, coupled to the cross box C111 by means of a rubber composition coupling C29. The coupling is divided into three sections C27, C28 and C29; C27 and C28 each have three pins which are more clearly shown in figures F20, F21 and F22, whilst the rubberised coupling has six holes. If therefore the half coupling C28 is pushed to the end of the motor shaft whilst C27 is slid along its shaft C55 towards C28, three pins of one coupling C27 will fall into three holes in the rubber, whilst the three pins in C28 will fall into the remaining three holes. If the two grub screws C31 and C32 are then tightened the coupling will be completely assembled and any mechanical vibrations from the motor will not be transmitted along the shaft to the cross box. The motor leads are connected to the four way "Ebonestos" block, each to its appropriate colour C38, C39, C40 and C41. Thus if the motor is to be removed it is only necessary to withdraw four motor leads from Ebonestos blocks, slacken off grub screws C31 and C32 slide coupling apart on shaft and withdraw the four motor fixing bolts C34, C35, C36 and C37. If, when a motor has been

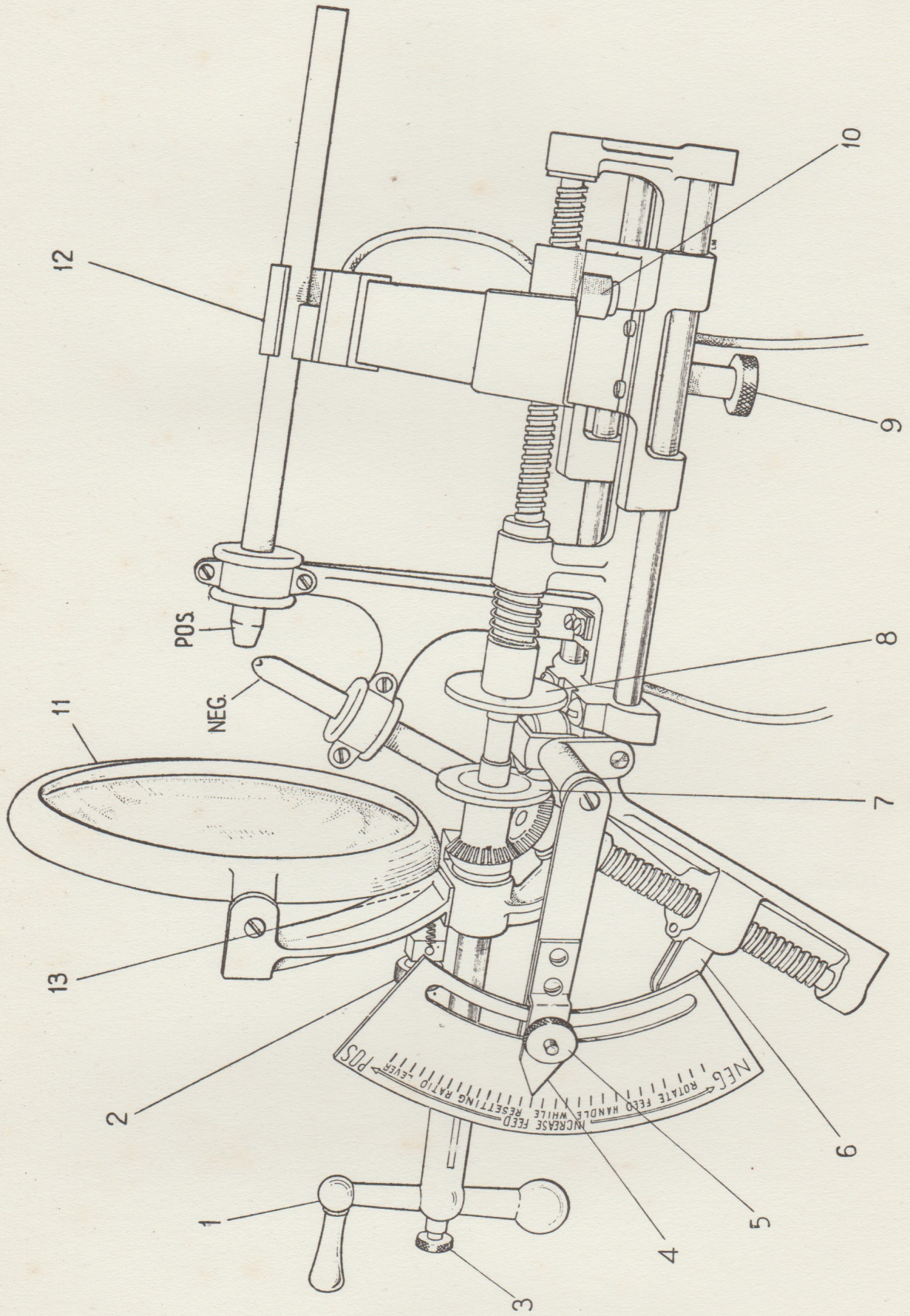
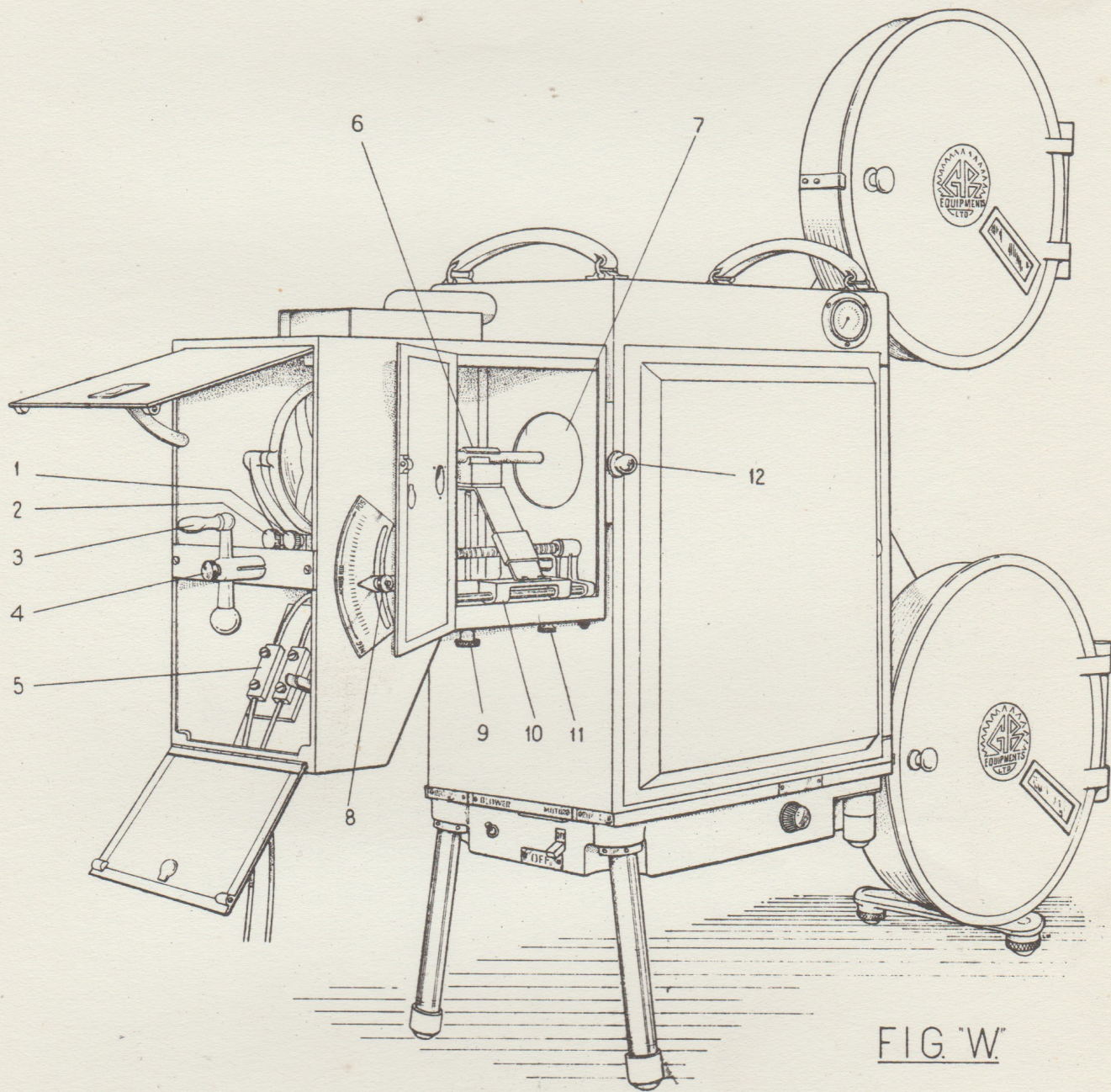


FIG. "V"

FIG. "V"
ARCLAMP MECHANISM ASSEMBLY

PART NO.	DESCRIPTION	PART NO.	DESCRIPTION
625/104	MIRROR SPIDER ASSEMBLY.	625/207	NEG CARRIAGE RELEASE TRIGGER.
625/106	POS. CLAMP SCREW ASSEMBLY.	625/208	THRUST WASHERS.
625/107	NEG. CLAMP SCREW ASSEMBLY.	625/209	THRUST WASHERS FOR BALL RACE.
625/112	POS. RELEASE CATCH ASSEMBLY.	625/210	COLLARS ON LEAD SCREWS.
625/113	NEG. CARRIAGE TRIGGER ARM ASSY.	625/211	POS. FEED KNOB BUSH.
625/115	MAIN FRAME.	625/212	POS. FEED KNOB.
625/116	MIRROR FRAME.	625/213	NEG. FEED KNOB BUSH.
625/117	UPPER BEARING.	625/214	NEG. FEED KNOB.
625/119	POS. CARBON CARRIAGE.	625/218	SPRINGS FOR MIRROR FRAME.
625/120	GIMBAL.	625/219	ANCHOR PILLAR FOR SPRING.
625/121	LOWER BEARING.	625/220	SPRING FOR NEG. RELEASE TRIGGER.
625/122	POS. CARBON HOLDER BRACKET.	625/222	INSULATING BUSHES FOR POS. HOLDER.
625/125	SUPPORT PLATE FOR LAT. ADJ. SCREW.	625/223	INSULATING BUSHES FOR NEG. HOLDER.
625/126	NEG. CARRIAGE GUIDE BAR.	625/225	GUARD PLATE FOR POS. HOLDER.
625/127	POS. HOLDER GUIDE BLOCK.	625/226	INSULATOR, POS. HOLDER. (TOP)
625/128	NEG. HOLDER GUIDE BLOCK.	625/227.	INSULATOR, POS. HOLDER. (BOTTOM.)
625/129	POS. "V" PLATE FOR 12MM. CARBONS.	625/228.	INSULATOR NEG. HOLDER. (TOP)
625/130	POS. "V" PLATE FOR 6MM. CARBONS.	625/229	INSULATOR NEG. HOLDER. (BOTTOM.)
625/131	NEG. "V" PLATE FOR 9MM. CARBONS.	625/230	POSITIVE LEAD.
625/132	NEG. "V" PLATE FOR 5MM. CARBONS.	625/231	NEGATIVE LEAD.
625/133	POS. "V" BLOCK FOR 6-12MM. CARBONS.	625/301	SCREW HOLDING 625/117 TO 625/115.
625/134	NEG. "V" BLOCK FOR 5-9MM. CARBONS.	625/303	SCREWS HOLDING 625/126 TO 625/117.
625/135	POS. SLIP NUT.	625/304	SCREWS IN 625/107.
625/136	NEG. SLIP NUT.	625/306	SCREWS HOLDING 625/122 TO 625/133.
625/142	MIRROR ADJ. SCREW (VERT. MOVEMT.)	625/307	SCREW FOR 625/131 OR 625/132 TO 625/128.
625/143	MIRROR ADJ. SCREW (LATERAL MOVEMT.)	625/308	SCREW HOLDING 625/122 TO 625/119.
625/144	KNOB FOR MIRROR ADJUSTING SCREWS.	625/309	SCREWS HOLDING 625/225 TO 625/122.
625/145	POSITIVE FEED SPINDLE.	625/310	SCREWS HOLDING 625/130 TO 625/127.
625/146	NEGATIVE FEED SPINDLE.	625/314.	SCREWS HOLDING 625/212 & 214 TO 625/211.
625/147	MIRROR FRAME PIVOT SCREWS.	625/315.	SCREW IN 625/135.
625/149	GUIDE ROD FOR CARRIAGE.	625/318	NUT FOR 625/201.
625/150	TRUNION SCREWS.	625/320	NUT FOR 625/308.
625/201	PIVOT STUD FOR MIRROR FRAME.	625/322	WASHER FOR 625/201.
625/202	RETAINING SCREW FOR PIVOT STUD.	625/321	WASHER FOR 625/306.
625/203	BEVEL GEAR. (DRIVER).	625/332	TAPER PINS.
625/204	BEVEL GEAR. (DRIVEN).	625/333	TAPER PINS.
625/205	NEG. FEED COUPLING SCREW.	625/342	BALL THRUST RACE.
625/206	BLOCK FOR MIRROR ADJ. SCREW.	628/111	MIRROR.



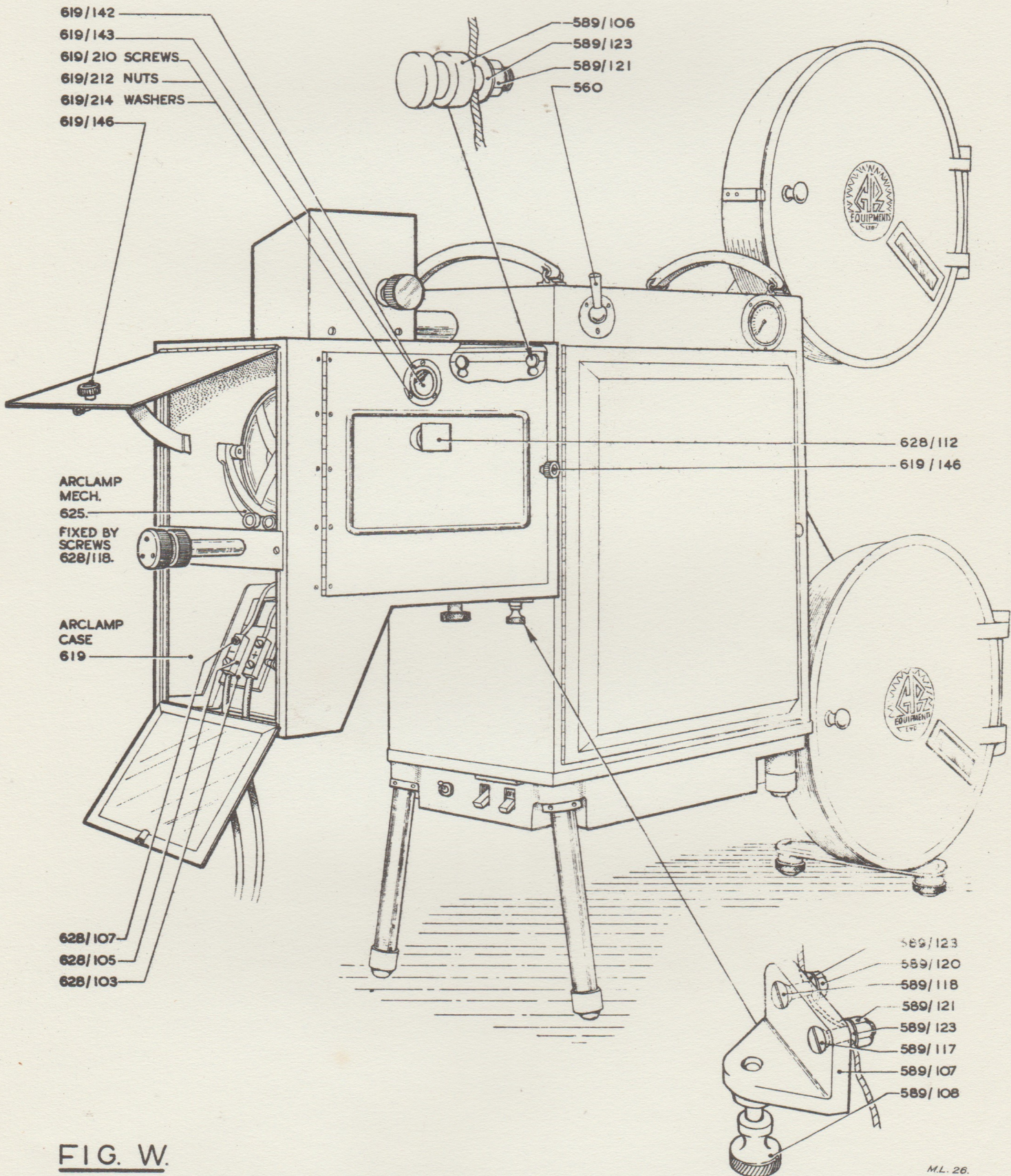


FIG. W.

FIG. "W."

PROJECTOR WITH ARCLAMP ATTACHMENT.

PART NO.	DESCRIPTION
560	ARCLAMP CUT-OFF COMPLETE.
589/106	STUDS, SUPPORTING ARCLAMP CASE.
589/107	BRACKET FOR ARCLAMP CASE.
589/108	CLAMPING SCREW.
589/117	REAR SCREW, FIXING BRACKET.
589/118	FRONT SCREW, FIXING BRACKET.
589/120	NUT FOR REAR SCREW.
589/121	NUT FOR FRONT SCREW, & STUDS.
589/123	WASHERS ON SCREWS.
619	ARCLAMP CASE COMPLETE.
619/142	CLAMP FOR GLASS.
619/143	RUBY GLASS.
619/146	DOOR KNOBS.
619/210	SCREWS HOLDING GLASS FRAME.
619/212	NUTS FOR SCREWS.
619/214	WASHERS FOR SCREWS.
625	ARCLAMP MECHANISM COMPLETE.
628/103	INSULATING BLOCK.
628/105	TERMINAL BLOCK.
628/107	SCREWS IN TERMINAL BLOCKS.
628/112	PERISCOPE.
628/118	SCREWS FIXING MECHANISM TO CASE.

