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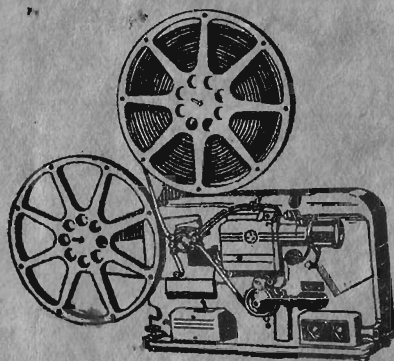
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INSTRUCTION BOOK
No. 1812

16-mm.
SOUND-FILM PROJECTOR
Type 450/30



THE
BRITISH THOMSON-HOUSTON
COMPANY LIMITED, RUGBY, ENGLAND

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No. 1812

16-mm.
SOUND-FILM PROJECTOR
Type 450/30



THE BRITISH THOMSON-HOUSTON Co., LTD.,

RUGBY, ENGLAND.

IMPORTANT

The high standard of performance of BTH Projection Equipment is the result of skilful design and meticulous care in every stage of manufacture. Every equipment is fully tested and accurately adjusted before leaving the Factory.

Regular attention to the small amount of maintenance recommended in this Instruction Book will ensure a continued high level of performance throughout the life of the equipment.

In case of difficulty, further information and assistance can be obtained from the Company's nearest Authorized Sales and Service Agent or direct from:—

Electronics Sales (16 mm.) Department,
The British Thomson-Houston Co., Ltd.,
RUGBY, ENGLAND.

Please quote the Serial Number of the equipment in all enquiries.

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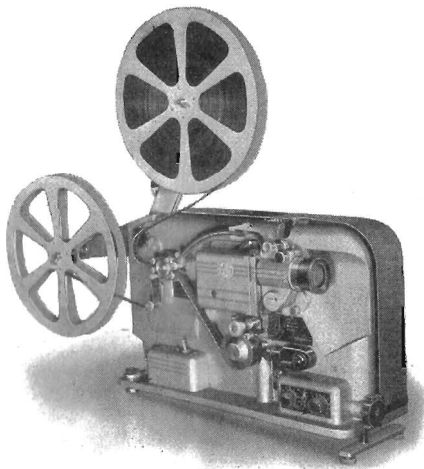


Fig. 1. Projector set up for operation.

16 mm. SOUND-FILM PROJECTOR Type 450/30

The Projector

The projector is housed in a leathercloth-covered transit case. In normal circumstances, when received all lamps, valves, etc. will be in position and the projector will be ready for connection and operation, although a preliminary inspection is recommended before putting it into service (see page 7). Unless otherwise specified, the lens supplied with the projector will be of 2" focal length, other sizes being available if required (see Lens Chart, Fig. 3). One spare film spool is supplied with the projector.

The 450/30 projector in its standard form is designed for use on 50-cycle a.c. mains, but an alternative version suitable for 60-cycle mains can be supplied.

Speaker

The speaker is a 15-watt single-unit type, mounted in a carrying-case. To utilize the full output of the amplifier, a second speaker can be connected in parallel.

Mains-unit Rectifier

The tappings on the auto-transformer of this unit render the equipment suitable for use on 50- or 60-cycles-per-second A.C. supplies from 110 to 120 volts, or



Fig. 2. 15-watt speaker.

between 200 and 250 volts. The filament and H.T. supplies for the amplifier are obtained from this unit, which, beside the transformer, contains the rectifier valve.

Mounted on the front of the unit are the amplifier 'ON/OFF' switch, an indicator light, and socket connections for a voltmeter or for a record-player turntable.

Lamps, Valves, etc.

The following is a list of the lamps and valves supplied with the equipment. The types mentioned have been selected as the result of prolonged tests, and for the best performance the correct replacements must be used.

- Projector Lamp: 115 volts, 750 watts, black-top, pre-focus base,
or
250 watts, Type ME/D mercury-vapour lamp. (450M/30. See page 17.)
- Exciter Lamp: Mazda, 4 volts, 24 watts, S.B.C.
- Photocell: Mazda, Type PE 50.
- Amplifier Valves: 3—Brimar Type 6AU6.
2—Mullard Type EL37.
- Fuse for Amplifier: 1—Cartridge-type, 500 milliamp.

Mains-unit Rectifier

- Rectifier: 1—Mullard Type GZ32.
- Indicator lamp: 1—3.5 volts, 0.15 amp. M.E.S.

