Film-Tech

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PROJECTIONIST'S TROUBLE-SHOOTING and MAINTENANCE GUIDE

VOLUME FOUR

COMPLETE EASY TO UNDERSTAND INSTRUCTIONS FOR MAINTENANCE AND TROUBLE-SHOOTING OF ALL

COMMERCIAL PROJECTORS

(SIMPLEX — BRENKERT — MOTIOGRAPH — ETC.)

CAMERON PUBLISHI

FILM TRAP ASSEMBLY

The adjustable tension on the film gate is accomplished by an adjusting knob on the rear of the gate housing. Turning to the left decreases the tension, while turning to the right increases the tension. This controls tension on all three pairs of pressure pads in the gate. The intermittent film pressure pad has individual adjustment of the same type.

Film should be run at the slighest tension possible. After adjustment the "jam nuts" should be locked to prevent the adjustments from "creeping".

THREADING IN FRAME

Framing the film when threading at the projection aperature is accomplished by checking with the secondary framing aperture at the top of the film trap.

The direct frame distant relation between the projection aperture and the secondary aperture assures of a perfect frame at all times. A 110-volt framing lamp is located behind the frame aperture to insure good light for checking the darkest of film. The switch for this light extends out through the quarter panel on the operating side.

CHANGEOVER

The changeover is of the horizontal solenoid type, with a quick pull.

It is designed for operation on 110-volt AC or DC.

There is an adjusting screw to adjust the tension to regulate the speed of shangeover as desired. The screw is located on the top of the coil housing and operates on the guide shaft.

There is a two-pole changeover switch mounted on each case, and a detailed wiring diagram is mounted on the inside of the floor base panel to enable the circuit to be properly checked and wired.

GEAR TRAIN AND IDLERS

The gear train and idlers are enclosed in a steady lubricating spray from the rotary lubricator and require no attention on the partvof the projectionist.

There is a safety measure incorporated in this gear train to prevent the stripping of gears in case of an accident. This consists of a shear trip, which is inserted in the hub construction of the outside main drive gear.

If any abnormal strain is produced in the projector, the shear pin will part and the main drive gear will become an idler.

This gear is easily reached as it is exposed to the left outside, by the sound drive pinion. After the abnormal strain (such as a bad film "pile-up", or something getting caught in the mechanism,)is removed, another pin or part of the same pin can be re-inserted and the main gears in the projector are left in perfect condition to continue their work.

Do not adjust or remove any gears in the gear train, these are correctly positioned at the factory, and will always retain their proper position

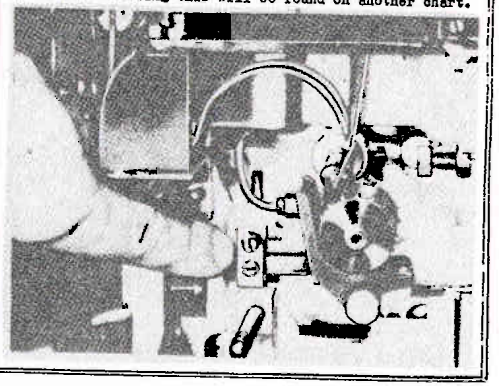
THE GOVERNOR	This unit is a loaded type governor, and is actuated against the weight of the fire shutter and linkage by means of a controlled centrifugal force. The return is accomplished by a gentle spring action assisted by the design and balance of the governor ball weights. The ball weights exert a pressure against a push rod at the required projector speed, opening the shutter. Inverse action occurs at a drop of speed Lubrication is automatic from the rotary lubricator.
APERTURE COOLING FANS	The fan is mounted on the governor drive shaft and is a part thereof. It is of the rotor type and requires no attention. The fan draws cool air from the front opening behind the rear shutter opening, up over the aperture and heat baffles, discharging the hot air through the orifice at the top rear of main housing. All operating doors must be kept closed when projecting to confine the air stream to the aperture and baffles. Lubrication is automatic.
LUBRICATING PUMP	This is of the gear type and requires no attention or adjustment. On the operating side of the machine, the method of mounting can be seen--four fillister head screws in the base casting flange. The oil level gauge is observed at this point also, and should never show less than one-fourth full when the projector is at rest. The reading must be taken with the projector not running as the pump relieves the oil from the gauge when operating.
REMOVING PUMP UNIT	The unit can be removed by loosening the four fillister head screws in unit casting on operating side. The oil gauge must be turned slightly to get at one screw. The oil feed tube must be unclamped from casting and lifted from pump. Unit can then be removed.
LENS MOUNT ASSEMBLY	The lens mount is of the new pre-focus type made to accomodate all standard size American made lenses. No detailed instructions are required other than care in handling. Do not press down on the camshaft locking lever as the spring tension is sufficient to hold the lens tube. No extra pressure is required to lock this tube. Always keep the pre-focus collar tight after final setting. In this way, any projectionist on any shift, can clean the lenses without losing definition of projected picture. Always keep lens so mounted that there is ample focusing distance to adjust in or out of focus. The assembly is equipped with a micrometer focusing knob, for close adjustment of lenses.

SHUTTER SHAFT & ASSEMBLY	The shutter is of the differentiated disc type opposing rotation, that cuts the light beam in the center of the light aperture.
ADJUSTMENTS	On the operating or film side of the projector properly located in the front upper center housing is an adjusting shaft with a screw slot. This is the only adjustment, and is a micrometer compensator for any slight "travel ghost" that might be incurred. This adjustment should be made while the picture is being projected.
TIMING SHUTTERS	The timing of the opposing blades of the light cut-off shutter is done as follows: Looking from the rear of the projector with the right hand side of the shutter housing removed, it will be noted that the two blades are mounted on flanged hubs of different diameters. The inner blade is mounted on the larger hub, and the outer blade on the smaller hub. In the face of these two hubs will be noted two 10 x 24 fillister head machine screws which tighten the hub flange on to the blade proper. The necessary operation of timing the shutter is to determine the movement of the intermittent by hand in such a way that the intermittent sprocket will just start its pull down. Now loosen the 10 x 24 screws by one turn each, and it will be found that the blades can be moved independently on the hub without disturbing the intermittent setting or moving the mechanism. Looking from the rear of the projector, the inner blade or the one with the larger hub, moves in a counter clockwise direction and can be moved up in that direction until it divides the aperture plate in half. Take the outer blade, the one with the small hub, and move this in a clockwise direction until the two blades meet directly in front of the center of the aperture opening. Now tighten the two 10 x 24 screws in the large hub as well as those in the small hub. This again locks the blades to the driving shafts. To check this procedure, turn mechanism by hand several times to determine whether the edge of the blades are meeting exactly in the center of the aperture as the intermittent sprocket starts its pulling down function. If this checks correctly, then shutters are in correct time for projecting. Any "travel ghost" that may be seen in the projected picture can be eliminated by use of the shutter setting device, explained above. Be sure to have adjusting screw on operating side of the projector divided equally before timing procedure is started. Seven turns with a screw driver on the adjusting stud will place it in the center of adjusting position from either stop. Do not disturb the set screws which hold the hubs to the driving shaft. The shutters cannot be timed in this way due to fixed counterseats in each shaft. As has been noted the shutters are held with a gripping action between the flanges of their respective hubs. Only remove the right section of shutter housing for adjustment.

BRENKERT PROJECTOR

INTERMITTENT MOVEMENT	The movement is of the X-star and segmented cam design. It is fully and automatically lubricated from the rotary lubricator.
CHANGING SPROCKET	The sprocket can be changed quickly. Remove the end screw on sprocket shaft, then relieve the film stripper to enable the sprocket to be pulled off from the shaft. In replacing sprocket, do not set up hard on the holding screw. Finger and thumb pressure is all that is necessary as the sprocket is positive locking. If sprocket is to be reversed after removal, it will be necessary to remove the two small taper pins which hold locking flange to the sprocket, also the two small screws which locate this flange. The flange can now be placed upon the outer end of the sprocket and pins reset and screws tightened.
REMOVING MOVEMENT FROM MECHANISM	The entire intermittent assembly can be removed and replaced during the time required for the running of a 1000 foot reel of film on the other projector. Remove gear side main cover and gasket. Loosen clamp by unlocking lock nut on adjusting screw. Back screw out until clamp is loose. Raise clamp fork up sufficient to allow locking slot in movement to clear, then remove the complete assembly. To replace, reverse procedure. The intermittent must be properly aligned with locking key in center frame bearing If intermittent movement is removed from the projector it will be necessary to re-time the opposing cut-off shutters as set forth on a later chart.
REMOVING LOWER SPROCKET	This sprocket can be removed and replaced without the removal of any castings or other parts. Be sure to relieve the film stripper when removing the sprocket. This will prevent damage to the sprocket.
REMOVING LOWER SPROCKET ASSEMBLY UNIT	The unit can be removed in its entirety by removing the three filister head screws from the main casting flange. A new oil seal gasket should be used in replacing the unit otherwise oil leakage may result.
LUBRICATION	The lubricant is fed to the driving gear and shaft of this part from the gear side by the rotary lubricator. The film pad rollers have graphite impregnated bearings.
ADJUSTMENT LOWER SPROCKET ASSEMBLY	The adjustment of the pad rollers is accomplished by a stop screw and lock nut, which determines the proper distance from roller to sprocket. The allowable distance should not be more than .015". To remove pad rollers, loosen the small screw on arm. Remove stud lock spring and pull out roller studs. The rollers should be cleaned at regular intervals.
REMOVING UPPER SPROCKET ASSEMBLY UNIT	To remove the unit in its entirety, the gear side main cover must be removed and the large formica gear that carries the rotary lubricator must be removed, this is done by loosening the screw in shaft, then pull off the gear and lubricator, the oil tube clamp must be relieved to allow the unit to be removed. Adjustment is same as that given for Lower Sprocket Assembly above.