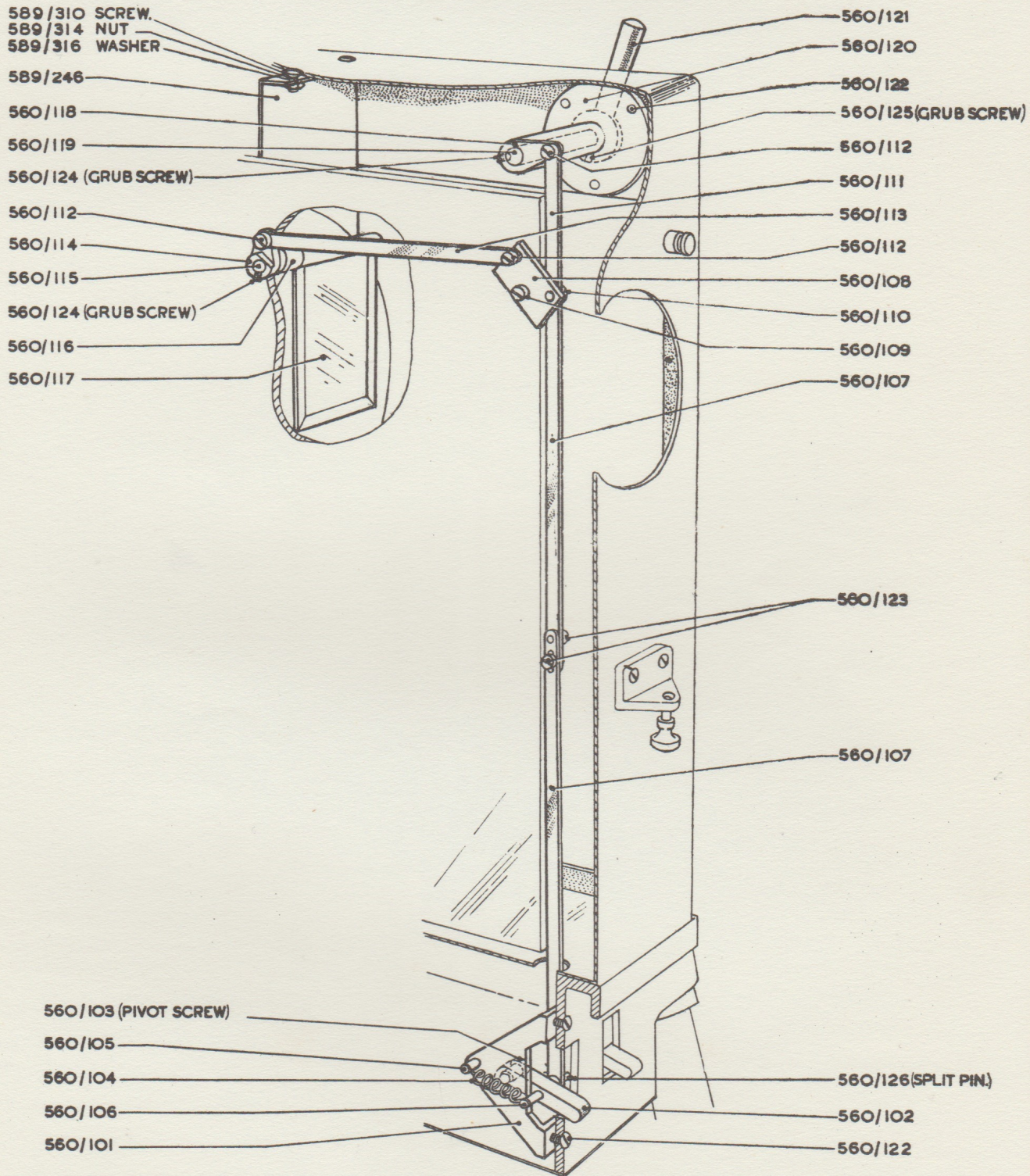


FIG. X.

ARCLAMP CUT-OFF.

PART NO.	DESCRIPTION
560/101	SUPPORT CASTING.
560/102	OPERATING TOGGLE.
560/103	TOGGLE PIVOT PIN.
560/104	SPRING.
560/105	SPRING ANCHOR PIECE.
560/106	CONNECTING PIN.
560/107	CONNECTING LINKS (LONG.)
560/108	SWIVEL PLATE.
560/109	PIVOT PIN FOR SWIVEL PLATE
560/110	RETAINING SCREW.
560/111	CONNECTING LINK. (SHORT)
560/112	RETAINING SCREWS.
560/113	CONNECTING LINK. (MEDIUM)
560/114	SHUTTER LINK PIECE.
560/115	SHUTTER SHAFT.
560/116	SHUTTER BUSH.
560/117	SHUTTER ASSEMBLY.
560/118	LINK PIECE.
560/119	SPINDLE.
560/120	BEARING.
560/121	HANDLE.
560/122	SCREWS SECURING 560/101 & 560/120.
560/123	SCREWS SECURING 560/107.
560/124	SCREWS IN 560/114 & 560/118.
560/125	SCREW IN 560/121.
560/126	SPLIT PIN.
589/246	FILM GUARD.
589/310	SCREWS SECURING 589/246.
589/314	NUTS FOR SCREWS 589/310.
589/316	WASHERS FOR SCREWS 589/310.

fixed to the mechanism excessive vibration occurs, slacken off the motor fixing screws and realign it, turning the mechanism over by hand before restarting the motor.

OPERATION OF "N" SERIES 3 ARC-LAMP ATTACHMENT.

The underlying principle in the design of this lamp is sheer simplicity of operation, so that certain of the little refinements common to the theatre type lamp are absent.

It is virtually a single knob control piece of apparatus but these facts by no means mar its performance, and extraordinarily good results are obtainable. The current carrying capacity is from 20 to 30 amps with 45 volts across the arc: 12 mm positive and 9 mm negative "Ship Luxe" or any make of similar intensity carbon is suitable, but both positive and negative carbons must be 8 inches in length.

The carbons provided the sizes specified are used, are kept in correct alignment by bushes of a highly refractory nature placed near the arc. This ensuring of alignment also automatically maintains the crater (within certain limits) in focus and only deliberate mal alignment will defect this object.

Quick release nuts enable the positive and negative carriages to be rapidly returned for re-carboning.

SETTING UP.

The lamphouse is offered up to the two studs at the top rear of the projector case and the lower captive screw in bracket inserted in the underside of the lamphouse and screwed up.

The side and two rear doors should be opened, the latter requiring the control handle V1 in a horizontal position to pass. It should be ascertained if the spindle holding the mirror gimbal V13 is forward in the slotted bracket. Adjust the ratio lever V4 so that the pointer is about five divisions above the midway line. A 12 mm x 8 inch carbon should be

inserted in the horizontal positive holder V12 and the carriage adjusted so that it is about 2 turns of the feed screw from the beginning of its travel.

A 9 mm x 8 inch carbon is now inserted in the inclined or negative holder and this carriage also set about 2 turns up.

The carbons should be adjusted so that the lower edges of their tips just touch. This point should measure $2\frac{1}{2}$ inches from the centre of the mirror, if not, slide the gimbal spindle and lock up when this distance is reached.

Connect up the arc supply leads with a suitable control resistance in circuit, to the two terminals W5, taking care that the positive line is connected to the positive terminal. The leads should be brought through the aperture in the bottom of the house.

STRIKING UP.

Remove any film from the machine and see that the sliding cut-off W12 is closed. The carbons should now be backed away about one turn of the handle W3, adjust resistance to first or second stud and close switch to supply. Close carbons slowly and immediately a light is produced, back away about half to one turn of the handle. Adjust resistance so that ammeter reads about 20 amps, and separate carbons so that about $\frac{1}{4}$ to $\frac{3}{8}$ inch gap results. Keep current adjusted to about 20 amps and check volts across the arc, which should average about 45 volts.

ADJUSTING MIRROR.

Two screws adjust the mirror, one in a vertical direction and the other in a sideways movement. The mirror is swung till the circular spot of light is concentric on the cut-off blade in its aperture.

The mechanism should now be started and further adjustments made, till the light spot floods the picture gate aperture concentrically and an even white light appears on the screen.

It will be found that these adjustments are fairly critical.

CARE AND MAINTENANCE.

Keep the inside of the lamp clean and dust out all carbon dust, making sure none accumulates on the insulation of the carbon holders.

Occasionally oil with a graphite impregnated oil, all moving parts, taking care none gets on the friction drive surfaces.

The mirror is best removed for cleaning and this may be done by a slight rotation to the left of the spring spider at the rear. Never attempt to handle the mirror while it is hot as it will crack. Should the negative carriage fail to move, the friction drive may be slipping; unless the negative carriage and drive is quite free this may happen. Do not attempt to force the drive if this happens, but remove the arc mechanism from the case as follows: Open rear doors, remove control handles and bridge strip between doors, two screws in the rear cross member of the frame casting, and one in the front cross member, hold the mechanism in the house. Removal of these enables the whole mechanism to be withdrawn.

The flexible leads from the terminal block obviously needs disconnecting as well.

The roughened faces of the driver and driven disc should be cleaned with a wire brush.

The forward or driven disc should be pressed away from the planetary roller, and the rear or driven disc rotated with the fingers: if it is not free to revolve, it is useless expecting the drive to work, and free movement must be restored before proceeding further.

Causes of stiffness may be: the rear disc and sleeve binding through lack of lubricant, foreign matter in the bevel drive teeth, jamming of the slip-nut on its thread, seizure of the inclined spindle in its bearings.

It should be born in mind that the friction drive, whilst adequate for its normal load, will not drive against excessive load. Stiffness in the positive carriage will not affect the friction drive, as the former is a direct drive.

BURNING RATES.

The arc feed control should be rotated about half a turn every minute so as to make up for the burning of the carbons, and observation should be kept that the position of the arc crater and the relative alignment of the carbon remains as originally set. If there is a tendency for the positive to run over the tip of the negative and the crater to form on the under side of the positive, the positive feed rate is too high and the ratio arm should be lowered.

Conversely, if the negative tends to rise and obscure the crater from the mirror, the negative feed should be slowed down by increasing the ratio arm to the positive side.

A little experience soon determines the correct feed settings.

As soon as the carbon carriages approach the end of their travel they should be slid back, the carbon clamps released, fresh carbon fed forward, and set as described in "Striking Up".

Particularly notice the burning rates of the carbons you are using at the normal amperage and if there is a risk of burning out before a reel finishes re-carbon up before starting the reel.

TECHNICAL DATA REFERRING TO ELECTRICAL
COMPONENTS

- R.1. Madza type V312 valve:
Heater volts 4 v 1 amp. Anode voltage 140v.
Anode current 4.5 - 6 Ma.
A.C. resistance 11,700 ohms.
Mutual conductance 3.0.
- R.2. Low tension rectifier, full wave type LB4 (Westinghouse)
- R.3. Mains transformer type 4056A.
Threading lamp winding 12 volts 0.5 amps.
Valve heater winding 4 volts 1.0 amps.
Primary tapped at 200/210v, 220/230v,
240/250v.
- R.4. Inter valve transformer as Ferranti type RD36.
D.C. resistance (a) Primary 900 ohms.
(b) Secondary 13 ohms.
Primary (middle bobbin) 5000 turns of 39 enamel copper
wire.
Secondary (Inner and Outer bobbin) 333 + 333 turns of
27 enamel copper wire.
Secondary Impedance at 1 volt R.M.S.
(a) at 50 cycles. Primary open circuit approx.
600 ohms.
(b) at 1000 cycles. Primary loaded with 12,000
ohms approx. 240 ohms.
- R.5. 0.1 μ F Condenser type 431 (T.C.C.)
- R.6. 0.1 " " " " "
- R.7. 0.005 " " " "M" "
- R.8. 2 + 2 " " " K4 "
- R.9. 2 + 2 " " " K4 "
- R.10. 50 " Electrolytic condenser (T.C.C.) 12v.
- R.11. 500 " " " " "
- R.12. 1 megohm $\frac{1}{4}$ watt Resistor (Erie)
- R.13. 1 " " " "
- R.14. 1 " " " "
- R.16. 15,000 ohm 1 watt Resistor "
- R.17. 15,000 " " " "
- R.18. 15,000 " " " "
- R.19. 25,000 " Type 4N "

- R.20. 300 ohm $\frac{1}{2}$ watt Resistor (Erie)
 R.21. 20 " 1 " " "
 R.22. 20 " 1 " " "
 R.23. 250,000 ohm $\frac{1}{4}$ watt Resistor (Erie)
 R.25. Anode of cell (I.E. pin C of valve holder on bedplate)
 R.30. 100,000 ohm potentiometer.
 R.31. 300,000 ohm resistor.
- B.147
 & 148 Suppressor choke type T.163.
 D.C. Resistance 1.35 ohms.
 Total Inductance 550 microhenries.
 Winding 200 turns No. 24 S.W.G. D.C.S. Wire.

L A M P S

PROJECTOR LAMP.

Class A1 Monoplane lamp 1000 watts 100 volt with G.E.S. cap. Filament height 120 mm from centre contact cap.

EXCITER LAMP.

6 volts 1 ampere.

THREADING LAMP.

12 volts 0.2 amperes.

M O T O R S

BLOWER MOTOR.

Type MK5 U.J.E. series wound $\frac{1}{40}$ H.P. 6000 R.P.M. 230v 50 cycles single phase. Double impregnation dynamically balanced, sleeve bearings.

A.C. MOTOR (DRIVING).

$\frac{1}{8}$ H.P. Capacitor type, 1440 R.P.M. 230v, 50 cycles. Double impregnation.

D.C. MOTOR (DRIVING).

$\frac{1}{8}$ H.P. Compound wound for 90 volt line. 1440 R.P.M. Condenser from brush to frame in each line housed inside casing.

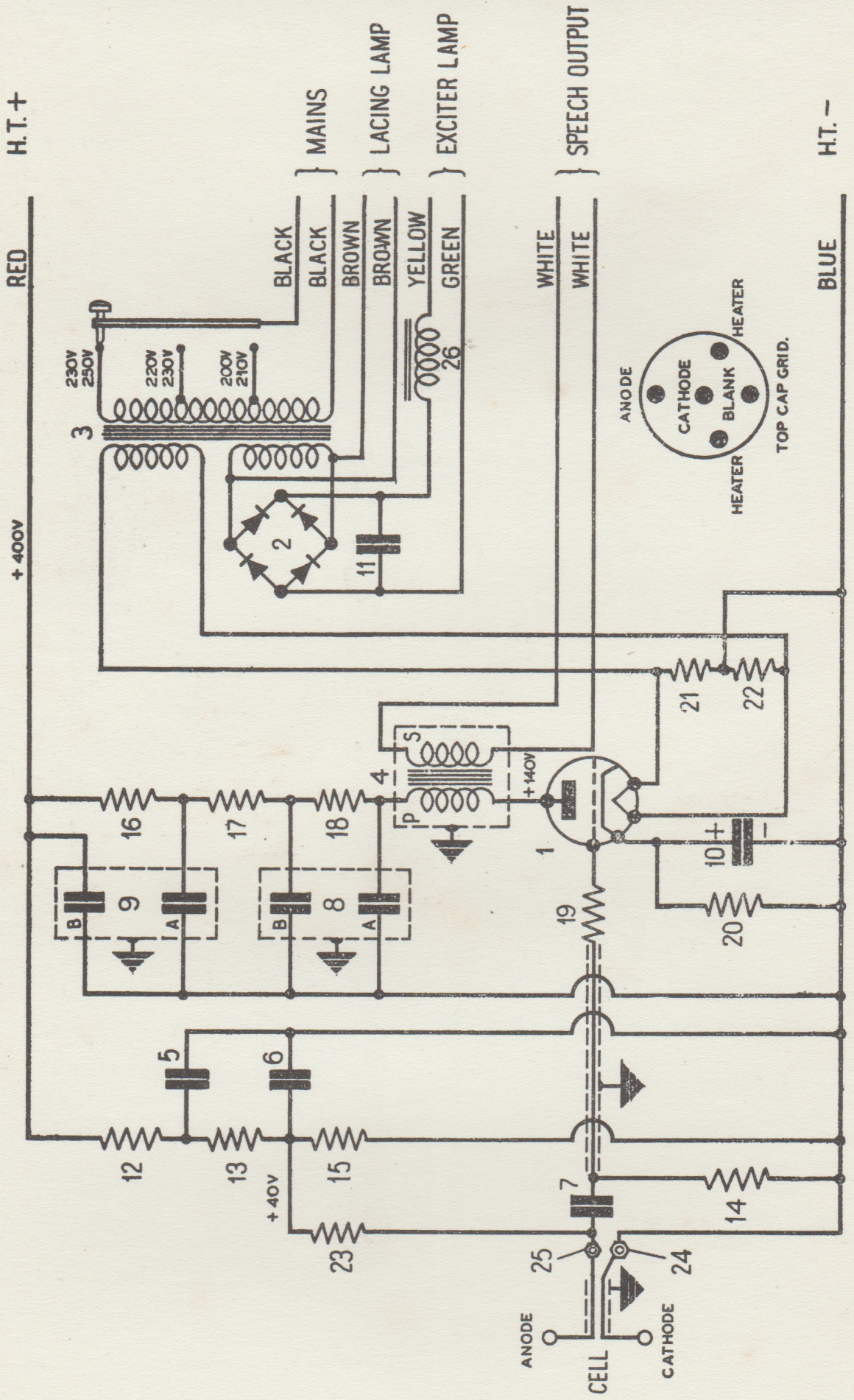


FIG. R.

