

INSTRUCTIONS
FOR SETTING AND
OPERATING THE
ZEISS IKON
HIGH CAPACITY
ERNEMANN
II AND III
MACHINES



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Zeiss Ikon A.G. Dresden

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We cannot accept responsibility for any imperfection in the functioning of the machines in the event of any part being altered or subjected to treatment not conforming to, or exceeding, the limits of the directions contained in this booklet.

The Ernemann II Machine is supplied both as a

Right-Hand Machine and as a
Left-Hand Machine



The left-hand machine is an exact mirror reversal of the right-hand machine. The two machines are identical as regards their parts.

The Directions for Setting up and Operating are given for the right-hand Machine but apply with the necessary obvious modifications equally to the left-hand machine. Where there are notable differences these will be pointed out in the text.

Mode of Packing

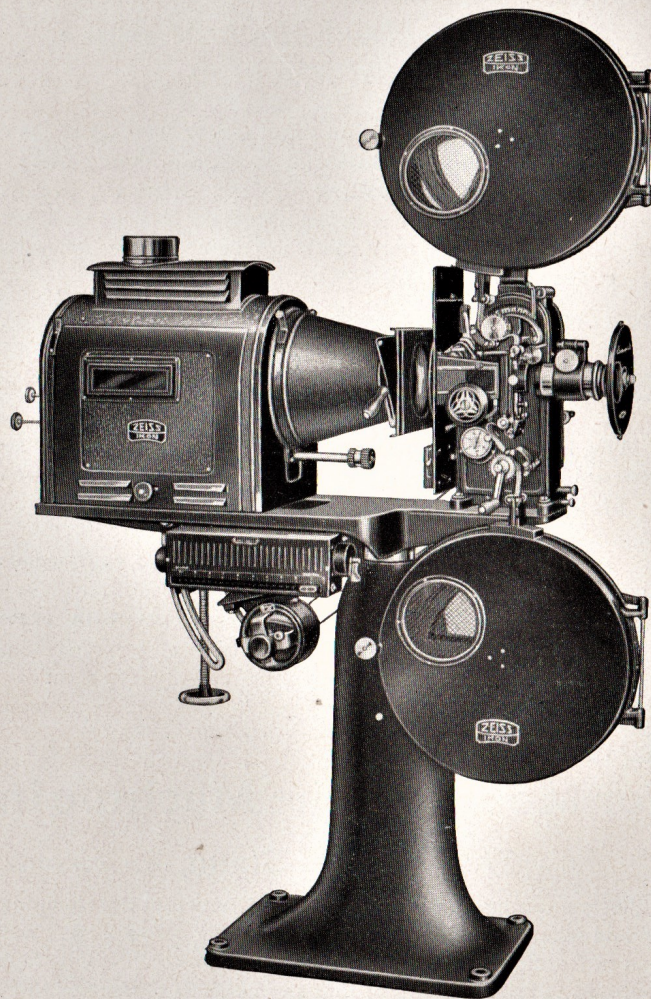
The Zeiss Ikon Ernemann II Projector of standard design mounted on a pedestal stand is despatched from our works in sections, as follows:

- I. Pedestal Stand, comprising
 - a) the pedestal.
 - b) the stem with table plate and electric equipment attached.
- II. Mechanism,
- III. Lamphouse, fire protection magazines with arms, fire guard, and diascope attachment.
- IV. Source of Light.

Directions for Mounting the Machine in Position

The Pedestal Stand, cast iron pillar (Plate I)

When setting up the pedestal stand, note that the clamping screw 2 to the stem should face the screen. Turn the clamping screw 2 back a little way and within and in front of it place the thrust washer 1 (which will be found wrapped in paper and tied to the column), so that the concave surface of the washer may fit well in the cylindrical surface of the stem fitting within the pedestal. In no case should the washer be allowed to protrude from the bore of the fitting. Place the table plate 6 upon any suitable support so that its ribs may face upwards. Affix the heel piece 7 with the cylindrical stem to the table plate by means of the bolt 9. Release the bolts 11 on either side of the table and fold out the slot links 10 and attach these by the link screws 8 to the heel piece. Then



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RIGHT-HAND MACHINE

carefully slip the table plate 6 together with the stem into the pedestal. The table may be raised and lowered by means of the screw spindle 3 with cross-piece 4. From the latter unscrew the two screw bolts 5, introduce the spindle itself together with the cross-piece through the door, and by turning it in an anticlockwise direction screw it sufficiently far into the stem so that the cross-piece may be on a level with the two holes in the pedestal column. Attach the cross-piece to the latter by means of the two bolts 5.

Respecting the vertical adjustment, the directions for swivelling and tilting of the table plate will be found under the heading "Lay-out of the Machine relatively to the Projection Theatre".

The Lower Fire Proof Spool Box

(Plates II and VII)

The lower fire proof spool box with its arm is screwed in below the table plate by means of four screws. It should be aligned in accordance with the locating marks. In the key of the friction gear insert the spring supplied and introduce the driving shaft 17 from above through the hole in the table plate.

The Projection Mechanism (Plates II, III, IV and VI)

Carefully place the mechanism provisionally upon the machined part of the table plate. The driving shaft 17 has a cross-piece 15, which must engage in the slit of the driving socket 16 at the base of the projector. By slowly turning the belt pulley at the rear of the mechanism make sure that the coupling works without constraint in any position. The locating marks in the front of the projector should register with those on the table plate. The body of the projector, having been thus set out, should be fixed firmly and evenly upon the table plate by the four screws. Once again make sure that the take-up friction gear works smoothly and correctly. In order to mount the fire shield to the projector remove the two screws 55 from the studs 54 which protrude from the machine casing and unscrew the knurled knob 58 in the fire-trap. To the two studs attach the fire shield and the light-screening cone facing the film-gate. The movability of the fire-trap should not be impeded in any way. Test this by turning the knurled knob 58.

Upper Fire Proof Spool Box (Plate III)

The upper fire proof spool box is attached to the projector body by two screws 29. The two short socket pieces held by the screws serve merely for protection during transport and are not needed in the mounted machine. (In the event of the Ernemann II machine being equipped with a diascope attachment the diascope arm should be clamped between the upper magazine arm and the body of the machine in accordance with the section headed "Diascope Attachment".)

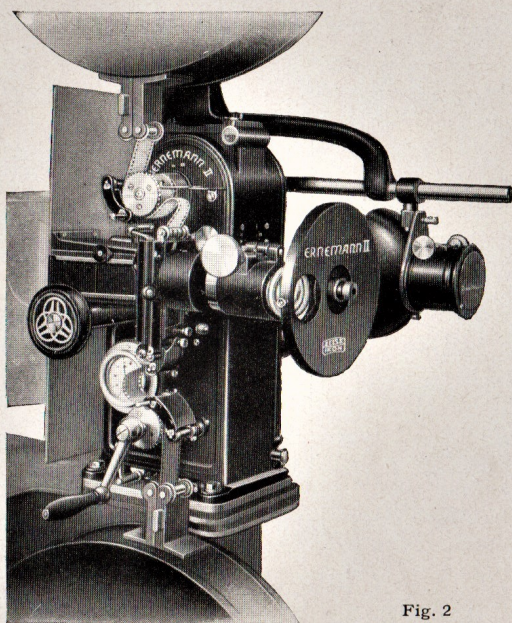


Fig. 2



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RIGHT-HAND MACHINE MECHANISM

The Diascope Attachment (fig. 2)

Clamp the diascope arm on the side of the projector motor drive under the arm of the upper fire proof spool box and screw the latter and the diascope arm jointly to the projector. Push the diascope rod into the eye-holes and fix it by means of the tommy screws. Slip upon the diascope rod the diascope lens jacket so as to depend from it on a level with the optic axis.

The Optical Equipment

a) The Cine Lens (Plate IV)

The bearing bush for the shutter shaft serves likewise as the carrier of the lens jacket. To put in the lens fold up the lens jacket and slip in the lens in such a way that the arrow engraved on the lens mount as well as the engraved designation of the lens faces the screen. Clamp the lens by tightening the ring clamp in the front part of the body. Next, it may be roughly focused by setting the distance between the middle of the lens and the filmgate so as to correspond to the focal length of the lens engraved on the lens mount. Release the tommy screw to the lens jacket and displace this along the shutter bearing. A definitely sharp focus may subsequently be obtained by means of the focusing head 37 of the lens jacket. Where required, the shutter shaft may be displaced in its bushing after the release of the tommy screw to the lens jacket. The shutter should be about $\frac{3}{8}$ inch in front of the lens. After setting, retighten the tommy screw.

b) The still-view lens (diascope lens)

The diascope lens should be put in the lens jacket in like manner as the cine lens. As in the case of the cine lens let the arrow engraved on the lens mount and the designation thereon face the screen. The focal length corresponds approximately to the distance between the lens and the drop frame of the diascope attachment.

Electrical Equipment

The electrical equipment comprises the motor, regulating resistance with connecting box and switch.

The motor is attached by two screw bolts with lock nuts from below to the sluing motor plate. The belt pulleys of the motor and projector mechanism should be accurately aligned. The belt should lie on without sagging. The belt tension may be restored with the aid of the set-screw in the motor plate. At the end of the performance it is advisable to slip off the belt or to release the belt tension.

The regulating resistance is attached to the table plate by means of the screws which will be found screwed in the table plate on the serving side.

