GENERAL INSTRUCTIONS

FOR

INSTALLATION, MAINTENANCE

AND OPERATION

OF

E7

Zimplex

PROJECTOR MECHANISM

PRICE 50 CENTS

INTERNATIONAL PROJECTOR CORPORATION

88-96 GOLD STREET - - NEW YORK 7, N. Y.

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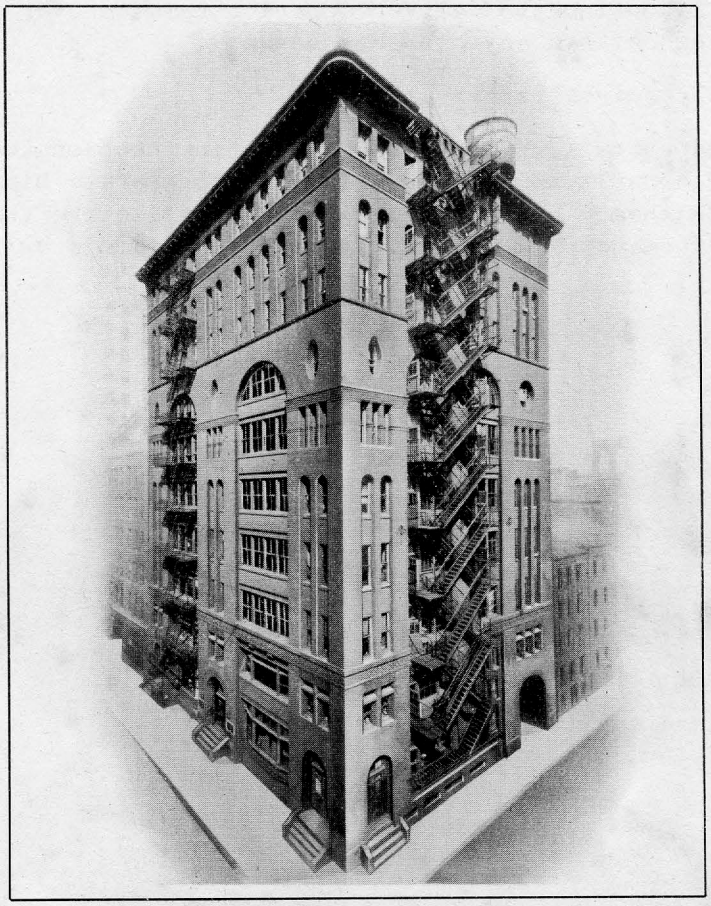


HOME OF SIMPLEX EQUIPMENT

Oldest and largest factory in the world devoted to the manufacture of standard professional motion picture projectors. Here have been originated and perfected methods and standards which for over thirty years have given us an international leadership in the motion picture field. A thoroughly progressive spirit enables us to give theatre owners the highest possible value at the lowest possible cost. No other firm has facilities that are at all comparable to ours for the economical and efficient manufacture of motion picture equipment and parts.

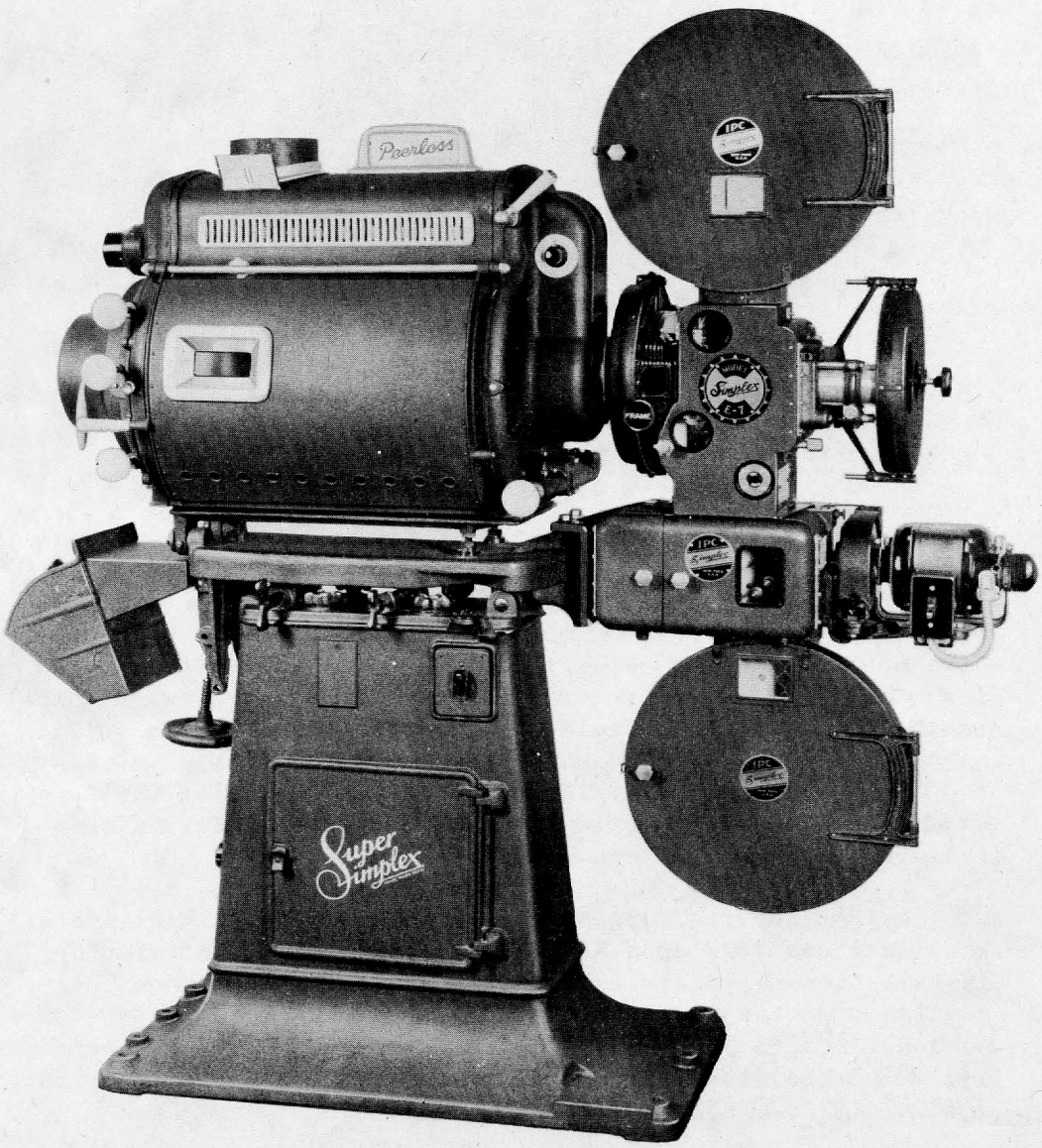
Simplex service supplements *Simplex* quality. Exhibitors know they can rely upon *Simplex* Distributors for satisfactory installation of *Simplex* equipment, advice and help when emergencies arise and prompt delivery of genuine *Simplex* parts when needed. *GENUINE SIMPLEX PARTS* always give the greatest value and are absolutely essential to get the best results with *SIMPLEX PROJECTORS*.

The Simplex E-7 Mechanism is built with unexampled accuracy to do the best job of projection ever achieved.

Because of advanced mechanical design, modern, different and better, it will continue to deliver superior results over a longer period of peak performance than any hitherto known.

It requires proper attention.

The user is urged to read these instructions carefully and thoroughly, to consult them frequently, and to operate his Projector in accordance with them. By so doing he will realize the full benefits of the superb performance and durability his Mechanism is built to deliver.



