Film-Tech

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GENERAL INSTRUCTIONS

FOR

INSTALLATION, MAINTENANCE

AND OPERATION

OF

PROJECTOR MECHANISM

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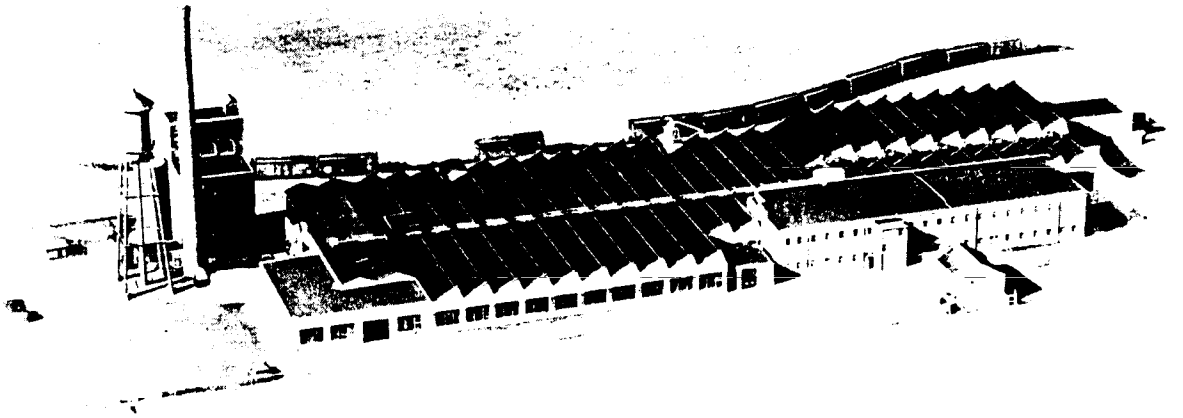

HOME OF SIMPLEX EQUIPMENT

The newest, largest and most modern factory of the oldest manufacturer of standard, professional Motion Picture Projectors in the world. Here, there will continue to be originated and perfected, methods and standards that have given us an international leadership in the motion picture field for over forty years. 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 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, for advice and help when emergencies arise and for prompt delivery of *GENUINE SIMPLEX PARTS* when needed. *GENUINE SIMPLEX PARTS* always give the greatest value and are absolutely essential for best results with *SIMPLEX PROJECTORS*.

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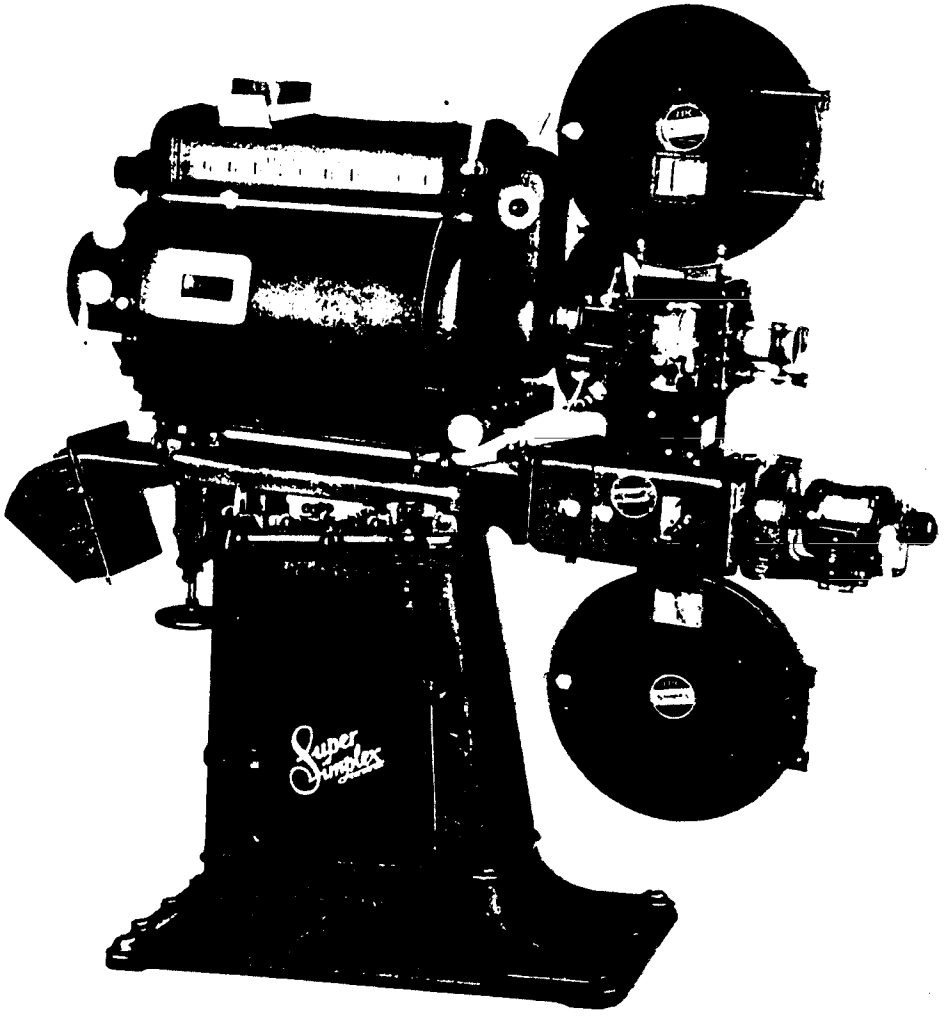

Super Simplex Projector has had wide and long use in the world's finest theatres. Its many advantages have been conclusively proved. It is therefore unnecessary to make any special claims of superiority in a publication of this nature intended solely for the purpose of supplying information which will enable projectionists to get the best results. Super Simplex Projector has been designed and manufactured to give the finest projection, insure simple, dependable operation and to keep maintenance costs at a minimum. By carefully following the instructions in this book, projectionists will find their work made much easier and more satisfactory to owners anxious to provide patrons with the best possible projection at the lowest possible cost.

Neglect is false economy. Repair, Replace with Genuine Simplex Parts.

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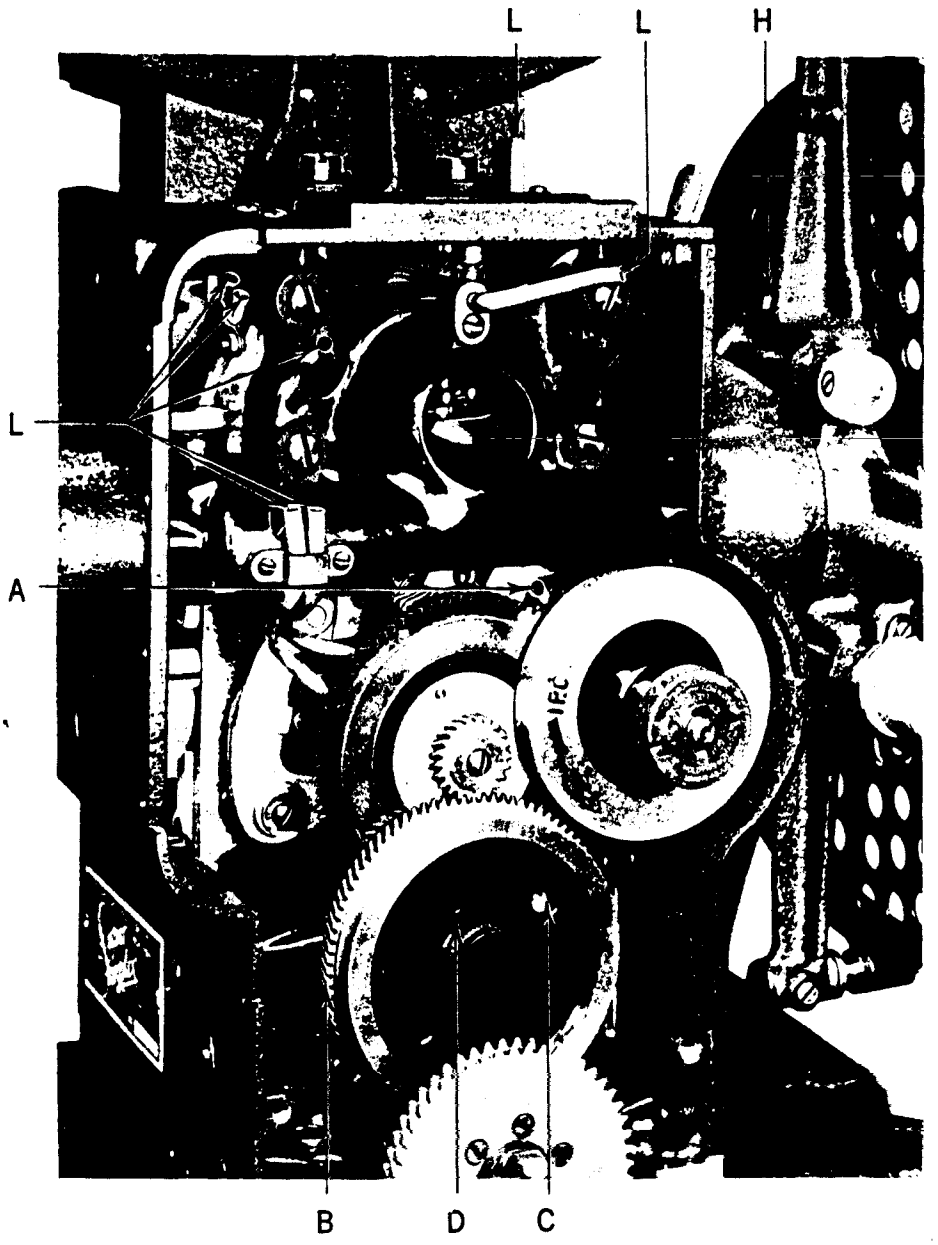