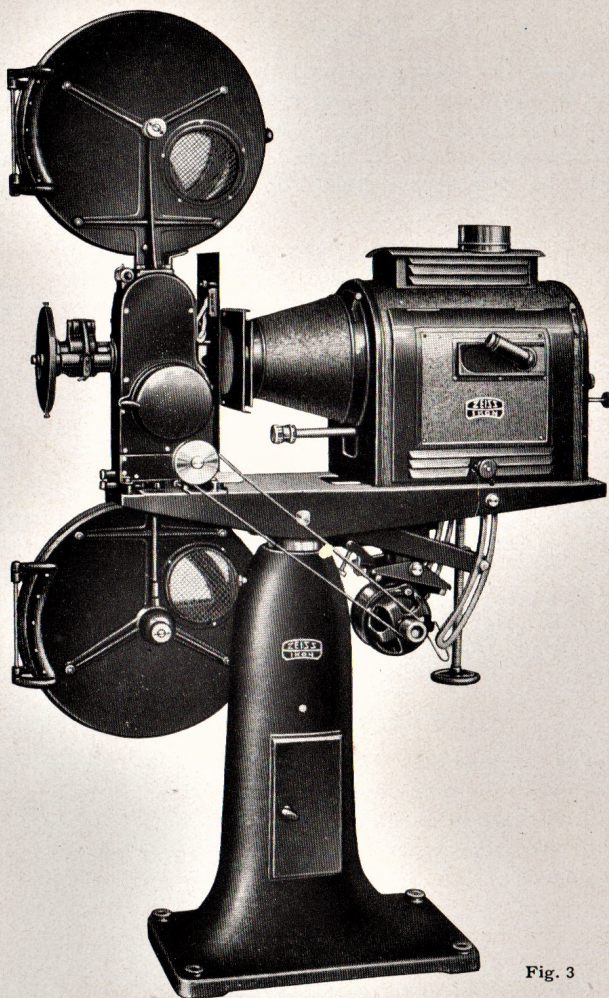


Fig. 3



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RIGHT-HAND MACHINE MOTOR DRIVING SIDE

The electric connections should be made in accordance with the diagram shown on Plate XI.

In the event of the machine being furnished with a "Protector" fire preventing device the electric connections require to be made conforming to special directions.

The standard motor used with the right-hand machine requires to undergo a slight modification when it is to be used in conjunction with a left-hand machine since the latter rotates in the opposite direction. To this end detach the carbon brush holders on the brush bridge from the holding pins by releasing the holding screw and re-attach them after giving them half a turn (180°). While doing so release and interchange the supply wires so as to reverse the direction of rotation. Note that the brushes should be set at right angles to the commutator. Their position and that of the movable brush bridge is correct when the running of the motor is attended with a minimum of sparking at the brushes. In the event of a machine being ordered as a left-hand machine the modification of the motor is carried out before delivery.

The Lamphouse

The lamphouse should be set up on the table plate and affixed thereto by means of the screws supplied with it.

The distance between the lamphouse or source of light and the film-gate varies according to the source of light employed. Particulars affecting these distances will be found in the directions for using the respective lamps.

When projecting still pictures in conjunction with reflector lamps the mirror diascope arrangement should be attached to the lamphouse before screwing the latter in position.

For use with the diascope arrangement of the left-hand machine the supplementary lamphouse only is supplied.

Respecting the mode of putting in the source of light and its management the reader is referred to the respective separate directions.

Having put the source of light in the lamphouse, the latter and the source of light require to be aligned. The lens jacket, the film-gate, and the source of light should be situated along the optical axis. When testing the course of the rays the fire-trap should be raised with the aid of the knurled knob 58.

Sources of Light and Cooling Devices

These devices should be mounted in accordance with the special directions furnished with the respective appliances.

Lay-out of the Machine relatively to the Projection Theatre

(Plates I, IV, IX and X)

The inscribed dimensions on Plate X indicate the height of the optical axis and the space occupied by the Ernemann II machine. These dimensions are to be taken into account when setting up the machine in the cabin. The height of the optical axis determines the position of the machine lens ports in the front wall of the operating room. Again, the height of these lens ports is affected by the dip of the machine in accordance with the following table:

Height of the centre of the machine lens port in	Degrees of Dip							
	upward			downward				
	+10°	+5°	0	-5°	-10°	-15°	-20°	-25°
centimetres	137	131	125	119	113	105	98	90
(inches)	(54)	(52)	(50)	(47)	(45)	(42)	(38)	(35)

In the case of the low pedestal these values are reduced by 20 cm. The pillars admit of a vertical range of motion of 5 cm above and below the median height. The horizontal distance between the ports in the operating room follows from Plate X, which is a dimensional sketch of the front of the operating room arranged for the accommodation of two right-hand machines*). The observation port, being independent of the position of the machine, may, of course, be placed elsewhere conformably to local conditions.

The centres of the film-gate, the cine lens, the machine port, and the screen should be in a straight line. In order to raise or lower the apparatus when mounted on a pedestal stand, first release the clamping-screw 2. The table stem in the cast iron pedestal may be displaced and the table thereby raised or lowered by means of the screw spindle 3, access to which is afforded by the side door in the pedestal. After setting the table to the required height retighten the set-screw. It is not advisable to use the full range of motion of the stem. It should not be extended more than 6 inches above the top of the cylindrical sleeve fitting, and where a greater height is needed a higher plinth should be provided for the machine base to stand on. To set the table plate and with it the machine at the required angle release the slot link screws 8 and operate the screw spindle 12. Having effected

*) Dimensional sketches for a right-hand machine and left-hand machine mounted side by side will be furnished on application.

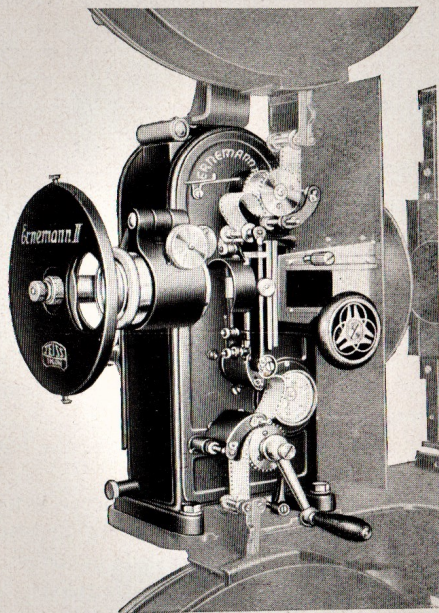


Fig. 4



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LEFT-HAND MACHINE MECHANISM

the requisite adjustments, retighten the slot link screws. Where a very oblique position of the machine axis is required (exceeding 15° , say) the floor upon which the machine is to stand should be given the required ramp.

A safety strip of easily combustible material connecting the machine with the drop shutter in front of the machine lens port, as prescribed in the police regulations of many countries, can be made to serve for actuating our "Protex" drop shutter arrangement and is best attached to the hook 31, since in the event of ignition taking place in the film-gate or in the upper loop the safety strip will burn through at the earliest danger moment and cause the shutter to drop.

Having definitely established the required line of projection it is advisable to firmly immobilise the pedestal stand. In the case of stone floors the base of the pedestal should be screwed down by means of stone screws embedded in cement, while in that of wooden floors the base may be screwed directly down to the floor.



Trial Run

Oiling

(Plates II, III, IV and V)

Before starting the machine the projector should be filled with our special oil*). Oil should always be kept away from the influence of light, heat and dust. After the release of the tommy screw 60 swing the protecting cover 59 to the right, and with the funnel furnished as part of the outfit fill into the machine below the Maltese cross about $5\frac{1}{2}$ ounces of oil, also a little oil into the Maltese cross mechanism itself. Replace the cap and screw it in. The tommy screw 60 should not be tightened firmly. In addition, release the small screw 62 on the oil circulation glass 64 and pour into the latter a few drops of oil. By a few turns of the hand crank make sure that the oil circulation functions properly, that is to say, that the oil circulation oil tube 64 may show a continuous supply of oil flowing through it. Machines which have not been in operation for some time should in the first instance be filled with the standard oil to which has been added 10 per cent of acid-free petroleum, and this should be worked through with the hand crank. This mixture of oil and petroleum should be allowed to flow out after coursing through the machine. The first charge of oil should be renewed after a fortnight, the next after a further period of four weeks, the third after another two months, and subsequently at regular intervals of two or three months. Apart from the circulating system, oil should be applied to the oil-hole 26 at the upper arm, likewise to the oil-hole 24 at the lower arm. These oil-holes are marked in red. It is better to apply oil to these two holes sparingly and frequently than copiously at longer intervals. Also the front ball-bearing in the shutter shaft should be greased at longer intervals. To this end release the two screws 39 and detach the front portion 40 of the shutter casing. Release the knurled nut 41 in front, withdraw the shutter and unscrew the shutter guard back 38 of the shutter casing by turning it. The ball bearing, which is thereby exposed to view, should be supplied with best ball-bearing grease, after which the detached parts should be remounted in the reverse order. The ring-lubricated bearings of the motor should be filled with best standard motor oil or with our special oil.

It goes without saying that any superfluous oil, especially in places liable to come in contact with the film, requires to be carefully removed. Connection to the source of light and the motor having been established (the latter through the connecting box), the machine may be cautiously allowed to run by the motor drive, but, for the time being, without a film, and, while doing so, watch the oil circulation and the tension of the belt. Should the belt slip, though the tension appears to be normal, the belt tension pulley should be adjusted or the surface of the belt rubbed with best belt-wax, as the case may be.

*) To be obtained from the Zeiss Ikon A.-G., Dresden, or from any cinematograph stores.