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MAINTENANCE (Con't)

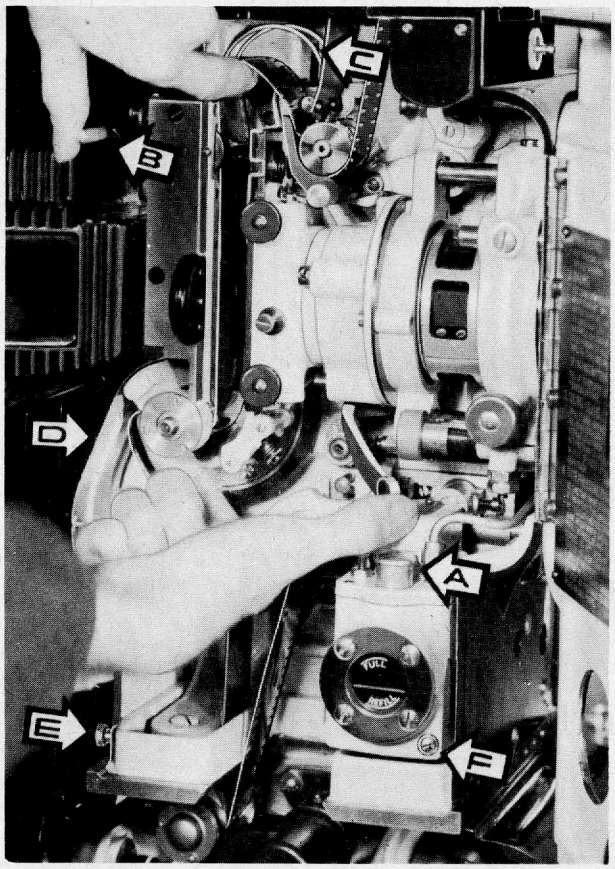

FIGURE 1.

(A) RESERVOIR OF ONE-SHOT OILING SYSTEM

(B) FIRE SHUTTER LIFT LEVER

(C) AUTOMATIC FIRE SHUTTER TRIP LEVER

(D) DRUM COVER

(E) DRUM COVER ATTACHING SCREW

(F) DRAIN SCREW FOR OIL RESERVOIR

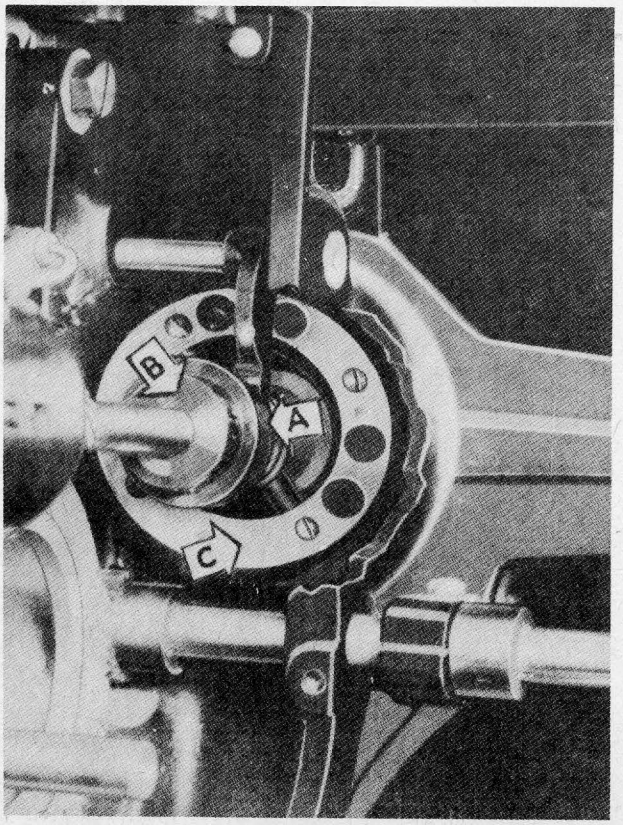

FIGURE 2.

(A) GOVERNOR FLANGE

(B) GOVERNOR STOP COLLAR

(C) GOVERNOR RING

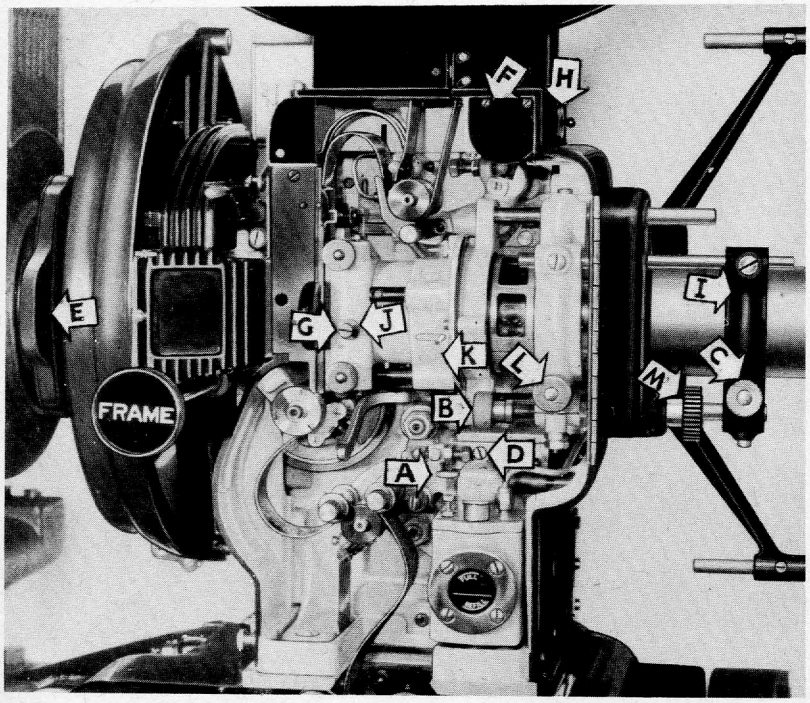

FIGURE 3.

(A) ONE-SHOT OIL SYSTEM PUMP HANDLE
(B) INTERIOR FOCUSING KNOB
(C) EXTERIOR LENS COLLAR LOCKING KNOB
(D) SHUTTER ADJUSTING SLIDE LOCKING SCREW
(E) AIR DEFLECTOR SLIDE
(F) THREADING LAMP SHIELD FASTENING SCREW
(G) LONG TENSION PAD ADJUSTING SCREW
(H) THREADING LAMP SWITCH
(I) EXTERIOR LENS COLLAR
(J) LONG TENSION PAD ADJUSTING SCREW LOCK NUT
(K) SLIDING FILM SHIELD
(L) INTERIOR LENS COLLAR LOCKING KNOB
(M) EXTERIOR FOCUSING KNOB

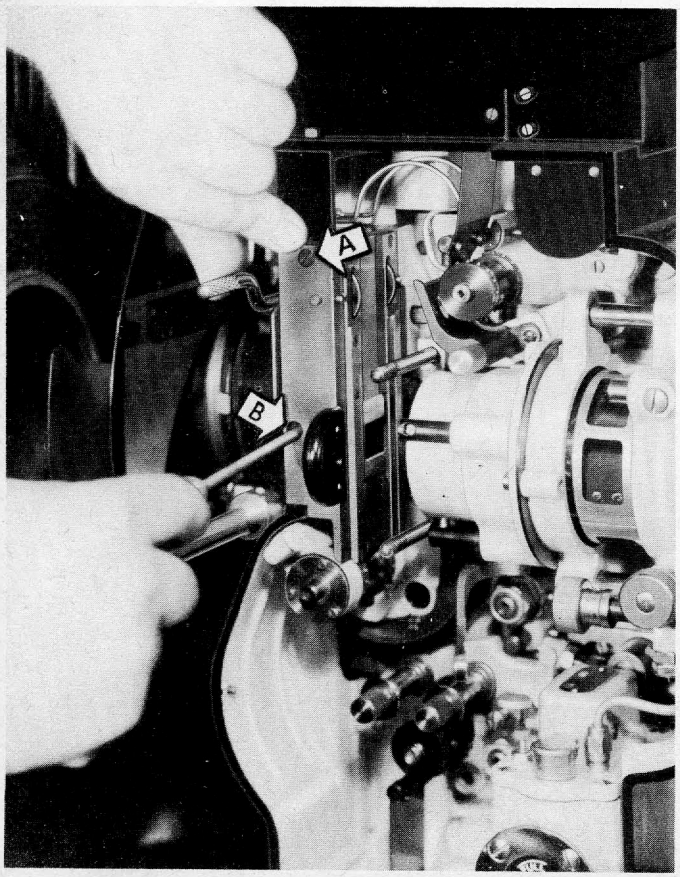

FIGURE 4.