FIGURE 1.

A – INTERMITTENT MOVEMENT OIL FILLING TUBE

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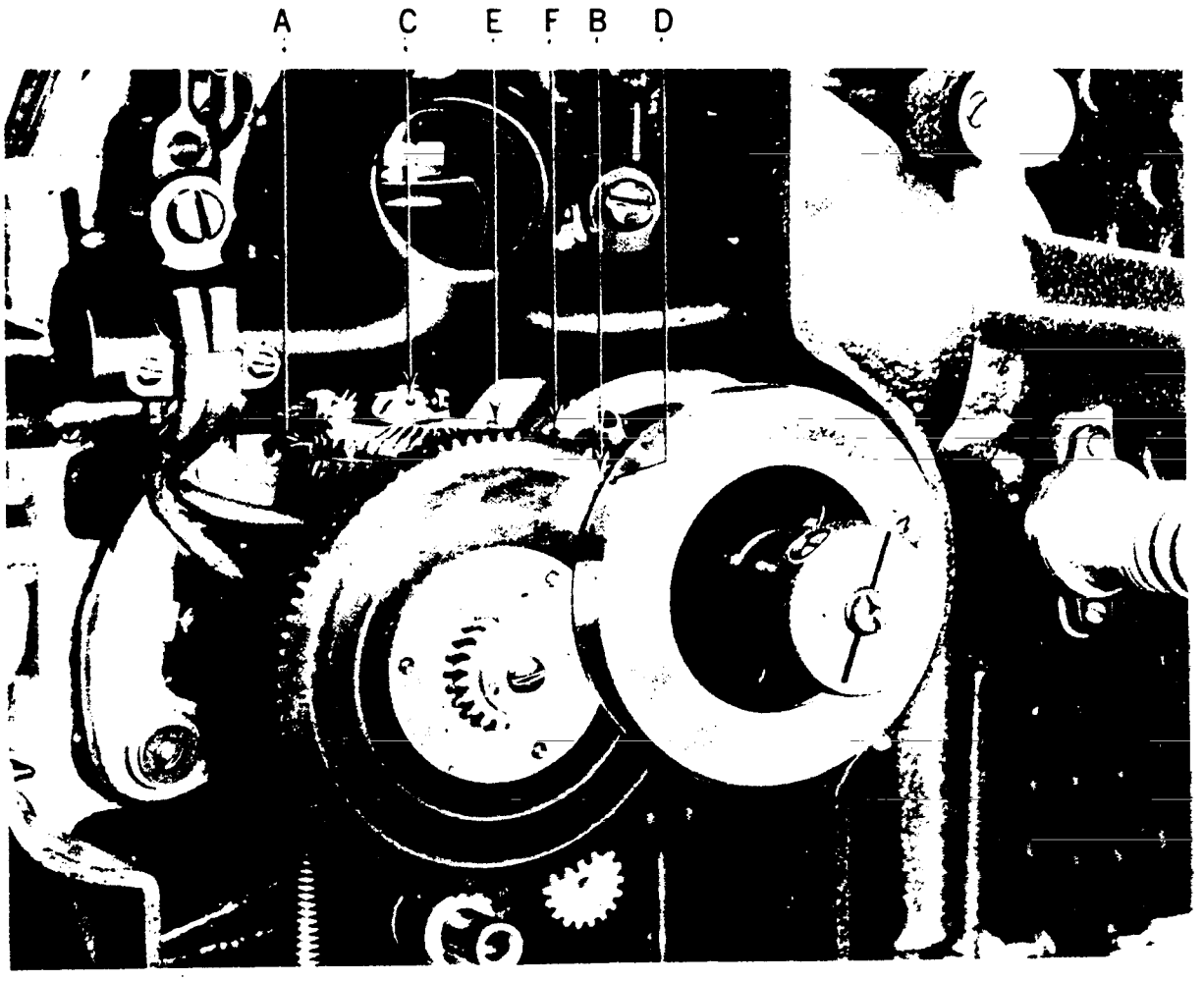

FIGURE 2.

Intermittent Movement Partially Removed

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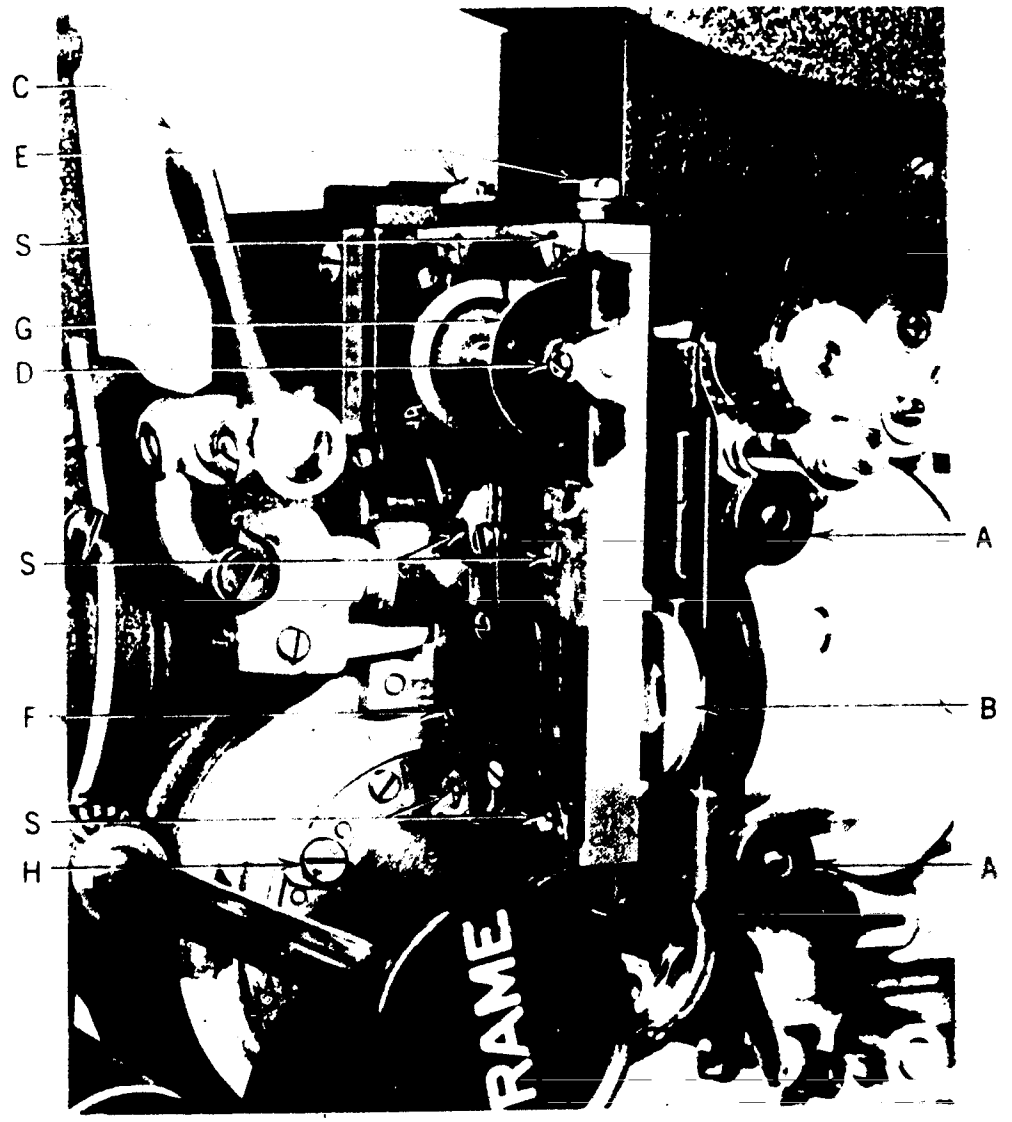