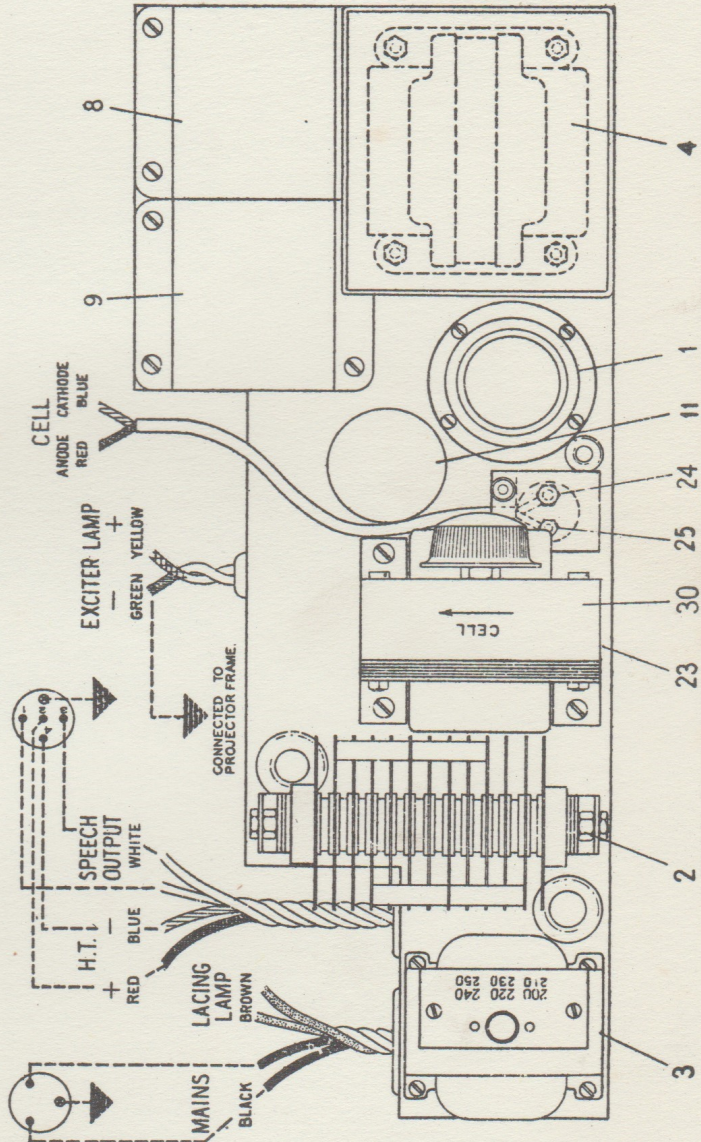
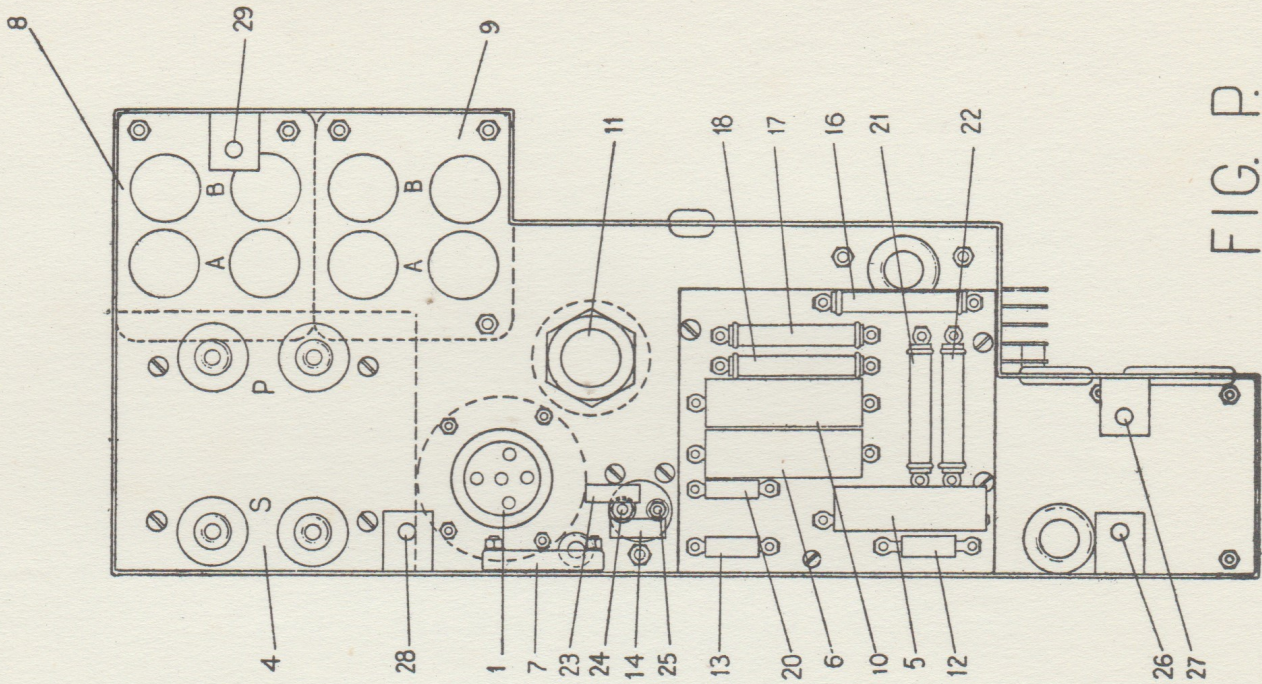
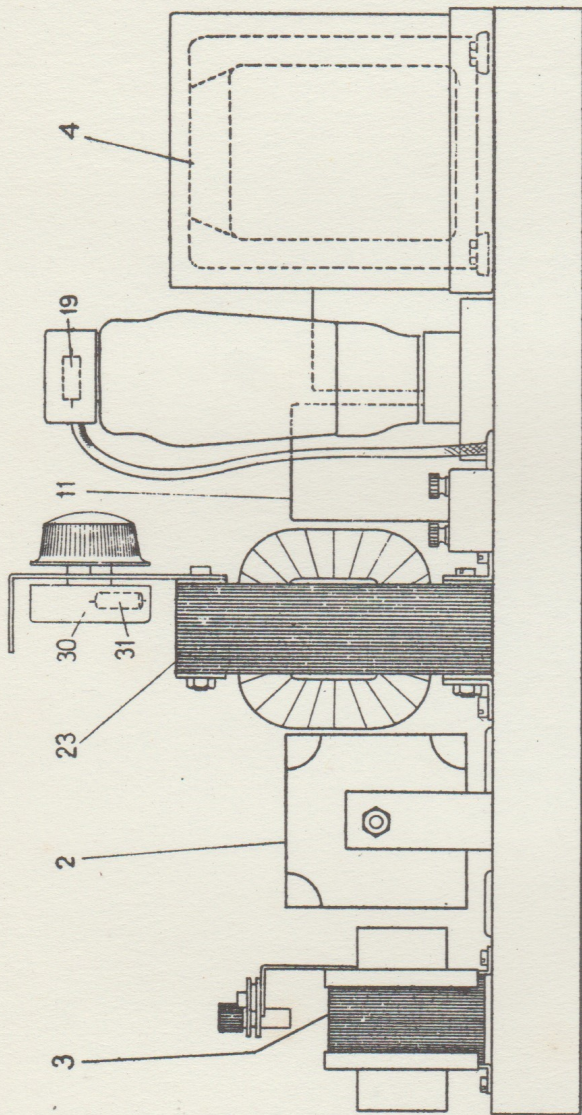


FIG. P.

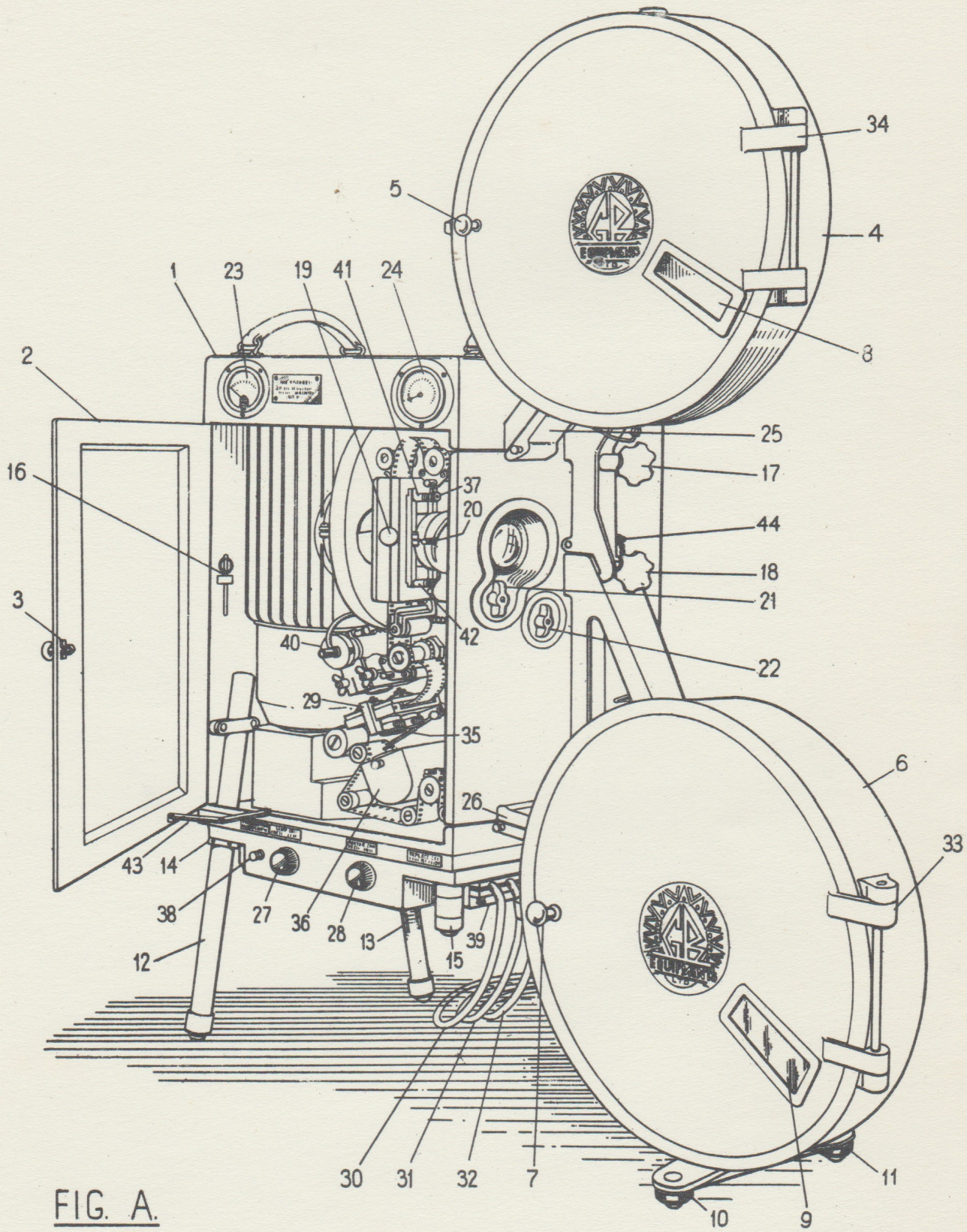


FIG. A.

FIGURE "A".

REF. NO.	DESCRIPTION
A 1	Projector Case
A 2	Projector Case Door
A 3	Door Catch
A 4	Top Spoolbox
A 5	Spoolbox Door Catch
A 6	Bottom Spoolbox
A 7	Spoolbox Door Catch
A 8 & 9	Spoolbox Inspection Windows
A 10 & 11	Front Elevators
A 12 & 13	Rear Adjustable Legs
A 14	Collets for Locking Legs
A 15	Front Feet (Non adjustable)
A 16	Tommy for Leg Collets
A 17 & 18	Hand screws for securing Spoolbox arms.
A 19	Picture Gate
A 20	Lens Barrel Advancing Lever
A 21	Lens Focussing Knob
A 22	Picture Centreing or "Racking" Knob
A 23	Lamp Supply Voltmeter
A 24	Speedometer
A 25	Top Spoolbox Firetrap
A 26	Bottom Spoolbox Firetrap
A 27	Lamp Voltage Adjusting Knob
A 28	Motor Speed Regulator (D.C. Models only)
(NOTE: ON A.C. MODELS THE SPEED REGULATOR IS SUBSTITUTED BY SWITCH: SEE CIRCUIT FIGURE O(b)14.	
A 29	Sound Gate
A 30, 31 & 32	Current Supply and Speech Output cables
A 33 & 34	Spoolbox Door Hinges
A 35	Sound Gate Objective (SHOWN SET UP FOR FRONT PROJECTION)
A 36	Photo Electric Cell Housing
A 37	Picture Gate Pressure Adjusting Screws
A 38	Push Button Operating Lamp Supply Voltmeter
A 39	Terminal Panel
A 40	Exciter Lamp Holder
A 41 & 42	Picture Gate Pressure Blocks
A 43	Door Strut
A 44	Knurled Headed Pin for Independent removal of Top Spool Arm

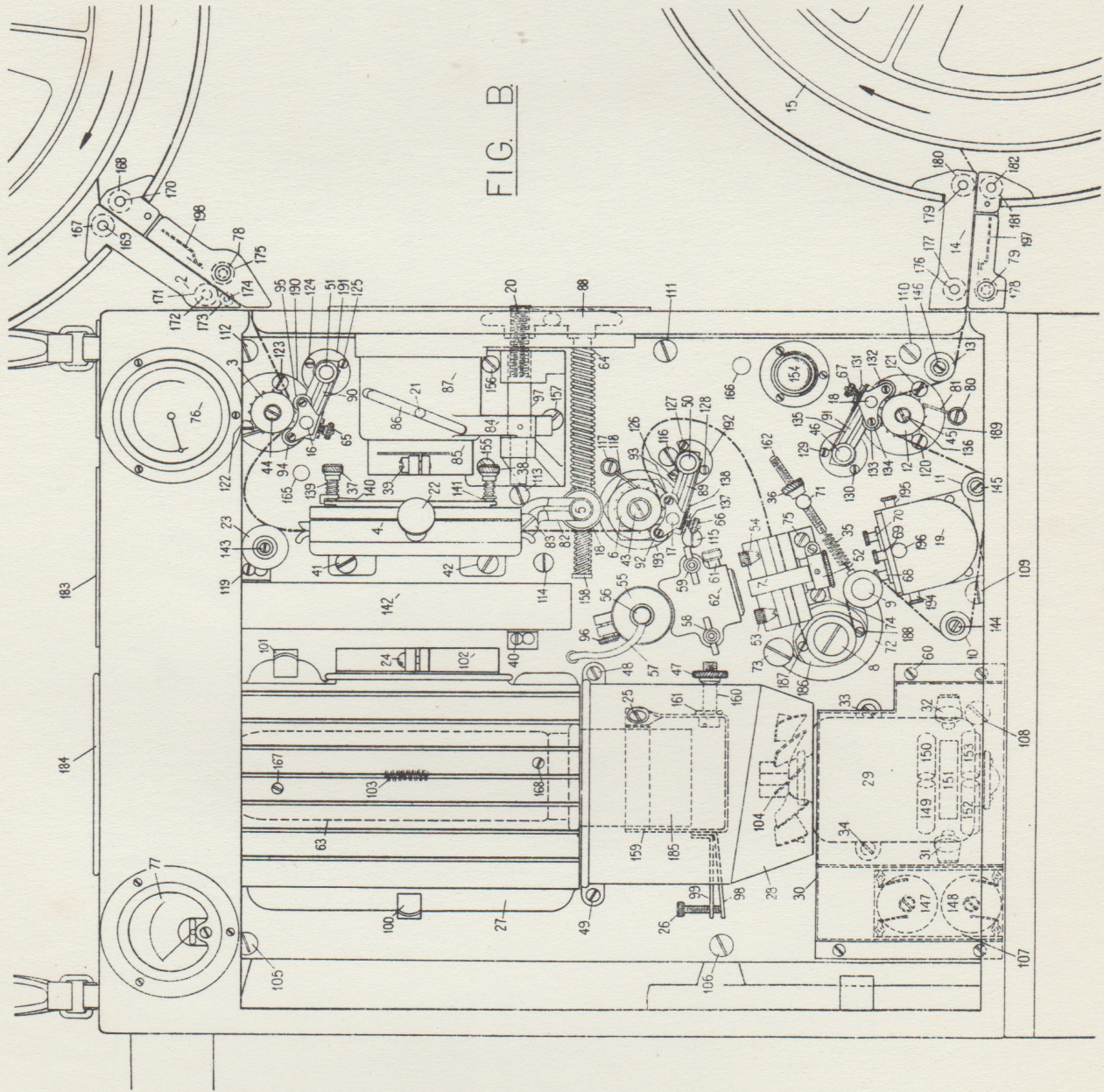


FIG. B

FIGURE "B"

REF. NO.

DESCRIPTION

PROJECTION LAMPHOUSE ASSEMBLY AND BLOWER.