(A) FILM TRAP FASTENING SCREW (UPPER)

(B) FILM TRAP FASTENING SCREW (LOWER)

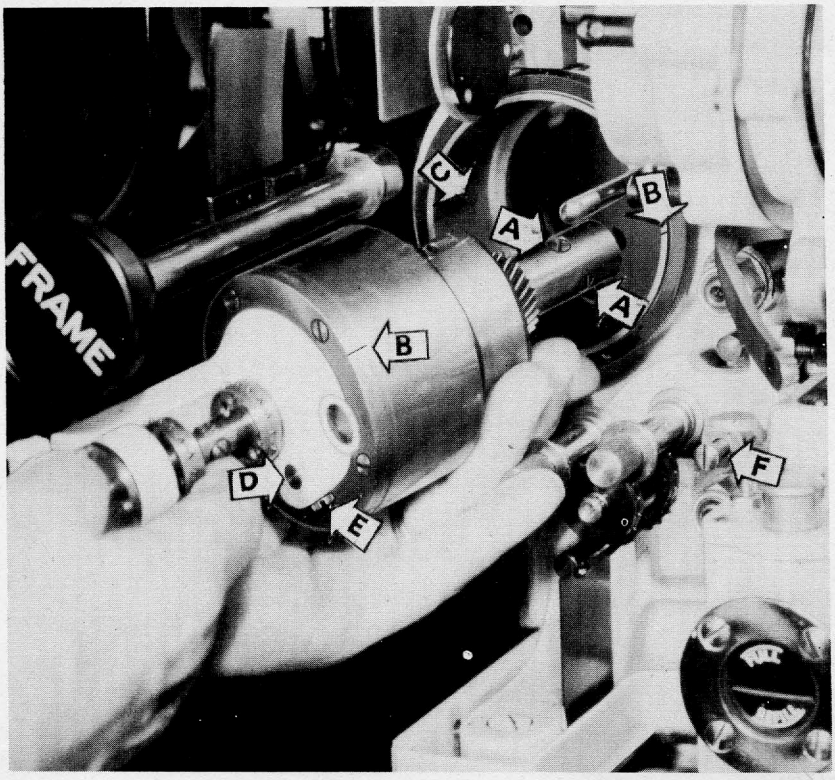

FIGURE 5.

(A) FLYWHEEL GEAR FASTENING SCREW

(B) INTERMITTENT GUIDE LINES

(C) SYNCHRONIZING CAM

(D) CAM END PLAY ADJUSTMENT STUD

(E) CAM END PLAY ADJUSTMENT LOCKING SCREW

(F) LOWER SPROCKET PAD ROLLER ARM STUD AND FASTENING SCREW

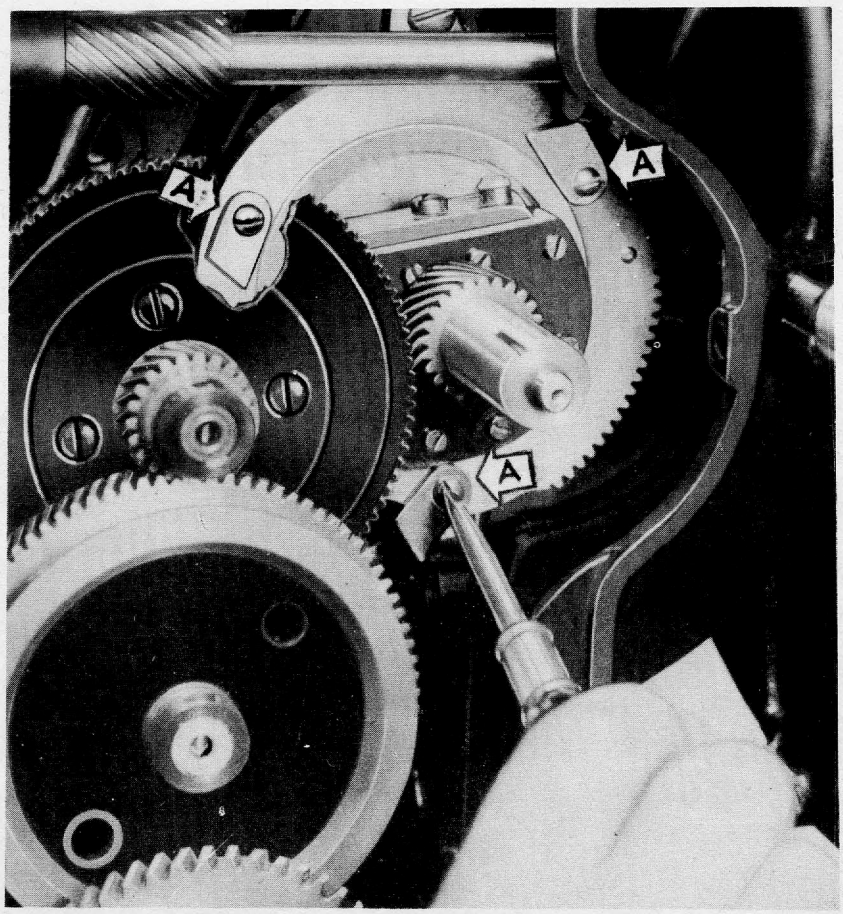

FIGURE 6.

(A) INTERMITTENT RETAINING CLAMPS

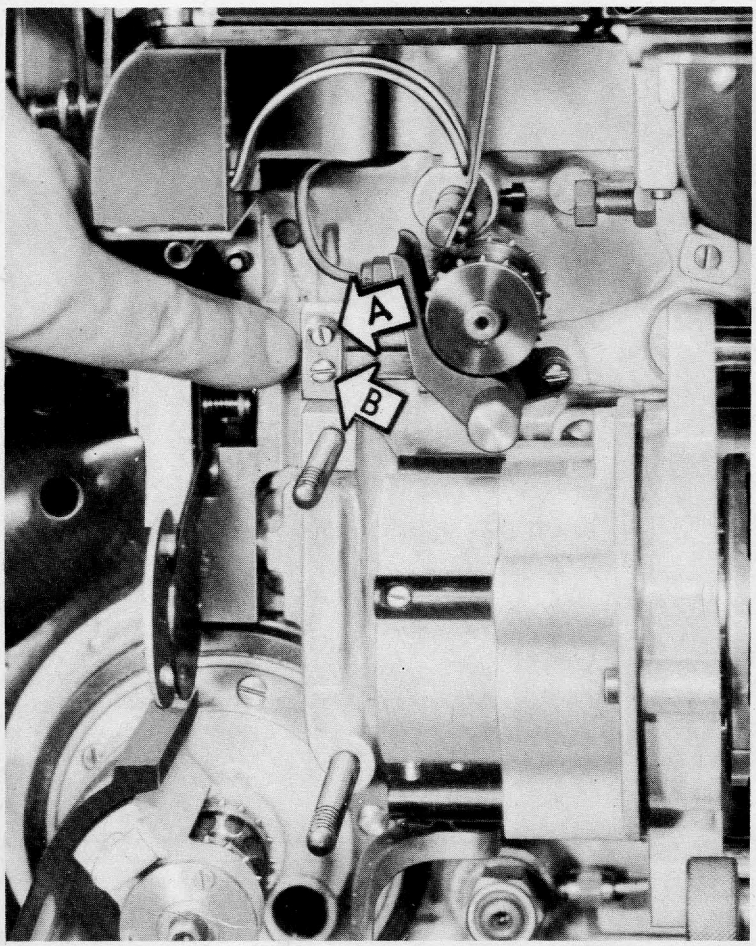

FIGURE 7.

(A) FILM GATE GUIDE ROD ADJUSTING SCREW

(B) FILM GATE GUIDE ROD ADJUSTING SCREW

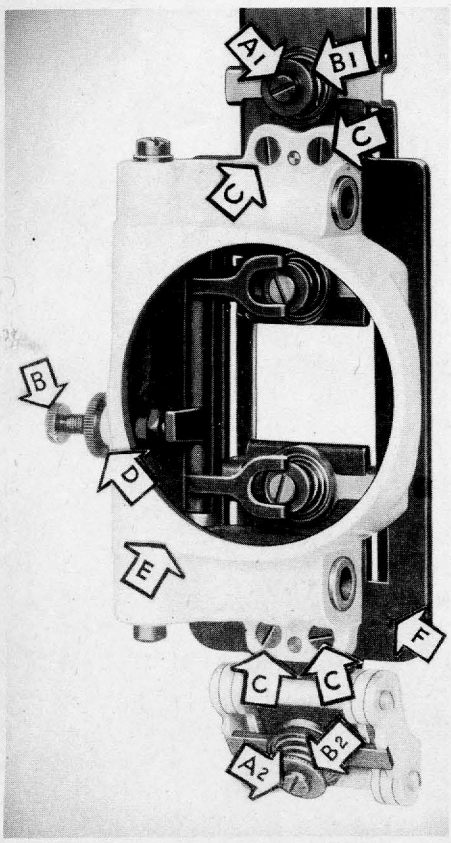

FIGURE 8.