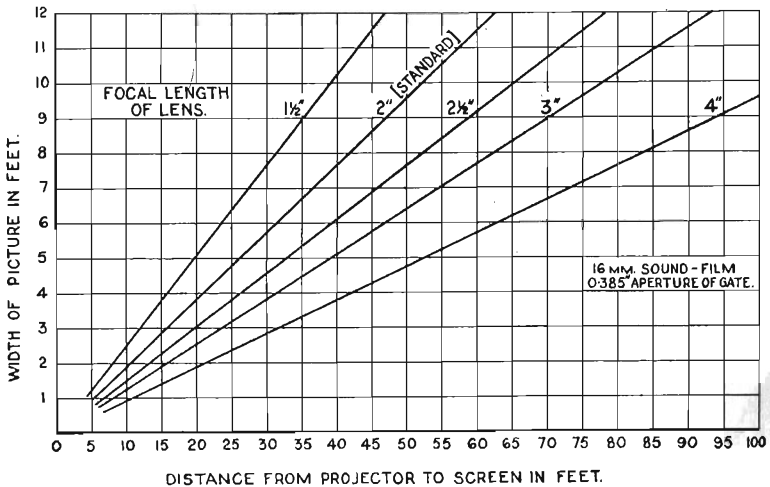


Fig. 3. Lens Chart.

RECOMMENDED ACOUSTIC CONDITIONS AND CHOICE OF SCREEN

Before proceeding to the instructions on projection and maintenance, the user will be well advised to study the conditions which determine the quality of both sound and picture. While it may be impossible to obtain ideal results in surroundings which are basically unsuitable for sound-film projection, careful attention to the recommendations given in the following paragraphs will almost certainly be repaid by a considerable improvement.

Sound

The quality of sound-reproduction is largely governed by the acoustics of the hall, which if unsuitable can spoil the performance of the finest film and equipment.

If the hall in which sound-films are to be shown has hard plaster walls and a bare wooden floor, sound will be reflected to and fro, causing an echo. 'Direct' sound reaching a listener will be blurred by 'reflected' sound reaching him successive fractions of a second later.

Reflected sound can be reduced by the introduction of sound-absorbent material, which is generally most effective on the back wall. Many such materials are obtainable, to be sprayed on to the walls and ceilings, or to be applied in the form of boards and panels. It is realized that in many cases special preparations of this kind are impracticable; but much may be done with curtains and carpets, and the presence of an audience improves matters considerably.

Poor acoustic qualities **cannot** be corrected by adjustments to the projector, although the *effects* of poor acoustics, such as lack of intelligibility, can often be minimized by judicious use of the tone control. Despite objections which may be raised to draping the rear and side walls with curtains, there is often no alternative if good results are to be obtained.

The loudspeaker should be placed alongside or above the screen, so that sound is directed towards the centre of the audience.

Picture

Size of Picture. In considering the layout of the hall or room where films are to be shown, the size of the picture is very important.

A guide to the most suitable size of screen is the recommendation that the distance from the screen to the back row of the audience should not be more than seven times the picture-width, while the distance from the screen to the front row should not be less than twice the picture-width. Within these limits, screens should be from 4 ft. to 8 ft. wide, although satisfactory pictures up to 12 ft. wide can be obtained, especially when 'silver' or 'beaded' screens are used. and the hall is properly 'blacked-out'.

Selection of Screen. The choice of screen surface is of no less importance if successful results are to be obtained, as the amount of light seen by the audience depends upon the screen's reflecting quality.

There are three main types of screen in common use today, each with its own particular advantages and limitations. These three types are: matt-white, silver, and beaded. Before deciding which surface is most suitable for given conditions, the characteristics of each type must be fully understood.

Matt-white screens are generally the least expensive and have the lowest reflectivity, but they are quite satisfactory for screens not more than 10 ft. wide. The principal advantage of a matt-white surface lies in its diffusive property, making it possible to view the picture from a wide angle without loss of brightness. For square-shaped halls, matt-white screens will give the best average brightness for all members of the audience.

Silver screens reflect considerably more light than the matt-white variety, and are therefore to be preferred when the picture is more than 8 ft. wide. A silver surface is, however, more directional, the reflectivity falling off rather rapidly at angles of more than 20/25 degrees on each side of the centre line.

Beaded screens, also, are more efficient than matt-white screens, but they should not be used when the projector is located above or to one side of the audience, as the light is mainly reflected straight back along the axis of projection.

All these screens can be obtained in perforated form if it is desired to place the speaker immediately behind the screen, which is the ideal position and that usually adopted in commercial cinema installations.

Position of Projector and Screen

Projector. The projector should if possible be located well behind the audience. Its stand must be perfectly rigid and should have a felt-covered top to minimize noise. (Care must be taken to ensure that the felt does not obstruct the fan air-intake on the underside of the projector). Running noise can be entirely eliminated by enclosure in a projection box or behind curtains, but this is not really necessary, as the 450/30 is a very quiet-running machine.

As a general rule, the base of the projector should be at a height of not less than four feet from the floor. This height is convenient for operation and ensures that the light-beam will clear the heads of the seated audience.

Screen. The bottom of the screen should be four or five feet from the floor. The picture size for lenses of various focal lengths for a given throw can be ascertained from the Lens Chart, Fig. 3. If the standard lens (2" focal length) supplied with the projector does not give the desired width of picture, the correct lens-size can be determined from this Chart.