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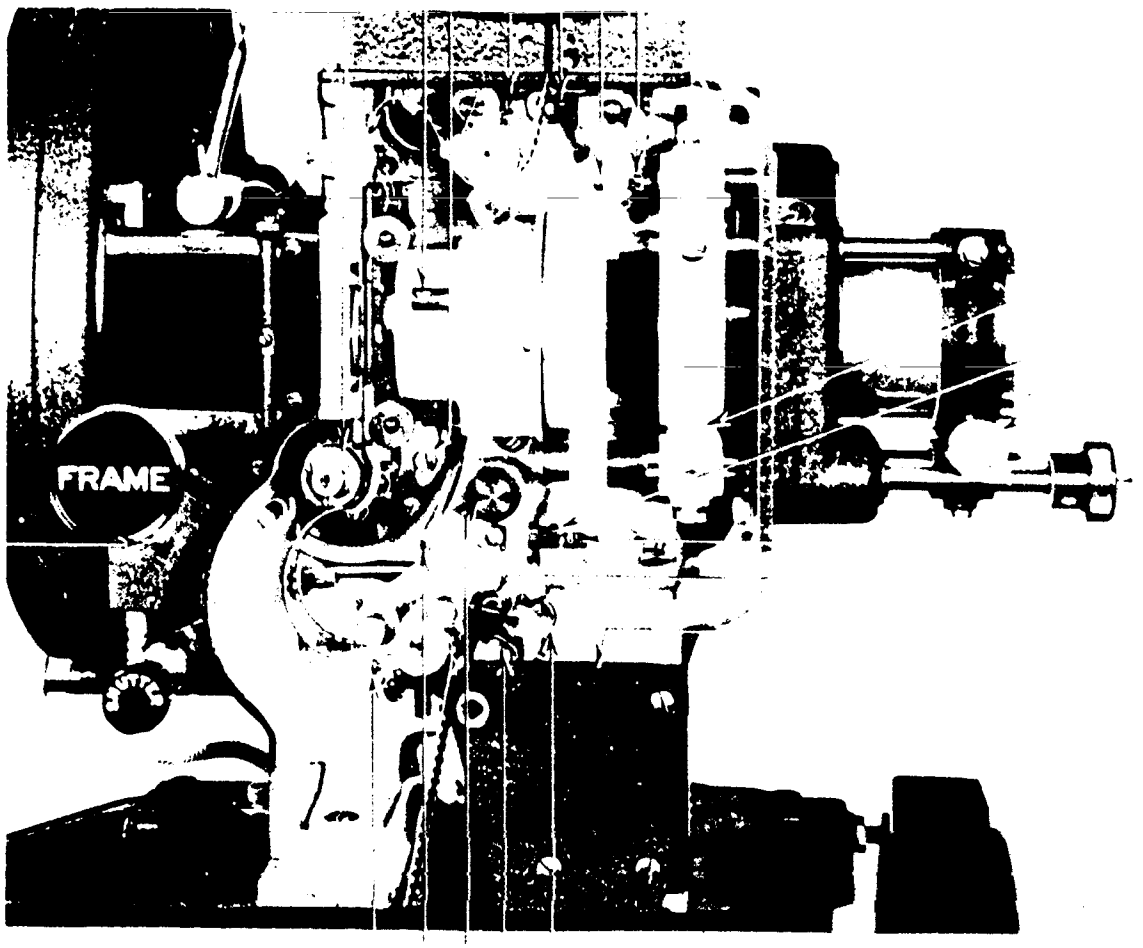

FIGURE 4.

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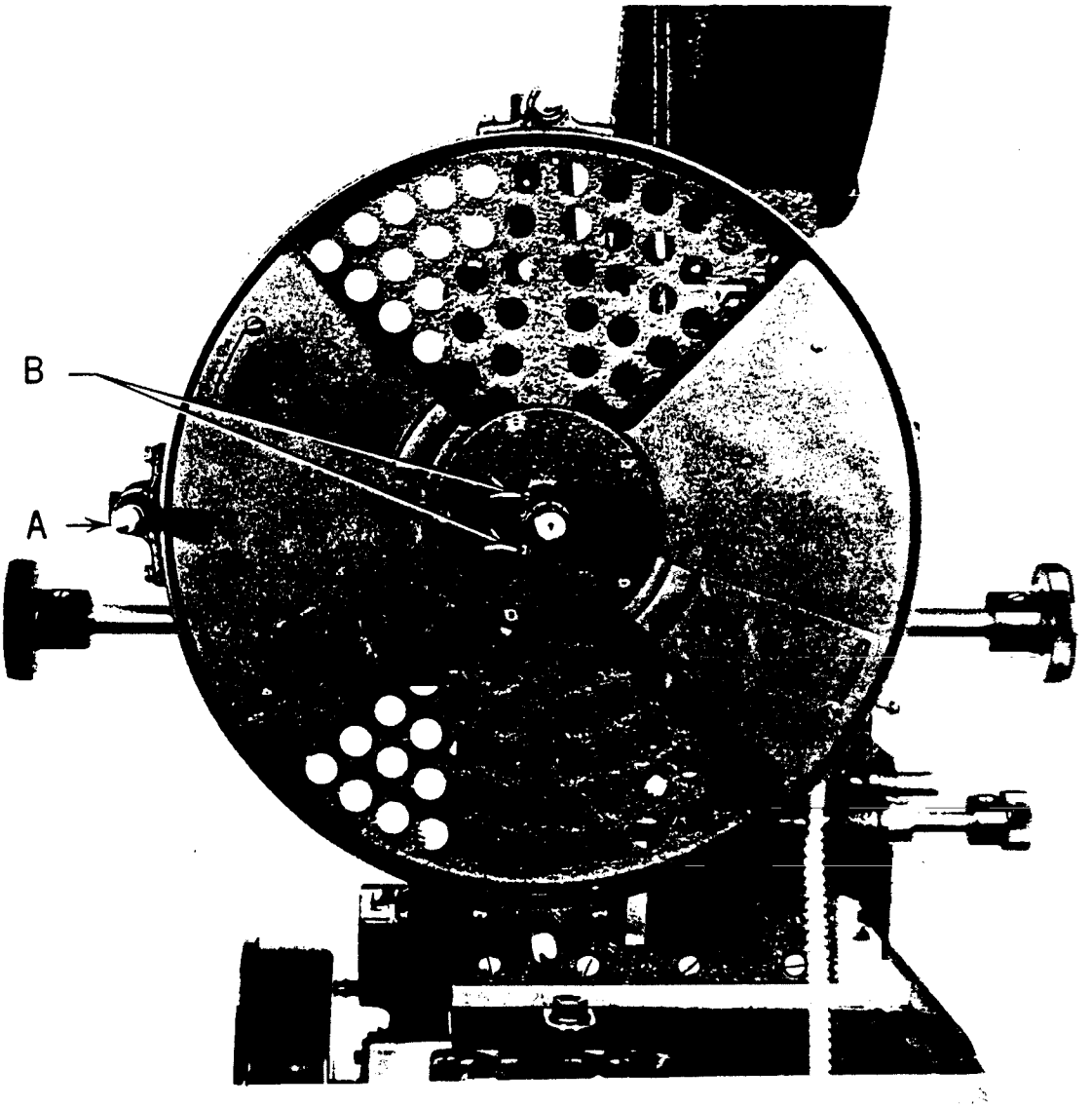

FIGURE 5.