B 27	Lamphouse Cover.
B 63	100 volt 1000 watt Monoplane Filament Incandescent Lamp.
B 28	Projector Lamp Holder Housing.
B 185	Porcelain Projector Lamp Holder.
B 159	Metal Clamp for Projector Lamp Adjustment.
B 26	Locking Screw for Projector Lamp Adjustment.
B 160	Screw for Backward and Forward Adjustment for Projector Lamp.
B 47	Adjusting Nut for Backward and Forward Adjustment of Lamp.
B 100 & 101	Spring Clip for locating Lamphouse Cover.
B 102	Condenser Lens Mount.
B 104	Blower Assembly.
B 29	Blower Motor.
B 30	Blower Motor Suppressor Unit Cover.
B 60	Screws holding Blower Motor or Screening Cover.
B 33 & 34	Fixing Screws for Blower Motor.
B 31 & 32	Blower Motor Terminals.
B 107	Panel for Chokes B 147 and B 148.
B 147	Choke.
B 148	Choke.
B 149	.001 Mfd. T.C.C. Type 431 Condenser.
B 150	.001 " " " " "
B 151	.05 " " " " "
B 152	.001 " " " " "
B 153	.001 " " " " "
B 48 & 49	Lamphouse Fixing Screws.
B 103	Projector Lamp Filament.
B 167 & 168	Screws securing Asbestos Baffles.
B 102	Clamping Collar for Condenser Mount.
B 24	Clamping Screw for Collar B 102.
B 98 & 99	Lock for Forward and Backward Lamp Adjustment.
B 184	Ventilation outlet for Projector Lamp.
B 77	Lamp Supply Voltmeter.
B 199	Push Button Operating Voltmeter.

PROJECTION LENS MOUNT.

B 87	Lens Carriage.
------	----------------

FIGURE "B" (CONTD).

REF. NO.	DESCRIPTION
B 97	Threaded Rod actuating Lens Carriage.
B 84	Threaded Lug working Rod B 97.
B 86	Helical slot in carriage.
B 21	Lever for advancing Lens barrel from gate.
B 20	Lens Focussing Knob.
B 85	Lens Barrel.
B 39	Lens Clamping Screw.
B 155, 156 & 157	Screws for securing Lens Mount.
<u>PICTURE GATE.</u>	
B 4	Gate Frame.
B 37 & 38	Nuts for Adjusting Gate Tension.
B 139	One of Gate Tension Springs.
B 22	Gate Catch Knob.
B 140 & 141	Pressure Blocks.
B 41 & 42	Screws securing Gate Frame.
<u>FLICKER SHUTTER.</u>	
B 142	Flicker Shutter Blade Cover.
B 40 & 119	Screws Securing Flicker Blade Cover.
<u>SOUND OPTICAL ASSEMBLY.</u>	
B 57	Exciter Lamp Supply Lead.
B 56	Exciter Lamp Supply and Filament.
B 62	Exciter Lamp Unit.
B 55	Exciter Lamp Housing.
B 58 & 59	Exciter Lamp Unit Clamping Screws.
B 61	Condenser Clamping Screw.
B 7	Sound Gate.
B 74 & 75	Screws Sound Gate.
B 96	Screw Clamping Exciter Lamp Holder.
B 52	Clamping Collar for Sound Objective.
B 53 & 54	Pressure Pad Adjusting Screws.
B 19	Photo-Electric Cell Housing.
B 68 & 70	Optical Bridge Adjustment Screws.
B 69	Screws securing Optical Bridge Mounting Plate.
B 194 & 195 & 196	Screws securing Photo-Electric Cell Cover.

FIGURE "B" (CONTD).

REF. NO.

DESCRIPTION

TAKE-OFF SPROCKET ASSEMBLY.

B 3	4 Picture Positive Sprockets.
B 44	Locking Screw and Key Washer.
B 122 & 123	Screws securing spindle bearing.
B 90	Take-off cradle casting.
B 94 & 95	Cradle Rollers.
B 16	Knurled opening knob and cradle pivot.
B 65	Pressure adjusting nut.
B 51	Main pivot for cradle.
B 124 & 125	Screws securing Main Pivot Bush.

INTERMITTENT SPROCKET ASSEMBLY.

B 6	4 Picture Intermittent Sprockets.
B 43	Locking Screw and Key Washer.
B 118	Film Stripper.
B 117	Screw securing film stripper.
B 92 & 93	Cradle Rollers.
B 89	Intermittent cradle casting.
B 17	Knurled opening knob and cradle pivot.
B 66	Pressure adjusting nut.
B 137	Tension spring.
B 138	Pressure plate.
B 50	Main Pivot for cradle.
B 127 & 128	Screws securing Main Pivot Bush.
B 192	Pivot Bush.
B 113 - 116	Screws securing Maltese Cross Gearbox.

TAKE-UP SPROCKET ASSEMBLY.

B 12	4 Picture take-up sprockets.
B 45	Locking Screw.
B 136	Key Washer.
B 80	Screw securing Film stripper.
B 81	Film stripper.
B 132 & 133	Cradle Rollers.
B 91	Take-up cradle casting.
B 18	Knurled opening knob and cradle pivot.
B 67	Pressure adjusting nut.
B 131	Screws securing leaf spring.
B 135	Spiral tension spring.
B 46	Main Pivot for cradle.
B 129 & 130	Screws securing pivot bush.
B 189	Sprocket spindle bearing.
B 120 & 121	Screws securing sprocket spindle bearing.

FIGURE "B" (CONTD).

REF. NO.	DESCRIPTION
	<u>ROUGH ROLLER, SPRUNG JOCKEY ROLLER, ETC.</u>
B 8	Rough Roller
B 186	Bearing for Flywheel spindle.
B 187 & 188	Screws securing Flywheel spindle bearing.
B 9	Spring loaded Jockey roller.
B 72	Jockey roller arm.
B 73	Pivot screw for Jockey roller arm.
B 35	Loading spring for sprung jockey.
B 162	Threaded adjusting rod.
B 36	Nut for adjusting jockey tension.
B 71	Anchoring pillar for jockey spring.
	<u>IDLE ROLLER</u>
B 23	Felt mounted roller
B 143	Spindle and retaining screw.
B 10	Idle roller.
B 144	Spindle and retaining screw.
B 11	Idle roller.
B 145	Spindle and retaining screw.
B 13	Idle roller.
B 146	Spindle and retaining screw.
	<u>"PICTURE CENTREING OR RACKING" ADJUSTMENT.</u>
B 88	Racking Adjustment Knob.
B 158	Threaded racking adjustment rod.
B 63	Spiral spring on racking rod B 158 to prevent back lash.
B 18	Racking adjustment roller.
B 5	Racking adjustment roller spindle.
B 82	Cast bracket bearing racking roller.
B 83	Shoulder screw pivot for racking roller bracket.
	<u>SPOOLBOX FIRE TRAPS.</u>
B 2	Top Spoolbox Fire Trap.
B 78	Opening knob.
B 167, 168) 171, 173) & 175)	Fire trap film guide rollers.

FIGURE "B" (CONTD).

REF. NO.	DESCRIPTION
B 169, 170) 172, 78) & 174)	Guide roller spindles.
B 198	Fire trap spring
B 14	Bottom spoolbox fire trap
B 79	Opening knob
B 177, 178) 180 & 181)	Guide rollers
B 176, 79) 179 & 182)	Guide roller spindles.
B 197	Fire Trap spring
<u>"PYRENE" FIRE EXTINGUISHER.</u>	
B 165	Top loop gas nozzles.
B 166	Bottom loop gas nozzles.
<u>MISCELLANEOUS</u>	
B 154	Lacing Lamp
B 76	Speedometer
B 77	Voltmeter for lamp supply
B 1	Take - off spool
B 15	Take up spool
B 57	Exciter lamp supply lead
B 105 - 112	Screws securing Projector bedplate in case.

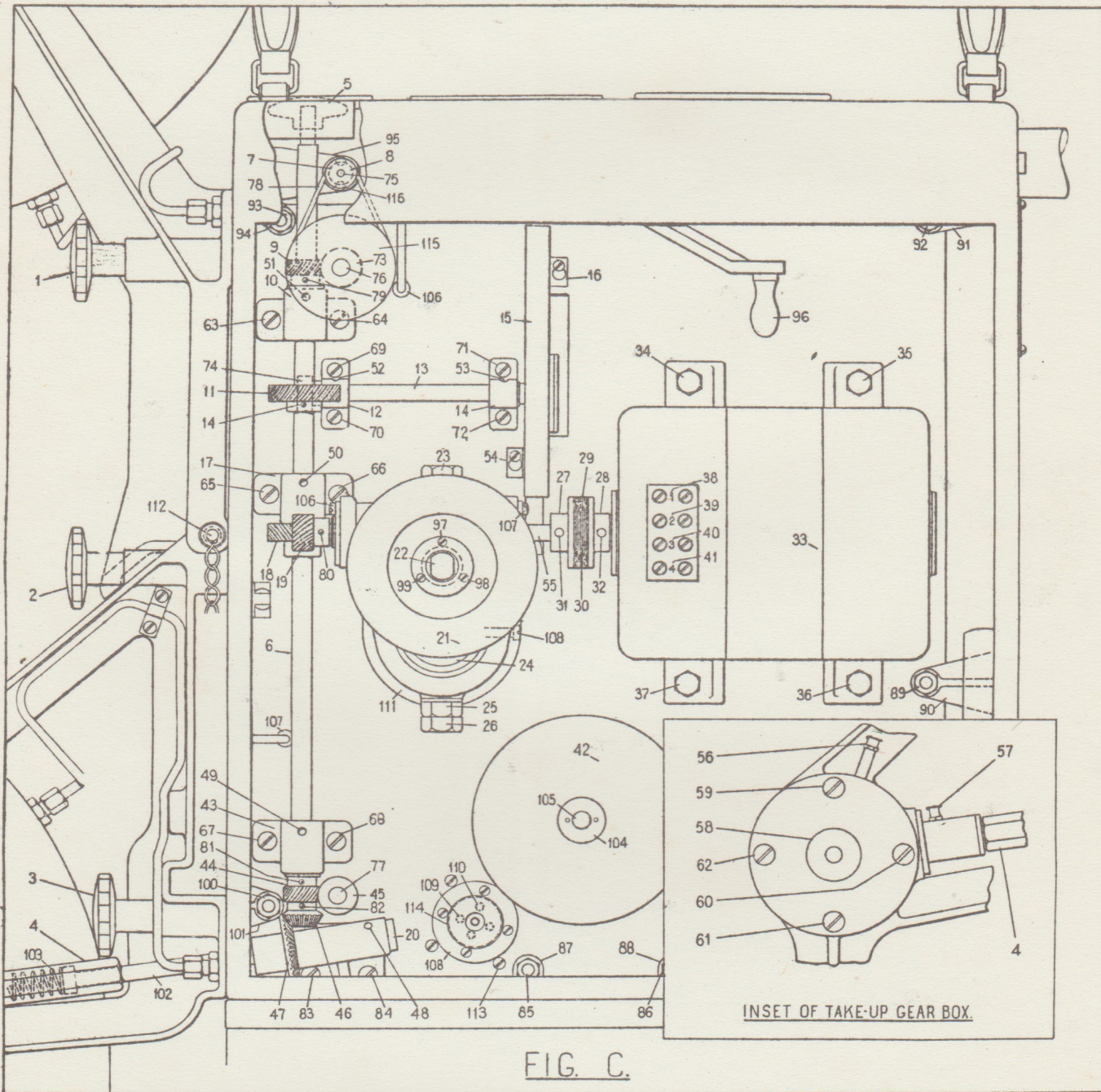


FIG. C.

FIGURE "C"

REF. NO.

DESCRIPTION.

VERTICAL SHAFT.

C 5	Inching Knob.
C 6	Vertical shaft.
C 7	Pulley on shaft coupled to speedometer.
C 8	Ball race on speedometer drive shaft.
C 75	Speedometer driving shaft
C 95	Bearing bracket for speedometer drive.
C 78	Speedometer driving belt.
C 9	Skew gear driving take-off sprocket.
C 115	Speedometer driving pulley on sprocket shaft.
C 73	Skew gear on take-off sprocket shaft.
C 76	Take off sprocket shaft
C 10	Top bearing bracket.
C 63 & 64	Screws securing top bearing bracket.
C 11	Skew gear driving flicker shutter.
C 74	Skew gear on flicker shutter shaft meshing with C11.
C 17	Intermediate bearing bracket.
C 65 & 66	Screws securing intermediate bearing bracket.
C 18	Skew gear driving vertical shaft.
C 19	Skew gear on horizontal driving shaft meshing with C18.
C 43	Bottom bearing bracket.
C 67 & 68	Screws securing bottom bearing bracket.
C 44	Skew gear driving take-up sprocket
C 45	Skew gear on take-up sprocket shaft.
C 77	Take-up sprocket shaft.
C 46	Bevel gear driving film take-up shaft.

MALTESE CROSS BOX AND MOTOR DRIVE.

C 33	Projector mechanism driving motor.
C 38 to 41	Terminals 1, 2,3 & 4 respectively (See circuit Figure(s) on motor terminal block).
C 34 to 37	Motor fixing screws
C 27 & 28	Motor coupling bosses.
C 29	Laminated rubber coupling washer
C 31 & 32	Grub screws for releasing coupling bosses.

FIGURE "C" (CONTD).

REF. NO.	DESCRIPTION
C 55	Horizontal driving shaft.
C 111	Cross Box.
C 21	Pin wheel flywheel.
C 22	Locking and extracting nut.
C 97 & 99	Screws securing extracting nut flange.
C 23	Oil filling plug.
C 25 & 26	Oil draining vents.
C 24	Oil level indicating window.
C 108	Screw locking eccentric Maltese cross adjustment bearing.
C 106 & 107	Screws locking horizontal shaft bearing.
C 19	Skew gear driving vertical shaft.

FLICKER SHUTTER.

C 74	Skew gear driving flicker shutter and auto-cut-off assembly.
C 13	Shutter shaft.
C 12 & 14	Bearing brackets.
C 69, 70) 71 & 72)	Screws securing bearing brackets.
C 15	Flicker shutter blade cover.
C 16 & 54	Bottom holes and screws for quick removal of cover.

TAKE-UP DRIVE.

C 4	Hexagonal sleeve of telescopic take-up rod.
C 103	Take-up rod sleeve.
C 102	Take-up rod plunger.
C 47	Bevel gear driving take-up.
C 48	Bearing bracket.
C 83 & 84.	Screws securing bearing bracket.
C 20	Take up shaft driving spindle.
C 59 to 61	Screws securing cover plate on take-up gear box. (see inset).
C 58	Nut for adjusting spring tension on take-up friction.

ROUGH ROLLER FLYWHEEL.

C 42	Flywheel.
C 104	Locknut.
C 105	Spindle.

FIGURE "C" (CONTD).

REF. NO.

DESCRIPTION

"PYRENE" FIRE EXTINGUISHER.

C 96 Re-setting handle.
C 106 Feed pipe for top loop gas nozzles.
C 107 Feed pipe for bottom loop gas
nozzles.

LUBRICATING POINTS FOR (1) THIN
OIL

C 51 Top bearing bracket.
C 50 Intermediate bracket.
C 49 Bottom bracket.
C 52 & 53 Flicker shutter shaft bearings.
C 48 & 57 Take-up drive.
C 56 Take-up spool spindle.

LUBRICATION POINTS FOR (2) "STAY-
PUT" GREASE

C 7 & 8 Speedometer driving gears.
C 9 & 73 Top sprocket driving gears.
C 11 & 74 Shutter assembly driving gears.
C 18 & 19 Vertical shaft driving gears.
C 44 & 45 Bottom sprocket driving gears.
C 46 & 47 Take-up bevel gears.

MISCELLANEOUS

C 112 Pin for the independent removal of top
spool arm.
C 1, 2, & 3. Spool box arm clamping screws.
C 85 & 86 Nuts and bolts securing cast base.
C 87 & 88 Lugs of cast base.
C 89, 92,) Bolts securing Projector bedplate in
93 & 100) case.
C 90, 91,) Cast lugs supporting Projector bed-
94 & 101) plate.
C 108 5 pin valve holder into which plugs
photo-electric cell housing.
C 110 Anode pin.
C 109 Cathode pin.
C 113 Screws holding P.E. Cell housing.
C 114 P.E. Cell Lead cover.