(A_1) TOP TENSION PAD ADJUSTING NUT RETAINING SCREW

(A_2) INTERMITTENT TENSION SHOE ADJUSTING NUT RETAINING SCREW

(B) LONG TENSION PAD ADJUSTING SCREW

(B_1) TOP TENSION PAD ADJUSTING NUT

(B_2) INTERMITTENT TENSION SHOE ADJUSTING NUT

(C) GATE CASTING FASTENING SCREWS

(D) LONG TENSION PAD ADJUSTING SCREW LOCK NUT

(E) GATE CASTING

(F) GATE PLATE

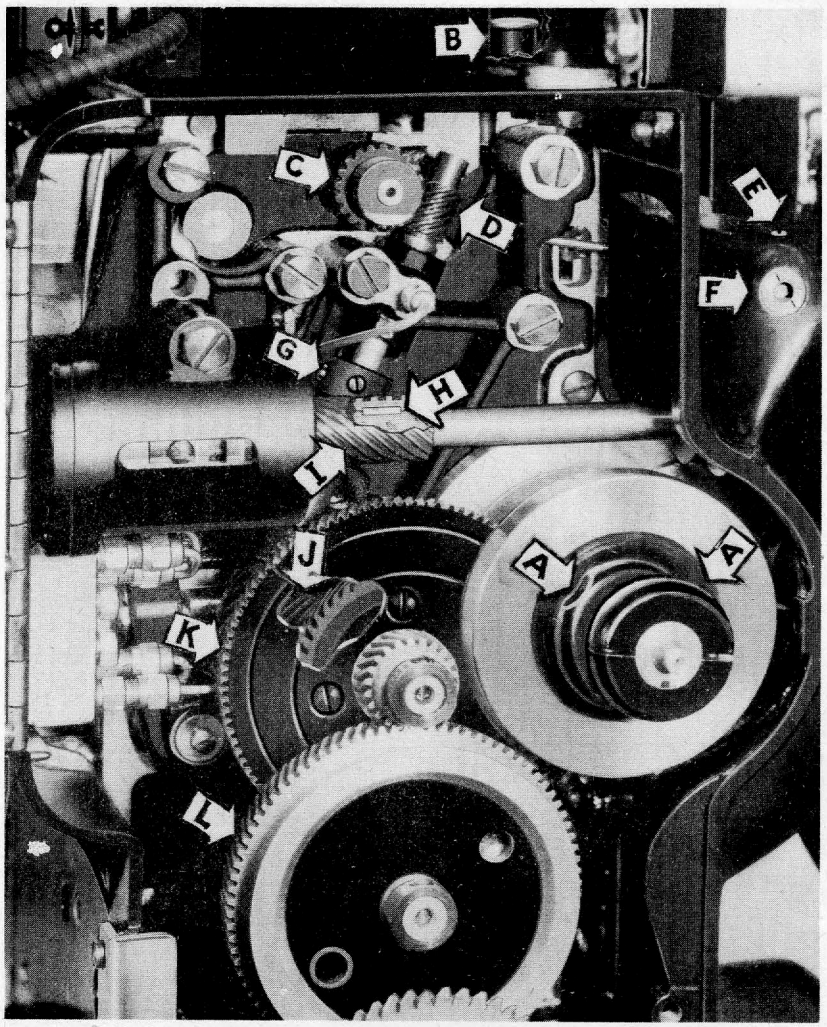

FIGURE 9.

(A) INTERMITTENT FLYWHEEL CLAMPING SCREWS
(B) NICKEL PLATED CAP COVERING HOLE THROUGH WHICH OBLIQUE SHAFT MAY BE REMOVED
(C) UPPER SPROCKET SHAFT DRIVEN GEAR
(D) UPPER SPROCKET DRIVING GEAR
(E) FIRE SHUTTER RAISING LEVER ADJUSTING BUSHING LOCK SCREW
(F) FIRE SHUTTER RAISING LEVER ADJUSTING BUSHING
(G) SHUTTER GEAR DRIVING GEAR
(H) SHUTTER GEAR WOODRUFF KEY
(I) SHUTTER SHAFT GEAR
(J) LOWER GEAR ON OBLIQUE DRIVE SHAFT
(K) INTERMITTENT DRIVE GEAR ASSEMBLY
(L) MAIN DRIVE GEAR

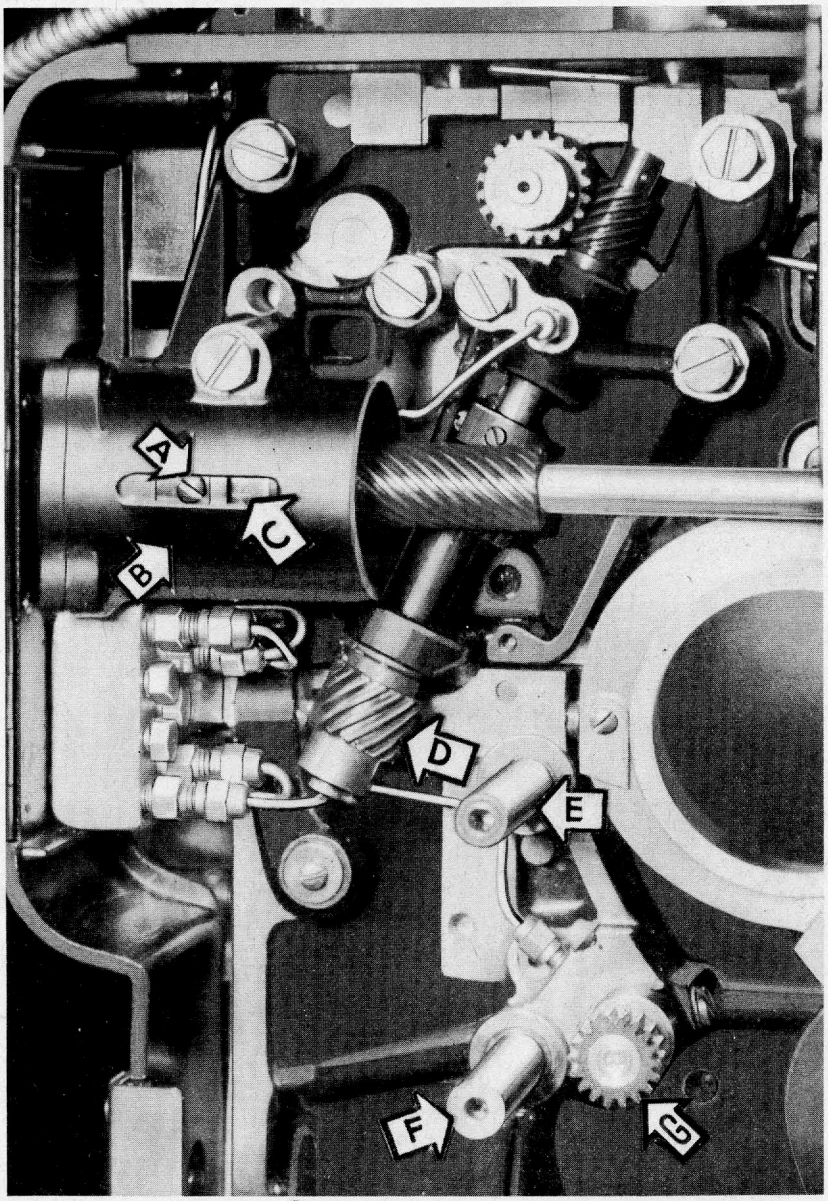

FIGURE 10.

(A) SLIDING SLEEVE GUIDE SCREW
(B) SHUTTER GEAR SLIDING SLEEVE SUPPORT CASTING
(C) SHUTTER GEAR SLIDING SLEEVE
(D) LOWER GEAR ON OBLIQUE DRIVE SHAFT
(E) INTERMEDIATE DRIVE GEAR STUD
(F) MAIN DRIVE GEAR STUD
(G) LOWER SPROCKET DRIVEN GEAR

Wipe away any oil that may have been spilled in the film compartment. Wipe away any excess oil that was placed on sprockets, idlers and so on just before shipment, to prevent rusting under the unfavorable climatic conditions sometimes encountered in transportation.

SECTION 6. INSERTING THE LENS. Turn the interior focusing knob, B, Fig. 3 until the lens collar is in half-way focusing position, with equal focusing leeway at either side. Insert the lens (or the lens in its adapter) in the lens collars, making sure the front end of the lens or adapter clears the front shutter.