SIMPLEX E-7 PROJECTOR ---------- ROUTINE OPERATION.

LUBRICATION	While the projector is new, the pump of the automatic oiling system is operated as already described, in the chart on Installation, about every two hours that the projector is in operation. As time goes on, the intervals of lubrication are gradually lengthened until, when the mechanism is completely broken in, the automatic oiling system is used only 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 the chart on Installation, whenever it is shown that more oil is required. As has been pointed out, it is always advisable to oil the intermittent from the driving side, the sight glasses are readily discernible from this side. The gears and governor are oiled as is described on the chart on Installation, at least once a day, while the mechanism is new, this lubrication is also applied less frequently as the machine breaks in, when it will be required only about twice a week. Gears and governor are never lubricated while the projector is running. Use oil and not grease on the gears.
CLEANING	Owing to the white enamelled interior, illuminated by the threading lamp, and to the ease with which component parts can be removed, as described in the chart on Maintenance, 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, easily reached and should be removed at once.
PAD TENSION ADJUSTMENT	The E-7 has 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. Instructions covering this will be found on another chart. 

REMOVING THE SPOT SIGHT BOX.	This is removed from the operating side of the mechanism merely open the door of the projector and draw the spot sight box toward you.
REMOVING THE REAR SHUTTER GUARD.	The rear shutter guard is built in two vertical sections or halves, each of which may be removed 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 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 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 of the shutter guard can then be lifted off.
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 removed. If the rear half of the shutter 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. Proceed similarly at the bottomand 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 correctly "timed" as described later.
REMOVING THE FILM GATE.	Put the gate in half-open position, by operating the gate-opening lever. Take off the kurled 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 into position, then replace the knurled thumb screws.
REMOVING THE FILM TRAP.	Remove spot sight box, as already described, hold up the fire shutter by means of lift lever and remove the rear retaining screw with a thin screwdriver, as shown in B Plate 104. Next remove the front retaining screw, the one indicated by the left forefinger in A, Plate 104. Lift the fire shutter and draw the trap toward you.

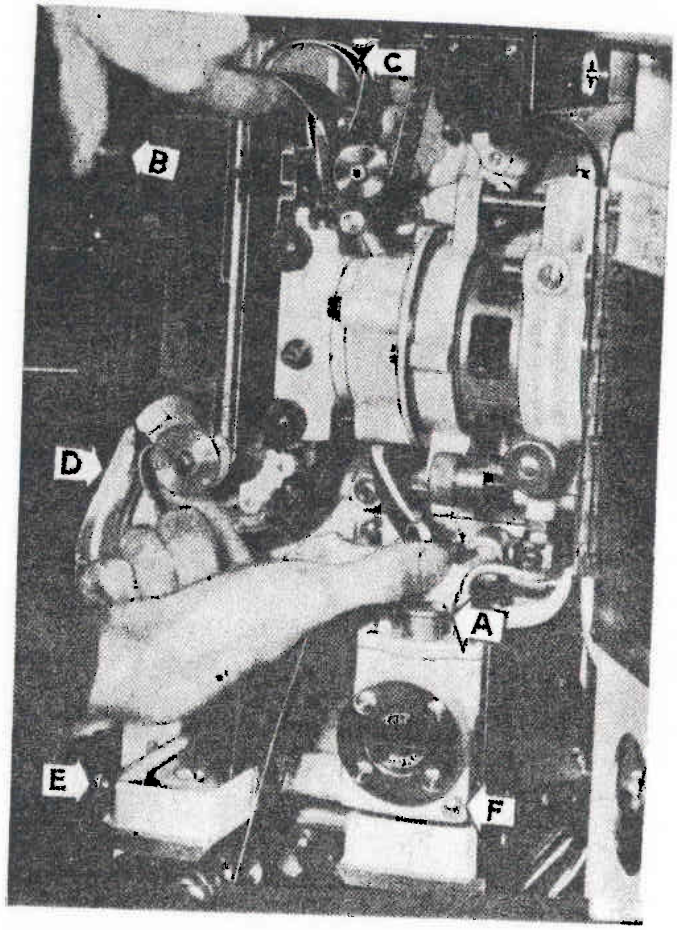


PLATE 101

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.

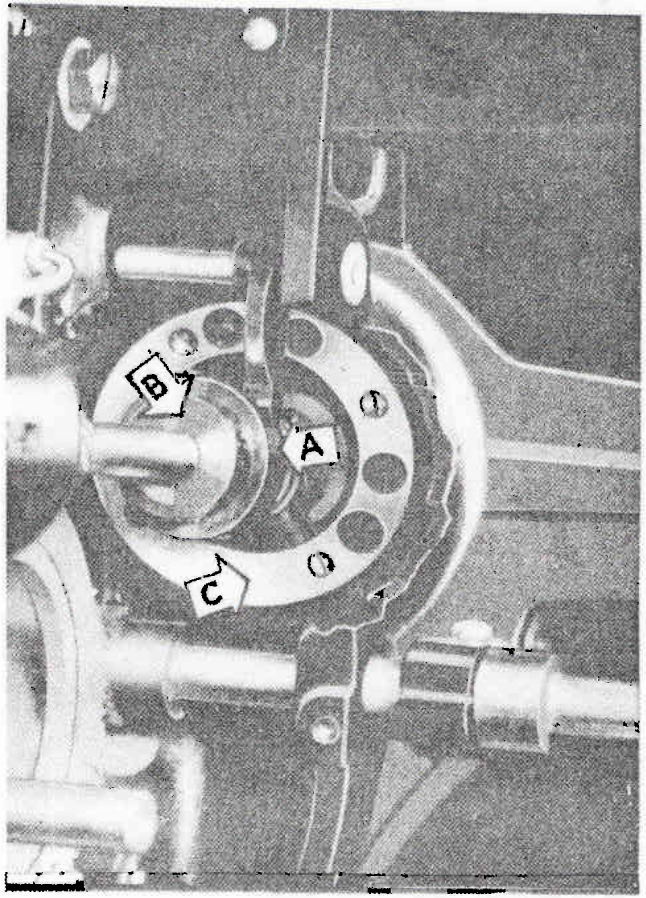


PLATE 102

A-governor flange. B-governor stop collar. C-governor ring.

TAKING OUT THE INTERMITTENT MOVEMENT.	Remove the spot sight box, film gate and film trap, as already described. Next remove right back drum cover, D, Plate 101, which is just below the film trap. This casting is held by three knurled thumb screws, E, Plate 101, 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 non-operating side, loosen the clamping screws in the outer rim of the intermittent flywheel, then remove the flywheel by drawing it off its shaft. It is important that you do not loosen the shaft screws in A, Plate 109. Now refer to A, Plate 106. Three wedgeshaped clamps hold the movement, and in turn are held by three screws, one of which is in contact with the screwdriver in Plate 106. Loosen all three screws till the clamps swing freely. It is not necessary to remove any gears. The third screw, hidden in Plate 106, behind the intermittent gear, can be exposed by operating the framing knob. Swing the three clasps clear of the movement, re-lock the screws tightly to prevent the clamps dropping back into their previous position. Returning to the operating side, set the gate opening lever in open position, lift the fire shutter, and draw the movement toward you as shown in Plate 105.
INSERTING INTERMITTENT MOVEMENT.	Make sure the case of the movement is clean, and that the surface of the synchronizing cam into which it fits, C, Plate 105, 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.
INSTALLING NEW INTERMITTENT	Take off its flywheel. Slide the movement into place from the operating side, lining up the guide lines B, Plate 105, so the guide lines on the movement and the guide lines 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.
REPLACING OLD INTERMITTENT	A movement that has been taken from the mechanism and is to be replaced, is slid part way into the synchronizing cam. Line up the guide lines roughly, deferring accurate alignment until later. At the operating side look for an "O" mark on the intermittent gear hub, just outside the gear, and a corresponding "O" mark or dot on the micarta gear that meshes with the intermittent gear. Rotate both gears until the teeth indicated by these "O" marks are in contact with each other. Now push the movement all the way into the synchronizing cam. SEE NEXT CHART.