A – CENTER SHUTTER GUARD STUD

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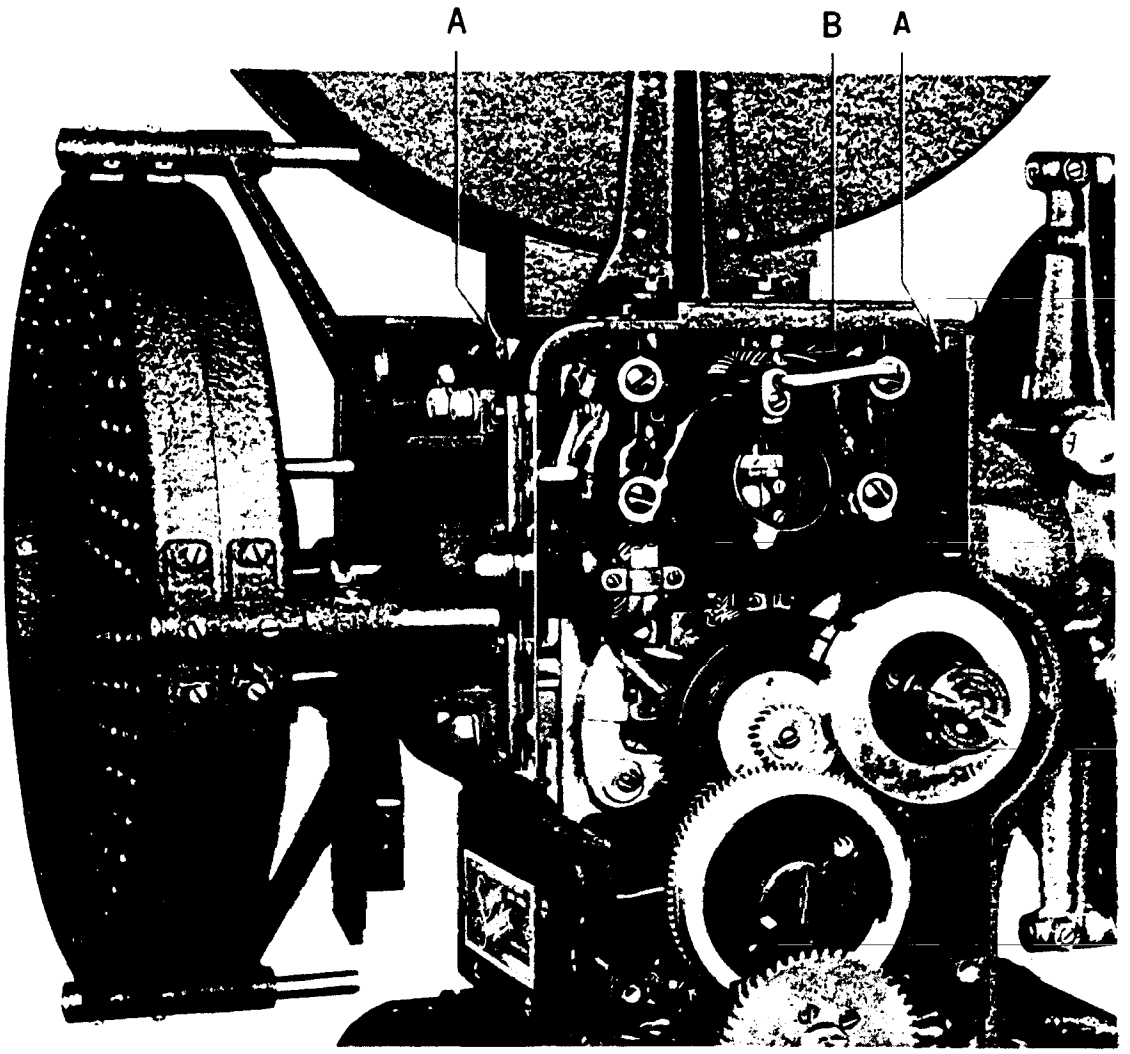

FIGURE 6.

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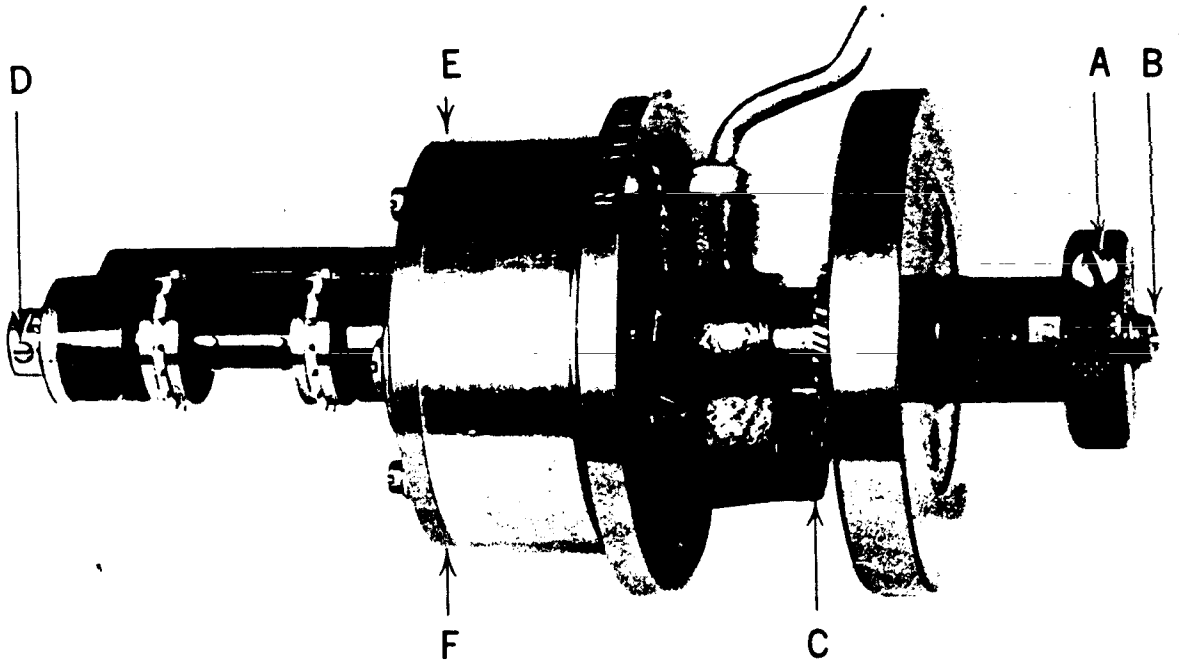