SECTION 7. PREPARING THE FOCUS. Remove the spot sight box as in Section 13. Strike the arc, and focus the lens accurately as possible by hand, opening and closing the fire shutter momentarily to check the effect on the screen. (The projector is not running, and there is no film threaded in). Make absolutely certain that the lens barrel not only clears the front shutter, but that there is sufficient clearance to allow the lens to be brought forward into focus after film has been threaded. Lock the lens in the collars by means of the interior L, Fig. 3, and exterior lens collar locking knob, C, Fig. 3. Replace spot sight box. Start the projector, and line up the aperture image on the screen, using the lateral and vertical adjustments provided by whatever pedestal is installed. The projector is running; there is still *no* film threaded.

SECTION 8. THREADING. Operating the gate and fire-shutter-lift levers as in B, Fig. 1, thread the projector as in Fig. 3, leaving loops as there indicated. Threading in frame is facilitated by pressing forward on the fire-shutter-lift lever (shown against upper thumb in Fig. 1 which simultaneously lifts the fire shutter and lowers the framing lamp behind the aperture, lighting that lamp in the process.

WARNING! Be careful not to make the upper loop too large, or the excess film may trip the fire shutter, which is designed to be tripped by piled-up film in case of a break. If the upper loop is made too large the projector will have to be stopped, and the loop shortened, before the performance can proceed. Fire shutter trip may be readily removed and replaced at will by simply pinching the two sides together and pulling from or inserting in receiving holes in cross bar.

SECTION 9. COMPLETING INSTALLATION ADJUSTMENTS. Thread a film showing titles. Start the projector and sharpen the focus, using either the interior focusing knob B, or the exterior focusing knob M, Fig, 3, which will be found at the front of the mechanism on the operating side.

Check the shutter adjustment by observing the screen. The projector leaves the factory with shutters set perfectly, but they may have been disturbed in the course of installation.

If travel ghost is seen, release the locking screw of the shutter adjusting knob slide, which will be found inside the mechanism, just under the lens barrel. Operate the shutter adjusting knob until all travel ghost is completely cleared, and tighten down the locking screw, D, Fig. 3.

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SECTION 10. **LUBRICATION.** While the projector is new, the pump of the automatic oiling system is operated, as explained in Section 5, about every two hours that the projector is actually running. As time goes on, the intervals of lubrication are gradually lengthened until, when the mechanism is completely broken in; the automatic system is used only once about every *four* hours of actual running time, which schedule is continued through the life of the projector.

The intermittent oil viewing ports are observed from time to time, and the intermittent reservoir is refilled, as described in Section 5, whenever the ports show that more oil is needed. It is always advisable to oil the intermittent from the driving side, rather than from the operating side as the sight glasses are readily discernible from this side.

The gears and governor are oiled, as in Section 5, at least once a day while the mechanism is new, but this lubrication is also applied less frequently as the machine breaks in, when it will be needed only twice a week. Gears and governor are *never* oiled while the projector is running.

SECTION 11. **CLEANING.** Owing to the white-enamelled interior, illuminated by the threading lamp, and to the ease with which component parts can be removed (see removing instructions under **MAINTENANCE**, on the pages that follow) the mechanism is easily kept in spotless condition. All foreign matter that may impair the image, soil the film, or cause undue wear to moving parts, can readily be seen, is easily reached, and should be removed at once.

SECTION 12. **PAD TENSION ADJUSTMENT.** The Simplex E 7 includes provisions by which the film pad tension can readily be adjusted, even while the projector is running, to compensate for the use of new, worn or oily film. The detailed instructions given in Section 40 should be consulted, and used from time to time as the conditions of operation require.

SECTION 13. **REMOVING THE SPOT SIGHT BOX.** This is removed from the operating side. It pulls out -- merely open the door of the projector and draw the spot sight box toward you.

SECTION 14. **REMOVING THE REAR SHUTTER GUARD.** The rear shutter guard is built in two vertical sections, or halves, each of which can be taken off separately.

To take off the half at the operating side, take out the machine screw seen at the bottom of the shutter guard, when facing it from the operating side. Take out the corresponding screw at the top of the guard. Going now to the drive side of the projector, two machine screws will be seen facing you at the bottom of the guard. The one nearest the mechanism is taken out. The corresponding screw at the top of the guard is taken out. The operating side half of the guard can then be lifted off.

To take out the drive side half, remove *both* machine screws facing you at the bottom of the drive side of the guard, and *both* machine screws facing you at the top of the drive side. Take out the nickel-plated hexagon bolt just above the drive side framing knob. The drive side half of the shutter guard can then be lifted out.

SECTION 15. **REMOVING THE FRONT SHUTTER GUARD.** At the top of the guard take out *one* machine screw -- the one at the very top, and furthest to the front. Take out the corresponding screw at the bottom -- the one furthest toward the bottom and furthest front. At the drive side remove the machine screw furthest toward the drive side. The front half of the guard can then be drawn off.

If the rear half of the guard is to be removed, loosen the shutter hub clamping screws and draw the front shutter off its shaft. At the top of the guard take out the top-most screw -- the one corresponding to, and just behind, the screw that

was removed to take off the front half of the guard. Proceed similarly at the bottom and at the drive side, again removing three screws in all. The rear half of the guard can then be drawn off the shutter guard support rods.

When the front shutter is replaced, it must be "timed" as described in Section 20.

SECTION 16. REMOVING THE FILM GATE. Put the gate in half-open position, by operating the gate-opening lever. Take off the knurled thumb screws at the top and bottom of the gate. Draw the gate toward you.

To replace it, again operate the lever to half-open position. Push sliding shield in lens mount forward. Engage the hole in the bottom of the gate with the lower stud, and slip the gate home, and replace the knurled thumb screws.

SECTION 17. REMOVING THE FILM TRAP. Remove spot sight box (Section 13). Hold up the fire shutter by means of lift lever and remove the rear retaining screw with a thin screwdriver, as in B, Fig. 4. Next remove the front retaining screw -- the one indicated by the left forefinger in A, Fig. 4. Lift the fire shutter again and draw the trap toward you.

SECTION 18. TAKING OUT THE INTERMITTENT MOVEMENT. Remove spot sight box, film gate and film trap (Sections 13, 16, and 17). Next remove right back drum cover, D, Fig. 1, just below the film trap. This casting is held by three knurled thumb screws, E, Fig. 1, two along the bottom edge and one at the inner edge, half-way up. When these thumb screws have been loosened, draw the casting toward you.

At the drive side, loosen the flywheel clamping screw located at the side of the center flange of the flywheel hub. *(WARNING:* Do *not* loosen the two shaft screws shown at "A" in Figure 5 which are accessible through holes in the hub, but only the screw shown at "A" in Figure 9.) Remove the flywheel by withdrawing it from the shaft. Refer to Fig. 6 and loosen the three screws holding the wedge shape retaining clamps shown at "A", one of which is in contact with the screwdriver. Loosen all three screws until the clamps swing freely. The third screw, hidden in Fig. 6 behind the intermediate gear, may be exposed by operating the framing knob. Swing the three clamps clear of the movement and tighten the screws lightly to prevent the clamps from dropping back into their previous position. It is not necessary to remove any gears on the drive side. Returning to the operating side, open the film gate with the gate opening lever, lift the fire shutter and draw the movement toward you as in Fig. 5.

SECTION 19. INSERTING AN INTERMITTENT MOVEMENT. Make sure the case of the movement is clean, and that the surface of the synchronizing cam into which it fits, C, Fig. 5, is also clean. Oil both lightly as a precaution against rust.

The procedure to be followed will differ slightly, according to whether the movement to be installed is a new one, or one that has been taken out of the same machine and merely is being replaced.

In the case of a new intermittent, take off its flywheel, as in Section 18. Slide the movement into place from the operating side, lining up the guide lines B, Fig. 5 so the guide line on the movement and the guide line on the framing cam coincide perfectly. Push the movement home when the small dowel pin in the framing cam will match up with the hole in the movement provided to receive it. Be careful to see that flywheel gear and large micarta gear are properly meshed while performing this operation.

A movement that has just been taken from the mechanism and is to be replaced is slid part way (not all the way) into the synchronizing cam. Line up the guide lines roughly, deferring accurate alignment until later. At the drive side look for an "0" mark on the intermittent gear hub, just outside the gear, and a corresponding "0" mark or dot on the micarta gear that meshes with the intermittent gear. Rotate both gears until the teeth indicated by these "0" marks are in contact with each other. Now push the movement all the way into the synchronizing cam. Leaving

the gears at the drive side properly meshed, as indicated by the "0" marks, return to the operating side and rotate the movement in the synchronizing cam until the guide lines are perfectly matched and push the movement home.