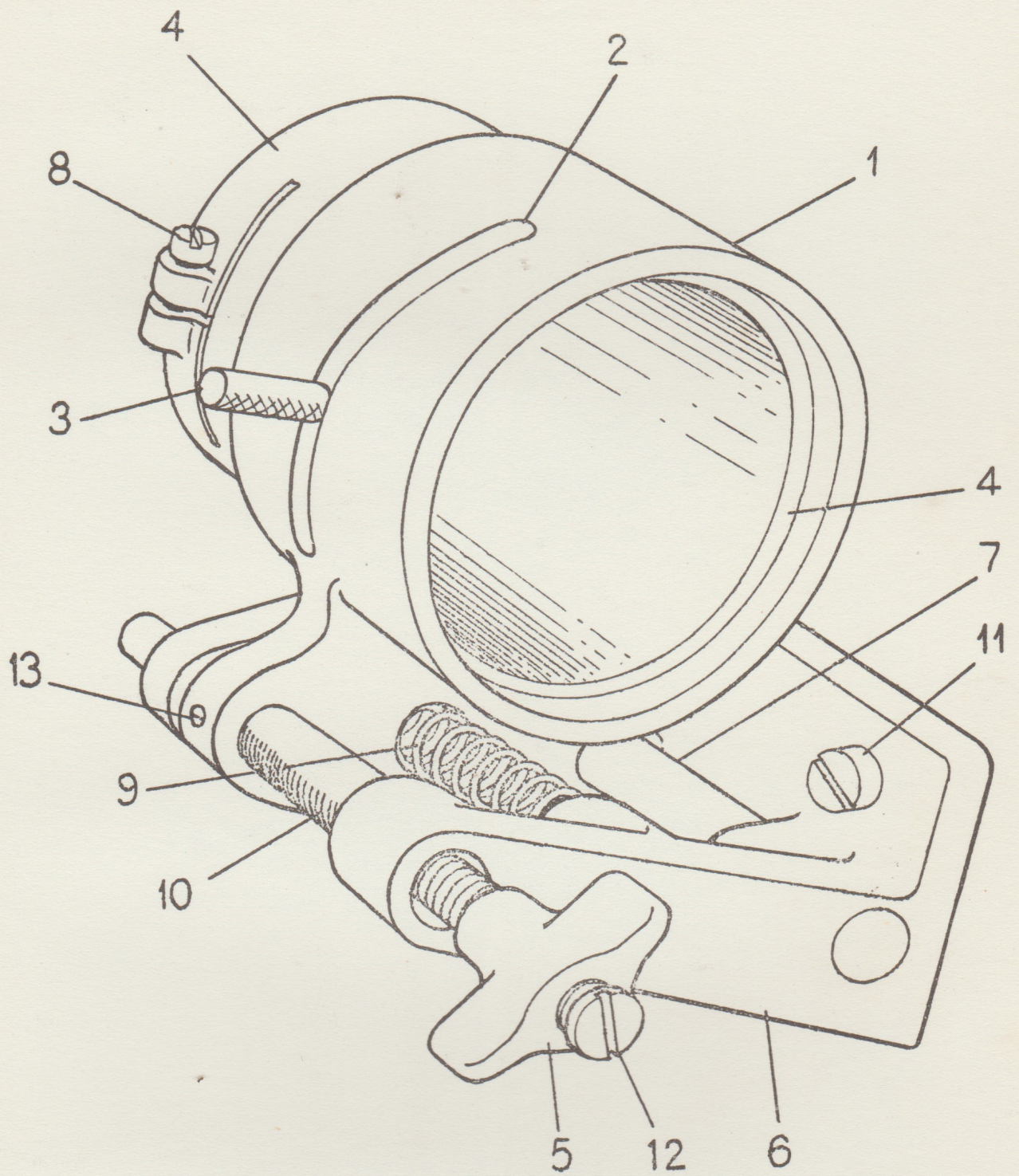


FIG. D.

FIGURE "D".

REF. NO.	DESCRIPTION
D 1	Lens Carriage.
D 2	Helical slot.
D 3	Lens Barrel advancing lever.
D 4	Lens barrel.
D 5	Focussing knob.
D 6	Lens assembly supporting bracket.
D 7	Slide rail.
D 8	Lens clamping screw.
D 9	Loading spring to prevent backlash.
D 10	Threaded rod actuating carriage.
D 11	One of 3 screws securing bracket to bedplate.

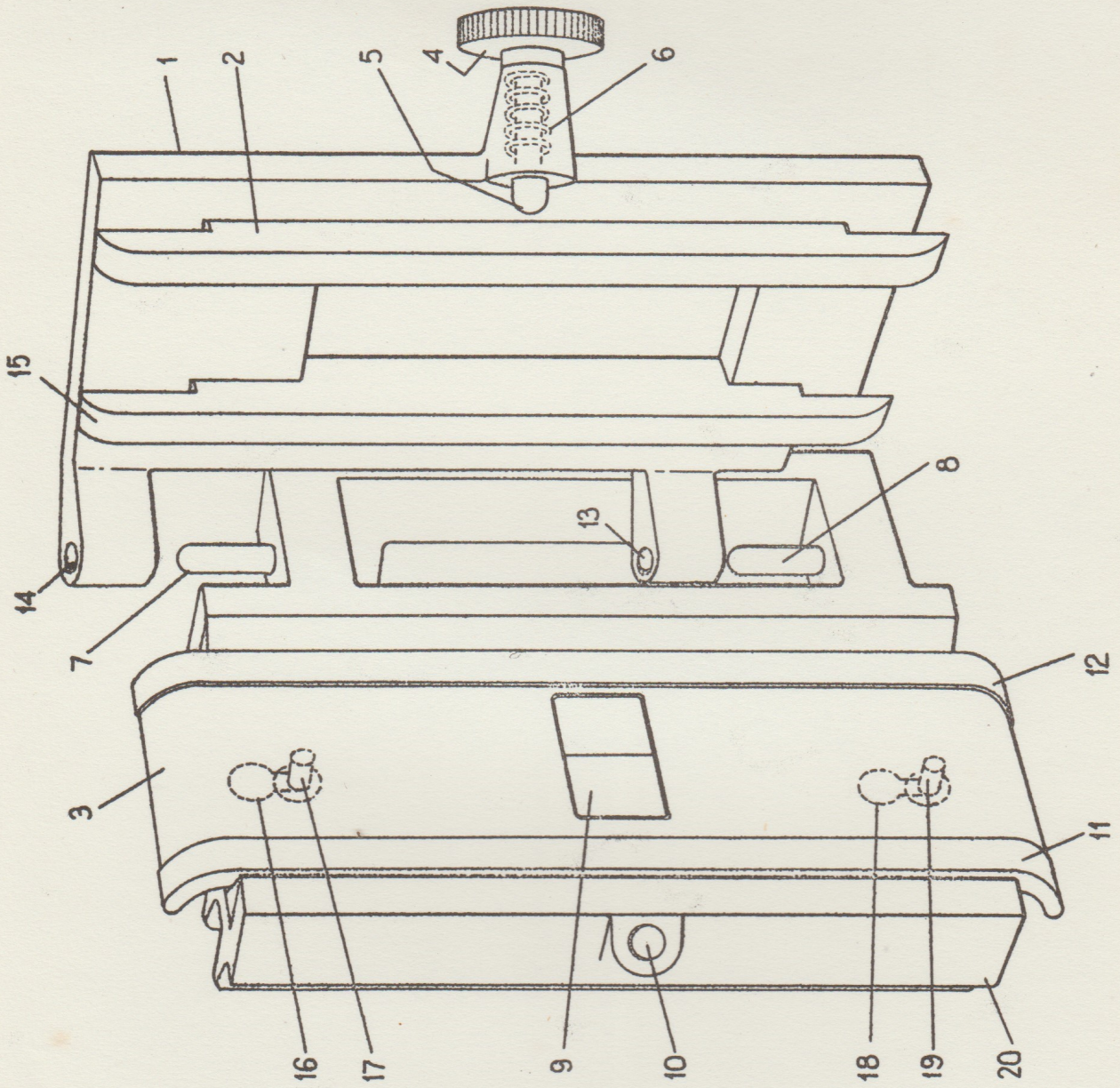


FIG. E.

FIGURE "E".

REF. NO.	DESCRIPTION
E 1	Hinged portion bearing pressure runners.
E 2 & 15	Pressure Runners.
E 3	Removable back plate, or aperture plate.
E 4	Spring loaded gate catch.
E 5	Catch pin.
E 6	Catch pin spring.
E 7 & 8	Hinge pins.
E 9	Picture aperture or mask.
E 10	Gate catch dimple.
E 11 & 12	Raised film runners.
E 13 & 14	Hinge lugs.
E 16 & 18	'Buttonholes' for pins of removable back plate.
E 17 & 19	Pins of back plate.
E 20	Cast radiation gate frame.

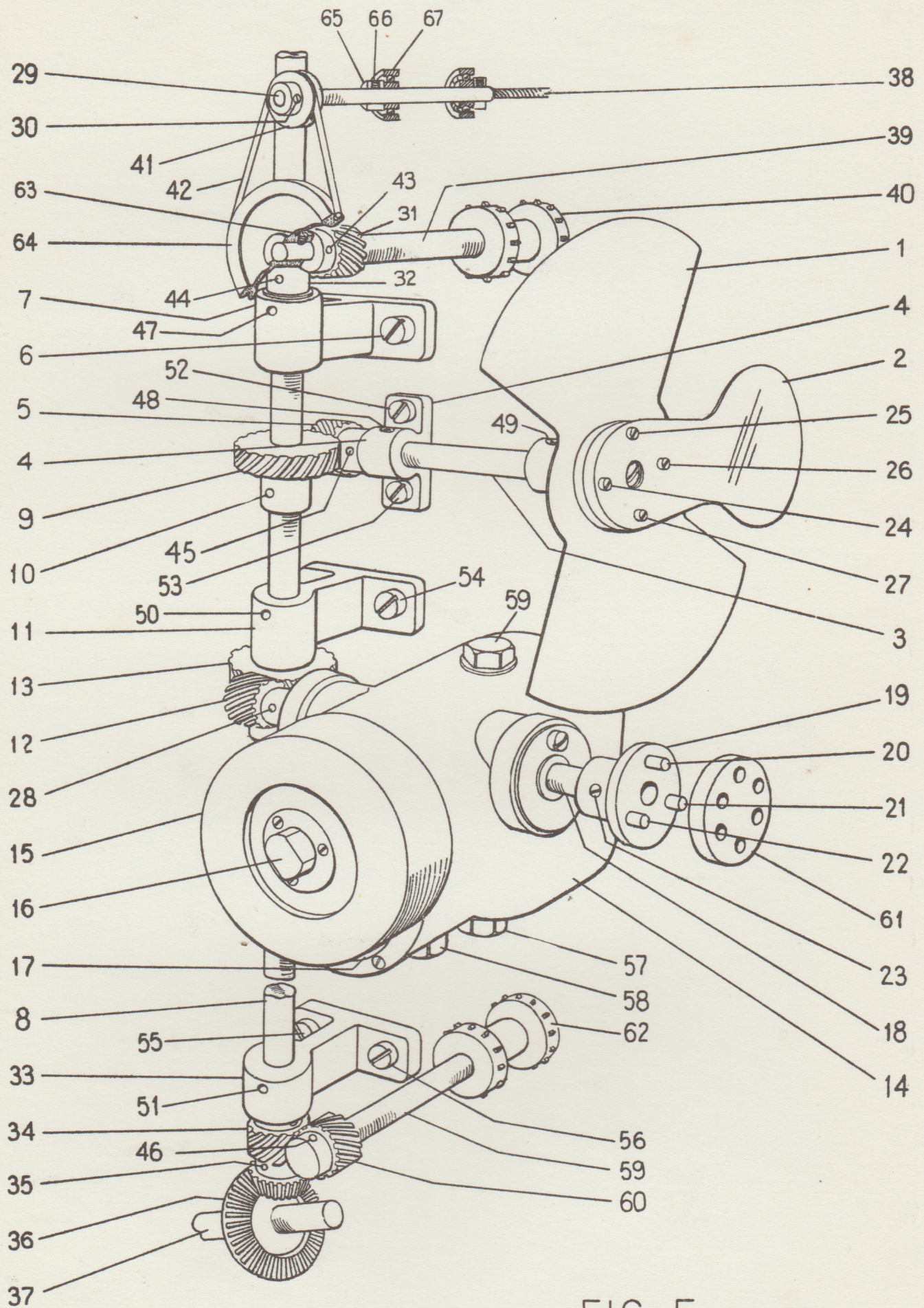


FIG. F.

FIGURE "F".

REF. NO.

DESCRIPTION

LAYOUT OF DRIVE.

F 1	Flicker shutter blade
F 2	Auto light cut off.
F 3	Flicker shutter shaft.
F 4	Bearing bracket.
F 5	Skew gear driving shutter shaft.
F 67	Ball race on speedometer shaft.
F 6, 54,) 55 & 56)	Screws securing vertical shaft bearing brackets.
F 66	Collar locking screw.
F 7	Vertical shaft top bearing bracket.
F 65	Ball race locking collar.
F 8	Vertical shaft.
F 9	Skew gear driving shutter assembly.
F 64	Speedometer driving pulley on sprocket shaft.
F 10, 35,) 46, 43,) & 44)	Taper pins.
F 11	Intermediate vertical shaft bearing bracket.
F 12	Skew gear driving vertical shaft.
F 13	Skew gear meshing with F12.
F 14	Maltese cross gear box.
F 15	Pinwheel Flywheel.
F 16	Dual purpose nut for withdrawing or locking flywheel.
F 17	Oil level indicator window.
F 18	Horizontal driving shaft.
F 19	Motor coupling.
F 20, 21,) & 22)	Coupling pins.
F 42	Speedometer Driving Belt.
F 41	Speedometer Driving Pulley.
F 38	Speedometer Flexible coupling.

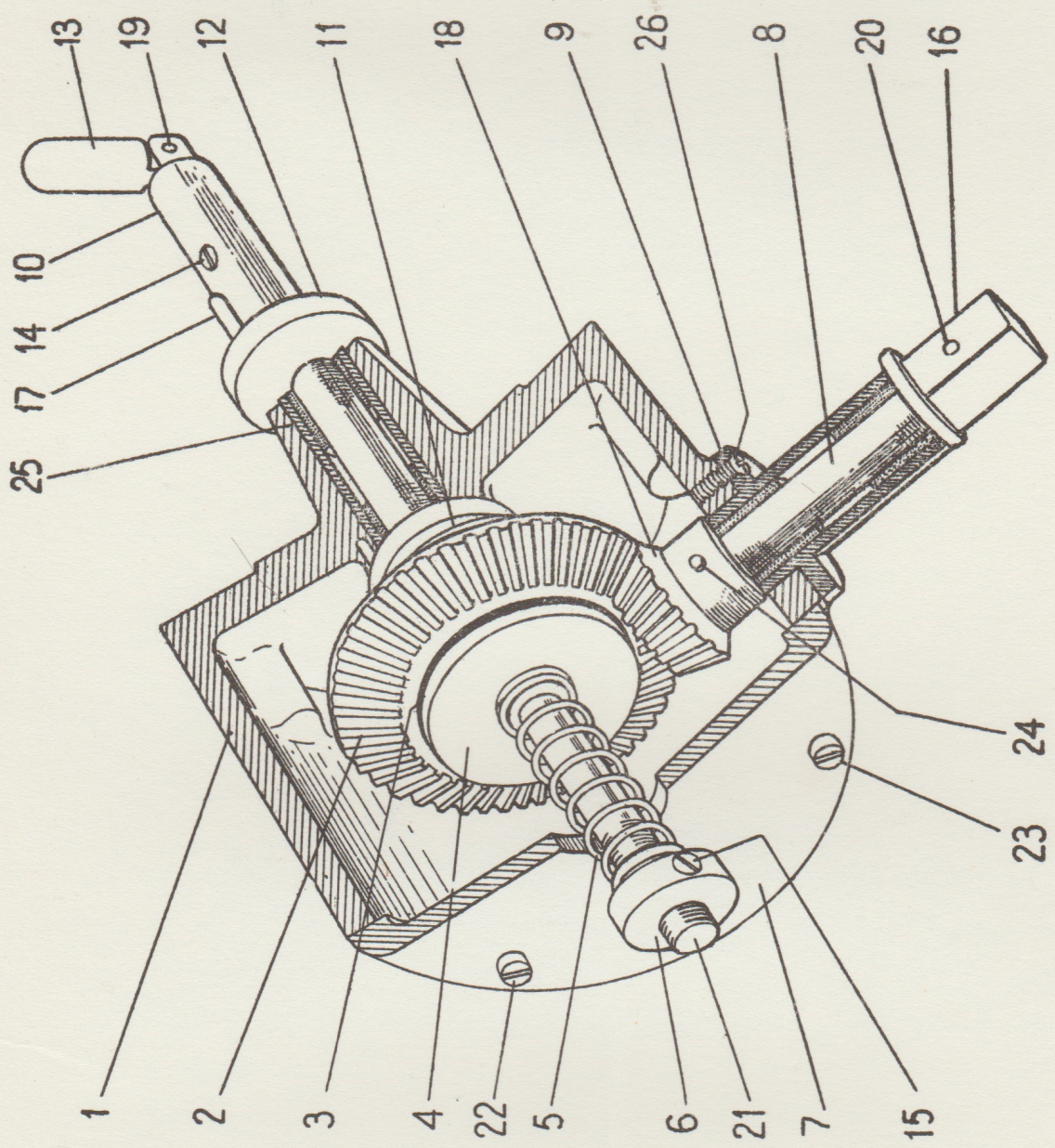
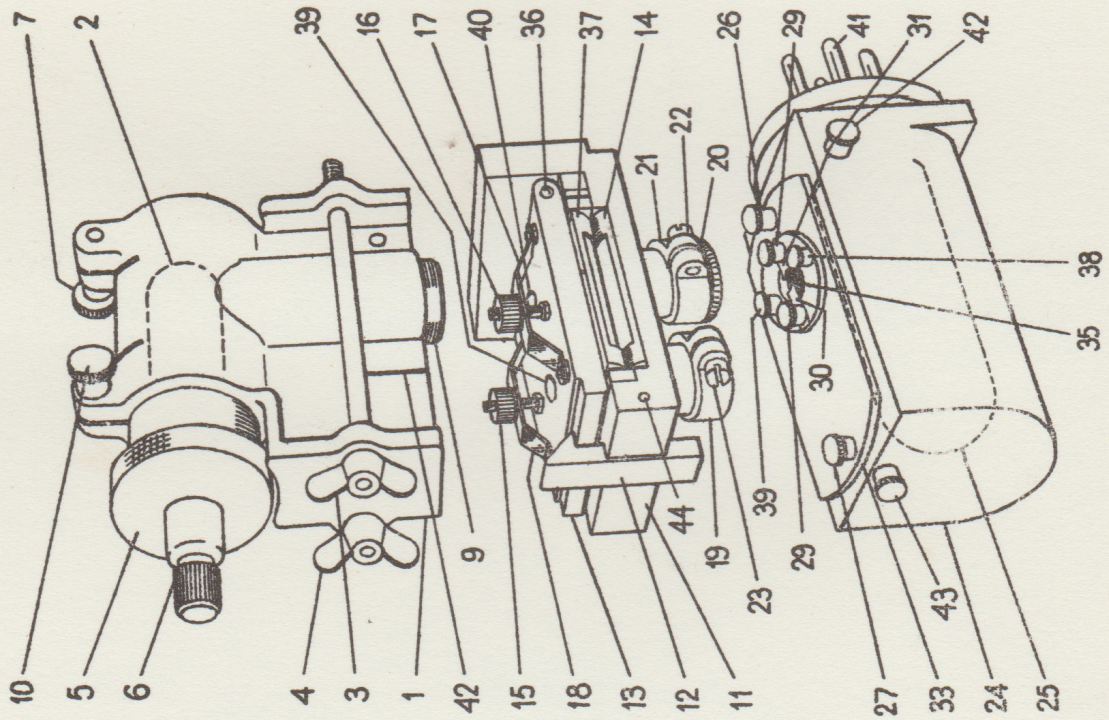