Threading the Film (Plates II, III and IV)

The tension on the film runners is adjusted at the works to suit the normal rate of shifts of about thirty picture changes per second without the use of a velvet runner. Before threading the film it is well to verify the tension as this is liable to be disturbed during transit. When properly adjusted, the runner tension should be no greater than will just allow a clean-cut piece of new film, placed squarely into the film-track, to be threaded with a certain amount of difficulty but without kinking. Excessive tension gives rise to a braking effect and is liable to cause damage to the perforations, while insufficient tension causes the picture to tremble. As the running speed is raised the tension likewise requires to be increased. The runner tension is adjusted by means of the two set screws 42. Care should, however, be taken to make the runner tension approximately equal at top and bottom. The upper spring may, however, be set to a smaller tension than the lower spring.

Set the framing knob 56 so that the white index line may be at the top.

Open the doors of the upper and lower fire proof spool box. Fold back the lens, assuming it to be a short focus lens, up to its limit stop, and open the aperture plate 36. Next slip the full film spool upon the centre pin of the upper fire proof spool box, thread the film into the hinged safety channel 25, and close the upper fire proof spool box, whereby the film spool becomes automatically coupled to the pay-out spindle. Draw out about two yards of film from the box, lift off the pressure roller fork 53, and, forming the upper loop, pass the film under the upper sprocket 30 into the film-track and place it upon the intermittent sprocket 44 so that a picture coincides with the film-gate. Now close the aperture plate 36. After forming the lower loop, making it large enough to fully rest upon the loop steadier, and, while lifting up the idler bracket roller 48, pass the film over the bottom sprocket 49 and thence into the lower safety channel 13. Finally fix the end of the film under the clip on the core of the solid spool in the lower fire proof spool box. It is advisable to secure the film by giving the spool at least two turns by hand in order to ensure good automatic coiling. Note that the striking pin 14 in the back of the box should engage in the holes in the spool. Now close the lower box. Return the lens (if previously folded back) into its original position. The emulsion side of the film should face the source of light where the machine is in front of the screen, while for rear projection it should face the lens.

In the event of the machine being furnished with the "Protector" fire preventing arrangement the motor will not start until the lever is thrown over to the right (see special directions).

Framing up (Plate IV)

In the event of two partial pictures separated by the frame line appearing jointly upon the screen turn the framing knob 56 to the left or right, as may be required.

Setting the Shutter (Plate IV)

The shutter should be set at a distance of about $\frac{3}{8}$ in. from the lens. To this end release the tommy screw on the cine lens jacket in order that the encased shutter may be first set in its proper position by pushing it in or drawing it forward. Having done so, retighten the tommy screw firmly. The shutter is set at the works so as to be in phase. Should, however, the pictures, more especially the titles, be found to exhibit travel ghosts so as to present blurred streaks above and below the boundaries of the picture the shutter should be readjusted. To roughly adjust the shutter with the aid of the adjustable resilient shutter bushing release the knurled screw 41, press the shutter into the bushing, and displace it by the requisite number of teeth, allowing it finally to re-engage. The final adjustment can be made, while the machine is running, by releasing the small set-screw and turning the knob 34.



Management and Care of the Machine

To maintain the efficiency and reliability of a projector it is indispensable that it should receive due care and attention. Our practical experience in this respect urges us to lay special stress upon the vital importance of proper treatment. The prospective operators of the machine will be well advised to carefully peruse the directions and to thoroughly digest the information given therein so as to completely master all the conditions which determine the service and enduring success of the machine.

Cleaning

It goes without saying that, like any other machine, the projector should be kept constantly clean. At certain short intervals depending upon the extent to which the machine is put in operation, it should be thoroughly cleaned. While the complete enclosure of the motion gear and the continuous circulation of the oil obviates the access of contaminating matter to the actual mechanism, fullest attention should nevertheless be bestowed upon the parts situated outside the casing. This applies in particular to all those parts which come in contact with the film, since the latter invariably deposits abraded matter, which is liable to give rise to pronounced friction and thereby may occasion undesirable noise, rain-line effects, and damage to the perforations, and may even tear the film.

In the event of film dust flakes making their appearance in the film runners, on the sprockets and idlers they should be forthwith removed with the aid of a small stick or with a fine camelhair brush (no wire brush), and in no case should hard metal tools be employed. It is advisable to lightly grease runners and tracks every evening. As a means of lessening wear and obviating noise good results have been derived from the use of wooden runners, which are particularly to be recommended as a means of keeping down the wear of the film when projecting from the rear of the screen. To obviate excessive deposition of dust flakes from first-run films velvet runners should always be used. To put them in, open the gate, place the carriage in the film-track in such a way that the acute angled piece may hook in from below and the rectangular bend grip over at the top. The runner surface should lie snugly in the film-trap. Do not omit under any circumstances to release the tension on the runner. In the event of the velvet lining becoming much soiled or worn after prolonged use put in a fresh runner. Many experienced operators rub a little graphite into the velvet, but this should only be done with extreme care in view of the risk of soiling the film. After putting in the velvet runner verify the position of the jet.

From time to time the safety channels of the boxes should likewise be cleaned.

Within the oil circulating system the oil undergoes continuous automatic cleaning. The oil sighting glass contains a filter cartridge, which, after the release of the plug screw 63, may be easily withdrawn for the purpose of cleaning it with petrol. It is likewise advisable to frequently detach the oil-filter to the Maltese cross movement and to clean it in like manner.

Oiling

(see also paragraph headed "Oiling" in section on "Trial Run")

We emphatically advocate the exclusive use of our special oil. The automatic lubrication of our machine does away with the former necessity of applying oil from day to day to all oil-holes in the machine, with the exception of the oil-holes mentioned on page 13 which require a daily application of a few drops of oil. When wooden runners are used it is advisable to lightly oil their sliding surfaces every evening after cleaning so as to gradually impregnate the wood with oil. Wooden runners which are not in use should be kept in oil.

In one series of the Ernemann II machines there is a receptacle under the mechanism for catching waste oil. The discharge tube to this receptacle is situated in the front of the mechanism under the oil discharge tube proper. From time to time the knurled plug should be unscrewed and any oil which may have accumulated in the receptacle allowed to flow off.

The Fire Trap (Plate VI)

The arrangement of the friction gear to the fire-trap within the body of the machine offers the best possible guarantee of its unfailing functioning. Should, nevertheless, the friction gear after prolonged use, fail to act, it should be attended to. To this end lift off the cap on the driving side of the machine, remove the Maltese cross gear, as explained in the respective section on page 20, and release the nut 68 with the aid of the hexagon spanner supplied. By turning to the right or left the knurled disc 69 situated behind it, the friction may then be adjusted either way. The small screw 67a, which comes into view, should not be touched as it is a locating screw. After making the necessary adjustment retighten the hexagon nut, place the Maltese cross gear in position, close the front cap, and verify the action of the shutter.

Friction Gears to the Fire Proof Spool Boxes Upper Box (Plate III)

In the event of the upper spool being set in motion too freely or being too heavily braked the tension to the friction gear should be corrected by turning the knurled knob 27 one way or the other. At prolonged intervals the screw 28 should be released and the friction gear taken apart for the purpose of cleaning and oiling or greasing it.

Lower Spool Box (Plate II)

It need not be pointed out that the take-up of the film is a matter of special importance. The initial pull on the film should not be such as to cause the perforations to be damaged by the bottom sprocket or the film even to be torn. On the other hand, it should not be so weak that ultimately the spool fails to rotate. The leather disc 19 of the friction gear should have a few drops of oil applied to it from time to time, but this should be done with discretion. Any excess of oil would prevent transmission of motion. In order to apply oil remove the protecting cap 18 which is attached by a bayonet catch. Though the appropriate friction is regulated at the works before delivery, it must not be overlooked that the adjustment may be disturbed during transit, when the machine is being set up, by cleaning operations, or such like. The readjustment should be made in like manner as is done in the case of the upper fire proof spool box with the aid of the knurled head 21. Should it be found necessary to take the friction gear apart, be it on account of its being dirty or the disc saturated with oil, worn, or such like, the protecting cap 18 should be removed from the bayonet joint, the screw 20 released, the knurled knob 21 unscrewed as well as the spring 22 and the friction disc 23 withdrawn. The leather disc 19 will then be accessible. The parts should then be reassembled in the reverse order.

The Optical Components

The lenses, condensers and mirrors should first be dusted with a soft camelhair brush and then carefully cleaned with a piece of softest doeskin, which should be carefully kept from contact with dust or grease and reserved exclusively for this purpose. It should be borne in mind that high-grade optical glass presents a more sensitive surface and polish than do inferior kinds of glass. When taking apart the components of lenses, which should never be done unless absolutely necessary, particular attention should be paid to the proper position and sequence of the lenses, as otherwise no picture can possibly form, or at best it will suffer seriously in its quality. When slipping the lens into its jacket always let the side bearing the maker's name face the screen.

The Driving Motor

The commutator of the motor, being liable to be soiled in time in consequence of the wear of the carbon brushes, should be cleaned at short intervals.

We recommend for this purpose the use of our special "Kollektol" cleaner. A piece of rag moistened with this preparation should be held against the commutator whilst it is running. Kollektol is not merely a cleaning medium but has, in addition, useful preserving properties.

Emery cloth should not be used under any circumstances. Fine glasspaper is permissible in an emergency only.

In the event of the carbon brushes requiring to be exchanged it will be an advantage to shape the ends of the carbons with the aid of a round file so as to make it conform to the barrel of the commutator.

The carbons should be set at right angles to the commutator. Should there be any pronounced sparking the brush-holders should be displaced after releasing the holding screw until the sparking reduces to a minimum.

The motor bearings should be refilled with oil from time to time.