Whether the movement is a new one or an old one, it is now set properly in the synchronizing cam, and ready to be locked in place. This is done by means of the wedge-shaped clamps on the driving side, all three of which are swung down into the slots provided for them on the intermittent casing. Their holding screws are then tightened down. The flywheel is replaced on the intermittent shaft, the key in the flywheel fitting into the guide groove on the shaft. The flywheel clamping screws A, Fig. 9, are tightened evenly. The rear casting of the housing, the film gate, film trap and spot sight box are replaced.

In the case of a new movement it is still necessary to "time" the shutters; if an old movement has been replaced with proper reference to the "0" mark, as explained above, retiming the shutters will not be required but it is best to check shutter timing in any case.

SECTION 20. TIMING THE SHUTTERS. Loosen shutter adjusting slide fastening screw. Turn the shutter adjusting knob at the front of the projector, under the exterior lens collar, until the shutter synchronizing device lock screw D, Fig. 3, is in approximately central position in its slot. Remove aperture plate.

Loosen the lens collar locking knobs C, Fig. 3, and remove the lens and air deflector slide E, Fig. 3. Loosen both clamp screws on both front and rear shutters, leaving those shutters free to turn on their shafts. Remove the spot sight box.

Insert the shutter aligning barrel in the lens holder with the knurled screw toward the front shutter. Lock it in place with the lens collar locking screws. Insert the shutter aligning shaft in the aligning barrel with the grooves toward the front shutter, lifting the fire shutter out of the way and being careful not to strike the aligning shaft against either front or rear shutter blades.

Line up the narrow groove in the shaft -- the one nearest the front of the shaft -- with the front of the aligning barrel. When this is properly done, and the knurled screw is tightened down, the lower end of that screw will enter the wider of the two grooves on the shaft, holding the shaft in place but leaving it free to rotate even when the knurled screw has been turned as far as it will go. Rotate the shaft until its flat extensions face downward. Set movement in its locked position by turning motor flywheel or knob on end of motor shaft *not by shutter shaft knob.*

Take the intermittent indicator and hold it vertically, with the diamond-shaped end upward. Slip the diamond over the axis of the intermittent sprocket shaft, which protrudes beyond the double bearing arm.

Turn the mechanisms over by hand in the normal direction, very slowly, watching the lower end of the intermittent indicator. Stop when the indicator just begins to move.

Grasp the rear shutter by its hub clamp and turn it until the edge of one blade (either blade -- they are identical) comes up against the flat extension of the shutter aligning rod. Be sure the shutter is free so as not to turn the mechanism. While turning the shutter hub push it toward the projector to assure that it will remain clear of the rear of the shutter guard. Lock the shutter in this position.

Turn the front shutter assembly similarly until the edge of either blade comes up against the flat extension of the aligning shaft, making sure the shutter re-

mains centered with reference to its guard, so it will not rub. Lock the front shutter in position.

Remove the shutter aligning devices from the lens holder; remove the intermittent indicator.

Replace the aperture plate, spot sight box and lens, and refocus the lens as in Sections 6, 7, and 9.

A slight adjustment may be necessary (see Section 9) to remove any travel ghost that may remain.

SECTION 21. CHANGING THE INTERMITTENT SPROCKET. The sound drive should first be disengaged, and the projector turned over by the front shutter knob to note the "feel" of the mechanism for comparison when the job is completed. The same test is repeated after the new sprocket has been installed, to determine whether the intermittent movement is then set properly.

The next step is removal of the film gate and film trap (Sections 16 and 17) and of the housing casting just under the film trap (first paragraph of Section 18).

The screw under the right hand oil sight of the movement is then taken out, and the oil drained into absorbing material. Any oil that reaches any part of the mechanism is carefully wiped away.

The four other screws in the same circumference are then removed, after which the double bearing sprocket arm can be drawn out. This must be done with extreme care to avoid striking the star wheel as it leaves the intermittent casing. The gasket between the arm and casing must be preserved undamaged, or replaced with a new one.

The fastening screw in the sprocket hub is then removed, and the star wheel with its shaft, is drawn out of the double bearing arm. Lift the sprocket out of the arm replace it with the new one. Slide the star wheel shaft back into position. This is done very gently, with a slight twisting motion; no tools are used to drive the shaft. If the fit is snug, the shaft may be lubricated with a drop of *Simplex oil*. When the screw holes are lined up the fastening screw is replaced in the sprocket hub, but before it is tightened down, sprocket and star are pressed toward each other until there is *no* perceptible end play but rotation is still *perfectly* free. Replace gasket.

The double bearing arm is now held in the left hand, the fingers of the right hand resting against the sprocket. In this way, and with due care to avoid striking the star, the star wheel is brought gently against the cam. The left hand now rotates the double bearing arm carefully until a locating hole in its casting engages a corresponding locating pin in the frame of the movement. Pin and hole are kept in approximate contact while the fingers of the right hand rotate the sprocket very slowly until they feel the star engage the cam radius. The double bearing arm is then gently brought home: -- locating pin and hole, star and cam, engaging simultaneously. Patience and care are essential; a single hasty motion may damage the star or cam and make satisfactory performance impossible.

With the arm in place, the five screws are restored; loosely at first. Then all are tightened down to draw the arm firmly against the intermittent casing. They are loosened again to allow the arm to shift downward of its own weight, and again made up tight.

The projector is now again turned over by the front shutter knob to determine whether there is the slightest trace of binding between star and cam; comparison being made with the "feel" of the project or as it was before the sprocket was changed. Unless the action is absolutely perfect the five screws are loosened, the arm moved slightly, and the screws made up tight again. This process is repeated as many times as necessary until the star and cam action has been brought to perfection. The slightest hint of compromise at this point is not permissible.

The intermittent reservoir is then re-oiled, using clean *Simplex oil* from a clean can; gate, trap and housing casting are restored, and the sound drive is re-engaged.

Only men experienced in this work should undertake it. Otherwise the intermittent movement should be taken out as in Section 18, and returned to the manufacturer or to an authorized service station.

SECTION 22. REPLACING THE UPPER FEED SPROCKET. Take out the spot sight box, gate and film trap (Sections 13, 16, and 17). With a short screwdriver, reach through the hole in the upper sprocket shoe and remove the fastening screw from the sprocket hub. The gear and shaft can then be drawn out from the driving side. (CAUTION: There is a thrust washer on the shaft, between the gear and the main frame, which is needed for proper spacing and must not be lost.) The sprocket is lifted clear and the shaft is slid back into place through the hub of the new sprocket. The fastening screw is replaced; while this screw is being tightened down gear and sprocket are pressed toward each other to leave approximately .002 inch end play. Gate, trap and sight box are replaced.

SECTION 23. REPLACING THE LOWER FEED SPROCKET. Remove the housing casting below the film trap (first paragraph of Section 18). With a short screwdriver, loosen the screw that holds the lower stripper stud in the main frame casting; tilt the stripper out of the way. Remove the fastening screw in the sprocket hub, and draw the sprocket off the shaft. The new sprocket should be slipped all the way in, leaving only approximately .002 inch end play, and the fastening screw made tight with the sprocket in this position. The shaft may be pushed in from the non-operating side through a hole in the large main drive gear. The stripper is tilted back into place, care being taken that it just clears the sprocket hub and its fastening screw. The stripper stud holding screw in the main frame casting is tightened down, and the housing casting replaced.

SECTION 24. REPLACING THE UPPER FEED SPROCKET SHOE. Do not attempt to take the shoe off the arm on which it mounts -- the entire arm must be removed from the mechanism. The stud on which the arm rides is loosened with a screwdriver and drawn out with pliers. The arm can then be removed.

The shoe is mounted in the arm by means of a shoe stud and two browned machine screws. One screw holds the shoe stud, the other holds the shoe itself. Take both screws out of the arm, being careful not to lose the washer on the shoe screw.

The shoe and its stud will now come off. Slip the stud through the new shoe and replace it in the arm. Replace and tighten down the stud holding screw, pressing on the stud at the same time to remove end play. When this screw is tight the shoe should be free to rotate on its stud, but with *no* end play at all. The shoe locking screw (with its washer) is now replaced, but is *not* tightened down.

The arm and arm stud are now replaced in the mechanism, aligned so the shoe rides properly on the sprocket, and locked in place.