The distance between projector and screen should be adjusted so that the picture slightly overlaps the edges of the screen. For a permanent installation where the relative positions of projector and screen cannot readily be adjusted to give this result, the edges of the screen should be masked with black cloth.

PRELIMINARY INSPECTION

Undo the knurled nuts, 2, Fig. 4, and take off the main cover. Check that all valves, etc. are in position and are undamaged. Examine the oil reservoir at the top of the intermittent mechanism. It will be realized that in certain cases a very considerable period will have elapsed from the time the projector leaves the Factory until it reaches the user; if the felt pad in the reservoir appears to be dry, follow the procedure set out under the heading 'Lubrication' on page 14, **but do not over-oil.**

1. Re-wind button.
2. Main cover fixing nuts.
3. Speaker socket.
4. Jack-socket for record-player or microphone.
5. Supply input plug.
6. Inching knob.

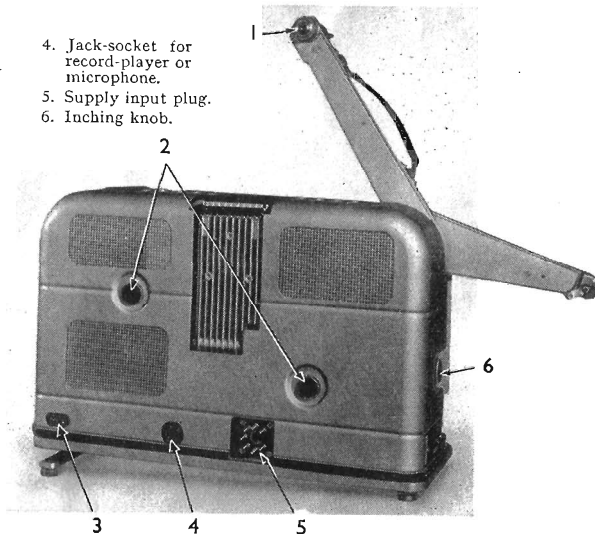
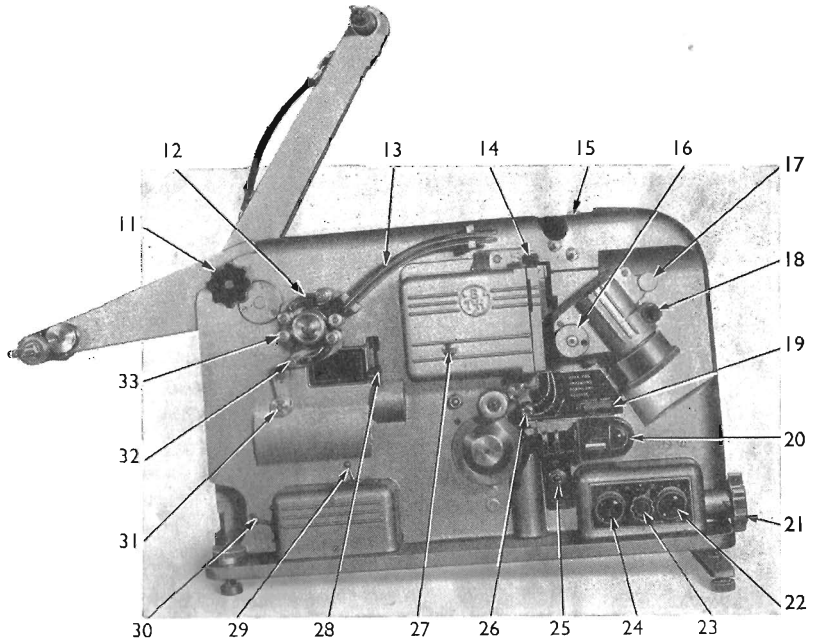


Fig. 4. Non-operating side of projector.



- | | |
|--------------------------------|------------------------------|
| 11. Spoolarm locking knob. | 23. Selector switch. |
| 12. Sprocket-pad (upper). | 24. Volume control. |
| 13. Film guide rails. | 25. Exciter-lamp switch. |
| 14. Framing knob. | 26. Pressure-roller knob. |
| 15. Spoolarm catch. | 27. Mirror-box fixing screw. |
| 16. Lensholder fixing nut. | 28. Change-speed lever. |
| 17. Picture-gate release knob. | 29. Projector-lamp switch. |
| 18. Lens clamping screw. | 30. Motor switch. |
| 19. Exciter-lamp adjustment. | 31. Snubber roller. |
| 20. Sound optical system. | 32. Sprocket-pad (lower). |
| 21. Tilt-adjusting knob. | 33. Guide roller. |
| 22. Tone control. | |

Fig. 5. Operating side, showing projector ready for threading (see text).

PROJECTION

Setting up the Projector

Set up the projector as recommended on page 6, determining the distance from the screen appropriate to the required picture width from the Lens Chart, Fig. 3. Set up the speaker above or alongside the screen.

Electrical Connections

Important: Before making any connections make sure that the actual supply voltage and frequency correspond to the ratings of the projector. The projector **MUST NOT** be connected to D.C. Mains.