Exchange of Working Parts

Despite the most careful treatment to which a machine may be subjected some of its motion parts are inevitably exposed to wear. The Ernemann II machine is no exception in this respect. In designing it facilities have been provided for the easy exchange of parts which are particularly exposed to natural wear.

In the event of the Ernemann II machine requiring repairs which exceed the limits of a mere exchange of worn parts it is distinctly advisable that the mechanism should be sent to our works, where the necessary experienced mechanics are available to carry out the work with the requisite precision.

Exchange parts should be carefully cleaned with the aid of a brush and petrol, especially those surfaces of these parts which engage with corresponding gear fittings. The slightest trace of dirt or even the layer of grease applied as a protection from rust suffices to impair the precision of the meshing and may interfere with the interchange of the parts in question. Cleaning before putting in the new part is accordingly an imperative necessity. Many complaints relating to imperfect fitting or meshing have been found to have had their origin in insufficient cleaning.

Note that the Maltese cross mechanism for the right-hand machine is marked with the letter *R*, that intended for the left-hand machine being distinguished by the letter *L*. The intermittent, feed, and bottom sprockets, the tension rollers and runners are identical in both machines.

Maltese Cross Mechanism (Exchange Part) (Plates IV, V, VI and VIII)

The exchange part comprises only the principal gear components. To begin with, open the film aperture plate 36 and turn the framing knob 56 into its median position. After releasing the tommy screw 60 swing aside the cover 59 on the driving side. From the exchange part, which will then be exposed, unscrew the nut and locknut 67 with the aid of the key provided for the purpose, after which the exchange part may be withdrawn. Owing to its strict manufacture to standard gauge the exchange part can be relied upon to fit and function faultlessly and may be put in without any subsidiary adaptation. When interchanging, only one of the gear couples requires to be disturbed, and the meshing is readily restored when the exchanged part is put in position. To obviate any extensive readjustment of the rotating shutter put in the exchange part in such a way that the Maltese cross may be in the shift phase, while the cover wing of the shutter (which is marked by a white line) is in front of the lens. Finally retighten the two nuts 67 and replace the cover 59, which completes the exchange. Next, re-set the shutter (see Section "Setting the Shutter", page 15). We do not supply the separate elements of the exchange component, but it is practicable in an otherwise intact exchange part to replace the intermittent sprocket.

Intermittent Sprockets (Tables IV and VI)

Before putting in a new sprocket the shaft and bushing of the intermittent sprocket should be cleaned with particular care)*

The interchange is effected as follows: Open the aperture plate 36, release screw 46, detach the coupling disc 66, and withdraw the worn sprocket by gently twisting it. When putting in the new sprocket note that its slit should register with the slit in the shaft end. When attaching it place the coupling disc 66 upon the middle of the shaft end in such a way that its dowel pin may accurately engage in the mutually opposite slits of the shaft end and sprocket collar and that it may lie on fairly without a tilt. Insert screw 46 and tighten firmly. The interchange should be made with the utmost care, so as to guard against a chance of any sprocket tooth being damaged by impact with any other part. Any ever so slightly damaged tooth ruins the film. The sprocket is mounted upon its shaft with the utmost degree of attainable precision, for this determines the steadiness of the picture. In no circumstances should the sprocket be forced upon the shaft or withdrawn therefrom by tapping or violent thrusts. It should be mounted upon it solely by twisting it by the feel of the hand. We strongly recommend for this purpose the use of our sprocket tractor.

Top and Bottom Sprockets (Plates IV and VI)

It is a well known fact that all sprockets wear on one side. In the Ernemann II machine the mutual interchange and the exchange of the top and bottom sprockets 30 and 49 respectively are readily practicable.

Top Sprocket: After lifting off the pressure roller fork 53 release the screws 32, after which the sprockets may be readily drawn off.

Bottom Sprocket: To begin with, release the screw 51 which holds the hand crank 52, noting that the screw is left-handed, and pull off the crank. Then release the three screws 50 and withdraw the sprocket, lifting off the roller fork 48 while doing so.

Pressure Rollers and Idlers (Plate IV)

To ensure faultless working it is essential that all pressure rollers should run freely. So soon as the rollers cease to revolve the moving film wears flats upon them, rendering the rollers useless. The exchange of pressure rollers is a simple procedure in the Ernemann II machine. Each roller spindle is secured in position by a half-round disc. After releasing the screw which holds the disc the latter may be turned through an angle of 90°. The spindle may immediately be withdrawn and the rollers exchanged. The spindle should then be secured in position and the disc-screw firmly tightened.

*) See also the directions which are furnished with every genuine Zeiss Ikon sprocket.

After the exchange of the rollers 47 to the intermittent sprocket and of the rollers 45 to the film-track of the film-gate the resilient fork should be re-set. The distance of the lower rollers from the bottom sprocket should be equal to about double the thickness of the film. It may be so set after the release of the nut by re-setting the screw situated on the resilient fork of the film gate on the side towards the mechanism. The screw 43 should not be used for this adjustment.

Runners (Plate IV)

Metal or wooden runners should be exchanged after opening the film-gate 36, by pushing aside the catch 35, which will cause the two runners to drop out. The new runners should be introduced by their lower ends, pressed in, and then locked. After exchanging, the runner tension should be re-set with the aid of the two set-screws 42.

Optical Equipment

When using different focal lengths for still-view projection with our diascope attachment for reflector lamps it is to be noted that the focal length of the condenser lens necessarily changes with that of the cine lens. Hence when subsequently ordering an additional diascope lens of a different focal length it will be necessary to order also the corresponding condenser. On the other hand, when subsequently ordering a condenser lens it is indispensable that particulars of the focal length of the diascope lens and, in the case of the reflector lamps, of the nature of the reflector should be furnished.



Supplementary Directions for Mounting and Working the Zeiss Ikon High Capacity

Ernemann III Projector

The Ernemann III Machine should be set up and operated in accordance with the directions provided for the Ernemann II Machine. The handling of the machines differs only in the following points.

I. Optical Equipment

(page 7)

In order to put in the lens release screw 1. Sharp focusing is effected with the aid of the knurled knob 2, after releasing the tommy screw 3.

II. Threading the Film

(page 14)

Open the film-gate by depressing catch 4. In the place of a velvet-runner put in a carriage plate 5, inserting it from above while the film-gate is open. This

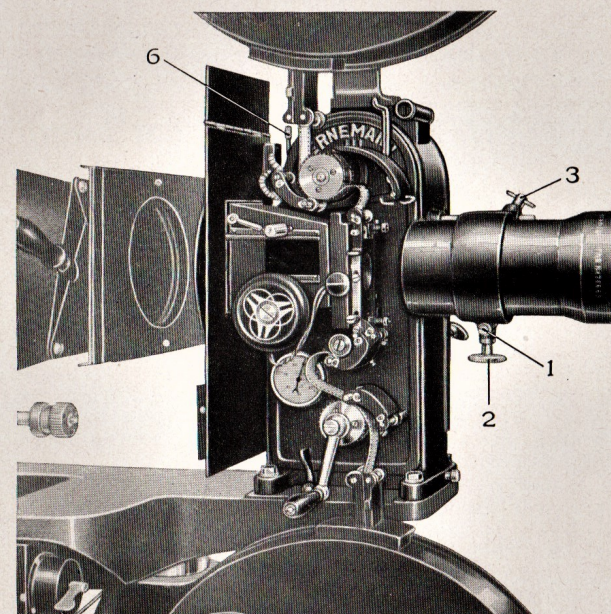


Fig. 5 Ernemann III Mechanism

carriage plate has either steel running surfaces or velvet linings for first-run films.



III. Setting the Shutter (page 15)

The shutter rotating in the film-gate frame is set in phase before delivery. Fine adjustments may be applied, while the machine is running, by actuating the knurled knob 6.

IV. Cleaning (page 16)

In the place of the velvet runners carriage use a motion plate with velvet lining.

The rear blower jet and the compressed air conduit are mounted in the film-gate frames.

V. Fire Trap (page 17)

The automatic fire trap is operated by the centrifugal governor mounted within the mechanism and requires no attention.

VI. Runners (page 22)

Metal or wooden runners may be exchanged after opening the film-gate by unscrewing the knurled screw 7.

VII. Film Setting Pilot Lamp

This lamp is fitted within the film-gate frame. The fitting may be withdrawn for the purpose of putting in a new bulb.

VIII. The observation window

to the light-protecting tube may be opened by pushing the slide to one side.

IX. A Loop Steadier

is not needed since the guide rollers at the film-gate extend over a large number of teeth.

X.

The carriage plate must be displaced.



Faults Cause and Remedy

Faults of the projection may be detected both by the eye and the ear. The operator should at the outset accustom his ear to the sound of a normally working apparatus. Any pronounced variation therefrom will then warn him of the presence of a fault. Other defects may be detected by watching the picture on the screen or by inspecting the film as it runs through the machine.

A) On the Screen:

Tremor of the picture

This may be due to vibration of the machine as a whole, owing either to a bad foundation or in consequence of the machine not being screwed down properly to the floor or stone foundation. Other causes: Wobbling of badly bent spools. When using a motor not originally supplied with the machine note whether the armature runs smoothly (Unsteady running of the armature is bound to affect the machine as a whole). To verify this let the machine run with the light switched on but without film and watch the projected frame.

Picture not steady

The runner tension may be too slack or one-sided. Pressure rollers to the sprocket do not run properly — Excessively large loop — Damaged intermittent sprocket — In the great majority of cases the fault is due to the film strip. By way of an incontestable test a length of standard film*) may be supplied.