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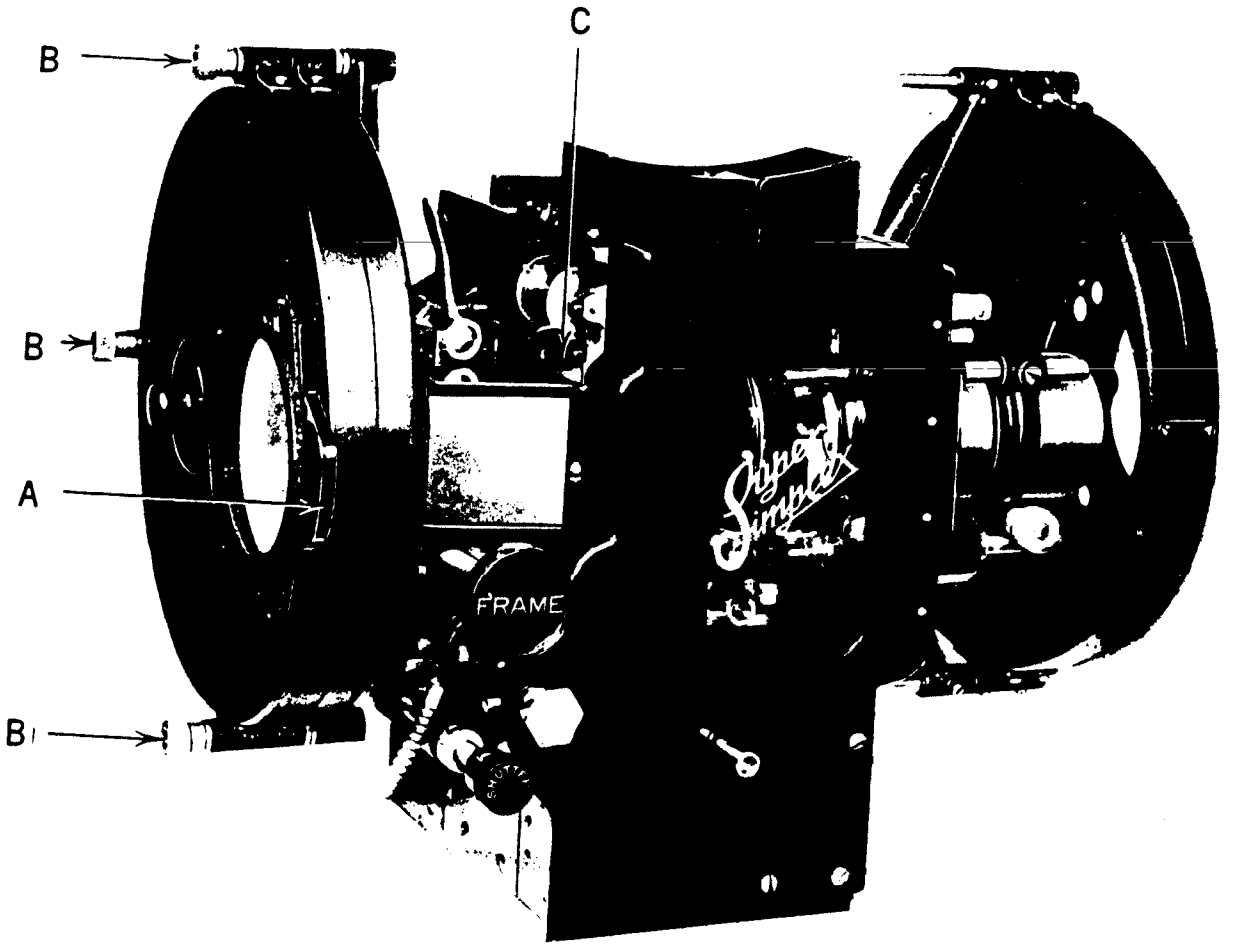

FIGURE 8.

SUPER SIMPLEX WITH DOUBLE SHUTTER

I N S T A L L A T I O N

SECTION 1. CLEAR AWAY PACKING MATERIAL. Go over the mechanism thoroughly to remove every trace of packing material which may have crept in during the course of transportation. Remove all retaining cords, leaving no short pieces that may possibly interfere with the operation.

SECTION 2. MOUNTING. The two mounting holes are aligned and positioned exactly as in earlier models of Simplex Mechanisms. The projector is mounted on the pedestal or sound head in accordance with the requirements of the sound head. When tightening down the two mounting screws into the base of the head do not use a wrench on the screw driver. Excessive tightness may cause mutilation of the mounting bolt heads, minute warpage of the mechanism base and possible trouble in future removal.

WARNING! Wherever the design of the sound head requires that the projector be shimmed to line up the drive shaft hole in its base casting with a "floating" shaft in the sound drive, place the shims as close as possible to the projector mounting holes. Otherwise extremely slight warping of the heavy base plate of the projector may occur when the mounting bolts are tightened and may impair the perfect factory alignment of the moving parts.

SECTION 3. MOUNTING OF AUTOMATIC CHANGE-OVER DEVICES. Automatic changeover devices are mounted in accordance with the instructions of the manufacturer.

SECTION 4. FRAMING LAMP WIRING. The framing lamp connector may be plugged into any 110 volt AC or DC outlet.

SECTION 5. LUBRICATION. USING SIMPLEX OIL only, lubricate the mechanism in the following manner (See Section 10 for maintenance information):

Use a thoroughly clean oil can with a narrow spout that will not block the oil tubes and prevent the escape of air. Fill the oil tubes shown at "L" and "H" in Fig. 1, and the intermittent bearing shown at "L" in Fig. 4. Place a few drops of oil on the gears and governor. Oil all sound drive bearings.

The intermittent movement oil supply is replenished on the non-operating side (gear side) of the projector. By means of the framing handle, rotate the intermittent until the oil tube is in the position shown at "A" in Fig. 1. Fill the intermittent slowly, using a narrow spout can, until the oil level is at the "Oil Level" mark shown adjacent to the oil level sight glass. When inspecting the oil level, the two windows should be at the same level. This oil level should be observed daily, and replenished when necessary.

WARNING! DO NOT fill the intermittent movement or oil any of the Super-Simplex bearings while the mechanism is in operation. The movement should be filled with Simplex Oil to the indicated level on the sight glasses only when the mechanism is at rest.

Turn on the power and run the projector three to five minutes. Shut down, and re-oil all the points shown at "L" in Figure 1. The intermittent and the bearings are now sufficiently lubricated for starting normal operation under load.

During the first week of operation, and especially the first few days, the projector should be amply lubricated after every fourth reel that has passed through the projector. This will insure a continuance of the fine fit and bearing smoothness that was originally developed at the factory.

Before threading up with film, wipe away any oil that may have been spilled in the film compartment. Wipe away any excess oil that was placed on the sprockets, idlers, etc., just before shipment, to prevent rusting under the unfavorable climatic conditions sometimes encountered in transportation. (See Section 10 for routine lubrication.)

SECTION 6. INSERTING THE LENS. Loosen clamp screws "B" and "C" in Fig. 4 and turn the focusing knob "A" in Fig. 4 until the lens collar is in half-way focusing position, with equal focusing leeway at either side. Insert 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. Warning! Do not thread up film.

Turn the projector over by hand until the rear shutter will be entirely clear of the light beam. Strike the arc and focus the lens accurately as possible by hand to a sharp focus of the outline of the aperture, opening and closing the fire shutter by hand to check the effect on the screen.

When the Super Simplex also incorporates a front shutter, 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 the film has been threaded, and that the focusing adjustment in its most forward position will not cause the lens barrel to interfere with the front shutter. Lock the lens in the collars by means of the interior and exterior lens collar locking knobs "B" and "C" respectively in Fig. 4. Start the projector and line up the aperture image on the screen, using the lateral and vertical adjustments provided by the pedestal.

SECTION 8. THREADING. Open the pad rollers away from the top and bottom sprockets, and open the gate by means of lever "F" in Fig. 4. Place reel in upper magazine, and thread up according to the film path shown in Fig. 4.

WARNING! Be sure the arc lamp is either turned off or the dowser is closed. Thread film through the sound unit to the lower magazine reel.

When the gate is closed on the film, turn on the framing lamp switch "E" in Fig. 4. The position of the frame in respect to the aperture may be checked by pressing forward the lens shield tube at point "G" in Fig. 4, while at the same time opening the fire shutter so that the film will be illuminated by the framing lamp.

At the first trial, turn the projector over by hand a few times and check the threading, insuring that the sprocket teeth are engaged in the film sprocket holes. After the motor is turned on, an inspection of the film loops will reveal any serious error in their setting. Slight experience will rapidly increase the facility with which the threading operation is accomplished.

SECTION 9. COMPLETING FOCUSING ADJUSTMENTS. Thread up a film having plenty of titles. Start the projector and sharpen the focus by means of the focusing knob "A" in Fig. 4.

Check the shutter adjustment by observing the screen for travel ghost. The projector leaves the factory with shutters set perfectly, but they may have been disturbed in the course of installation. By means of the "Shutter" knob, travel ghost may be cleared from either the top or bottom of the picture.