Before connecting up as described below, make sure, that the amplifier switch on the mains-unit rectifier is 'OFF'.

- (1) Set the voltage-selector plugs on the mains unit to suit the supply voltage.
- (2) Push the socket on the cable attached to the mains unit onto the corresponding plug on the projector (5, Fig. 4).
- (3) Plug the speaker lead into the 2-pin socket (3, Fig. 4).
- (4) As despatched from the Factory, the mains-supply lead is fitted with an insulated socket on one end only; this socket is to be plugged on to the mains-unit rectifier. The other end of the lead is to be connected by means of a suitable plug to the A.C. mains-supply—*the green lead must be earthed.* The red lead should be connected to 'line' and the black lead to 'neutral'. Mains-supply should **not** be taken from a lamp-socket.

450M/30 Projector. On the 450M/30 projector, the choke must be connected between the mains unit and the projector.

Inspection before threading film

Before loading the projector with a film, the supply should be switched on and the equipment checked to make sure that it is working correctly. Check that the change-speed lever is in the correct position—16F/S or 24F/S (16 or 24 frames per second)—to suit the film that is to be used. Check also that the adjustable shutter is set correctly (see page 11). Unscrew the spoolarm locking knob (11, Fig. 5) and pull it out as far as possible. Release top spoolarm catch (15), and swing the arms out, locking them in the extended position by pushing in the knob and screwing it up fingertight.

Switch on the motor and check that the mechanism is running satisfactorily. Switch on the projector lamp. (Note: On standard 450/30 projectors, the lamp will not light until the motor is switched on. For special notes on 450M/30 projectors, see page 17.)

Turn the front-foot knob to set the angle of the projector so that it illuminates the screen correctly. Switch on the amplifier (the switch is on the mains-unit rectifier) and allow the valves to warm up. Switch on the exciter lamp. Set selector switch, 23, Fig. 5, at 'O'.

Turn the volume control up until a hum can be heard in the speaker. The sound system can then be checked by momentarily interrupting the beam of light from the exciter lamp to the photocell, when a 'plop' should be heard in the speaker. Check that the exciter lamp is in the position that gives maximum volume, if necessary adjusting the height by rotating thumbwheel 19, Fig. 5. Adjust the height until the light falling on the photocell is at its brightest.

Threading

Put the full film-spool on the top spoolarm spindle. (NOTE:—On films with a single row of sprocket-holes, these holes should be on the side away from the projector). For 'straight' projection, it is unimportant whether the film leaves the top spool from the right or the left as seen from the operating side, i.e. whether the film turns the spool clockwise or counter-clockwise. But, if the direction of the film is to be reversed, it must be remembered that when the top spoolarm spindle is the **driven** member it runs **anti-clockwise**. In these circumstances, therefore, when threading, not only must the sprocket-holes be outwards but the film must pull off the spool from the right—i.e., it must turn the spool **clockwise**. If necessary, the film must be rewound.

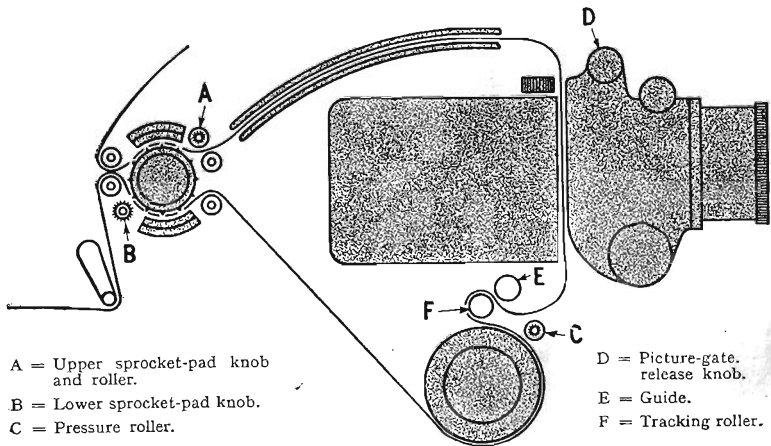


Fig. 6. Diagram of film-path.

Secure the spool by means of the locking lever on the end of the spindle, put a suitably-sized empty spool on the lower spoolarm and lock it in a similar way.