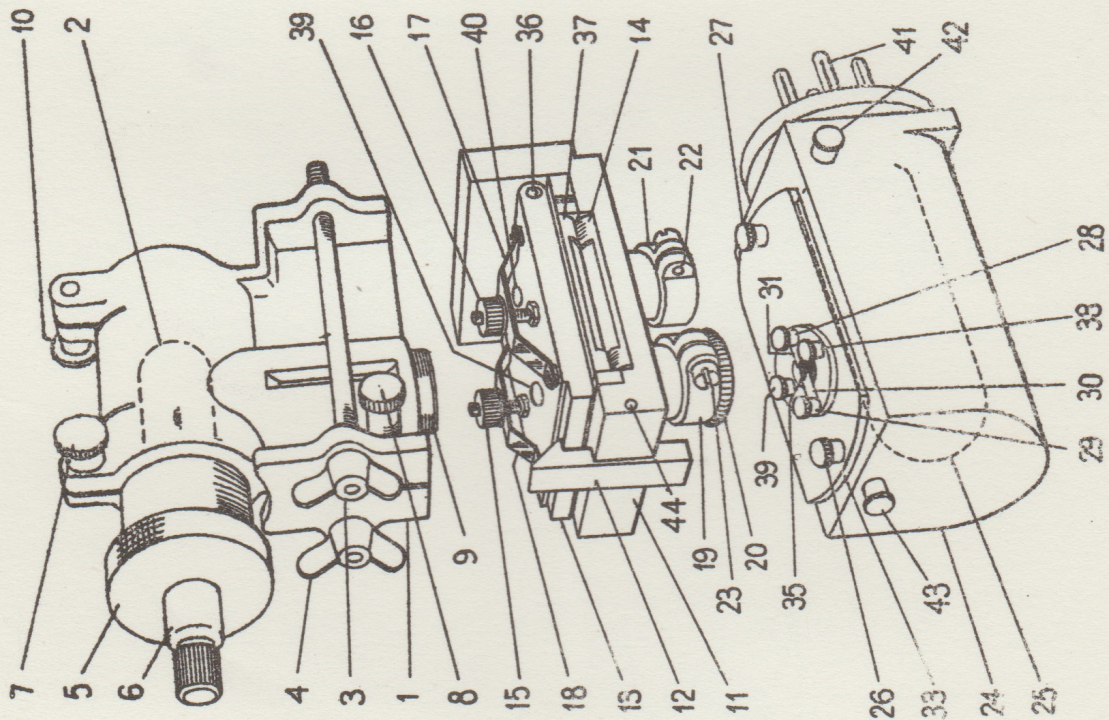
FIG. G.

FIGURE "G".

REF.NO.	DESCRIPTION
G 1	Cast gear box.
G 2	'Floating' Bevel gear.
G 3	Leather clutch washer.
G 4	Spring loaded pressure disc.
G 5	Loading spring.
G 6	Spring tension adjusting nut.
G 7	Removable end cover plate.
G 8	Driving shaft.
G 9	Flanged bearing sleeve.
G 10	Adaptor sleeve for use with ½" dia.bore spools.
G 11	Friction disc behind gear.
G 12	Spool spindle flange.
G 13	Spool latch.
G 14	Screw securing adaptor sleeve G10
G 15	Grub screw locking adjusting nut.
G 16	Hexagonal adaptor for telescopic drive rod.
G 17	Pin registering with spool hub.
G 18	Bevel driving gear.
G 19	Pivot pin for spool latch.
G 20	Ball catch for telescopic drive sleeve.
G 21	Take up spindle.
G 22 & 23	Cover plate fixing screws.
G 24	Taper pin.
G 25	Take-up shaft bearing sleeve.
G 26	Screw securing bearing sleeve.



REAR PROJECTION



FRONT PROJECTION

FIG. H.

FIGURE "H".

REF. NO.

DESCRIPTION

SOUND OPTICAL ASSEMBLY.

H 1	Block for exciter lamp housing.
H 2	Exciter lamp 6 volts 1 ampere.
H 3 & 4	Exciter lamp block clamping screws.
H 5	Exciter lamp holder.
H 6	Terminal for centre contact of exciter lamp.
H 7 & 10	Exciter lamp holder clamping screws.
H 8	Condenser lens clamping screw.
H 9	Sound optical condenser lens.
H 11	Fixed portion of sound gate..
H 12	Gate catch.
H 13	Hinged portion of sound gate.
H 14	Fixed skid or back plate of sound gate.
H 15 & 16	Adjusting nuts for pressure pad tension.
H 17 & 18	Lead springs for pressure pad tension.
H 19 & 21	Clamping collars for clamping sound objective lens.
H 22 & 23	Locking screws for clamping collars.
H 24	Metal housing for P.E. Cell.
H 25	P.E. Cell. Osram type C.M.G.25.
H 26 & 27	Clamping screws for bridge mounting plate.
H 28, 29,) 38 & 39.)	Optical bridge adjusting screws.
H 30 & 31	Optical bridge masking pieces.
H 33	Optical bridge mounting plate.
H 36	Soundgate pivot.
H 37	Soundgate pressure pad.
H 41	4 Pin cell mounting base.
H 43	Screw securing Photo-electric cell cover.
H 20	Objective lens.
H 35	Bridge.
H 42	Slit in casting for clamping condenser lens.

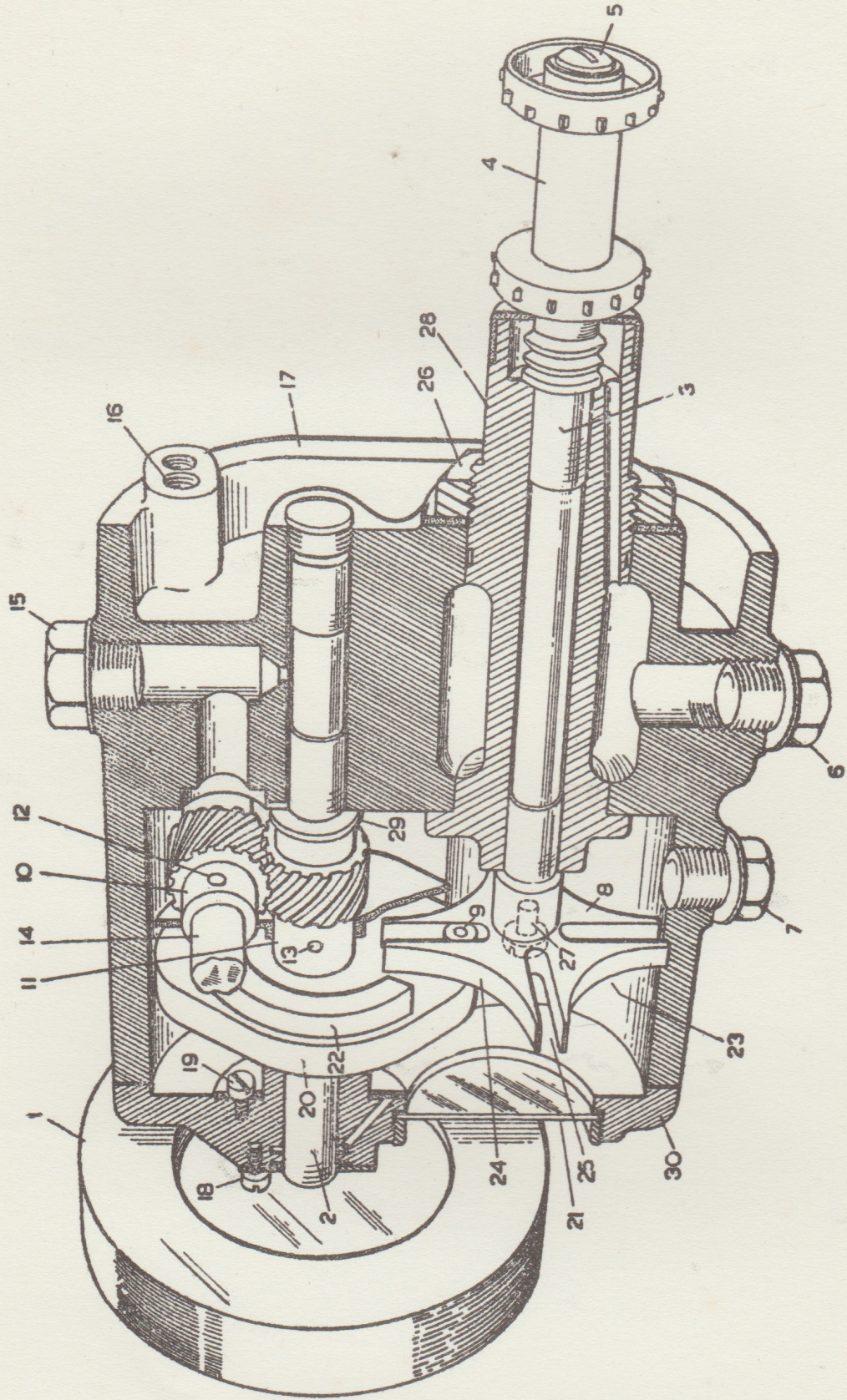


FIG. J.

FIGURE "J".

REF. NO.	DESCRIPTION
J 1	Pinwheel flywheel.
J 2	Pinwheel shaft.
J 3	Intermittent sprocket and Maltese Cross shaft.
J 4	Intermittent sprocket.
J 5	Locking screw and key washer.
J 6 & 7	Oil draining vents.
J 8	Maltese Cross.
J 9	Striking pin and roller.
J 10	Skew gear on horizontal driving shaft.
J 11	Skew gear on pinwheel shaft.
J 12	One of 2 taper pins securing gear J10.
J 13	Taper pin securing gear J11.
J 14	Horizontal driving shaft.
J 15	Crossbox oil filling plug.
J 16	Hole receiving one of bedplate fixing screws.
J 17	Cast metal cross gear box.
J 18 & 19	Screws securing gland washers.
J 20	Pinwheel.
J 21	Oil level indicator window.
J 22	Cross locking cam.
J 23	Maltese cross oil bath.
J 24	One of radiused faces which engage with locking cam.
J 25	One of the four slots in cross.
J 26	Locknut for eccentric bearing.
J 27	Screw securing Maltese Cross.
J 28	Eccentric bearing for cross adjustment.

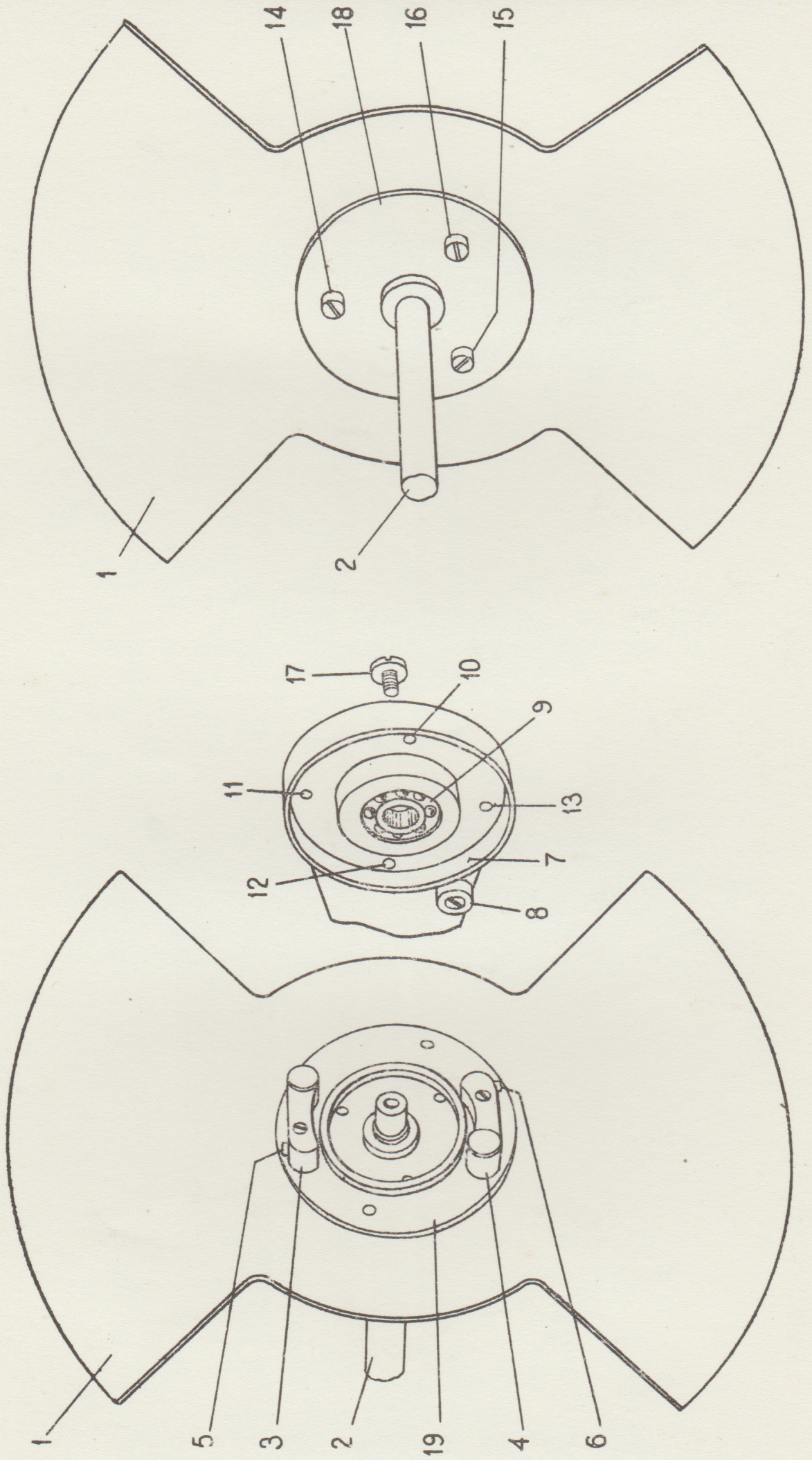


FIG. K.

FIGURE "K".

REF. NO.	DESCRIPTION
K 1	Flicker shutter blade.
K 2	Driving shaft.
K 3 & 4	Centrifugally operated pawls.
K 5 & 6	Leather friction inserts.
K 7	Friction drum.
K 8	Leather buffer washer.
K 9	Cut-off blade bearing.
K 10, 11) 12 & 13)	Screws securing auto cut-off blade.
K 14, 15) & 16)	Screws locking flicker shutter blade.
K 17	Screw securing friction drum.
K 18	Locking cheek for flicker blade.
K 19	Shutter boss.

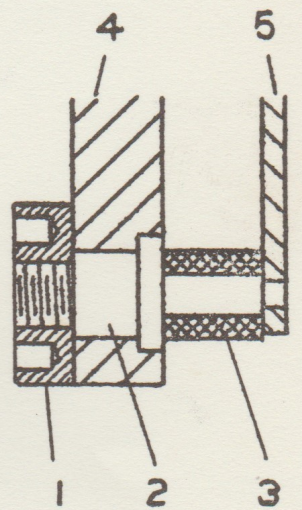
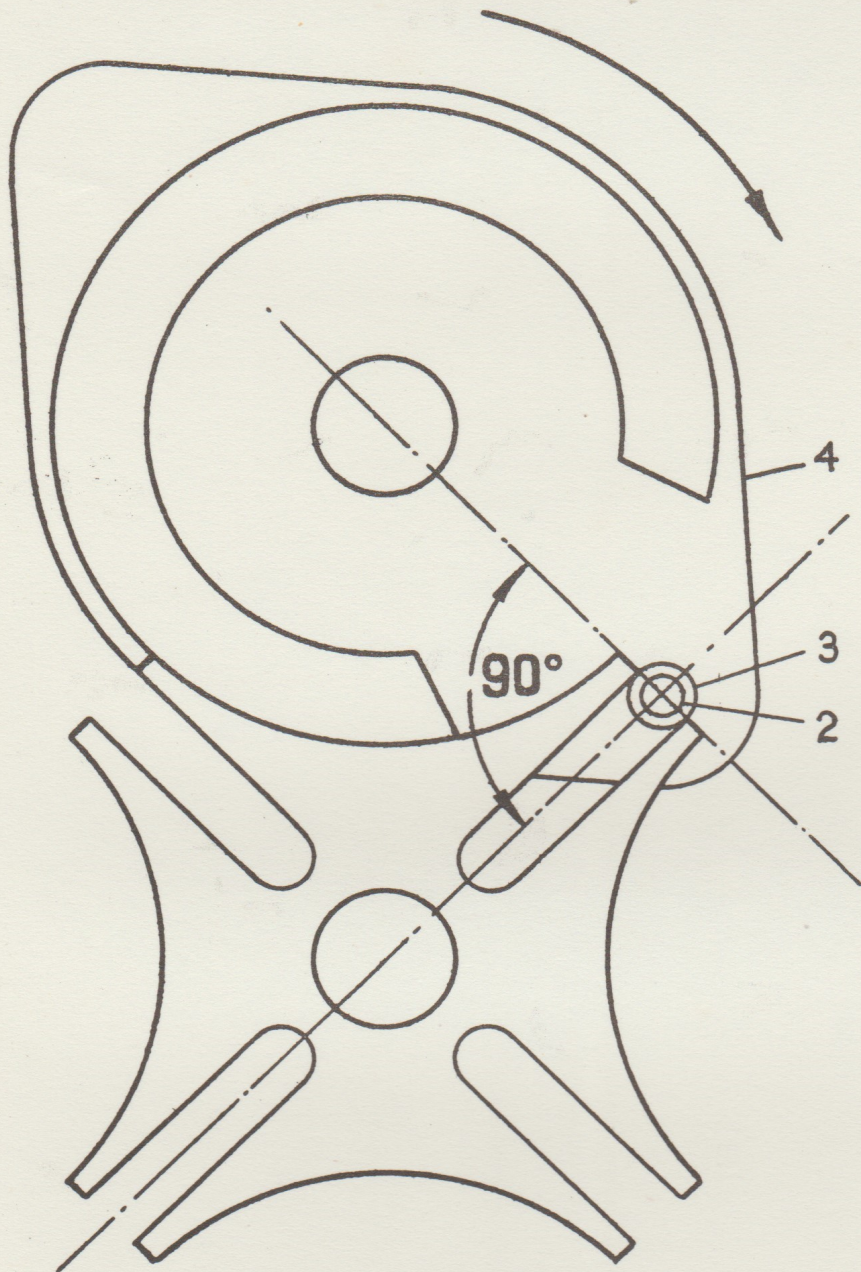


FIG. L.