The picture is blurred over its entire surface

Components of the lens may have been put in wrongly in their mount — The lens may need focusing — The lens may require cleaning — Port window pane may be bad in quality or steaming (port window panes should be made of plane-parallel polished plate glass).

The picture is blurred in places

The illuminating system and the lens may be imperfectly adjusted — The film may be bulging — The screen excessively inclined to the axis of projection — The velvet runners put in wrongly or unevenly worn — Grease or finger marks on the lens — The film as such may be wholly or partially blurred, as experience has shown to be sometimes the case.

*) To be had from the Zeiss Ikon A.-G. or from any cinematograph establishment.

Flicker

Travel-ghost upward or downward beyond the boundaries of the pictures

B) In the Film Motion:

Pronounced noise in the film-track

Film runs to one side from the safety channel

Film slips down from the feed sprocket or the bottom sprocket

The film does not wind

C) As disclosed by the film run through the machine:

Damaged perforations

Insufficiently high rate of picture shifts — Excessively intense screen illumination for the rate of shifts (with A. C. arc lamps it is impossible to project strictly non-flickering pictures).

Adjust the shutter wing.

Side guide rails or runners soiled by deposits of film dust flakes: Clean thoroughly, very slight lubrication of the runners and sliding tracks. With first-run films velvet runners are indispensable — Loops may be too large. Note that the sound varies with the kind of film used. The sound usually diminishes by the use of wooden runners.

Film spools bent — Magazine arms wrongly attached.

Film not properly placed upon the sprocket teeth or in the channel — Upper and lower fire preventing safety channel not in alignment with the film-track — Roller U-pieces to the top sprocket and bottom sprocket may be bent and hence the rollers operate on one side only — Film may be unevenly perforated.

The lower film-spool may not ride on the striking pin — The friction cone to the bottom spool box requires adjustment — The spool may be bent — The film leader may have become detached from the spool core — The leather disc of the friction gear may be too copiously oiled.

The film loops may be too small — Runners or aperture plate may be too tightly drawn up (owing to tension not having been readjusted when putting in a velvet runner) — Friction at the lower fire proof spool box in excessive tension — Guide and tension rollers do not turn — Teeth of the top, bottom, or intermittent sprocket may be damaged — Pronounced deposit in the film-

Rain effects (due to scratch lines on the emulsion or plain side)

D) Machine Faults:

Motion gear seizes or turns irregularly in newly mounted machine

The motor fails to start

Motor runs, yet the mechanism fails to operate

Reduced rate of picture shifts

Brake fails to act

Oil running from bearing of driving shaft

Oil circulation not showing after prolonged rest of machine

The belt slips off the driving pulley

track — Further causes due to inaccurately perforated film material. Where the pitch of the holes is too small or excessive or where the opposite row of holes is staggered their damage is inevitable. The sprockets themselves are made with such mathematical precision that they cannot be suspected to be the cause of defects.

Dirty rollers, safety channels and film-track — Rollers, owing to failure to turn, worn on one side only — Film may be badly threaded into the safety channel.

Coupling between mechanism and lower arm jams, in which case align the mechanism. If fault not discovered let the mechanism run without interchangeable component (exchangeable part). If the machine runs correctly the cause is to be sought in the Maltese cross mechanism.

Commutator soiled — Defect in connections.

Driving belt has stretched and requires tightening — Belt slips — should be rubbed with best belt wax — The driving gear may have seized (see above). For its preservation slip off the belt after the performance.

Supply voltage below normal — motor deficient in power (see also preceding section) — Excessive tension of runners and friction gear.

Braking surface on inside of driving disc badly soiled with oil.

Oil stands too high in oil gauge.

Oil has descended too low in the rising pipe — Unscrew plug on oil circulation glass and add a few drops of oil.

Pulley in projector not in alignment with the belt.



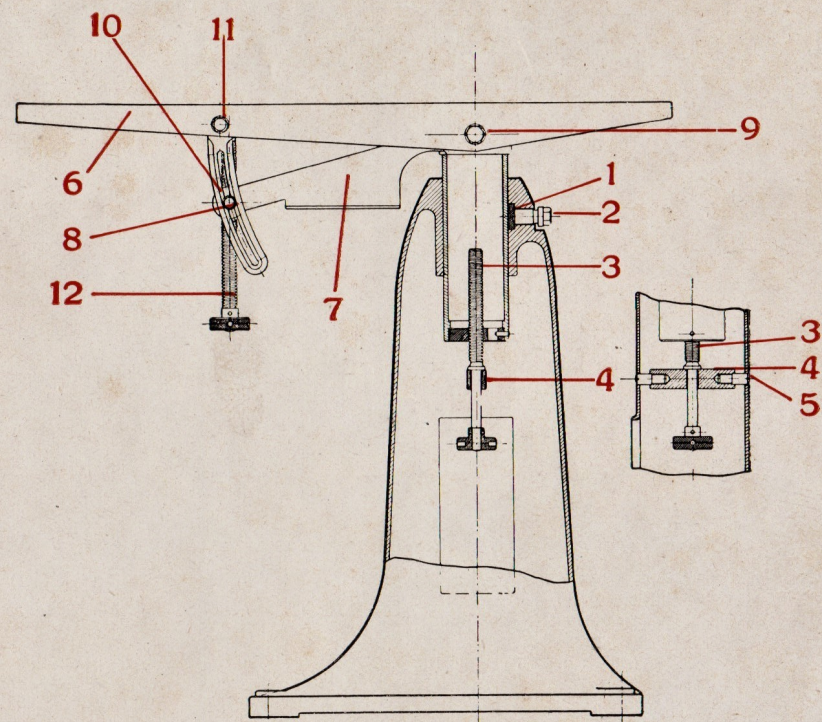


PLATE I *Pedestal*

Reference Numbers

- | | |
|--|---|
| 1. Thrust washer | 7. Heel piece with cylindrical table stem |
| 2. Clamping screw | 8. Slot link screws |
| 3. Screw spindle for rising and lowering | 9. Screw bolt in heel piece |
| 4. Cross-piece to the spindle | 10. Slot links to the table plate |
| 5. Screw bolt in cross-piece | 11. Slot link bolt |
| 6. Table-plate | 12. Screw spindle to the dipping motion |

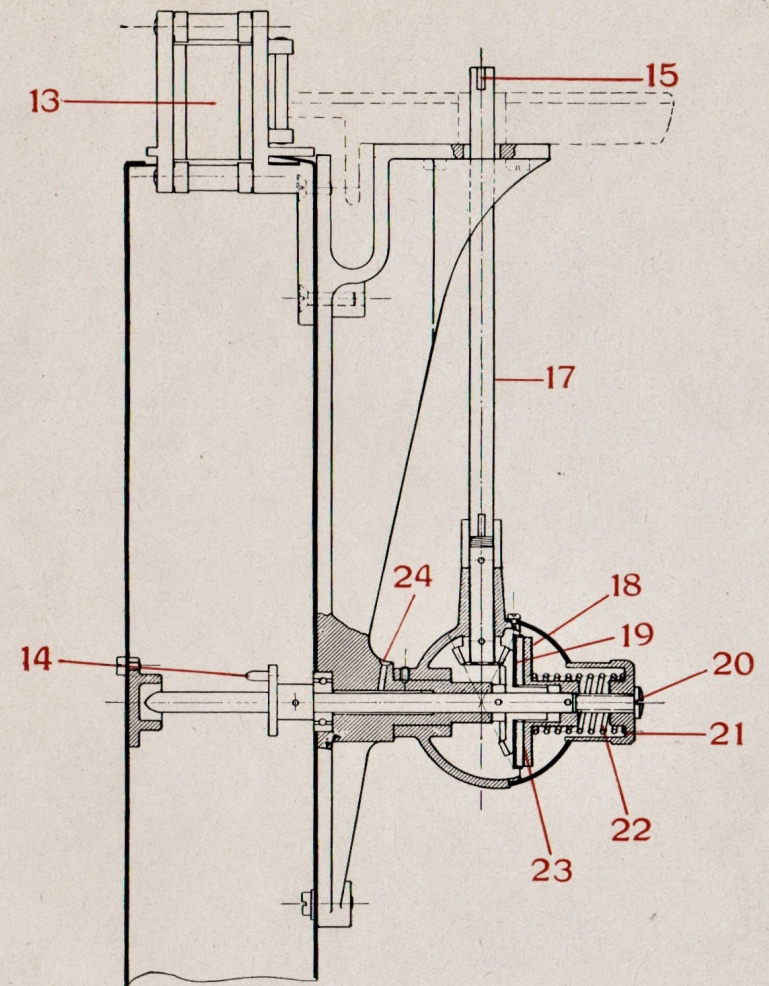


PLATE II Section through the lower (take-up) fire proof spool box
Looking towards the machine

Reference Numbers

- | | |
|---|-------------------|
| 13. Safety channel | 19. Leather disc |
| 14. Striking pin for the spool | 20. Screw |
| 15. Cross-piece in the driving spindle (coupling) | 21. Knurled knob |
| 17. Driving shaft for take-up mechanism | 22. Spring |
| 18. Protecting cover | 23. Friction disc |
| | 24. Oil-hole |