Open the top and bottom sprocket pads, 12 and 32, Fig. 5, turn knob 17 anti-clockwise and swing open the lens-holder. Lift the sound-drum pressure-roller by means of knob 26. Pull about five feet of film off the top spool and proceed to thread the film as follows:

- (1) Pass the film over the top of the film sprocket and close pad 12, Fig. 5, making sure that the teeth are engaged in the sprocket holes.
- (2) Pass the film between the guide rails and into the picture gate, making sure that the top loop is of the correct size when the lens-holder is closed.
- (3) Referring to the threading diagram, Fig. 6, pass the film between the guide E and the tracking roller F; pass the film round the sound drum and close the pressure roller by knob C.
- (4) Set the film loop below the gate to suit optical soundtrack, as indicated on the engraved plate on the projector. Check that the film is properly seated round the tracking roller F, Fig. 6, making sure that both side-pressure buttons are bearing correctly on the edges of the film.
- (5) Pass the film under the film sprocket and **over** roller 33, Fig. 5. Close lower pad 32, and make sure that the teeth are engaged in the sprocket holes above and below the sprocket. This can easily be checked by feeling that there is a very slight movement of the film if it is gently pulled to and fro with the pads closed.
- (6) Finally, pass the film round the snubber roller 31, Fig. 5, and put the end into the slot of the take-up spool, taking up the 'surplus' film by turning the spool **clockwise**.
- (7) Inch the projector by means of the inching knob 6, Fig. 4, or switch the motor on for a moment, to check that the film is correctly threaded. The complete film path is shown in the threading diagram Fig. 6, and in Fig. 7.

Adjustable Shutter

In the normal 24-frames-per-second position, the two blades of the adjustable shutter are arranged to coincide, forming a single blade which interrupts the light-beam twice per frame. To eliminate 'flicker' at 16 frames-per-second, one blade can be swung into a position diametrically opposite the other, forming a two-bladed shutter which gives four light-interruptions per frame.

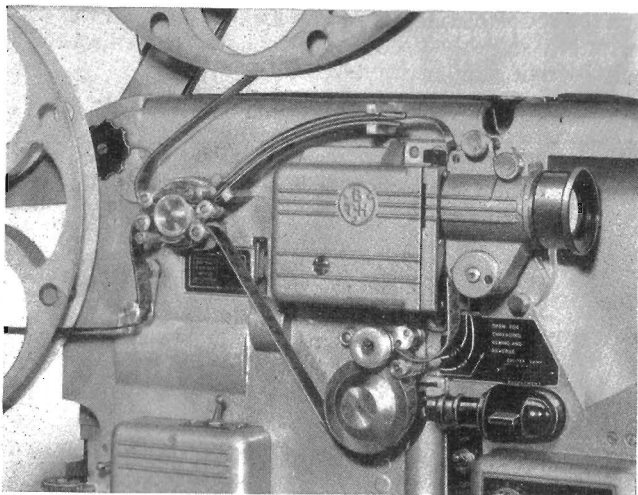


Fig. 7. 'Close-up' of film-path.

To adjust the shutter, undo fixing screw 27, Fig. 5, and remove the mirror-box. Turn the inching knob until the shutter is in a convenient position. The adjustable blade is slightly larger than the fixed blade and is notched. To extend it, hold the flywheel stationary, and with the left hand rotate the adjustable blade until it clicks into position **opposite** the fixed blade.

The shutter can be set in an intermediate, partly extended, position. This position is only used in 450M/30 projectors, which are fitted with the ME/D mercury-vapour lamp (see page 17).

To revert to the single-bladed shutter, the movable blade is rotated until it clicks into position, and is completely covered by the fixed blade.

Sound Optical System

The sound optical system, 20, Fig. 5, is focused correctly before despatch. It should, however, be noted that there are two settings for the optical tube. The standard setting is marked 'STD', and is suitable for black-and-white and most colour films, on which the emulsion is on the film surface away from the projector lamp; the tube is set in this standard position before the projector leaves the Factory. For the other setting, the tube is rotated away from the projector; this setting is to be used when the emulsion is on the reverse side of the film from normal, as is the case with some colour films.

The tube is locked in each position by a leaf-spring.

Running

After switching on the amplifier, it must be allowed about half a minute to warm up. To avoid overheating, do not leave the amplifier switched on for long periods unless the motor is running.

Switch on the motor and projector lamp, and focus the picture by rotating the lens in its holder; when satisfied that the focus is correct, lock the lens-holder by means of the clamp screw 18, Fig. 5. The framing of the picture can be adjusted, up or down as required, by turning the framing knob 14.

Adjust the volume control to the required level, and set the tone control to give the best quality of reproduction.

When the end of the picture comes into sight, the volume control should be turned down and the projector lamp switched off (or the dowser shutter closed, in the case of the 450M/30 projector—see page 17). The motor should be allowed to run until the film has all passed through the projector.

Reverse Running. Provision is made for running the film backwards. To reverse direction, switch the motor off, put the pressure roller in the 'open' position by lifting knob 26, Fig. 5, and switch the motor on again. The film will now run backwards, but it must be remembered that, as already emphasized, the top spool when 'taking-up' runs **anti-clockwise**. To run the film forward again, switch off the motor, lower the pressure roller onto the sound drum, and switch on.

The projector should not be run in reverse for long periods with the projector lamp on.

Rewinding

When the film has completed its run through the projector, take the free end of the film from the lower (full) spool and insert it into the slot of the now-empty upper spool. Give this spool a few turns **anti-clockwise** to engage the film.