ROUTINE OPERATION

SECTION 10. LUBRICATION. Use SIMPLEX OIL only. Considerable time and expense has been expended in an effort to provide an oil that will provide the maximum wear resistance, film strength and corrosion resistance under the temperature and humidity extremes found in normal operation.

After the first week the projector should be oiled at all of the oiling points indicated at "L" in Fig. 1 and Fig. 4 before the equipment is operated at the beginning of the working day. This oiling should be repeated twice during the day.

The governor and shutter shaft gears should be given a few drops of oil daily, and occasionally a drop or two on the other gears and all other sliding points. The internal gear of the main drive gear and the pinion gear driving the lower sprocket should be occasionally lubricated. This is accomplished by rotating the projector by hand until one of the large holes in the main drive gear is opposite the pinion gear as shown at "C" in Fig. 1. The oil should be directed at the face and teeth of the pinion gear. The framing shaft bearings may be oiled occasionally by the oil tube at "H", Fig. 1.

SECTION 11. CLEANING. The white enameled interior has been provided so that all dirt and foreign matter is easily observed. All such matter that may impair the image, soil the film or promote undue wear and corrosion to moving parts should be removed.

Since the film gate is easily removable (See Section 14) the film trap and gate parts are easily cleaned.

MAINTENANCE

SECTION 12. REMOVING APERTURE PLATE. The aperture plate consists of a brass aperture plate proper and a steel aperture plate sliding shim which serves to lock the former in place. Note that the aperture plate is located in front of the shim - that is, the aperture plate is closer to the lens (See "B" in Fig. 3).

To remove, grasp the steel shim and pull directly outward. Then grasp the brass aperture plate, move it back to the position formerly occupied by the shim and pull directly outward. To insert, push in the brass aperture plate first. Be sure the bulge is toward the lens. Then insert the shim behind it.

SECTION 13. REMOVING SPOT SIGHT BOX. This is removed from the operating side. Open the projector door, grasp the box above and below the spot sight glass and pull outward and upward.

SECTION 14. REMOVING THE FILM GATE. Open the gate and remove the two knurled nuts shown at "A" in Fig. 3. Withdraw gate slowly, using care not to bind on the upper or lower studs. To replace the gate, insert the studs into the top and bottom stud holes and push in evenly. Replace the knurled retaining nuts.

SECTION 15. PAD TENSION ADJUSTMENT. The pad tension has been adjusted at the factory for the normal tension required by normal operation, and extreme care should be exercised in making any readjustments as excessive tension is not only detrimental to the intermittent sprocket and movement but to the film as well, causing excessive wear or tearing of sprocket holes and patches. Furthermore, the readjustment must result in an even tension on both sides of the film if side sway and even sprocket wear are to be kept at a minimum.

It must also be kept in mind that in and out of focus effects caused by buckled film cannot be corrected by increasing the pressure on the pads. The maximum effective tension is that tension which is produced by a pressure that will completely flatten the edges of the film that lie directly beneath the tension pads at the aperture. The primary purpose of the tension pads is to immediately overcome the movement of the film after the intermittent sprocket has stopped and to keep the film flat at the aperture. Any pressure and tension greater than the minimum required for this duty is excessive.

To check or readjust the tensions, remove the film gate as in Section 14, hold the film gate vertically, sprocket shoes at the bottom, with the surfaces of the pads facing the projectionist, slip out the top tension pads by pressing the bottom of each pad back until it clears the back of the film gate plate, then push downward on the top end of the pad and the pad will be released.

To remove the tension pad at the aperture, invert the gate assembly, press the bottom of each pad with the thumbs until the cross piece clears the head of the fillister head screw - at the same time press downward on the top of each pad with the forefingers and the pad will be released.

With the pads removed, the springs will now protrude beyond the face of the film gate plate. The springs at the aperture should be adjusted until they protrude beyond the face of the plate by 1/4". The springs of the top pads should be carefully adjusted until they protrude beyond the face of the plate by 1/8".

The tension of the springs on the intermittent film sprocket should be just sufficient to keep the shoe assembly firmly against the apron. When the gate is in the projector, the shoes should close against the sprocket with only a slight deflection, just sufficient to insure contact over the entire face of the shoe *and no more.*

SECTION 16. CHANGING RIGHT & LEFT FILM TRAP SHOES. Remove aperture plate spot sight box and film gate as per Sections 12, 13 and 14. The three retaining screws in each film trap shoe may now be readily located (See "S" in Fig. 3) and may be removed with a short screw driver. Remove the old shoes and clean the film trap free of dirt, etc., that may have been deposited adjacent to the old shoes. Clean the new shoes free of rust preventive, grease and install.

SECTION 17. GUIDE ROLLER REPLACEMENT. (REFER TO FIG. 3) Remove the spot sight box. In order to line up the new rollers with reasonable accuracy, the new outside roller which contacts the guiding edge of the film (edge nearest the sound track) should have its film guiding face at the same horizontal point as the old roller, assuming the location of the old roller has been satisfactory. This is properly done by the use of a TL-202 Gauge which may be procured through any authorized service station. This may also be accomplished, with a lesser degree of accuracy, by placing a small steel rule or straight edge, vertically held, squarely against the film contacting face of the outside roller with the top of the rule against the back face of the film trap casting in the vicinity of the upper right hand shoe retaining screw. With a sharp steel scriber, enscribe a fine line on the machined surface of the casting at the edge of the rule. When the new roller is installed, it may be set in a similar manner by reference to the alignment with this enscribed line. The necessity for checking the alignment by the use of the gauge or the alternate procedure is not required if the guide roller assembly is only removed for inspection or cleaning and the collar is not disturbed.

To remove the guide roller assembly, loosen the set screw at "D" and withdraw the associated pivot pin slightly. This will release the entire assembly which may be reinstalled in the reverse manner.

To change the rollers, they are removed by releasing the set screw on the shaft collar and withdrawing the collar from the shaft. Place the new rollers on the shaft together with the spring. Place the retaining collar on the shaft and locate in approximately the original position. Tighten the collar set screw lightly. Clean and lightly lubricate the pivot bearings at the ends of the shaft. Wipe off both pivot bearing pins on the projector. Replace the roller and shaft assembly in the pivot bearings on the projector, pushing the loosened pivot lightly into place and lightly tighten the set screw "D".

The end play of the guide roller shaft in its pivot bearings must be reduced to the absolute minimum that will provide free rotation of the shaft and rollers. When this adjustment has been made, the set screw on the pivot may be tightened securely.

The horizontal alignment adjustment must now be made with either the gauge or straight edge, as previously described, and the alignment collar set screw tightened. A final check should be made by running a reel of film and watching the screen carefully for side frame lines. If frame lines on the sound track show up on the left hand side of the screen it indicates that the film is in too far toward the non-operating side of the machine. The adjusting collar on the guide roller shaft is then loosened and re-adjusted toward the operator, and vice versa.

SECTION 18. REPLACING FRAMING LAMP BULB. Remove the spot sight box. The framing lamp bulb is now visible and accessible. Remove and replace with a similar type.

SECTION 19. REPLACING THE UPPER FEED SPROCKET PAD ROLLER. Refer to Fig. 4 and release the set screw at "J". Lower the pad roller from sprocket, grasp the screw shown at "K" with a pair of pliers, withdraw, bringing with it the pad roller stud and releasing the pad roller arm assembly. Remove arm assembly, taking care not to damage the upper feed sprocket. Remove the pad roller from arm by releasing the shaft set screw and withdrawing shaft from arm. Clean the bore of the new pad roller and lightly lubricate. Place on shaft and assemble shaft in pad roller arm. Adjust end play to approximately .007" and tighten shaft set screw. Place arm assembly in mechanism and line stud hole up with the stud hole in the frame. Insert stud through arm and into frame. Tighten stud set screw, after checking end play to insure that there is no binding in the arm motion. See Section 23 for clearance adjustment with sprocket.

SECTION 20. REPLACING THE UPPER FEED SPROCKET. Remove the upper magazine. Remove the upper fire valve by removing the two screws shown at "E" in Fig. 3 and a third screw located in the front end of the fire valve. Loosen the stripper plate set screw at "H" in Fig. 4 and turn the stripper plate up out of the way. Turn machine over by hand until the sprocket set screw is accessible and release the screw. Withdraw the sprocket from the shaft.