The shoe is then rotated on its own stud until the inner curvature of the shoe parallels the curve of the sprocket, and the shoe holding screw is then tightened down.

Above and a trifle left of the arm stud will be seen a hexagonal bolt and lock nut. These are adjusted to leave exactly two thicknesses of film clearance (approximately .015") between sprocket and shoe, and the lock nut is tightened down in that adjustment.

SECTION 25. REPLACING THE LOWER SPROCKET PAD ROLLER. Loosen the lower sprocket and roller arm stud screw screw, F, Fig. 5 and draw screw and stud toward you. The pad roller arm can then be taken out. Loosen the holding screw of the shaft of the roller to be removed, after which the shaft, with its roller, can be drawn out of the arm. Insert the shaft in the new roller and replace it in the arm. Allow the roller .005 inch play, and tighten down its shaft holding screw. Replace the arm in the mechanism and restore the arm stud and holding screw. In tightening this screw, press inward on the screwdriver to remove all end play from the arm.

At the top right of the arm will be seen a hexagonal bolt and lock nut. Adjust these for exactly two film thicknesses (approximately .015") clearance between the sprocket and the *left* roller -- regardless of which roller was changed. Lock the hexagonal nut in that adjustment.

SECTION 26. ADJUSTING GATE PLAY. Remove gate. Loosen the gate guide rod adjusting screw locking screw, B, Fig. 7 and release the gate guide rod adjusting screw, A, Fig. 7. Work the gate opening lever back and forth while adjusting gate guide rod adjusting screw until the desired degree of friction is obtained; then tighten the locking screw and replace gate.

SECTION 27. REPLACING THE THREADING LAMP BULB. Take out the two screws in the face of the threading lamp shield, F, Fig. 3. The 120 volt bulb, a standard 6 watt, candelabra base type, can then be unscrewed and replaced.

WARNING! The bulb cover is held only by the shield; unless supported by hand it will drop when the shield screws are taken out.

SECTION 28. REPLACING THE FRAMING LAMP BULB. Take out the spot sight box (Section 13) and hold it upside down. Pressing on a nickel-plated stud that will be found near the rear of the spot sight box will lower the framing lamp within easy reach. The bulb is a Mazda #55, 6-8 volt bayonet base type.

SECTION 29. REPLACING THE MAIN DRIVE GEAR. Remove the lower housing casting on the drive side. Take out the collar fastening screw in the main gear shaft, slip off the collar and draw the gear L, Fig. 9, toward you.

Lubricate the new gear with a drop of *Simplex oil.* When installing it, rotate the lower feed sprocket until its gear meshes with the new main drive gear; then restore the collar, holding screw and housing casting.

SECTION 30. REPLACING THE INTERMEDIATE DRIVE GEAR ASSEMBLY. Take off the intermittent flywheel as in Section 18, second paragraph, and the main drive gear as in Section 29. Take out the collar fastening screw in the intermediate gear shaft, slip off the collar, and draw the gear assembly, K, Fig. 9, toward you. Lubricate the new assembly with a drop of *Simplex oil* on each gear. In installing it, after meshing all gears properly, make sure there is *no* end play. Restore the collar and fastening screw, the main drive gear, and the intermittent flywheel.

Retime the shutters as in Section 20.

SECTION 31. REPLACING THE LOWER SPROCKET DRIVEN GEAR AND SHAFT. Take off the main drive gear as in Section 29. At the operating side of the mechanism loosen the holding screw in the lower sprocket hub as in Section 23. The gear, G, Fig. 10, and shaft can now be drawn out from the driving side.

Lubricate the new gear and shaft with a drop or two of *Simplex oil.*

SECTION 32. REPLACING THE UPPER SPROCKET DRIVEN GEAR. Proceed as in Section 22, taking out gear, C, Fig. 9, and shaft from the driving side. Lubricate the new gear and shaft with a drop of *Simplex oil.*

SECTION 33. REPLACING OBLIQUE SHAFT OR GEARS MOUNTED THEREON. Remove the nickel-plated cap located just behind the magazine screws at "B" in Fig. 9 at the top of the mechanism. This may be done by inserting a screwdriver beneath the cap and prying it up. It is held in place by a circular

spring. Remove the lower cover plate on the drive side of the mechanism. Remove the main drive gear by removing the screw which holds the retaining collar in place. Remove the intermittent flywheel as instructed in Section 18. Remove the intermediate drive gear by removing screw and collar which holds it in place. Disconnect the lower oil tube connector from the distributing block. The loop in this tube permits it to be bent downward slightly and away from the lower gear on the oblique shaft. Remove screw which holds the lower gear, "J" in Fig. 9, to the oblique shaft and slip the gear downward and off the shaft. Remove key from shaft. Loosen the three retaining screws on the middle gear. Slip the shaft upward slowly until the key in the middle gear is visible and carefully remove with a pair of long nose pliers. The shaft may now be removed entirely by withdrawing it through the hole in the top of the mechanism.

The reassembly is made in the reverse manner At this time care must be taken to line up the key slot in the middle gear with the key slot in the shaft and insert the key before the shaft is pushed downward to its final position. Before tightening the three retaining screws of the middle gear, it should be located centrally, with respect to its mesh with the mating shutter shaft gear.

If necessary to replace sprocket driving gear, D, Fig. 9 on oblique shaft, remove shaft entirely, as above, carefully remove pin from old gear, and replace with new one, driving pin in carefully.

SECTION 34. REPLACING THE SHUTTER GEAR. Before undertaking the work in the projection room read the following instructions through and make sure there is room enough in front of the mechanism to perform the required operation. If there is not, the projector must be removed from the pedestal, and the work done on a table or bench.

The following parts are removed, in the order given: Front shutter shaft knob. Front half of front shutter guard, shutter, and rear half of the guard (Section 15). Shutter adjusting knob holding screw and shutter adjusting knob. Drive side door stop slide screw, disconnecting the stop slide from the door.

Remove the two nickle-plated screws at the top of the front shutter ball bearing housing, and draw the housing toward you, removing it from the mechanism. Loosen the exterior lens collar holding screws and draw off the exterior lens collar.

Take out all screws that face you when looking at the front of the mechanism *except* for the following: hinge screws; two small screws at the top just left of the threading lamp toggle switch; three black machine screws placed close together toward the drive side of the base casting. None of these are disturbed. All others -- seven in all -- are taken out.

Both doors are then opened, and the entire front of the housing, with the doors and the front shutter spider, is drawn forward and removed.

The front bearing casting (it surrounds the shutter shaft just behind the front shutter) is now removed by taking out the four screws that hold it. Turn framing handle on non-operating side counter-clockwise as far as it will go. Force back spring retaining collar sleeve and draw pin out of retaining collar being careful not to release spring suddenly. Draw off synchronizing spring.

At the non-operating side, take out the sliding sleeve guide screw, A, Fig. 10. Push the sliding sleeve, C, Fig. 10, forward in the sliding sleeve support casting, B, Fig. 10, until it protrudes slightly at the front.

Grasping the sliding sleeve where it protrudes from its support casting, rotate it clockwise 1/4 turn. Rotate the shutter shaft until the keyway to the rear of the shutter gear points upward. The sliding sleeve can now be drawn out and removed, and will take the shutter gear assembly with it.

CAUTION: There is a Woodruff key, H, Fig. 9, a wedge-shaped piece of metal, driving the shutter gear, which fits into the keyway in the shutter shaft. In drawing out the sliding sleeve make sure this key (which drives the shutter gear) is not lost.

The remainder of the work is done

on the shutter gear assembly, and not at the projector.

Take out the three screws that hold the ball bearing retaining plate, and remove that plate. Remove the shutter gear, I, Fig. 9, ball bearing and lock nut assembly from the sliding sleeve.

Remove the lock nut fastening screw and take the lock nut off the gear. Slip the gear out of the ball bearing.

The new gear is installed by reversal of the above procedures, with the following precautions:

Be sure to re-stake the fastening screw in the ball bearing lock nut.

The Woodruff key must be properly seated in the shutter shaft when the sliding sleeve assembly is replaced.

The sliding sleeve assembly must slip *freely* on the shutter shaft, but with *no* perceptible play.

Do not replace the front of the housing until the shutter shaft has been found to run smoothly. If it does not rotate freely the front bearing casting may have to be reseated by loosening its four screws, shifting it slightly, reseating the screws and trying the shaft again. It may prove necessary to repeat this procedure until perfect alignment is attained.

Re-time the shutters as in Section 20.