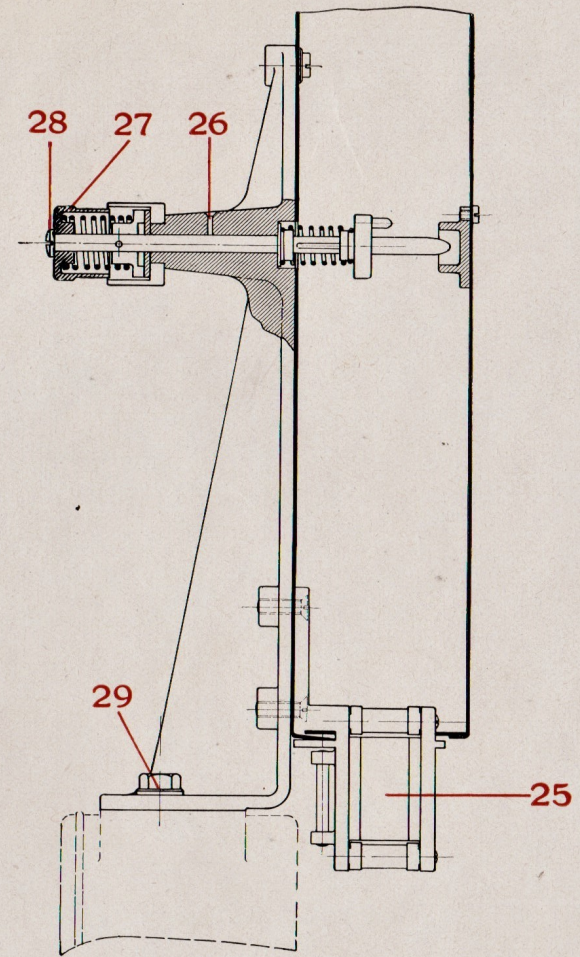


PLATE III Section through the upper fire proof spool box
Looking towards the machine

Reference Numbers

- | | |
|--------------------|-------------------|
| 25. Safety channel | 28. Screw |
| 26. Oil-hole | 29. Fixing screws |
| 27. Knurled knob | |

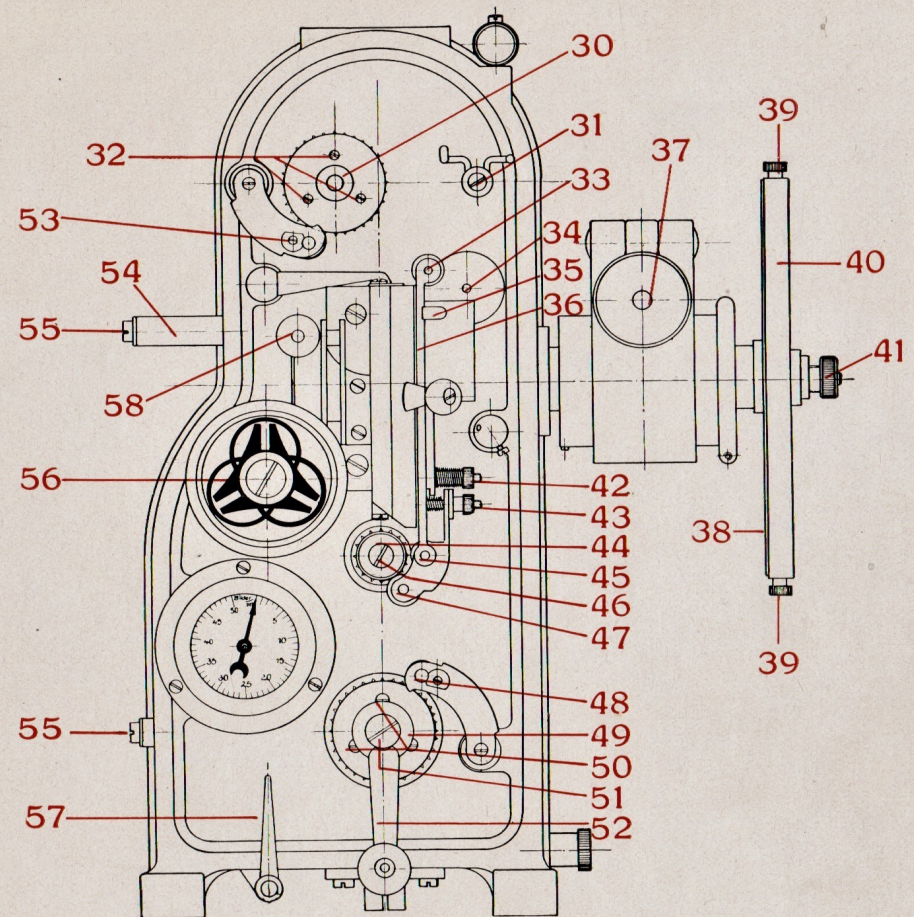


PLATE IV *The Mechanism - Crank Side*

For Ernemann II only

Reference Numbers

- | | | |
|--|---|---|
| 30. Top sprocket | 41. Knurled screw to the shutter bushing | 48. Idler bracket roller to the bottom sprocket |
| 31. Hook for safety strip | 42. Set screw to the runner tension | 49. Bottom sprocket |
| 32. Screws in top sprocket | 43. Spring tension screw to the bracket | 50. Screws in the bottom sprocket |
| 33. Upper idler roller on aperture plate | 44. Intermittent sprocket | 51. Head screw to the hand crank |
| 34. Shutter setting knob | 45. Lower idler roller on aperture plate | 52. Hand crank |
| 35. Runner catch | 46. Screw to the intermittent sprocket | 53. Idler bracket roller to the top sprocket |
| 36. Aperture plate | 47. Idler bracket roller to the intermittent sprocket | 54. Stud to the fire shield |
| 37. Focusing head to the cine lens | | 55. Screws to the fire shield |
| 38. Shutter guard back | | 56. Framing knob |
| 39. Shutter guard screws | | 57. Brake lever |
| 40. Shutter guard front | | 58. Knurled knob to the fire shield |

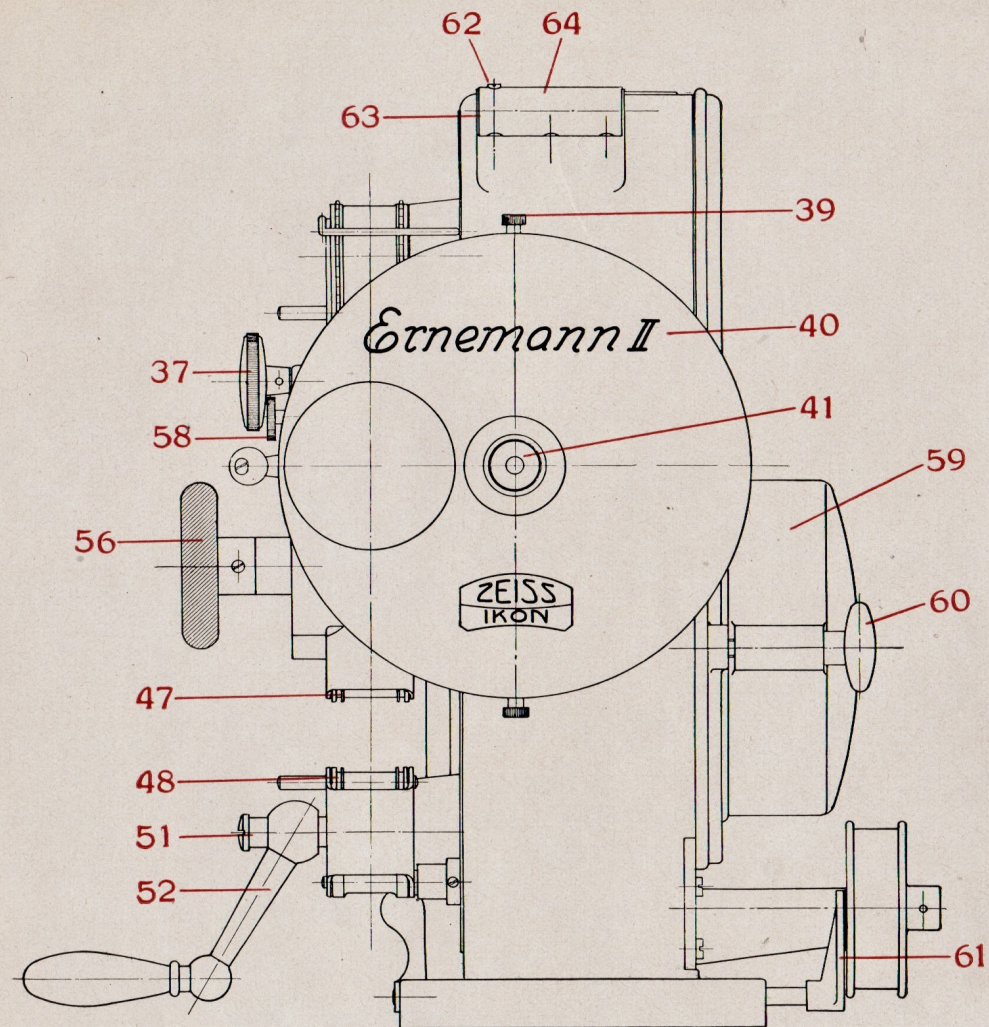


PLATE V *The Mechanism — Front View*
For Ernemann II only

Reference Numbers

- | | | |
|---|---|--|
| 37. Focusing index to the cine lens | 48. Idler bracket roller to the bottom sprocket | 59. Protection cover |
| 39. Shutter guard screws | 51. Head screw to the hand crank | 60. Tommy screw to the protection cover |
| 40. Shutter guard front | 52. Hand crank | 61. Brake shoes |
| 41. Knurled screw to the shutter bushing | 56. Framing knob | 62. Small screw to the oil gauge |
| 47. Idler bracket roller to the intermittent sprocket | 58. Knurled knob to the fire shield | 63. Plug screw to the oil circulation tube |
| | | 64. Oil circulation tube |