Clean the shaft and lubricate. Clean the bore of the new sprocket free of grease and lightly lubricate. Place the new sprocket on the shaft with the identification wording toward the operator after first checking to see that the set screw is withdrawn sufficiently to clear the shaft. If the fit is snug, push on slowly with a twisting motion. Do not drive on or use excessive force or the gears at the other end of the shaft may be injured. Before tightening the retaining set screw, check the end play and adjust to .001" or .002". Reset the stripper plate and tighten the stripper plate set screw.

SECTION 21. REPLACING THE LOWER SPROCKET PAD ROLLERS. Refer to Fig. 4. Remove the side cover plate at "M" by removing the three retaining screws. Remove the main shaft tubular shield at "N". Raise the pad rollers from the sprocket and remove the screw at "O". Note that the hole at the top of the stud at "O" is in the vertical position, and that a flat has been cut on the under side of the stud to provide clearance for the tubular main drive shaft shield. Remove the stud retaining screw and withdraw the stud with a pair of pliers. This releases the pad roller arm assembly and it may be withdrawn from the projector. The rollers may now be removed from the shafts by releasing the shaft set screws and withdrawing the shafts from the arm.

Install the new rollers on the shafts, first cleaning the bores of the rollers thoroughly and lightly lubricating. Assemble the shafts in the arms and tighten the set screws after adjusting the roller end play to approximately .007". To reassemble in the projector, place the stud in the pad roller arm as far as it will go. While holding the stud in this position with the flat at the bottom, insert end of stud into the hole in the frame and push both stud and arm toward the frame until the spring at "P" is contacted. Push the spring back with a screw driver to clear the arm, and then push the stud and arm forward as far as it will go. Insert the stud retaining screw and tighten. If the hole in the top of the stud tends to shift from the vertical position, a drive pin, or equivalent, may be inserted in the hole to hold it while the retaining screw is tightened. See Section 23 for clearance adjustments with the sprocket.

SECTION 22. REPLACING THE LOWER FEED SPROCKET. Loosen the lower stripper plate set screw at "I" in Fig. 4, with an offset screw driver and lower the stripper plate away from the sprocket. Release the sprocket retaining set screw and remove the sprocket from the shaft. Clean the shaft and lightly lubricate. Clean the bore of the new sprocket and lubricate. Place the new sprocket on the shaft with the identification wording on the outside, pushing on with a twisting motion. Before tightening the retaining set screw, adjust the end play to .001" or .002". Reset the stripper plate and tighten the stripper plate set screw.

SECTION 23. PAD ROLLER CLEARANCE ADJUSTMENT WITH SPROCKET. The upper and lower sprocket pad rollers may be adjusted for the proper clearance with the film sprockets by releasing the lock nuts and turning the adjustment screws at "Q" in Fig. 4. A thin end wrench, having a 13/32" opening, will facilitate this procedure.

The proper clearance is two thinknesses of film (approximately .015"). On the lower pad roller arm this clearance must apply to the left roller (at the end of the arm), regardless which roller was changed. After the adjustment is made, tighten the lock nuts on the adjustment screws.

SECTION 24. REPLACING UPPER FEED SPROCKET GEAR. Remove top cover plate as per Section 33. Turn the machine by hand until the retaining screw in the gear is vertical and accessible from the top. Carefully remove the screw, starting it with a well fitting screw driver and removing it with a split point or well magnetized screw driver. Loosen stripper plate on upper feed sprocket as described in Section 20. Turn stripper plate up out of the way, and pull sprocket and shaft out of the machine while holding tightly to the gear with one hand. The loose gear may now be removed by shifting it to the left and upward. Fit new gear to the shaft to insure that there are no burrs to interfere with final assembly. Install new gear and shaft in the machine, using procedure opposite to that for removal. Final end play adjustments of the shaft may be made by loosening the film sprocket set screw.

SECTION 25. REMOVING MAIN DRIVE GEAR. Remove the lower cover plate on the gear side by releasing the two thumb screws. Depress spring "D" in Fig. 1 until it no longer engages the rachet on the screw. Turn the screw counter-clockwise. When the screw is removed, pull the gear from the shaft.

To replace, place gear on shaft and push forward. At the same time slowly rotate the shaft from the operating side of the projector until the gear engages the half collar on the shaft. Then slowly rotate the gear by hand until the internal teeth engage the lower sprocket pinion gear and the external teeth engage the intermediate gear. Press forward as far as it will go and replace lock spring and retaining screw. Tighten screw with screw driver until it just stops, making sure that the pawl on the spring engages the rachet on the screw. Do not tighten further.

SECTION 26. REMOVING & REPLACING MAIN DRIVE SHAFT. Remove the side cover plate at "M" and the main shaft tubular shield at "N" in Fig. 4. Tap out the taper pin in the collar with a short punch and light hammer. Remove the lower side cover plate on the gear side of the projector and the shaft will come out with the gear. Detach gear from shaft by removing the retaining screw as per Section 25. Before reinserting the new shaft, clean out the bearings, using a stiff bottle brush if available. Flush with Simplex Oil and wipe away any excess after shaft is installed. If the old shaft is reinstalled, clean out the oil grooves and lubricate. Install shaft in the reverse manner and then replace the main drive gear. Be sure the large taper pin holes in the collar line up with the large taper pin holes in the shaft before inserting the taper pin. Tap the taper pin home securely with light blows so as not to injure the shaft or bearing.

SECTION 27. REMOVAL OF INTERMITTENT MOVEMENT. Remove spot sight box. Open film gate. Remove the intermediate gear shaft retaining collar shown at "T" in Fig. 4. The set screw may be reached with a screw driver through a hole in the front of the case.

Loosen the intermittent clamp screws shown at "R" in Fig. 4, and at "H" in Fig. 3, and push clamps toward sprocket shaft, tightening the screws lightly to hold the clamps in this position. Rotate the movement by the framing knob until the oil tube is in the position shown at "A" in Fig. 1. Grasp the intermittent gear in the left hand and the intermittent flywheel in the right hand and withdraw both from the mechanism.

SECTION 28. REPLACING THE INTERMITTENT MOVEMENT. Before the movement is replaced note the position of the pin at "E" and the pin hole in the intermittent case at "F", Fig. 2. Inspect the clamps on the intermittent case to insure that they are not loose or set so that they will impede the reentry of the intermittent. Mesh the intermediate gear with the flywheel gear so that the white dot on the intermediate gear is adjacent to the "0" mark on the intermittent flywheel as shown at "B" and "D" in Fig. 2. Swing the body of the intermittent movement so that the oil tube is in the position shown in Fig.2. While holding the two in mesh in the manner stated above, insert the intermittent into the mechanism and at the same time insert the intermediate gear shaft into its bearing. Push both forward slowly and evenly, aligning the pin hole at "F" with the pin at "E", until both are well in but not so far as to mesh the intermediate gear with the vertical shaft gear. At this time turn the vertical shaft gear, by means of the shutter shaft, so that the "0" dot at "C" in Fig. 2 faces directly toward the operator. Then turn the intermediate gear, keeping the mesh with the intermittent, so that the white dot, which has been closely adjacent to the "0" mark on the intermittent flywheel, is now aligned with the "0" dot at "C" on the vertical shaft gear. When in this position, push both the gear and movement so that the pin will enter the pin hole in the movement and the gear will mesh with the vertical shaft gear. Set the clamps on the operating side to the clamping position and tighten the clamp screws. Replace the intermediate shaft retaining collar, and insure that there is a very slight amount of shaft end play after tightening the set screw.

The main drive gear, spot sight box, etc., may now be replaced. Turn the projector over several times by hand to insure that everything is free before turning on the power. Check the shutter timing and adjust by means of the shutter adjusting knob. If the timing is considerably off, reset the shutters as per Section 31 or 32.

SECTION 29. CHANGING THE INTERMITTENT SPROCKET. After a considerable period of use the intermittent sprocket becomes worn and requires changing. This may be readily accomplished by experienced projectionists in a minimum of time. However, in case of doubt, we recommend that the movement be taken out and sent to the nearest approved service station where it will be economically serviced by factory trained personnel.