REPLACING OLD INTERMITTENT (Continued)	Leaving the gears at the drive side properly meshed, as indicated by the "O" 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.
INSERTING INTERMITTENT MOVEMENT.	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. The holding screws are then tightened. 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, Plate 109, are tightened evenly. The rear casting of the housing, the film gate, film trap and spot sight box are now replaced. In the case of a new movement it is still necessary to "time" the shutters. It is as well, even when replacing an old movement to check the shutter to see that it is correctly timed.
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, Plate 103, is in approximately central position in its slot. Remove the aperture plate. Loosen the lens collar locking knobs C, Plate 103, and remove the lens and air deflector slide E, Plate 103, then loosen both clamps 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 aligned shaft against either front or rear shutter blade 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 extension face downward. Set the movement in its locked position by turning motor flywheel or knob on end of motor shaft not by the shutter shaft knob. SEE NEXT CHART. 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 protudes beyond the double bearing arm. SEE NEXT CHART.

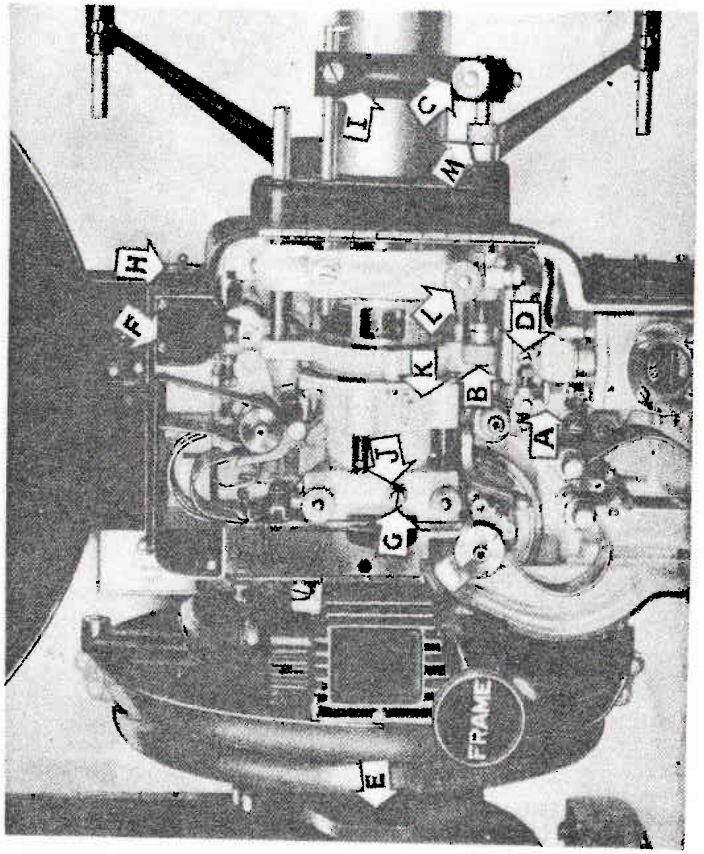


PLATE 103

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. 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.

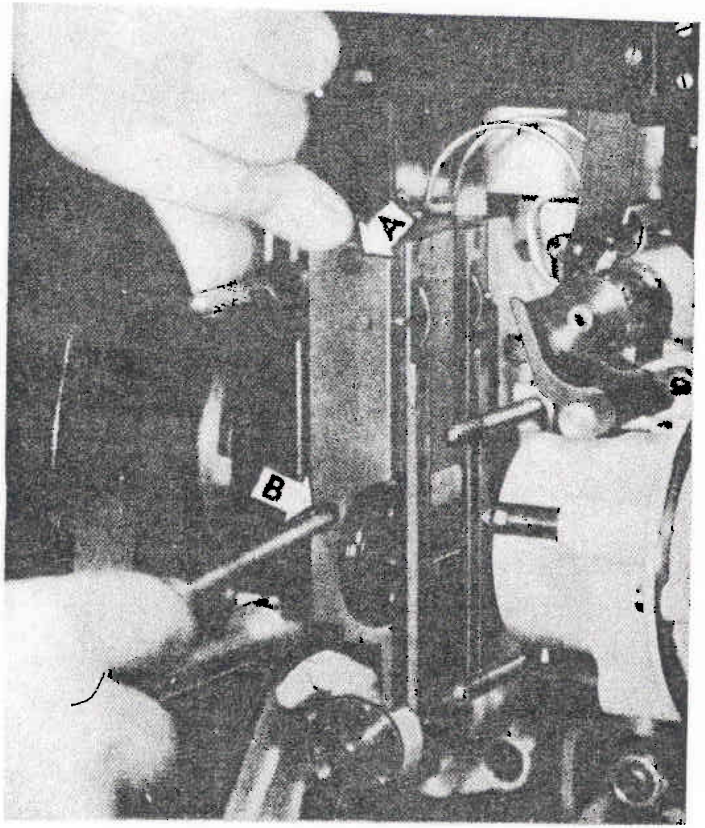


PLATE 104

A-film trap fastening screw (upper)
B-film trap fastening screw (lower)

TIMING THE SHUTTERS (Continued)	Turn the mechanism over by hand, in the normal direction very slowly, watching the lower end of the intermittent indicator. Stop when the indicator just commences to move. Grasp the rear shutter by its hub clamp and turn it until the edge of one blade, either blade, 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 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 remains 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 and remove the intermittent indicator. Replace the aperture plate, spot sight box and lens, and do not forget to refocus the lens. A slight adjustment may be necessary to remove any travel ghost.
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. Remove the film gate, the film trap and the housing casting just under the film trap. The screw under the right hand oil sight of the movement is then taken out, and the oil drained into absorbing material. Oil that reaches the mechanism should be wiped away. The four 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 and its shaft, is drawn out of the double bearing arm. Lift the sprocket out of the arm, and replace it with a 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 oil. When the screw holes are lined up, the fastening screw is replaced in the sprocket hub, but before it is tightened down, the sprocket and star are pressed toward each other until there is no perceptible end play, but rotation is still perfectly free. Replace gasket. SEE NEXT CHART.

CHANGING THE INTERMITTENT SPROCKET. (Continued)

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 then cam radius. The arm is then gently brought homeinto position. The locating pin and hole, star and cam, engaging simultaneously.

With the arm in place, the five screws are restored, and tightened down evenly. They are then loosened again to allow the arm to shift downward on its own weight, and then the screws are again tightened.

The projector is now again turned over by the front shutter knob to determine whether there is the slighest trace of binding between the star and cam. Unless this action is absolutely perfect the five screws are loosened, the arm moved slightly, and the screws retightened. This process is repeated as many times as found necessary until the star and cam action has been brought to perfection.

The intermittent oil reservoir is then re-filled, the gate, the trap and the housing replaced.

REPLACING THE UPPER FEED SPROCKET.

Take out the spot sight box, the gate and film trap. Then 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. Be careful not to lose the thrust washer, that is between the main frame and gear. 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, the gear and sprocket are pressed toward each other to leave approximately .002 inch end play. Replace the gate, trap and sight box.

REPLACING THE LOWER FEED SPROCKET.

Remove the housing casting below the film trap, as has already been described.
With a short screwdriver, loosen the screw that holds the upper 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 to see that it just clears the sprocket hub and its fastening screw.

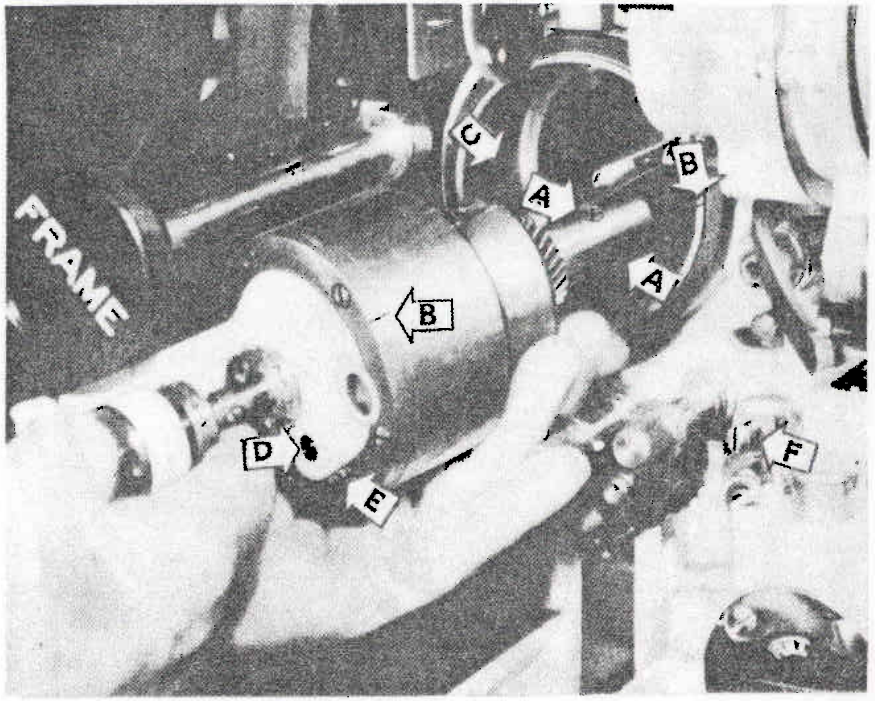


PLATE 105

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.