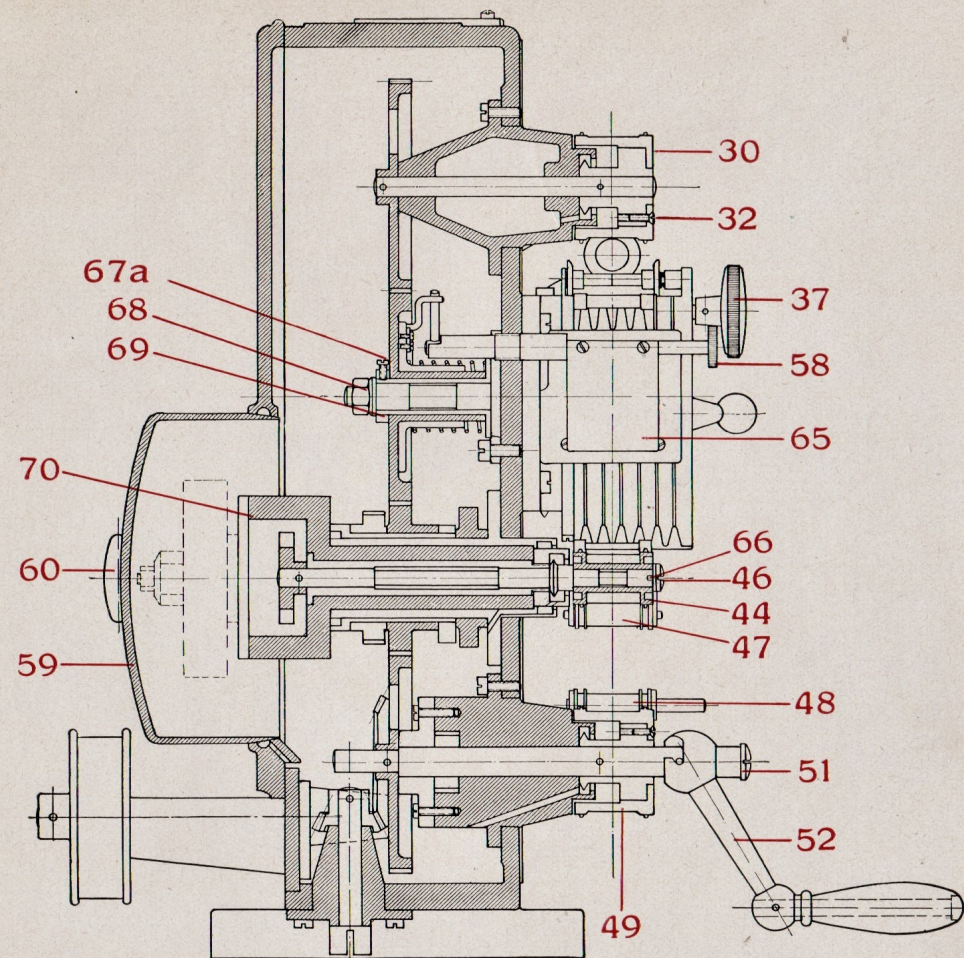


PLATE VI Section through the Mechanism — View towards the screen
For Ernemann II only

Reference Numbers

- | | | |
|---|---|--|
| 30. Top sprocket | 48. Idler bracket roller to the bottom sprocket | 65. Automatic fire-shutter |
| 32. Screw in top sprocket | 49. Bottom sprocket | 66. Coupling disc to the intermittent sprocket |
| 37. Focusing head to the cine lens | 51. Head screw to the hand crank | 67 a. Small screw to the automatic fire-shutter |
| 44. Intermittent sprocket | 52. Hand crank | 68. Nut to the fire-shutter friction gear |
| 46. Screw to the intermittent sprocket | 58. Knurled knob to the fire-shield | 69. Friction gear tension disc to the fire-shutter |
| 47. Idler bracket roller to the intermittent sprocket | 59. Protection cover | 70. Interchangeable part |
| | 60. Tommy screw to the protection cover | |

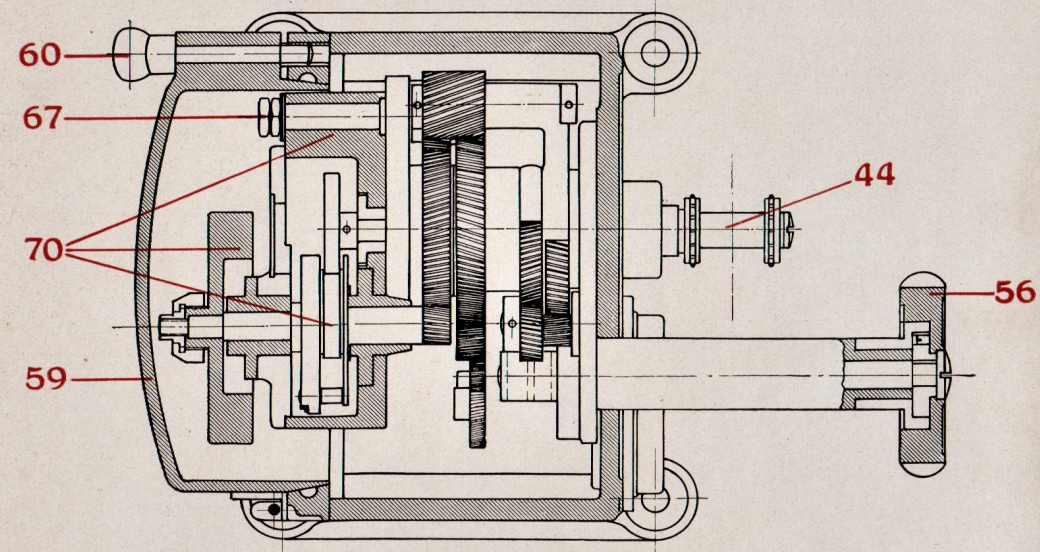


PLATE VII Section through the Mechanism — View from above

Reference Numbers

- 44. Intermittent sprocket
- 56. Framing knob
- 59. Protecting cover
- 60. Tommy screw
- 67. Nut and locknut
- 70. Interchangeable part