FIGURE "L"

REF. NO.	DESCRIPTION
L. 1	Locknut.
L. 2	Eccentric striking pin.
L. 3	Striking pin roller.
L. 4	Pinwheel.
L. 5	Pinwheel plate.

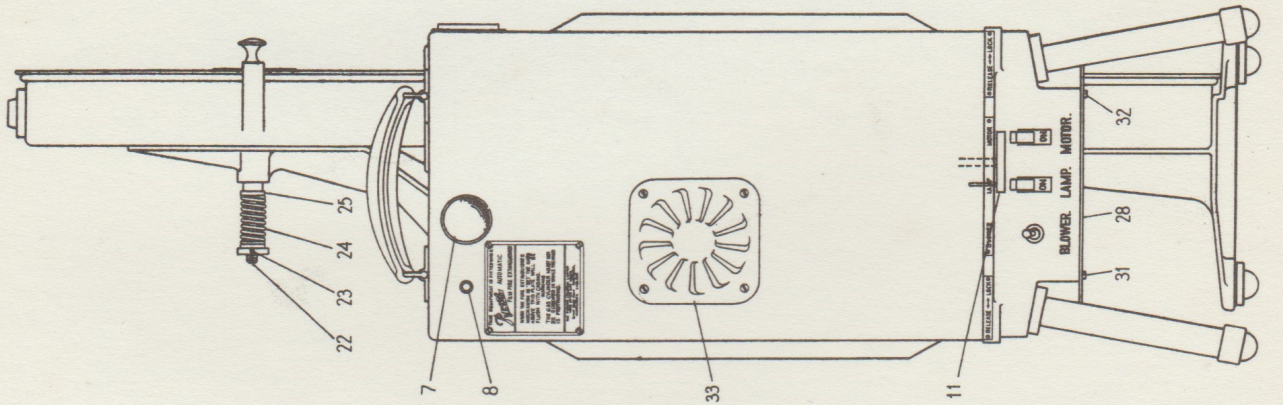
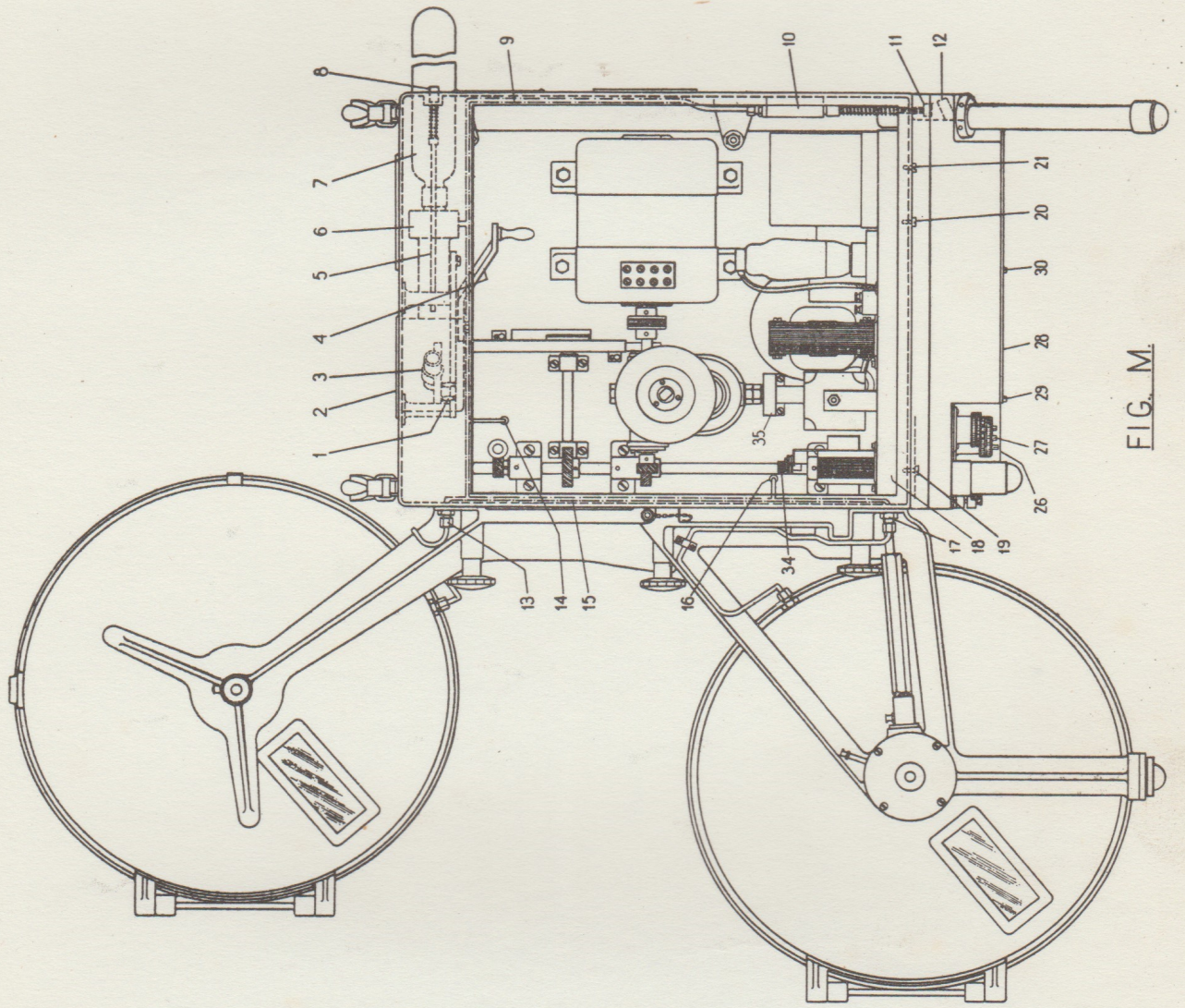


FIGURE "M"

REF. NO.

DESCRIPTION

"PYRENE" FIRE EXTINGUISHER.

M 1	Pins for Guncotton firing band.
M 2	Removable Cover for re-setting Plunger M3.
M 3	Plunger.
M 4	Re-setting handle.
M 5	Rod control for indicator knob 8.
M 6	Cylinder perforating mechanism.
M 7	Gas Cylinder.
M 8	Indicator knob.
M 9	Gas Tube supplying current breaking cylinder M10.
M 10	Cylinder controlling current breaking plunger M11.
M 11	Current breaking plunger.
M 12	Lamp and Motor switches.
M 13	Gas Tube supplying top spool box.
M 14	Gas tube supplying top loop gas jets.
M 15	Gas Tube (Shown Chain Dotted)
M 16	Gas Tube supplying bottom loop gas jets.
M 17	Gas Tube supplying bottom spoolbox.

HEAD AMPLIFIER.

M 18	Chassis.
M 19, 20) & 21)	3 of 4 fixing screws securing head amplifier.
M 34	Main Transformer.

TAKE OFF SPINDLE FRICTION CLUTCH.

M 22	Spindle.
M 23	Adjusting Nut and Locking screw.
M 24	Tension Spring.
M 25	Friction collar.

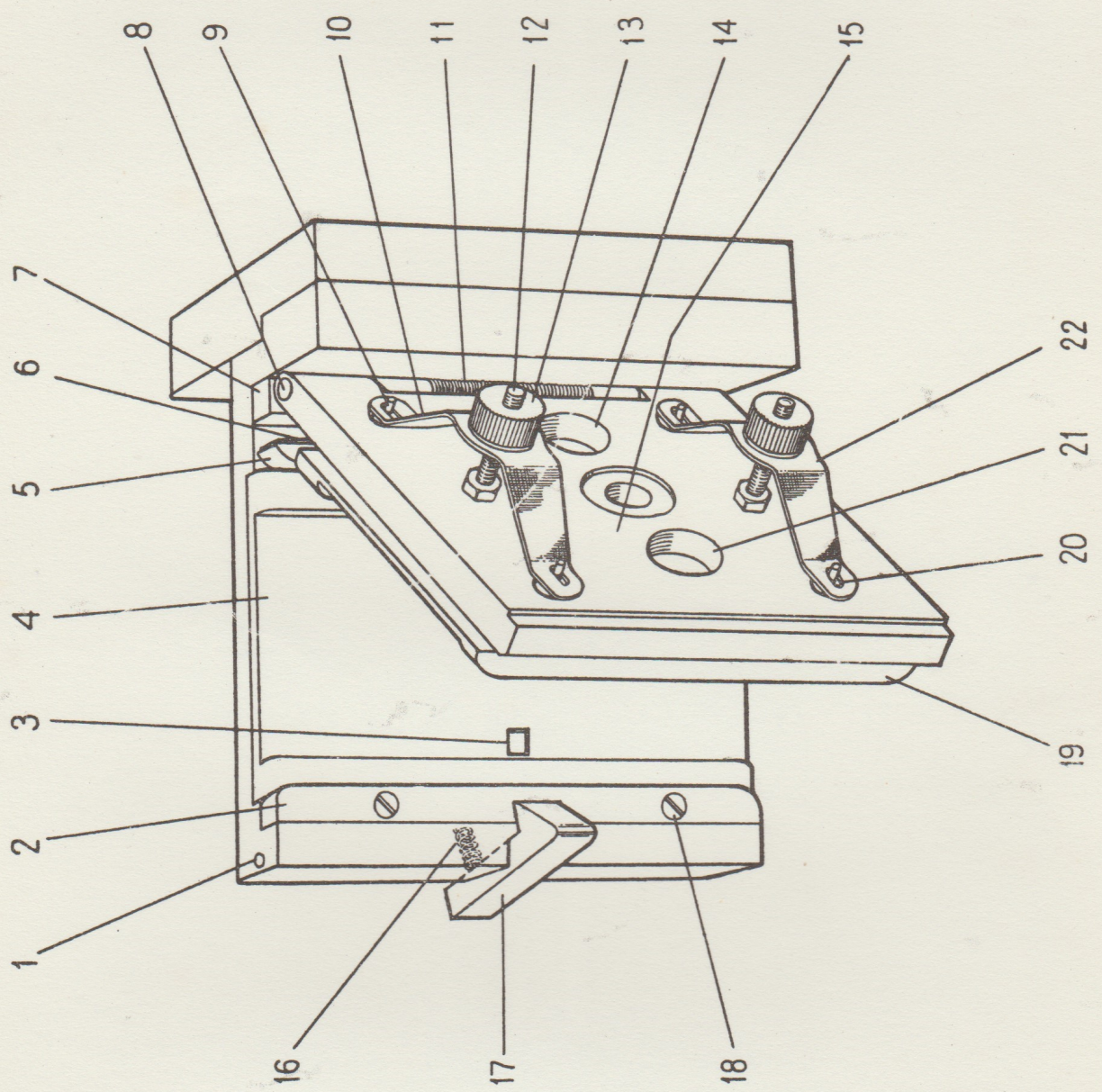


FIG. 1.

FIGURE "T"

REF. NO.

DESCRIPTION

SOUND GATE

T 1	Gate Catch Pin
T 2	Fixed Side Runner
T 3	Sound Track Aperture.
T 4	Back Runner Plate.
T 5	Side Pressure Runner.
T 6	Leaf spring loading Pressure runner.
T 7	Hinger block.
T 8	Gate Pin.
T 9 & 20	Pressure Pad Pins
T 10 & 22	Pressure Pad Leaf springs.
T 11	Gate opening spring.
T 12 & 13	Pressure Adjusting Nut and screw.
T 14	Light Aperture (For use with rear Projection).
T 15	Gate.
T 16	Gate opening spring.
T 17	Gate Catch.
T 18	Screws securing side runner.
T 19	Pressure pad.
T 21	Light Aperture (For use with Front Projection).

POWER AMPLIFIER.

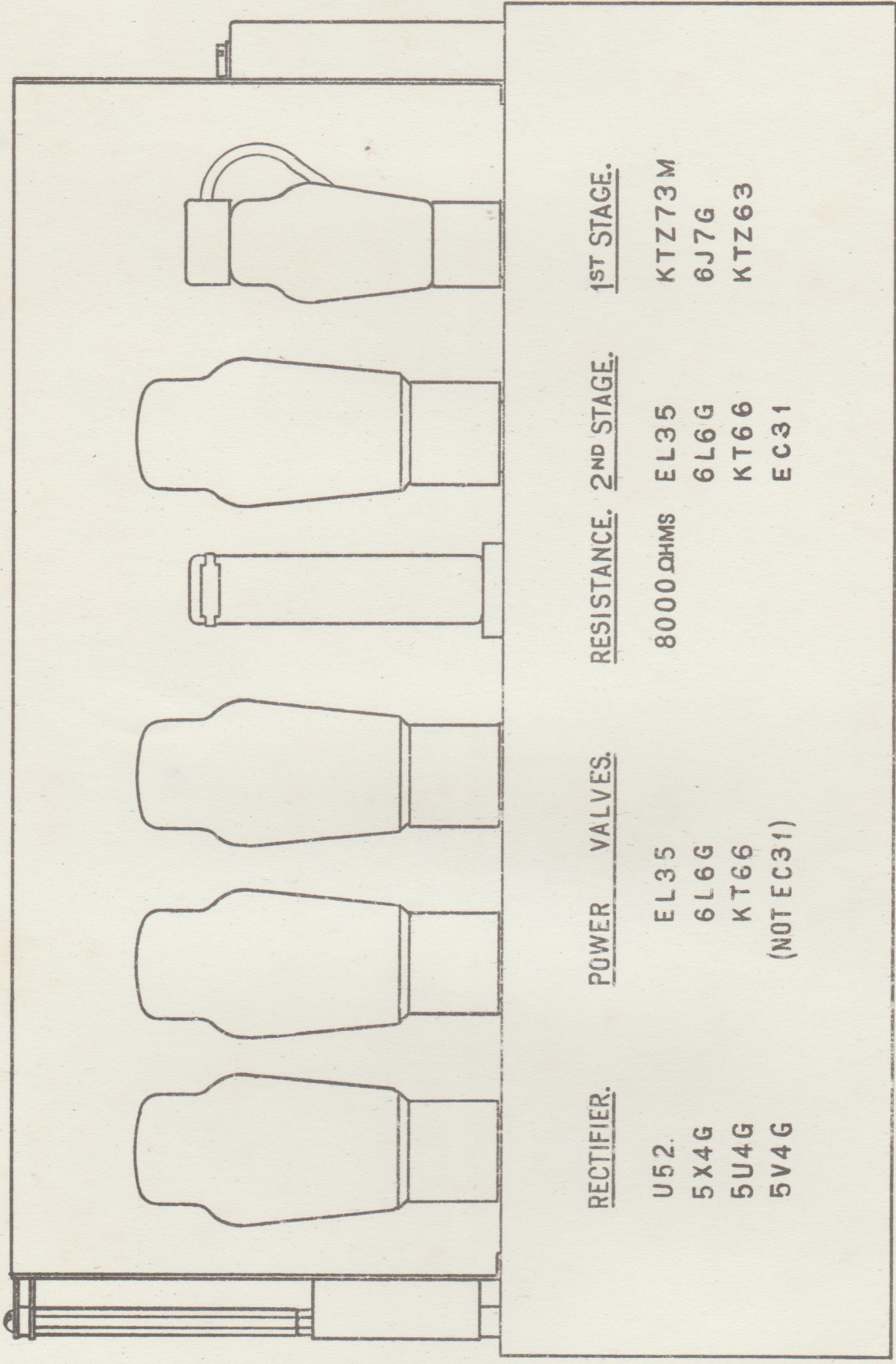
The Series 3 Power Amplifier consists of three stages of amplification with the output valves (PEN.428) connected in "Push Pull", the total undistorted output of which is approximately 15 watts.