REPLACING UPPER FEED SPROCKET SHOE.

Do not attempt to take the shoe off the arm on which it is mounted. 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 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 and the washer, is now replaced, but is not yet tightened down

The arm and arm stud are now replaced in the mechanism, aligned so the shoe rides properly on the sprocket, and is then 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 to the left of the arm stud will be seen a hexagonal bolt and lock nut. These are adjusted to leaves exactly two thicknesses of film clearance between sprocket and shoe, and the lock nut is tightened down.

REPLACING THE LOWER SPROCKET PAD ROLLER.

Loosen the lower sprocket and roller arm stud screw, F, Plate 105, 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 in the arm. Allow the roller about .005 inch play, and tighten down its shaft holding screw. Replace the arm in the mechanism and restore the arm stud and the 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 found a hexagonal bolt and lock nut. Adjust these for exactly two thicknesses of film clearance between sprocket and the left roller, regardless of which roller was changed.

ADJUSTING GATE PLAY.

Remove gate. Loosen the gate guide rod adjusting screw, B, Plate 107, and release the gate guide rod adjusting screw, A, Plate 107.

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 the gate.

NOTE. Two thicknesses of motion picture film measure approximately .015 of an inch.

SIMPLEX E-7 PROJECTOR ---------- MAINTENANCE

REPLACING SHUTTER GEAR.

Before undertaking the work in the projection room, read through this chart, and make sure that there is room enough in front of the projector mechanism to perform the required operations. If there is not, the projector must be removed from the pedestal, and the work done on the bench.

In the following order, remove these parts. Front shutter shaft knob. Front half of front shutter guard. Shutter. Rear half of the guard.Shutter adjusting knob holding screw. Shutter adjusting knob. Drive side door stop slide screw, which disconnects the stop slide from door.

Remove the two nickel-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 threading lamp toggle switch, three black machine screws placed close together toward the drive side of the base casting. None of these screws should be disturbed. All others, seven screws in all, should be removed.

Both doors are then opened, and the entire front of the housing, with the doors and the front shutter spider, is then 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 the framing handle on non-operating side, counter-clockwise as far as it will go. Force back spring retaining collar, being careful not to release the spring suddenly. Draw off synchronizing spring.

At the non-operating side, take out the sliding sleeve guide screw A, Plate 110, push the sliding sleeve C, Plate 110, forward in the sliding sleeve support casting, B, Plate 110,, until it protrudes slightly at the front.

Grasping the sliding sleeve where it protrudes from its support casting, rotate it clockwise ¼ turn. Rotate the shutter shaft until the keyway atthe 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.

There is a Woodruff key, H, Plate 109, which fits into the keyway in the shutter shaft. Make sure this key is not lost during this operation.

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, Plate 109, ball bearing and lock nut assembly from the sliding sleeve. SEE NEXT CHART.

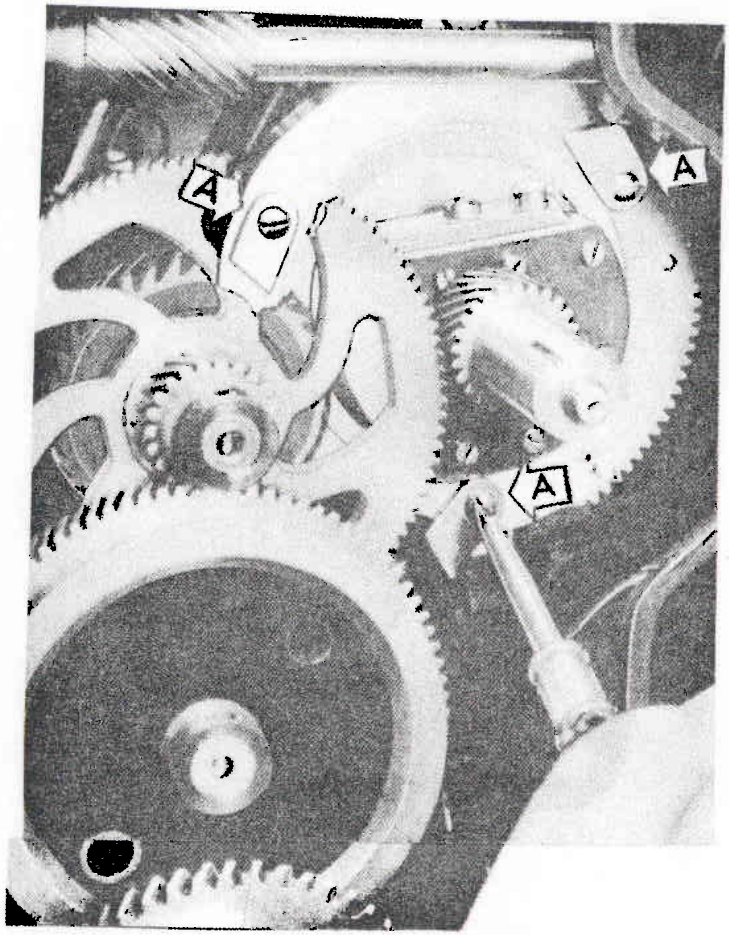


PLATE 106

A-intermittent retaining clamps.

REPLACING SHUTTER GEAR	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 the four screws, shifting it slightly and reseating. Repeat the procedure until perfect alignment is obtained. Re-time the shutters.
REPLACING MAIN, INTERMITTENT GEAR STUDS.	Take off the gear as already described. Insert a punch into the oil hole on non-operating side of the mechanism and at the operating side loosen and remove the stud self-locking nut or film protecting stud, with a suitable wrench. The stud K or F, Plate 110, can now be drawn out from the driving side. Oil the new stud and restore operation. In the case of the removal of the intermittent drive gear assembly stud, time the shutters as already described.
REPLACING GATE TOP TENSION PAD.	Take out the gate and remove the small screw at the center of the retaining screw A1, Plate 108. Remove the round knurled nut B1, Plate 108, 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.
REPLACING INTERMITTENT SPROCKET SHOE	Take out the gate and remove the small screw at the center of the bottom spiral spring, the sprocket shoe tension retaining screw, A2, Plate 108. Remove the knurled nut (the sprocket shoe tension adjusting nut B2, Plate 108) and the spiral spring. Slip off the shoe and replace, restoring the spring, the knurled nut and adjusting screw. Adjust the tension.
REPLACING LONG TENSION PAD	Remove the four gate casting holding screws C, Plate 108 Separate the gate plate E, Plate 108, which is located by two dowel pins, from the casting and proceed as already described for Replacing The Gate Top Tension Pad.
REPLACING LOWER SPROCKET DRIVEN GEAR & SHAFT.	Take off the main drive gear. At the operating side of the mechanism loosen the holding screw in the lower sprocket hub, as described in Replacing Lower Feed Sprocket. The gear G, Plate 110 and the shaft can now be drawn out from the driving side of projector.