Put the pressure roller in the open position by lifting knob 26, Fig. 5. Switch on the projector motor which will now run in the reverse direction. Now press the rewind button, situated at the rear of the upper spoolarm, 1, Fig. 4—holding it in for a second to make sure it is properly engaged—and the film will be rapidly rewound. The rewind drive is automatically disengaged on completion of rewind.

Record-player or Microphone

The jack-socket, 4, Fig. 4, enables a record-player or a microphone to be connected to the amplifier. Sound from film or from microphone/record player can be selected by setting selector switch 23, Fig. 5, at either 'O' or 'M' respectively.

The amplifier input impedance is 3.8 megohms, and the sensitivity 35 millivolts for full output at 1 kc/sec. Most high-impedance microphones and record-player pick-ups can thus be fed directly into the amplifier.

A convenient 225-volt a.c. supply for the record-player motor can be obtained from the two outer contacts of the voltmeter socket on the mains-unit rectifier.

STORAGE

Projector and Speaker

When not in use the projector and the speaker should be stored in a warm room, free from damp. Dust and dirt will of course give rise to trouble, and the projector must be kept clean. The speaker contains a powerful magnet that attracts iron or steel particles, and if these are not excluded they may find their way into the gap between the speech coil and the magnet.

Films

Films should be stored in their proper containers in a cool room. If kept too long in warm dry surroundings, they will lose their moisture content and may shrink and become brittle.

CARE AND MAINTENANCE

Lubrication

The intermittent mechanism requires regular lubrication. Remove the projector main cover; above the intermittent mechanism will be found a reservoir, fitted with an oil-absorbent felt pad. Drip on to this pad a small quantity—about 20 drops—of a good-quality light lubricating oil, such as sewing-machine oil. This procedure must be repeated from time to time, depending on the use of the projector; but it is essential that the amount of oil added should only be just enough to keep the felt pad moist.

All gears should receive an occasional smear of a high-melting-point grease, such as Mobilgrease No. 2.

All rollers should be **lightly** oiled periodically. A **single drop** of oil is sufficient.

All bearings are grease-packed ball-bearings, with dust-excluding caps, and should require no attention throughout the life of the projector.

Cleaning

All parts of the mechanism must be kept as clean as possible.

Lenses. The projection lens should be removed occasionally and both of the external faces cleaned, using, very gently, a piece of lens-cleaning tissue or soft linen. The lens should not be dismantled.

By undoing screw 27, Fig. 5, the mirror-box can be removed, complete with deflecting mirror and forward condenser-lens system. These items can then readily be cleaned, together with the front face of the main condenser lens. Keep the small lenses behind the aperture plate free from oil. Access to the other face of the condenser is obtained by opening the lamphouse and removing the projector lamp.

The **outside** surfaces of the lenses of the sound optical system should be cleaned occasionally, also the small mirror in front of the photocell, as dirt at this point can cause serious loss of sound volume. Remove the amplifier and the photocell, and wipe the surface of the mirror with a small pad of cotton wool on a match-stick.

Picture Gate. Emulsion and dirt should be removed from the gate at frequent intervals, using a small brush or a thin piece of soft brass. This is particularly necessary when using new film.

Emulsion may sometimes lodge in the space between the side-pressure plate and the aperture plate. **Failure to remove accumulated emulsion will result in picture unsteadiness.** The emulsion can be dislodged with the edge of a piece of thin card.

Sound drum. From time to time the periphery of the sound drum should be carefully wiped with a cloth moistened with methylated spirit.

SERVICING

It is inadvisable in the ordinary way for the user to attempt complicated adjustments to the projector mechanism; such work is generally better entrusted to the BTH Service Agent.

However, the replacement of valves, lamps, etc., presents no difficulty; and all main assemblies liable to require attention are readily removable as complete units. The methods of removal, where not immediately obvious, are described in the following paragraphs.

For the purpose of testing or servicing, it may sometimes be necessary to run the motor with the projector in an abnormal position, i.e. inverted or on its side. Under these conditions, **it is essential that the change-speed lever, 28, Fig. 5, should be in the mid-position—'neutral'.** Otherwise, serious damage to the soundhead mechanism may result.

Projector Lamp. To change the projector lamp, it is unnecessary to remove the main cover. Lift the latch and open the lamphouse, turn the lamp anti-clockwise to release it, and pull it out. Insert the new lamp, lock it by a clockwise turn, and close the lamphouse.

In the case of the 450M/30 projector, the clip-on lamphouse shield must first be taken off and the screw fixing the latch removed. The

ME/D mercury-vapour lamp can then be changed as described above.

NOTE: When handling the ME/D lamp, do not touch the quartz bulb with the fingers (see notes, page 17).

Exciter Lamp. To change the exciter lamp, pull off the cover and turn the adjusting thumbwheel 19, Fig. 5, to the right as far as it will go. This will unclamp the cap of the lamp, which can then be removed.