1. Mains Transformer.

The mains transformer has a primary tapped at 200, 220 and 240 volts, it also has a plus ten tapping which makes it possible to obtain any mains tapping between 200 and 250 volts A.C. A two ampere fuse is wired in series with the variable tapping line whilst a spare fuse is housed in a similar container by its side. An 0/250 v. voltmeter is connected across the mains input socket, and thus gives a reading of the mains voltage as soon as the cable is connected to the mains supply. The transformer tapping screws should be adjusted to a total voltage as registered on the voltmeter.

2. Speech Line.

The output transformer is so designed that any single speaker unit or combination of units having a resultant D.C. resistance of between ten and twenty ohms can be suitably matched. The amplifier does not provide any field excitation current and therefore it will be necessary to use permanent magnet units. As the D.C. resistance of the speaker units is not to exceed twenty ohms it is advisable to keep the speech lead as short as possible and the cable as heavy as possible, thus cutting down the resistance of the lead to a minimum. If more than one unit is to be used it will be necessary to ascertain that they are in correct 'phase'. By correct 'phase' we mean that both diaphragms should move in the same direction at one particular instant.



<u>RECTIFIER.</u>	<u>POWER VALVES.</u>	<u>RESISTANCE.</u>	<u>2ND STAGE.</u>	<u>1ST STAGE.</u>
U52.	EL35	8000 OHMS	EL35	KTZ73M
5X4G	6L6G		6L6G	6J7G
5U4G	KT66		KT66	KTZ63
5V4G	(NOT EC31)		EC31	

SERIES 3 POWER AMPLIFIER VALVES.

3. Valve Efficiency.

For the purpose of ascertaining that all valves are working correctly, a milliammeter has been incorporated together with a switch. Compensating resistances have been added and thus by the turn of a switch it is possible to see separately if each stage is functioning correctly. By the inclusion of these compensating resistances the actual valve emission is not registered, but it is arranged that each stage should give a similar reading, the limits being set at between one and a half and two and a half milliamperes. M1 and M2 registers the first stage of projectors 1 and 2 respectively.

4. Tone Control.

For the purpose of tone control separate treble and bass lift controls are fitted. Thus the amount of treble and bass required can be adjusted to suit ones requirements.

5. Volume Control.

A large stud volume control is fitted in a convenient position on the amplifier panel. This controls volume when the amplifier is being used for film, disc or microphone. A separate attenuator is fitted to each head amplifier so that the output of two machines may be similar before feeding into a common power amplifier, thus making it possible to use the same fader setting for both machines.

6. Hum Dinger.

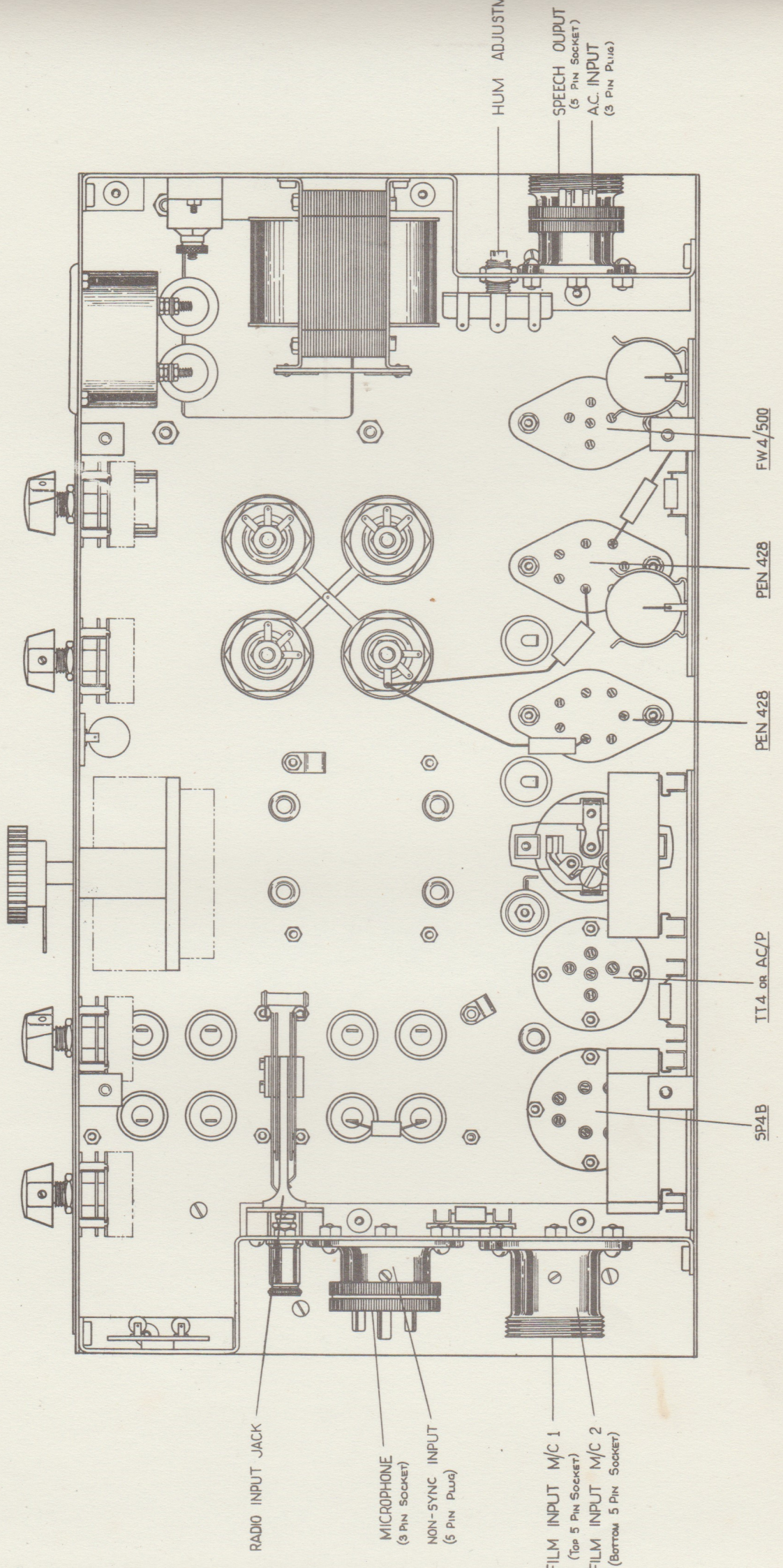
A variable resistance is fitted (45) to enable the output hum to be adjusted to a minimum.

7. Radio Input.

It may from time to time be desirable to amplify radio or some similar signal, the amplifier has therefore been fitted with a jack (52) so that this may be inserted via an ordinary telephone jack plug.

8. Anode Voltages.

For the purpose of periodically checking the amplifier a list of



RADIO INPUT JACK

MICROPHONE
(3 PIN SOCKET)

NON-SYNC INPUT
(5 PIN PLUG)

FILM INPUT M/C 1
(TOP 5 PIN SOCKET)

FILM INPUT M/C 2
(BOTTOM 5 PIN SOCKET)

HUM ADJUST

SPEECH OUTPUT
(5 PIN SOCKET)

A.C. INPUT
(3 PIN PLUG)

FW4/500

PEN 428

PEN 428

IT4 OR AC/P

5P4B

anode voltage readings is given:-

1st Stage (SP4B) 100 volts.

2nd Stage (TT4) 110 volts.

3rd Stage (PEN.428) 360 volts.

As the output valves are connected in "Push Pull" it is necessary that their characteristics are as near alike as possible, or distortion may be noticeable. The voltage on the anode of the last two valves will of course be similar.

9. Withdrawal of Amplifier.

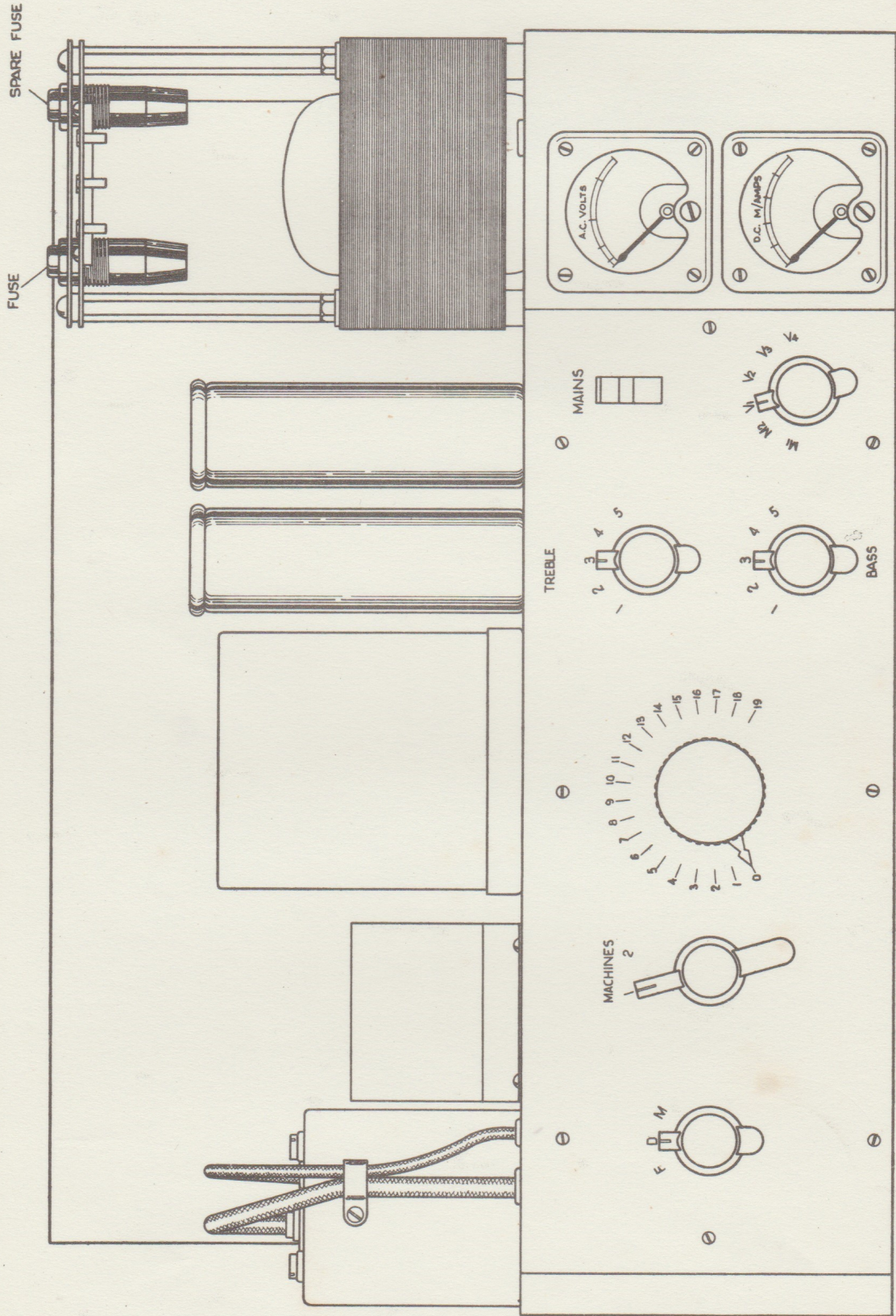
To remove the amplifier from its metal container it is only necessary to withdraw the four screws from the underside of the base and slide the amplifier out of the case.

10. Connecting Cables.

To simplify the installation of the equipment special cables are made standard, and these are given type numbers. A drawing showing the appropriate positions of each cable and its length is given later in this manual. Where cables are used to carry mains voltage it will be seen that a socket is fitted to the cable instead of a plug, thus making it impossible to obtain a shock when dismantling the equipment. The speech lead is divided into 50 ft. sections which may be coupled together according to the length of throw required.

Gramophone Attachment.

If required both single and double turntable non sync can be supplied for use with Series 3 Amplifiers. The single turn table consists of an electric motor and pick up, a volume control and a variable scratch filter, all housed in a metal container similar to the projector. The double turn table contains two volume controls thus enabling one to mix two records at the same time, or to fade out one record whilst the other is faded in.



SERIES '3' POWER AMP
LAYOUT 'B'

Microphone

A moving coil microphone can be supplied for use with Series 3 equipment. No pre-stage amplifier or polarising current is required.

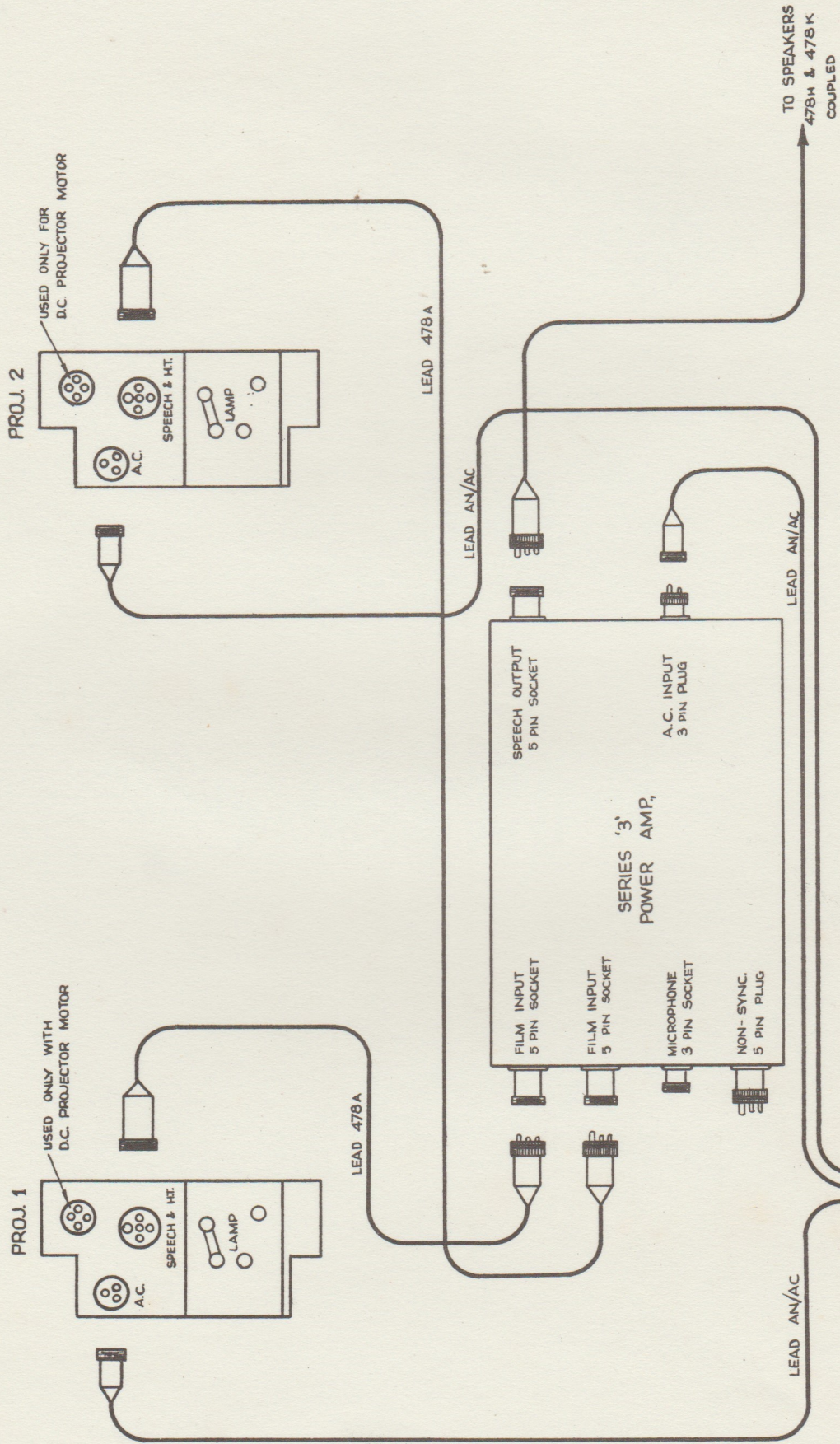
11. Dual Operation of Projectors

If a continuous performance is required two projectors will be necessary. As each projector has its own head amplifier it will therefore only require one power amplifier and set of speakers. A step down transformer is therefore fitted to the head amplifier, and the speech current carried along cables to the power amplifier where it is once more stepped up again and amplified. A change-over switch is then fitted to the power amplifier thus enabling us to amplify the signal produced by either projector No.1 or No.2. As each head amplifier is fitted with an attenuator the volume output of both machines may be adjusted until equal. Thus to change-over sound from one machine to another it is unnecessary to alter the main fader control but only to throw the switch over from machine No.1 to No.2. A similar switch is also fitted for the purpose of change-over from film to disc or microphone.

OPERATION

The sequence of operations to be carried out when starting up a show should always be as follows:

1. Switch on amplifier and check meter readings, they should register between $1\frac{1}{2}$ and $2\frac{1}{2}$ milliamperes.
2. See that switch is set for machine No.1 and for film reproduction.
3. Turn up main fader to about stud 10 and interrupt Beam of light to photo electric cell, this should produce a 'plip pop' sound. Return fader to zero.
4. Lace up projector, make certain that the picture is in correct rack.
5. Turn mechanism over by hand by means of the inching knob.



CABLE CONNECTIONS FOR SERIES '3' AMPLIFIER EQUIP.

LEADS REQUIRED :-

LEADS	TYPE	478A	478 H	478 K	AN/AC	FT.
2	TYPE	478A	10 FT.			
1	TYPE	478 H	50 FT.			
1	TYPE	478 K	50 FT.			
3	TYPE	AN/AC	25 FT.			

6. Run up motor.
7. Switch on projector lamp.
8. Turn up volume control to usual setting.
9. Check focus and racking of picture.

When finishing a reel the projector lamp should first be shut off, the volume turned in zero, and the film allowed to run off the spool before shutting the motor off.