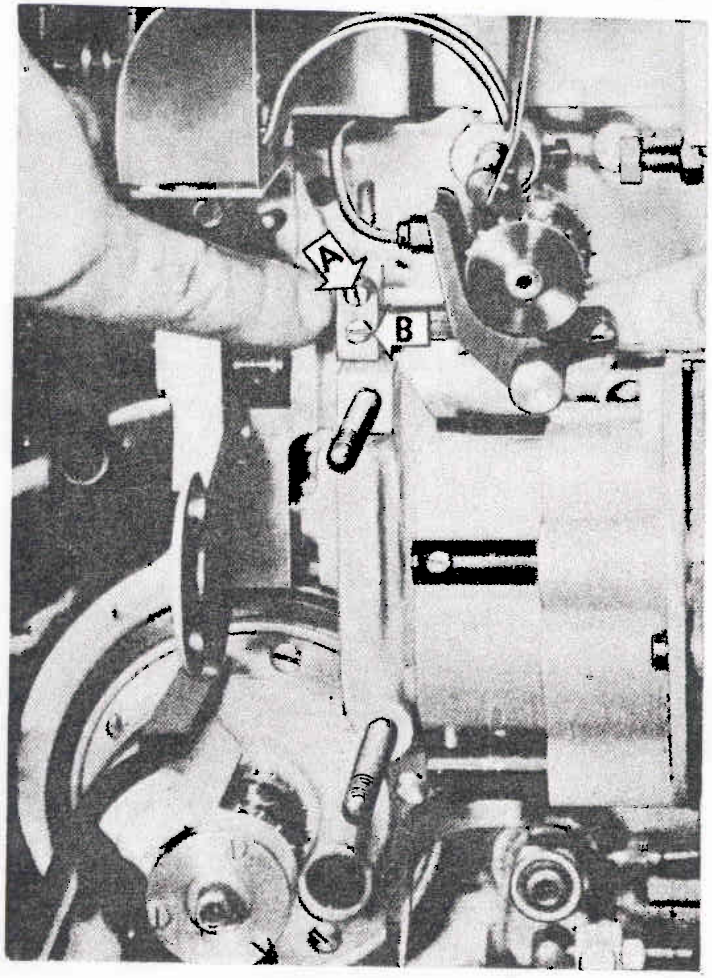


PLATE 107

A-film gate guide rod adjusting screw
B-film gate guide rod adjusting screw

REPLACING THREADING LAMP	Take out the two screws in the face of the threading lamp shield, F, Plate 103. The 120 volt bulb, a standard 6 watt, candelabra base type, can then be unscrewed and replaced.
REPLACING FRAMING LAMP	Take out the sight box 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.
REPLACING 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, Plate 109, toward you. Lubricate the new gear with a drop of 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.
REPLACING INTERMEDIATE DRIVE GEAR ASSEMBLY	Take off the intermittent flywheel as already described. Take off the main drive gear, take out the collar fastening screw in the intermediate gear shaft, slip off the collar, and draw the gear assembly, K, Plate 109, toward you. Lubricate the new assembly with a drop of 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.
REPLACING UPPER SPROCKET DRIVEN GEAR.	Proceed as explained under Replacing Upper Feed Sprocket, taking out gear C, Plate 109, and shaft from the driving side. Lubricate the new gear and shaft with a drop of oil.
REPLACING OBLIQUE SHAFT AND GEARS.	Remove nickel-plated cap just behind the magazine screws B, Plate 109, at top of mechanism. This may be done by inserting a screwdriver beneath the cap and prying it out. It is held in place by a circular spring. Remove the lower plate on non-operating side of mechanism Remove the main drive gear by removing screw which holds the retaining collar in place. Remove intermittent flywheel by loosening the two screws which hold it in place. Pull off the shaft. Remove intermediate drive gear by removing collar which holds it in place. Disconnect lower two oil tube connectors from distributor block and bend them slightly downward, out of the way. Remove screw which holds the lower gear J, Plate 109, to oblique shaft and slip gear off the shaft. Remove key from shaft. Remove screw from middle gear. Slip shaft out through hole in top of mechanism far enough to replace whichever of two lower gears necessary. Reassemble in reverse order from above.

SETTING GATE PAD AND SHOE TENSION.	UPPER PAD. Remove the gate as already described, and set the upper pad adjustment 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 be the same, just enough to hold 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, Plate 108, and round locking nut, D, Plate 108, shown at the side of the gate in G, Plate 103, and B, Plate 108. Run film, being careful to use a reel that has no camera jump in it, and watching screen, tighten the tension by turning the external adjusting screw clockwise until the picture is steady. Lock the correct adjustment by means of the 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 projected picture.
REDUCING INTERMITTENT NOISE	To cure imperfect adjustment of the intermittent movement, one sympton of which is noise, run the projector without film, 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, Plate 105. Pull or pry the flywheel shaft toward you, the smallest possible fraction of an inch, then again tighten screws. Restart the projector, if there is still noise again press against the end of the flywheel shaft as before. If you again reduce 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 the noise, or if there is still noise left after the above stated tests have been made, remove the drum cover, loosen the cam end play adjustment locking screw E, Plate 105, using the framing knob to bring the screw to the most convenient position. SEE NEXT CHART.

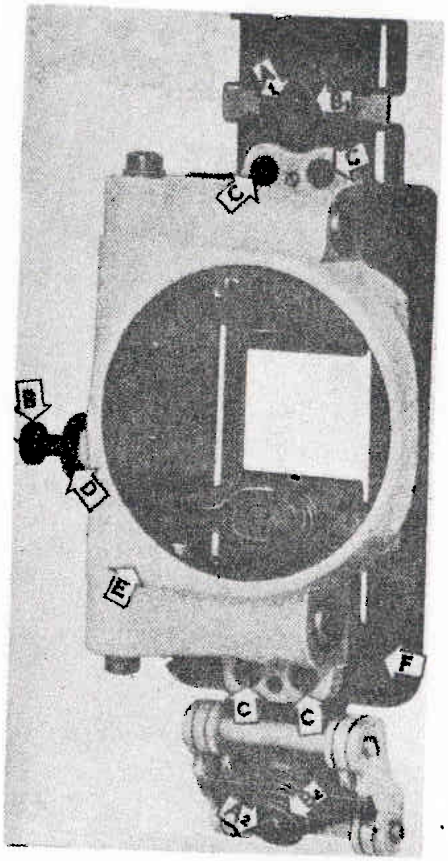


PLATE 108

A1-top tension pad adjusting nut retaining screw. A2-intermittent tension shoe adjusting nut retaining screw. B-long tension pad adjusting screw. B1-top tension pad adjusting screw. B2-intermittent tension shoe adjusting nut. C-gate casting fastening screws. D-long tension pad adjusting screw lock nut. E-gate casting. F-gate plate.

REDUCING INTERMITTENT NOISE. (Continued)	Run the projector without film and press inward on the cam end play adjustment screw D, Plate 105, 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 some absorbing material, and carefully wiping away any oil that has reached the mechanism in the process of draining. 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 restarted. 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 shipped to the manufacturer for adjustment.
ADJUSTMENT OF FIRE SHUTTER.	Remove spot sight box. Look down between the the rear of the mechanism and the rear shutter guard to locate the fire shutter lift pin fastening screw. This 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 adjustment was not properly made, and must be repeated.
ADJUSTMENT IF FIRE SHUTTER JAMS.	Remove the spot sight box. Just above the top of the fire shutter on the film trap there is a small stud or excrescence on the film trap casting. The top of the fire shutter in raised position, should not quite touch this stud, but should clear it by about 1/32nd of an inch. Loosen the fire shutter raising lever adjusting bushing lock screw, E, Plate 109, about ¼ turn, no more. Do not take out this screw. Now adjust the shutter height by turning the fire shutter raising lever adjusting bushing, F, Plate 109. Turning this bushing clockwise raises the shutter, turning it counterclockwise lowers the shutter. Turn down the lock screw when the proper adjustment is obtained.
ADJUSTMENT IF FIRE SHUTTER FAILS TO TRIP.	The fire shutter trip, C, Plate 101, should be operated manually from time to time to make sure the shutter is working properly. If it does not, take out the spot sight box and the film trap, according to instructions already given in these charts. Remove the shutter lever guard holding screw and take off shutter lever guard. Shutter mechanism can now be cleaned with kerosene to remove gummed oil.

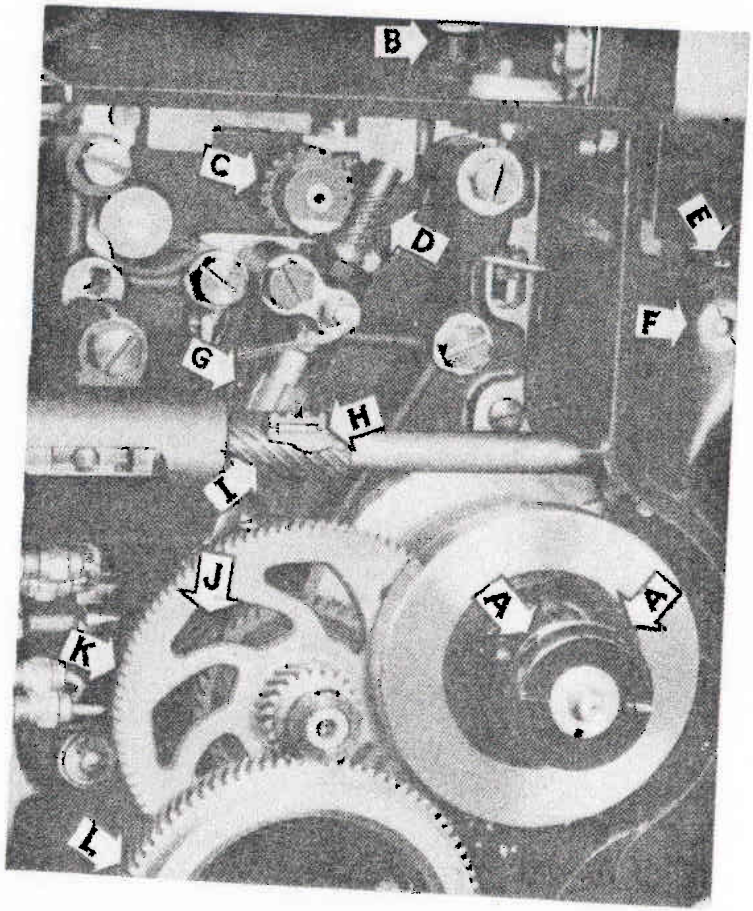


PLATE 109

A-intermittent flywheel clamping screws. B-nickel plated cap covering hole. 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.