Insert the new lamp with the filament support downwards, and with the pins of the cap at '11 and 5 o'clock'. Rotate the lamp to engage the holder as is usual with bayonet-cap fittings, and replace the cover. Turn the thumbwheel to the left. The first turn clamps the cap in its holder, and the lamp must then be adjusted to the correct height as described on page 10. In some cases, to obtain maximum volume it may be found necessary to turn the lamp so that the filament support is upwards.

Photocell. To change the photo-electric cell, turn the projector on to its side. Swing aside the spring clip which secures the photocell holder and its plug. Withdraw the plug and the holder can be pulled out.

Pull off the shield, which is a push-on fit and can readily be removed. Then take out the old photocell and insert the new; refit the shield, making sure that the ridge on the holder engages with the slot in the shield.

Re-insert the cellholder, pushing it in as far as it will go, and refit the plug; lock by swinging the spring clip back into position, so that it engages with the slot in the base of the holder.

Rectifier Valve. The Type GZ 32 rectifier valve is located in the mains-unit rectifier. Remove the cover-fixing screws, take off the cover, and remove the valve by pulling it firmly upwards.

Intermittent Mechanism. To remove the intermittent mechanism, undo fixing-screw 2', Fig. 5, and slide the mirror-box off. Remove the two 2BA screws at top and bottom of the intermittent mechanism, which can now be drawn off its locating dowel. Take care not to lose any shims which may be between the mechanism and the main casting at top and bottom.

When fitting a new intermittent mechanism, the meshing of the driving gears must be carefully checked. There should be the minimum amount of backlash between the gears, but on the other hand there must be *some* backlash, i.e. the gears must not be tight in mesh. If the correct depth of meshing cannot be obtained by the use of the original shims, it may be necessary to fit new or additional shims which can be supplied by your Agent. It may also be necessary to move the lens-holder and skids bodily sideways, by adjusting the circular nut 16, Fig. 5, until both skids are free to press into the aperture plate.

Amplifier. To remove the amplifier, turn the projector into its side and remove the main cover. Take out the photocell as described on page 16, and remove the two amplifier-retaining screws in the projector base.

Return the projector to the upright position. Take off the control knobs after loosening the grub-screws.

Un-plug the wiring connector, and the amplifier can then be withdrawn as a complete unit.

THE 450M/30 PROJECTOR

With certain Factory modifications, the 450/30 projector can be adapted to use a mercury-vapour lamp, with advantages of brilliance, efficiency, and long life. The projector is then described as 'Type 450M/30'.

The modifications include safeguards to prevent the inadvertent opening of the lamphouse while the lamp is alight, a precaution to be observed by the user. A 'dowser' shutter is fitted to protect the film, since the ME/D lamp is normally not switched off from beginning to end of the show. (See following notes on setting up and operation.)

* **The quartz bulb of the lamp should never be touched with the fingers**, as the natural oils of the skin may cause permanent marks which will appear on the screen, to be imprinted on the bulb. If the quartz has accidentally been touched, it should be cleaned immediately with methylated spirit.

Setting-up and operation

- (1) Make sure that the position of the voltage selector plugs on the mains-unit rectifier corresponds with the actual mains voltage.
- (2) The choke **must** be connected **between the mains unit and the projector**.
- (3) Check that the adjustable shutter is in the 'ME/D' position (see page 12).
- (4) The lamp takes about 15 minutes to reach full brilliance, so it should be switched on about 20 minutes before it is actually required; it should not be switched off again till the end of the show. Note, however, that once the lamp has reached full brilliance, it should not be left alight for long periods unless the projector motor is running.

- (5) Before starting to thread the film, make sure that the 'dowser' shutter in the mirror-box is cutting off the light beam.

WARNING

The lamphouse must not be opened while the lamp is alight.

Conversion to tungsten-lamp operation

- (1) Remove lamphouse cover and ME/D lamp.
- (2) Reverse the baffle over the fan outlet at the base of the lamphouse.
- (3) Remove the baffle fixed to the amplifier chassis below the lampholder.
- (4) Close the adjustable 'flicker-shutter' on the intermittent mechanism (see page 12).
- (5) Fit the tungsten-filament pre-focus base projector lamp.
- (6) Connect up the projector and mains-unit rectifier as for the standard equipment (see page 9), i.e. with choke out of circuit.

NOTE: In 450M/30, the lamp switch is not interlocked with the motor switch. When converted to tungsten-lamp operation, the motor must be running before the lamp is switched on, otherwise the cooling will be insufficient; also, if the dowser is open, the film will be damaged.

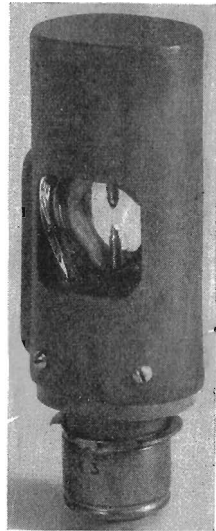


Fig. 8. The ME/D lamp.