Remove main drive gear as per Section 25. The projector should then be turned over by hand in the normal direction by turning the shutter shaft knob to note the "feel" of the mechanism. Watch the intermittent sprocket when turning and note the turning effort required just as the sprocket starts to move. The same test is repeated after the new sprocket is installed to determine if the reassembled movement is properly set.

The next step is the removal of the intermittent movement from the projector as instructed in Section 27. Remove the screw marked "Oil Drain" and drain the movement. Turn the flywheel until the sprocket is locked (midpoint in the stopped position) and remove the two clamping screws together with the three remaining retaining screws. Carefully pull the cover and associated star and sprocket from the case proper, directing the pull in line with the axis of the sprocket. Carefully lay aside the gasket, unless new gaskets are immediately available, and drain the remaining excess oil from the case. At this time note the location of the locating pin on the case and the associated hole in the cover.

Remove the collar shown at "D" in Fig. 7 by loosening the two set screws. Set the assembly down so that the center of the sprocket in the vicinity of the pins is firmly supported by a small "V" block, with the large ends of the pins pointing downward and clearing the bottom of the "V" by at least 1/8". It is very important that the sprocket and shaft be firmly and evenly supported at this point when removing the pins. Drive out the pins with a small drive punch and a light hammer, using light blows. The star shaft may then be pulled out of the sprocket and cover bearing.

Clean the bore of the new sprocket free of rust proofing lubricant and lightly lubricate with a light oil. After cleaning the star shaft, run it back and forth in the bore of the sprocket a few times to insure that the fit is not too tight for final assembly. In case the fit is somewhat tight, use a wringing motion and continue working back and forth until it is sufficiently free for final assembly. Never force the sprocket on the shaft.

Make the final assembly by inserting the cleaned and lubricated shaft into the cover bearing, then into the sprocket bore and then through the outboard bearing. Turn the sprocket on the shaft until the large holes on the sprocket line up with the large holes in the shaft. Select one hole that has the best alignment and ream slightly with the TL-184 Taper Pin Reamer until it appears as one continuous bore. Insert a new pin, and after placing the assembly on the "V" block tap the pin securely in place with light blows. In a similar manner ream the second hole and seat the second pin. Reassemble the collar on the end of the shaft. Check the end play of the shaft before and after tightening the set screws. A very slight amount of end play should be present, just sufficient for running clearance, and no more. Cut off any excess length of pins that may interfere with the film stripper.

To complete the assembly, hold the case in the left hand, with the oil tube projecting vertically and with the cover pin at the left. Place the cleaned gasket on the face of the case, aligning all holes with the holes in the case. Turn the flywheel until the pin on the cam is in the well at the bottom of the case. Pick the cover of the sprocket assembly up with the right hand and turn the star toward the case, aligning the pin hole in the cover with the pin on the case. Bring the two together and engage one of the curved sides

of the star with the curved surface of the cam, at the same time entering the cover pin into the hole in the cover. The cover may then be closed completely. Assemble the four retaining screws and the two clamp screws, together with their associated clamp, and tighten evenly all around. Fill the movement case to the normal level with fresh Simplex Oil, and oil the outboard bearing of the sprocket shaft. Spin the flywheel of the movement several times to distribute the oil to all parts. The movement should now be checked to insure that the star has no back-lash in the locked position, or that it is not excessively tight in this position. It must be adjusted so that the flywheel will turn freely, and no appreciable back-lash will be felt at the sprocket when in the locked position. This is accomplished by turning the flywheel until the star is in the locked position. Then hold the movement so that the oil sight windows are horizontal and loosen all of the cover retaining screws very slightly so that the cover settles down by its own weight and causes better contact between star and cam. The cover retaining screws may then be tightened.

Install the movement in the projector as per Section 28. Before installing the main drive gear, rotate the machine by hand, using the shutter shaft knob, and note the "feel" or turning effort. Compare with the effort required before the movement was originally removed from the machine. If there are any serious binds, particularly when the sprocket just starts to turn, the movement should be removed and rechecked.

SECTION 30. INTERMEDIATE GEAR, REMOVING AND REPLACING. Proceed as per Sections 27 and 28 in removing and replacing the intermittent movement.

SECTION 31. SHUTTER TIMING - REAR SHUTTER MODEL. Turn the shutter adjusting knob until the screw shown at "S" in Fig. 4 is approximately midway in the slot. Remove the rear shutter light shield cap, which covers the end of the rear shutter shaft, from the rear shutter guard. This cap is easily removable by pulling directly away from the guard. The two shutter hub clamp screws, shown at "B" in Fig. 5, are now exposed and should be loosened with a screw driver.

Turn the projector over by hand in the normal direction until the intermittent sprocket stops moving. Then continue to very slowly turn the projector until the intermittent sprocket starts to move and advance just two teeth. While in this position, using care not to turn the shutter shaft, adjust the loose shutter so that the midpoint of one of the blades lines up with the thumb nut stud on the side of the rear shutter guard. (This is shown in Fig. 5 with the rear shutter guard removed and the midpoint of shutter aligning with the stud at "A".) Tighten the clamping screws, making sure that the shutter is pushed back as far as it will go away from the end of the shutter shaft. Replace the light cap on the rear shutter guard and check the adjustment with film, readjusting slightly with the shutter adjusting knob to obtain the perfect setting.

SECTION 32. SHUTTER TIMING - FRONT & REAR SHUTTER MODEL. Turn the shutter adjusting knob until the screw head at "S" in Fig. 4 is located approximately midway in the slot. Remove lens. Remove the glass air deflector shown at "A" in Fig. 8. Remove spot sight box. Remove aperture plate. Remove rear shutter light cap. Loosen both hub clamp screws on both front and rear shutters, leaving them free to turn on their shafts. Turn both up in a vertical position.

Inspect the shutter aligning tool and insure so that the shaft turns freely in the barrel and that the knurled screw is tightened down so that a fore and aft axial movement of the shaft is prevented. Insert the aligning tool into the lens holder with the end having the knurled screw toward the front shutter. As the shaft nears the aperture, open the

fire shutter and pass the shaft through, using care not to strike the rear shutter blade. Rotate the shaft of the tool until tne flats on either end face upward. Set the intermittent movement in its locked position (when the sprocket stops turning) by turning the projector by hand. Hold the intermittent indicator vertically with the spring clamp at the top. Slip the spring clamp over the intermittent sprocket shaft collar which protrudes beyond the outboard bearing arm at "D" in Fig. 7. Turn the projector by hand in the normal direction very slowly while watching the lower end of the intermittent indicator. Stop turning when the indicator just begins to move.

Bring the rear shutter down until one edge of its blades (both are identical) lies flat upon the flat at this end of the aligning shaft. Be sure that the hub is loose on the shutter shaft so that the mechanism does not turn. While in this position tighten the hub clamp screws, keeping the shutter back as far as it will go from the end of the shutter shaft. In a similar manner, turn the front shutter (while free on its shaft) until one edge of either blades comes down flat upon the flat at the front end of the aligning tool shaft. Make sure that the shutter remains centered in respect to the shutter guards so that it will not rub. Tighten the hub clamp screws, locking the shutter to the shaft. Both shutters should now be against the flats at either end of the aligning tool shaft, and the intermittent indicator should be at the position where the sprocket just began to turn.

Carefully turn the projector by hand in the direction opposite to normal until the shutters are well away from the aligning tool. Remove the aligning tool from the lens holder, and remove the intermittent indicator. Replace the rear shutter light cap, aperture plate, etc., and refocus the lens. Check the adjustment by running with film, making any further refinements in the adjustment with the shutter adjusting knob.

SECTION 33. REMOVAL OF TOP COVER PLATE. Remove the upper magazine. Remove the four screws in the top of the cover plate. Do not disturb the two smaller screws adjacent to the oil tube. Remove one screw at the rear and one at the front (at "A" in Fig. 6), both being close to the gear side of the projector. Remove door stop screw at "B" in Fig. 6. The cover plate may now be lifted off vertically.

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