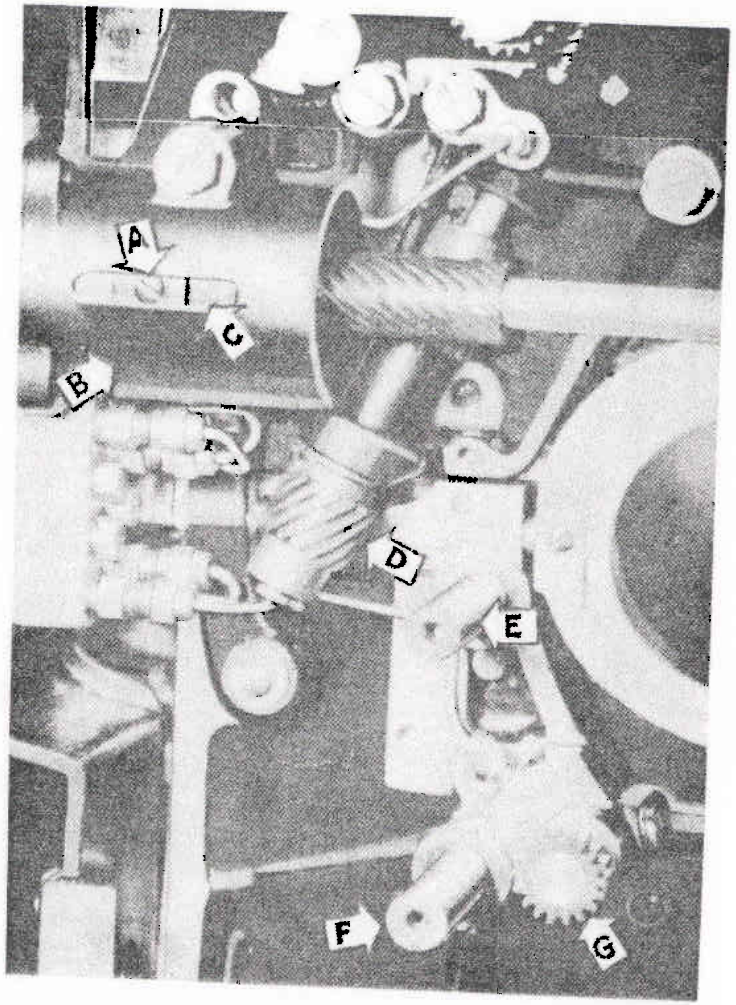


PLATE 110

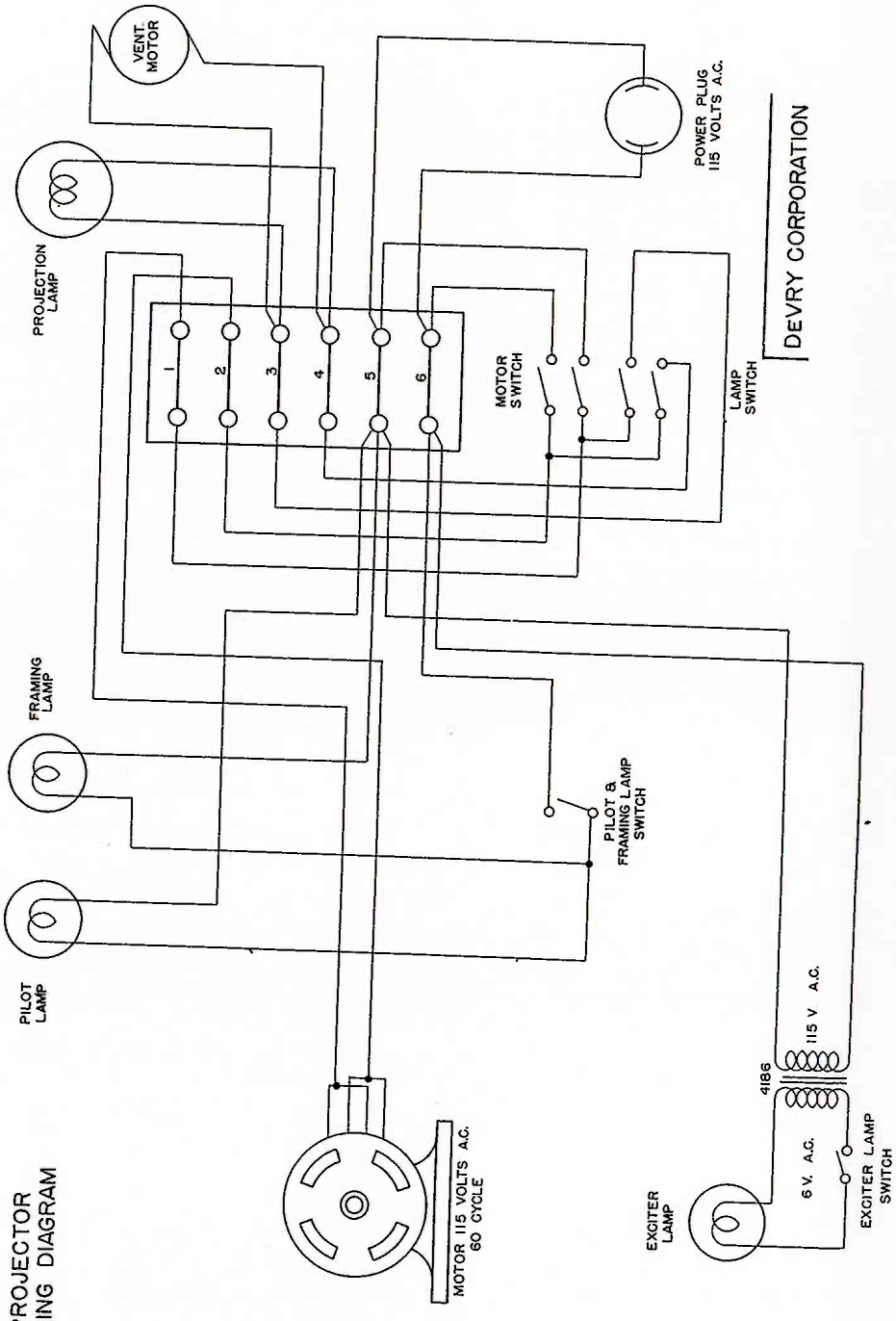
A-sliding sleeve guide screw. B-shutter gear sliding sleeve support casting. C-shutter gear sliding sleeve. D-lower gear on oblique drive shaft. E-intermediate drive gear stud. F-main drive gear stud. G-lower sprocket driven gear.

DEVRY SOUND PROJECTOR. -------- DESCRIPTIVE.	
LIGHT SOURCE.	The new projector is so designed to accommodate itself to any light source desired. It is available in four incandescent combinations from 1,000 watts to 2,100 watts, each one capable of two size lamps without any mechanical changes. The incandescent lamps used are of the bi-plane filament type, and prefocused bi-post type. Low or high intensity arc lamps are optional.
DRIVING METHOD.	Two replaceable V type belts are used to drive the mechaniam.
INTERMITTENT MOVEMENT.	The standard Geneva type intermittent movement is employed but differs from the usual Geneva movement, in that the star used in the DeVry projector is of the web type being doubly supported. The movement is machined to a tolerance of 2/10 thousands of an inch and operates in an oil bath.
WORKING MECHANISM.	The DeVry employs a silent chain drive, instead of gears, which allows service wear to be taken up. The mechaniam is so assembled that any part of the sound projector can be easily and quickly replaced in case of trouble. The projector head is built on a main center plate of cast aluminum so as to insure permanent alignment. The film handling mechanism, the sound head, the optical system and controls are mounted on one side of the center plate. All driving mechaniam is mounted on the non-operating side of the center plate.
SHUTTER.	The DeVry employs the rear barrel shutter.
SPROCKETS.	All sprockets are so designed that from six to ten film perforations are engaged in driving the film through the projector, the position of the intermittent sprocket is below and in exact vertical line with the aperture, thus framing can be accomplished without changing the shutter time. The tension shoes on the sprockets are full floating, pre-adjusted, and easily re-adjusted should this be necessary.
DRIVING MOTORS.	Motors can be supplied either of the constant speed type or governor controlled type, at the option of the purchaser.
TAKE-UP	The take-up is driven by a silent chain, and is equipped to take a full 2,000 ft of film. The upper magazine spindle has an adjustable drag break to regulate the speed of the feed reel.
AMPLIFIERS.	Amplifiers of any po wer output are available, the stock amplifier has an undistorted power output of 15 watts and within two dc variation has a flat frequency response from 35 to 10,000 cycles, at an overall gain of well over 100 decibels, at which level the harmonics introduced by the amplifier is less than 5% of the total output. All controls are on the outside of the amplifier case.
SPEAKERS.	The auditorium speaker has a frequency range of from 50 to 5500 cycles. Will handle an input of 15 watts. The special high frequency speaker, when installed with the auditorium speaker will produce a frequency response in a range of from 35 cycles upwards of 10,000 cycles.