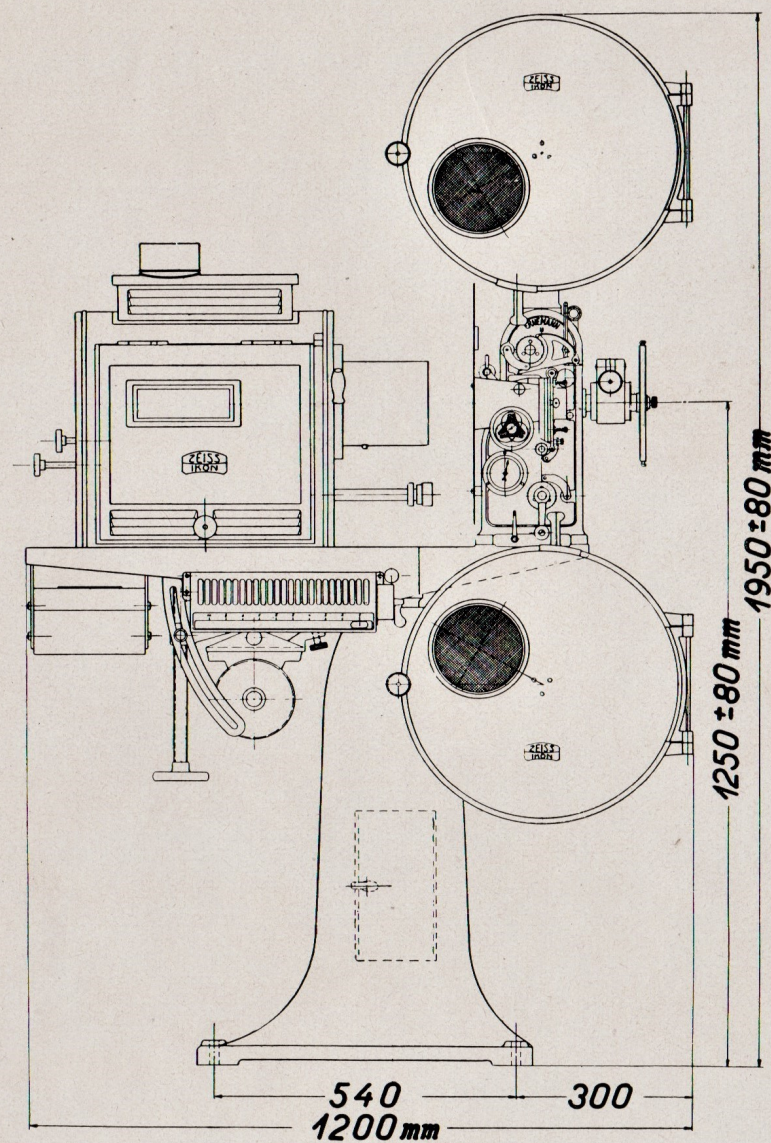


PLATE VIII *Dimensional Sketch*
Crank Side

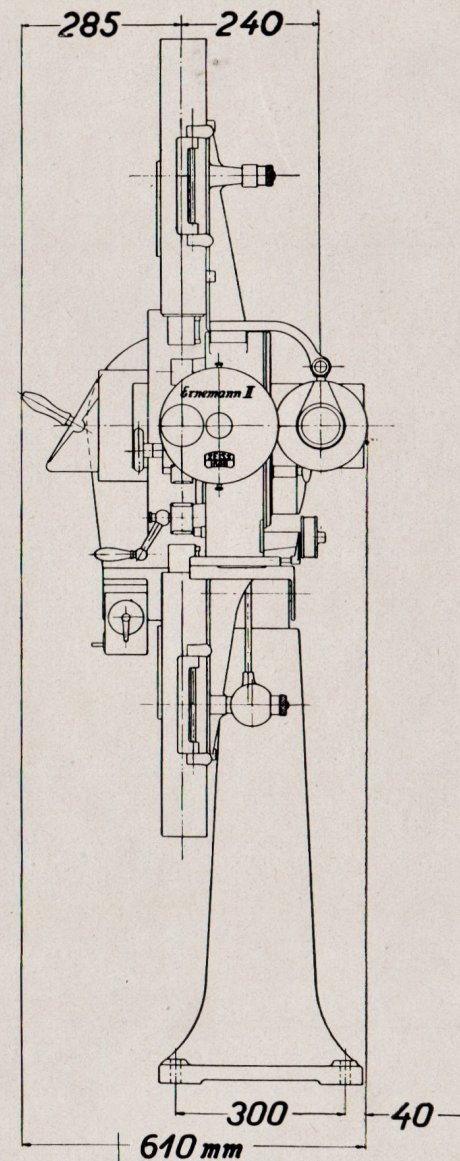


PLATE VIIIa *Dimensional Sketch*
Front View

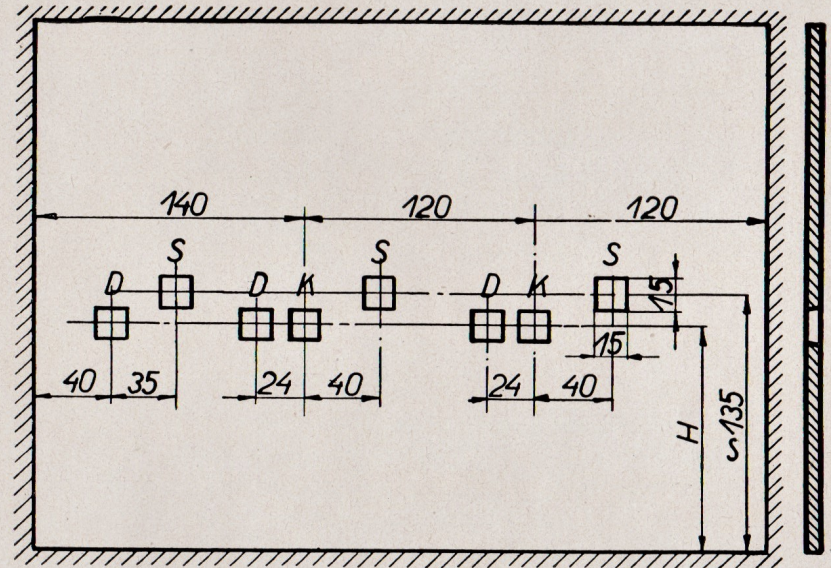


PLATE IX *Operating Room Front Wall with Apertures*

D = Aperture for lantern slide lens
 K = Aperture for cine projection lens
 S = Observation aperture
 H = Height of apertures, see Table
 page 11

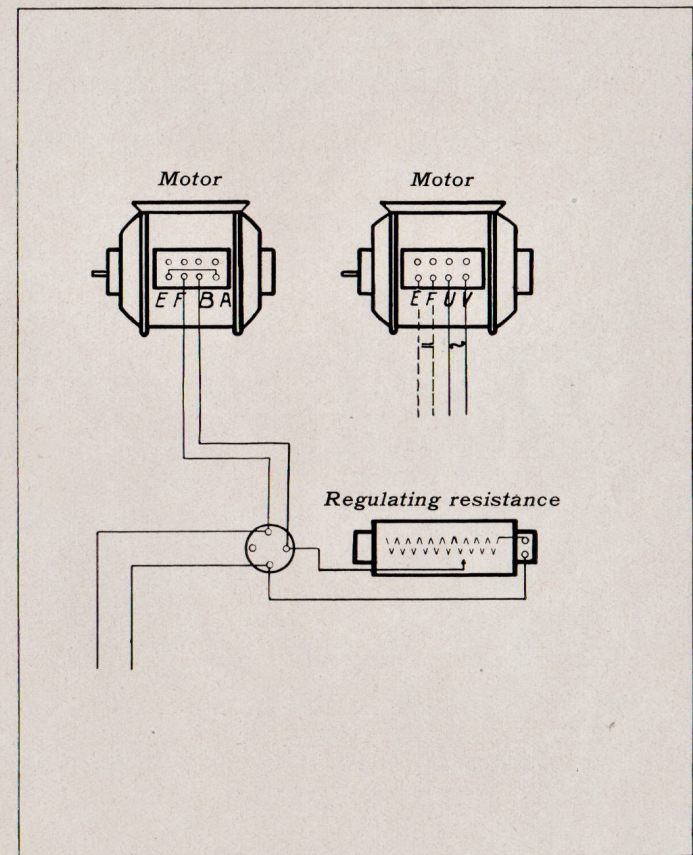


PLATE X

Diagram of Connections for the Driving Motor



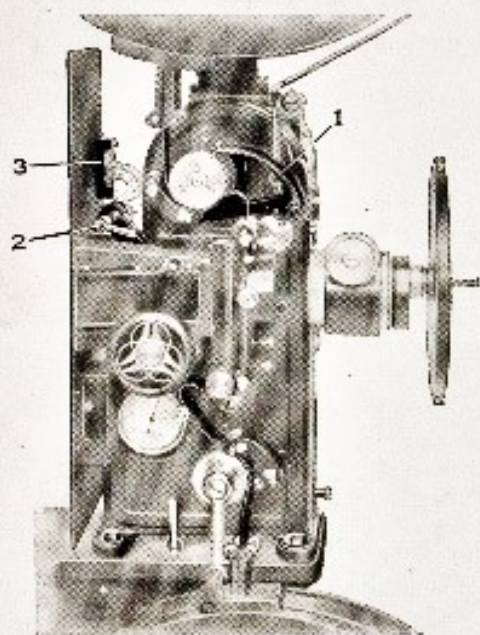


Directions for Using the PROTECTOR Fire Preventing Attachment

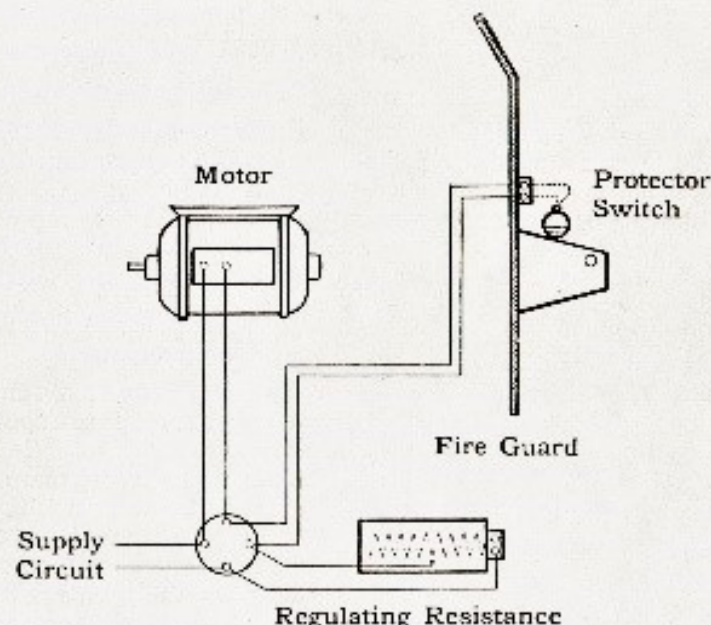
Ignition in the film-gate is in most cases caused by the rupture of the film between the film-track and the intermittent sprocket. Since in these cases the film remains stationary in the film-gate, whereas the mechanism continues to run on, the automatic fire-trap does not function forthwith and hence the film ignites unless there is a device which instantly closes the shutter to the lamp-house.

In these circumstances the "Protector" fire preventing device automatically cuts off the access of the heat rays and at the same time switches off the motor and thereby prevents the ignition of the film. It consists of a hoodlike releaser 1 (figur 1) mounted above the upper loop and connected by transmission rods to a special fire-trap and a mercury switch. The device operates as follows:

So soon as the film tears below the film-track it follows, since the mechanism runs on and the film is not carried along by the sprocket, that the upper loop necessarily increases in size. In consequence, it presses against the hoodlike releaser, which thereupon, through the agency of a lever, causes the special fire-trap to drop into the beam of light and also actuates the switch so as to cut off the current to the motor. When the film has been re-threaded and likewise when it is threaded in at the outset the fire-trap is raised from the path of the rays by pulling over the lever 2 to the right, and at the same time the circuit will be closed.



A motor-switch fitted to the apparatus should be permanently closed. The motor will then be switched on by folding over the lever 2, while it is switched off by lightly pushing the releaser 1 upwards. The mercury switch used precludes the possibility of failure. The attachment should be connected in accordance with



the diagram (figur 2) via the clamp-bar 3 on the fire-guard. By way of a connecting wire to the clamping-bar it is best to use a lead-sheathed copper wire. When putting in the mercury switch note that the free bent contact ends should not point towards the fire-guard, as in these circumstances the connection wires would be liable to become jammed.

In the event of the machine being already equipped with a "Protector" attachment all that will be necessary is to make the connections. In our Ernemann II, Hahn II, and Ernemann I machines the "Protector" arrangement may be attached subsequently. We recommend, however, that the mechanisms should be sent to our works for the purpose of appending the fire protection attachment.

Leiss Ikon A.G. Dresden-A.