POSSIBLE FAULTS AND THEIR CORRECTION

| SYMPTOM | POSSIBLE CAUSE | REMEDY |
|--|---|---|
| 1. Entire projector fails to operate. | Mains supply off. | Check mains supply. Inspect mains-unit rectifier and check output with a voltmeter. |
| 2. No sound (after allowing valves time to warm up). | (a) Amplifier fuse blown. (b) Broken connection. (c) Amplifier fault (defective valve) | Inspect fuse and replace as necessary. Check leads and plugs. First, make sure that the supply is reaching the valves by observing that their filaments are glowing. Then, try replacing valves. If still faulty, return amplifier to your Agent for attention. |
| 3. No sound from film, but hum audible in speaker. | (a) Exciter lamp faulty or out of adjustment. (b) Exciter lamp switch defective. (c) Photocell not fitted or fitted incorrectly; photocell lead plug not properly fitted into amplifier; or faulty connections between photocell and plug. (d) Photocell faulty. | Check and re-adjust. Check switch, 25, Fig. 5. Remove photocell holder and plug from base of projector and make sure that cell is properly fitted. Inspect screened-lead connection between cell-holder and plug. Refit cellholder and push 4-pin plug well home. |
| 4. Sound volume low. | (a) Exciter lamp out of adjustment or blackened with age. (b) Faulty valves. (c) Faulty photocell. (d) Dirty soundhead mirror. | Try replacement. Re-adjust or replace. Try replacing valves, remembering that more than one may be faulty. First observe if any valve is not glowing. Try replacement. Clean mirror (see page 15). |

POSSIBLE FAULTS AND THEIR CORRECTION (continued)

| SYMPTOM | POSSIBLE CAUSE | REMEDY |
|---|---|--|
| 5. Sound distortion—ripple. | (a) Film-loop too small between picture-gate and soundhead. (b) Tracking roller not rotating freely. | Thread correctly. Clean and lubricate. |
| 6. Unsteady sound. | (a) Dirt or emulsion on surface of tracking roller. (b) Tracking roller not rotating freely. (c) Dirt or emulsion stuck to sound drum; or dirt or oil on rim of brass disc which drives flywheels. | Clean. Clean and lubricate. Clean with cloth moistened with methylated spirit; make sure that felt wiper pad (rubbing on brass disc) is free from oil or grease. |
| 7. Noises and crackles in sound. | (a) Faulty speaker connection. (b) Faulty contact on 4-pin plug from photocell. (c) Valve or photocell not properly seated or making bad contact. (d) Faulty earthing of photocell holder, screen, or earthing contact of spring blade under cell-holder. (e) Faulty internal connection. | Clean pins of valve or photocell and press firmly home. Remove, inspect, clean, and replace. Return amplifier to your Agent for attention. Try replacement. Try replacement. |
| 8. Ringing noise at normal volume when projector is running with film. | (a) Faulty photocell. (b) Faulty first-stage valve in amplifier. | Return amplifier to your Agent for attention. Try replacement. Try replacement. |
| 9. Hum noticeable when running film. 10. Mains hum completely drowns sound from film; exciter lamp brilliance decreased. | Stray room-lighting reaching photocell. Faulty smoothing condenser in amplifier. | Trace source and correct. SWITCH OFF to avoid damage to valves and transformer and return amplifier to your Agent for attention. |

| | | |
|---|---|---|
| 11. Unsteady picture. | <p>(a) Dirt or emulsion in the gate. (b) Dirt or emulsion lodging under side-pressure spring. (c) Skids out of adjustment. (d) Film not correctly aligned with claw 'peckers'. (e) 'Pecker' insertion not deep enough. (f) Worn claw frame, insertion frame, or cam.</p> | Clean gate with a brush or brass scraper. Clean out. Re-adjust skids (see page 16). Return to your Agent for attention. |
| 12. Picture periodically out of focus. | <p>(a) Film badly buckled. (b) Lens-holder and skids displaced and not holding film flat in gate.</p> | Depth of insertion should be 0.030". Return to your Agent for attention. Return to your Agent for replacement of worn parts. |
| 13. Indistinct picture. | Dirt or oil on lens. | No remedy. Re-adjust skids (see page 16). |
| 14. Unevenly-illuminated screen. | <p>(a) Projector lamp not correctly positioned. (b) Screen not flat. (c) Condenser lenses displaced, or incorrectly assembled. (d) Flat or spherical mirror displaced.</p> | Clean. Open lamphouse and turn lamp fully clockwise. Return to your Agent for attention. Return to your Agent for attention. |
| 15. Illumination of picture not satisfactory. | <p>(a) Dark film copy. (b) Screen unsatisfactory or dirty. (c) Projector lamp blackened with age. (d) Mains-unit rectifier not set to correct mains voltage. (e) Dirt or oil on lenses and mirrors.</p> | No remedy. See recommendations on page 5. Replace. |
| 16. Projector damages film. | Incorrect threading—top loop too small or sprocket holes not correctly located on sprocket teeth. | Check, and, if necessary, adjust mains-unit voltage-selector plug. Clean. Thread correctly. |