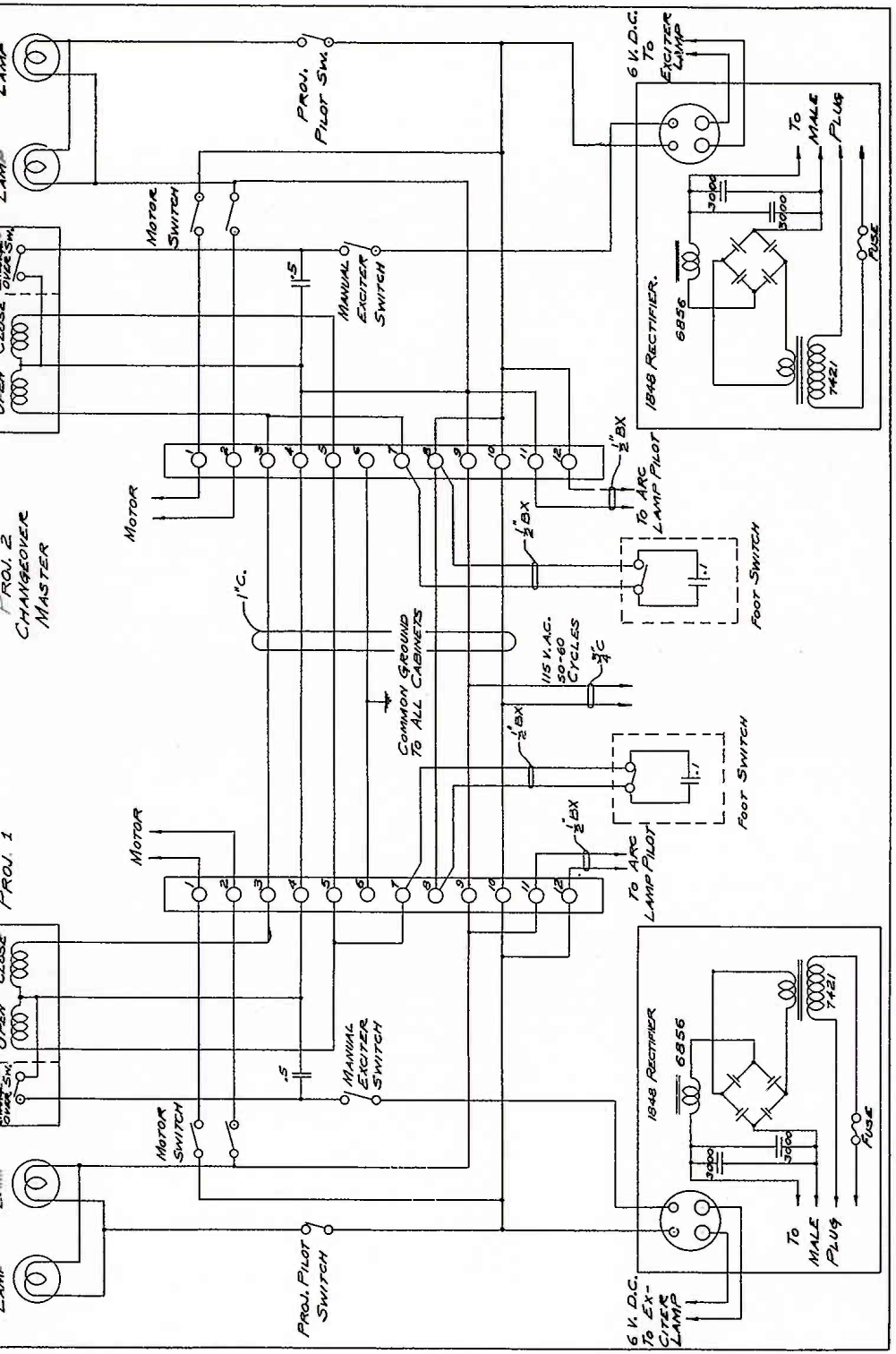
DE VRY 35m/m PORTABLE SOUND PROJECTOR.-----PLACEMENT OF EQUIPMENT.

PLACEMENT OF PROJECTOR AND SCREEN.	The ideal position for the projectors is on a level with the center of the screen and high enough to have the light rays reach the screen without interference by the audience. Do not place the projector in any position where the projection angle will be excessive, this will cause a distorted picture. Where the projector must be located at either side of your audience, care should be taken to see that the screen is so placed that it is at right angles with the axis of projection. (The light rays) The screen should always be located so that the viewing angle is not to great, this will cause the picture to be distorted. Do not have the screen too high, if your audience must sit close up to the screen, this will be hard on the necks of those occupying the front seats. The screen should of course be high enough to allow good viewing from the rear seats without straining the neck. Wherever possible have the front seats far enough from the screen, to insure good sound illusion, so that the sound appears to come from the screen characters rather than from the speakers placed at the side or behind the screen.
PLACEMENT OF SPEAKERS.	Unless a special sound screen is used do not set the speaker behind the screen, ordinary screens are not only poor sound transmitters, but theycare sound deflectors and mufflers, placing the speakers behind this type of screen will result in distorted sound reproduction. Place the speakers at the side of the screen, high enough so that the sound will reach the ears of all the audience without obstruction. Whereever possible keep the speakers away from walls etc, if the speaker is set on a light table, sound reproduction may be improved by placing a piece of felt or a few folds of cloth between the speaker and the table top. Before starting your performance, try positioning your speaker while sound is being projected, so thatyou can decide on best possible location and position.
OPERATION OF EQUIPMENT. Current supply.	The projector may be operated on either AC or DC 110 volts. The amplifier however will only operate on AC, unless a converter is used. The cord carrying power to the projector can be inserted in any circuit supplying 110 volts either AC or D.C. The cord carrying power to the amplifier may be inserted directly into the house current providing this is 110 volts 50-60 cycle A.C. current. Otherwise the amplifier power supply cord must be connected to the output of a converter.
Setting up the outfit.	The projection lamp, the photocell, the amplifier tubes are packed seperately. The exciter lamp comes ready installed and adjusted. Set up the outfit, and place the projector lamp in its socket in the lamp-house, these lamps are of the pre-focused type and can only be inserted in the proper operating position. Remove the cap from the outside of the sound drum and insert the photo-cell in its socket. Insert the amplifier tubes in their respective sockets, both the tubes and the sockets are numbered, be sure you insert the proper type tube in each socket.

Projector Wiring Diagram



PROJECTOR, DOWSER AND EXCITER SUPPLY WIRING



DE VRY 35m/m PORTABLE SOUND PROJECTOR. ------ OPERATION.

PROJECTOR OPERATION.

To set up the projector, slide the upper magazine out of its slot in the bottom of the case, and slide the cover plate out of its slot in the top of the case. Slide the upper magazine into place in the slot on the top of the case. Connect the plugs and cables as shown in the diagram which comes attached to the inside of the projector lid.

The machine is now ready to thread with the film. After threading, turn the motor knob in a counter clock wise direction a few turns by hand until all slack is taken up in film between the gate and the intermittent sprocket. Leave it in such a position that the shutter does not cover the front of the lens. Now place the pilot lamp in the place betwe n the lamp house and the gate and hold the safety shutter up out of the way. Looking in through the lens, you will see one frame of film illuminated by the pilot light, This should be exactly centered or "framed" in the gate aperture. If it is not move the framing lever up or down until the picture is accurately framed.

SOUND EQUIPMENT OPERATION.

Be sure that your equipment is properly con.ected before starting your show. To make sure that everything is operating satisfactorily, run a film through each projector before seating your audience. This will also give you an opportunity to properly set your fader, for proper sound volume, and give you your normal fader setting for the particular hall or room in which you intend operating. Once you have found the proper fader setting do not alter it unless this is necessary due to poor film recording or to the fact that your sound output volume is not sufficient due to the filling up of the auditorium. You will need a higher fader setting for a hall filled with people than you would in an empty hall.

Turn on the amplifier tubes a minute or two prior to the starting of your show, these tubes must have time to warm up before they become operative.

A tone control is provided to take care of poor sound output due to bad acoustics. The tone control has three positions. When turned to low, it reproduces all of the sound frequencies on the film, when turned to high, it cuts off the lower frequencies, where there is a great deal of excessive reverberation this setting may greatly improve the sound output quality. The third setting is marked "med" and when this setting is used a portion of the low frequencies are cut off.

When using two projectors, care must be taken to see that the sound output is balanced, in other words the sound volume should be the same from both projectors.

A difference in sound output volume may be due to the use of unbalanced tubes, using a defective exciter lamp in one of the projectors or a defective photo-cell.

When using two projectors the change over from one projector to the other should be made in such a manner that the audience is unaware of the change-over. As the reel of film runs out on one projector the second projector should be immediately switched in, so there is no break in either the picture on the screen or in the projected sound.

While these instructions cover the operation of the DeVry projector and sound equipment, they can be applied to practically all portable sound reproducing equipment used for the showing of motion pictures.

DE VRY 35m/m PORTABLE SOUND PROJECTOR.----- SERVICING.

PROJECTOR LUBRICATION.