SECTION 35. REPLACING THE MAIN OR INTERMEDIATE GEAR STUDS. Remove the gear as described in Section 29 or 30. On the operating side, remove the self-locking stud retaining nut on the intermediate gear stud, or the film protecting stud nut on the main drive gear stud, with a suitable wrench. The studs may be prevented from turning by inserting a straight pin punch in the oil hole on the lower side. The stud ("E" or "F" in Fig. 10) may now be drawn out from the driving side.

When replacing a stud, the cross hole at the end for the gear retaining collar screw should be vertical and the oil grooves should always be on the *lower* half of the stud surface. Before replacing a gear on the stud, oil the bearing surface with clean *Simplex oil*.

In the case of the removal of the intermediate drive gear assembly stud, time the shutters as in Section 20.

SECTION 36. REPLACING THE GATE TOP TENSION PAD. Take out the gate (Section 16) and remove the small screw at the center of the retaining screw, A1, Fig. 8. Remove the round knurled nut, B1, Fig. 8, (the pad tension adjusting nut) and the spiral spring. Slip off the tension pad. Slip on the new one; restore the spring, knurled nut and adjusting screw. Adjust the new pad tension as in Section 39.

SECTION 37. REPLACING THE INTERMITTENT SPROCKET SHOE. Take out the gate (Section 16) and remove the small screw at the center of the bottom spiral spring -- the sprocket shoe tension retaining screw, A2, Fig. 8. Remove the knurled nut (the sprocket shoe tension adjusting nut, B2, Fig. 8) and the spiral spring. Slip off the shoe and replace, restoring the spring, knurled nut and adjusting screw. Adjust the new shoe tension as in Section 39.

SECTION 38. REPLACING THE LONG TENSION PAD. Remove the four gate casting holding screws, C, Fig. 8. Separate the gate plate, F, Fig. 8, (which is located by two dowel pins) from the casting, and proceed as in Section 36.

SECTION 39. SETTING THE GATE PAD AND SHOE TENSION.

Upper Pad. Remove the gate as in Section 16, and set the upper pad adjusting screw for very light tension -- just enough to hold the film flat against the runners, and no more. Replace and remove the gate as often as necessary, testing the tension until the correct adjustment is obtained, which is then made permanent with the round knurled locking nut.

Intermittent Sprocket Shoe Tension. Proceed exactly as for the upper tension pad. Tension should also be the same: just enough to hold the film to the base of the sprocket teeth, and no more.

Restore the gate, and remove all pressure at the center pad by backing off completely the adjusting screw, B, Fig. 8 and round locking nut, D, Fig. 8, shown at the side of the gate in G, Fig. 3, and B, Fig. 8. Run film, being careful to use a reel that has no camera jump in it, and, watching the screen, tighten the tension by turning the external adjusting screw clockwise until the picture is steady.

WARNING: Make sure there is *no* excess tension, which will shorten the life of the runners, pressure pads, sprockets, star and cam, and tear sprocket holes in the film itself.

Lock the correct adjustment with the round knurled nut.

In operation, the external long pad adjusting screw and locking nut may be used to compensate for difference between new, used or oily film, without first removing the gate as above described. All that is needed is to back off the round knurled locking nut, and re-set the adjusting screw -- being careful *always* to use the minimum tension necessary for a steady picture. The correct adjustment is then made permanent with the locking nut.

It is very essential, in all adjustments made during operation, to be very careful to distinguish between projected unsteadiness and camera jump, and to avoid increasing the tension dangerously in an impossible attempt to cure the latter.

SECTION 40. REDUCING INTERMITTENT NOISE. To cure imperfect adjustment of the intermittent movement, one symptem of which is noise, run the projector with no film threaded, and while the machine is in operation press against the flywheel shaft where it protrudes beyond the flywheel clamp.

If the noise disappears or is reduced in intensity, loosen the flywheel shaft screws (not the clamping screws). The shaft screws are shown in A. Fig. 5, with the instructions *not* to loosen them when removing the intermittent.

Those screws having now been loosened slightly, pull or pry the flywheel shaft toward you (toward the non-operating side of the mechanism) the smallest possible fraction of an inch, and again tighten down the screws. Start the projector again: If there is any noise left again press against the end of the flywheel shaft as before. If this reduces the intensity of the remaining noise, repeat the process.

It is important *not* to try to take out all noise at once by moving the flywheel shaft over a longer distance, but to repeat the same procedure a number of times, and to stop it as soon as the shaft has reached the position in which the noise disappears or resists further treatment of this type.

If pressing on the end of the flywheel shaft does *not* reduce noise, or if there is still noise left after the above described process has been followed to the limit of its usefulness, remove the drum cover as in the first paragraph of Section 18. Loosen the cam end play adjustment locking screw, E, Fig. 5, using the framing knob to bring the screw to the most convenient position. Run the projector without film and press inward on the cam end play adjustment stud, D, Fig. 5, until the noise disappears. Holding the stud in this position, stop the projector, and make the adjustment permanent by tightening down the locking screw.

If there is still noise left after the above procedures, take out the screw under the right hand oil sight of the movement, draining the oil into rags or other absorbing material, and wiping away carefully any oil that reaches any part of the mechanism.

Loosen the four other screws in the same circumference, and restore. Without tightening, the screw that was taken out. The double bearing arm is thus allowed to shift downward of its own weight. The five screws are then tightened, the intermittent re-oiled, and the projector is run again. (Also see Section 21).

If there is still serious noise in the action of the movement the trouble is beyond ordinary projection room repair, and the movement should be sent for adjustment to the manufacturer or to an authorized service station.

SECTION 41. ADJUSTING THE GOVERNOR STOP COLLAR. If the governor stop collar, B, Fig. 2 has for any reason been disturbed, loosen its holding screws and slide it toward the governor until it just touches the governor flange. Allow it to rest against the flange with *no* pressure, and tighten down the holding screws.

SECTION 42. ADJUSTMENT OF FIRE SHUTTER Remove spot sight box (Section 13). Look down between the rear of the mechanism and the rear shutter guard to locate the fire shutter lift pin fastening screw. It is a black screw, the lowest that can be seen. Loosen it.

At the non-operating side of the mechanism, look in past the governor to locate the fire shutter lifting pin -- a steel pin about 1/8 inch in diameter which engages the slot that raises the fire shutter. Lift this pin as high as possible, making sure it remains in its slot; hold it in that position and re-tighten the fastening screw.

Run the projector without film, and try to push the fire shutter down by hand without using too much force. If it can be made to drop, the above adjustment was not perfectly carried out, and must be repeated.

SECTION 43. ADJUSTMENT IF FIRE SHUTTER JAMS. Remove the spot sight box (Section 13). (Note that just above the top of the fire shutter on the film trap there is a small stud or boss on the film trap casting. The top of the fire shutter, in raised position, should *not* quite touch this boss, but should clear it by about 1/32 inch). Loosen the fire shutter raising lever adjusting bushing lock screw, E, Fig. 9, about 1/4 turn, no more. Do not take out this screw. Now adjust the shutter height by turning the fire shutter raising lever adjusting bushing, F, Fig. 9. Turning this bushing clockwise raises the shutter, turning it counter clockwise lowers the shutter. Tighten down the lock screw when the proper adjustment is obtained.

Readjust the fire shutter lifting pin as in Section 42 and replace spot sight box.

SECTION 44. ADJUSTMENT IF FIRE SHUTTER INTERFERES WITH LIGHT BEAM. If this occurs, repeat the process described in Section 43 making certain the final adjustment leaves the top of the shutter no more than 1/32 inch below the bottom of the excrescence or stud mentioned.

SECTION 45. ADJUSTMENT IF AUTOMATIC FIRE SHUTTER FAILS TO TRIP. The fire shutter trip, C, Fig. 1 should be operated manually from time to time to make sure the shutter works properly.

If it does not, take out the spot sight box and the film trap (Section 13 and 17). Remove the shutter lever guard holding screw and take off the shutter lever guard. The parts of the shutter mechanism can then be cleaned with kerosene to remove gummed oil or other obstructions.

WARNING! The shutter lever guard should never be taken off unnecessarily.

SECTION 46. REMOVING THE FIRE SHUTTER MECHANISM. Take out the spot sight box (Section 13), the film trap (Section 17) and the fire shutter lever guard (Section 45). The two black pivot pins are then pried out, after which the fire shutter can be drawn off.

In replacing the shutter, check the fire shutter lift pin (Section 42) and make certain it is properly re-located in the slot that raises the shutter.

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