The top feed sprocket has an oil hole in the top of the sprocket shaft, just to the rear of the sprocket itself. The intermittent sprocket and lower sprocket are oiled at the shaft ends as indicated by the red markings. There is also an oil hole in the front plate just above the lower feed sprocket which is indicated by an arrow on the plate.
The sound sprocket is oiled by means of an oil tube located in the supporting bearing, to the rear of the sprocket.
A small oil tube is located just to the right of, and below the top sprocket, above the lens.
The intermittent movement is oiled by means of the oil cup which projects fromthe top of the case.
The motor has two oil cups, one on either side. To reach them, slide out the motor guard which will expose the motor. Be careful to replace guard before starting the motor.
Oil all these locations according to instructions that are supplied by the manufacturer.

CLEANING THE PROJECTOR.

Keep the gate and the aperture clean and bright. Particles of lint and dust will collect around the aperture, these should be removed, otherwise they will mar the screen picture.
Keep the film runners in the gate free from film emulsion, otherwise this will add undue tension on the film and cause the picture to jump on the screen, and may possibly break the film. Remov the emulsion with a rag moistened in alcohol. Do not use any hard metal to scrape off the emulsion. This will only add to the trouble.
Keep all sprocket teeth free from dust and dirt, use a stiff brush for this purpose, a tooth brush will do.
Check from the upper magazine to the take-up, along the film path, for dust and particles of film, the film path should be kept clean at all times.
Keep the projector lens clean. No not touch the glass surfaces of the lens with the fingers or with anything likely to scratch the surfaces. The lens may be removed for cleaning by loosening the screw on the hum of the shutter. Be careful to see that you replace the lens correctly that the front combination is outside, nearest the screen.
To remove the sound drum for cleaning etc, first take the cap off the drum and remove the photo-cell. Then loosen the screw at the left side of the base of the drum and pull the drum out. When replacing the drum see that the screw is properly seated in the hole in the drum mounting. Do not attempt to remove the sound optical system.

ELECTRICAL SERVICING.

Make sure that the plugs connecting the projector and the amplifier to the supply system are making good electrical contact. See that all fuses are firmly screwed into their sockets. Examine switch contacts and see that they are making good electrical contact. Examine tubes to see that they are making good contact between their terminals and the socket terminals.
Remember that tubes, photo-cells and exciter lamps must be replaced from time to time.
******** ********** *****

MOTIOGRAPH PROJECTOR. --------- OPERATING INSTRUCTIONS.

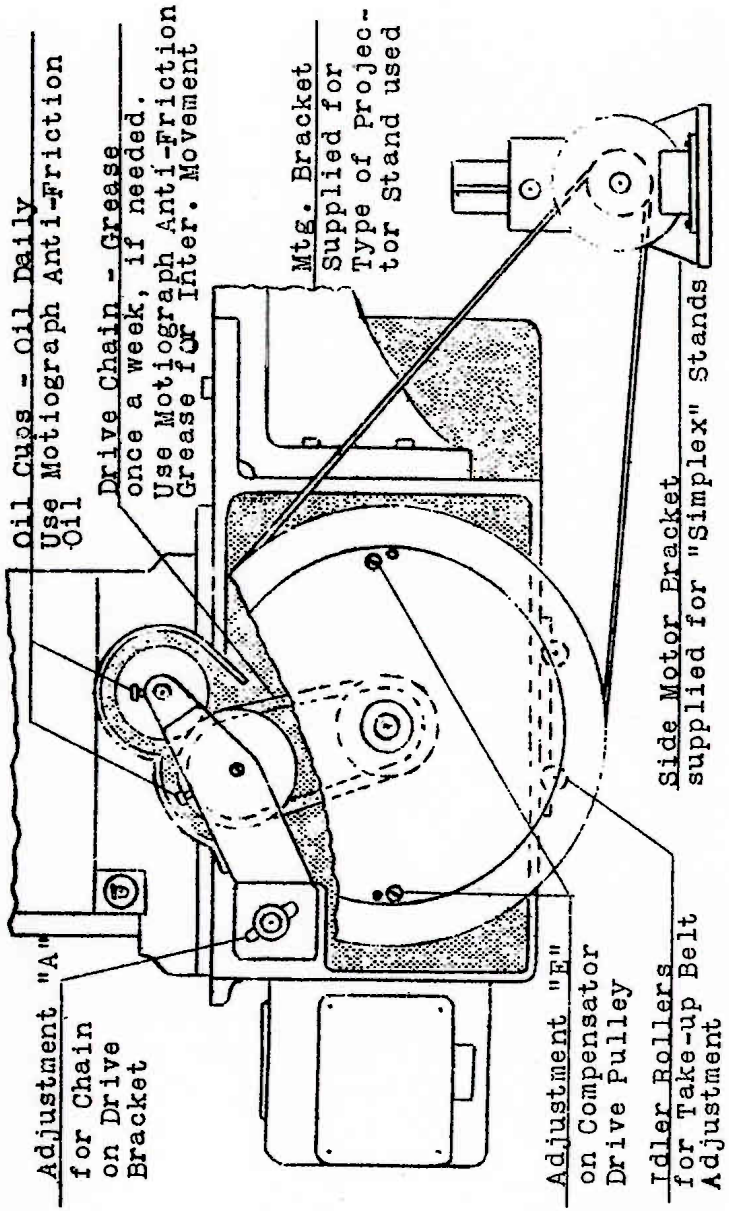
REMOVING DOUBLE BEARING INTERMITTENT MOVEMENT.

First open the film gate to free the intermittent sprocket shoe from the sprocket. Remove the large door from the take-up side of the mechanism, and the left side rear door Remove the large main gear, this is locked to the main shaft by a retaining screw. Back this screw off a few turns with a screw driver and by hitting the screw driver with the palm of the hand sharply, the screw will free the main shaft from the gear. Remove the retaining screw and draw the main shaft free of the gear. The gear itself may now be removed by grasping its lower portion with the fingers and drawing it towards you, gently rocking the balance wheel at the same time. The removal of the movement may now be made. First see that the mechanism is framed so that the center frame is at its lowest position. The movement is clamped to the center frame of the mechanism by two screws operating against sliding slotted washers. Loosen these screws a turn and slide the washers free from the movement casing. Grasp the balance wheel and draw the movement straight out until it is partly free from the center frame casing, then turn it about half a turn rotating the movement in a clockwise direction when it can be easily removed.

ADJUSTING DOUBLE BEARING INTERMITTENT MOVEMENT.

There are only three possible adjustments. These are the adjustment for end play of the intermittent sprocket or star shaft, adjustment for star and cam relation, and adjustment for end play of the cam or balance wheel shaft.
To adjust the end play in the star or intermittent sprocket shaft, loosen the set screw in the outer bearing of the star shaft and press inward on the plunger projecting from the outer bearing and retighten the set screw.
To adjust the star and cam relation, first loosen the set screw near the inner bearing of the double bearing bracket While both bearings of the star shaft are always in alignment with each other, the outer circumference of the bearing next to the movement casing is made eccentric in relation to the center of the bearing hole for the star shaft, thus permitting the star to be adjusted to the cam without disturbing the alignment of the two star shaft bearings. This eccentric bearing is called the inner bearing. Now make the fine adjustment by means of the two screws on the adjustment bracket. These two screws operate against the projection on the double bearing bracket and provide micrometer adjustment. Back one screw off and tighten the other in the direction adjustment is desired as directed by the arrows on the indicating plate. When adjustment has been completed retighten the set screw first mentioned, being sure to see thatthe double bearing bracket is inward as far as it will go against the case.

Under no circumstances should the star be adjusted so tightly against the cam rim that even the slighest bind or drag will be apparent when turning the balance wheel by hand.
If too close an adjustment is made, undue friction will naturally result. This will be evident by rapid wear and scoring of the star and cam surfaces where they come in contact and they will be ruined.
In addition the undue friction will develope heat and expansion of the parts may result in a freezing or seizing of the working parts which will make the movement in-operative.
Always remember that where there is friction there should be lubrication.



ADJUSTING DOUBLE BEARING INTERMITTENT MOVEME: T. (Continued)

To adjust for end play of the cam or balance wheel shaft, loosen the two set screws on the side of the balance wheel. These two screws lock against two long screws which run through the diameter of the balance wheel and seat on two flats on the cam shaft. After loosening these two screws, loosen also the two long screws. Grasp the knurled retaining sc ew on the end of the cam shaft between the fingers and by pressing the balance wh.el inward the drawing outward on the retaining screw, the balance wheel is pressed against the casing and the end play is taken up. Then reset the two long sc ews and lock them by resetting the first two screws and the operation is completed.

If on resetting the screws it is found that the fly wheel is set up too tightly, it may generally be freed by tapping the knurled screw with the handle of the screw driver.

ADJUSTING TENSION OF SLIDING FRAME.

The sliding frame of the mechaniam has four points of contact, all of which are adjustable for tension. Two of these engage with the round upright rod at the forward part of the mechanism and the other two engage the square upright rod at the rear of the mechaniam.

Too loose a tension of the shifting freme will cause an unsteady picture on the screen. Many times the intermittent movement is blamed for this when it is not at fault.

To test, place a finger on some portion of the sliding freme, when the mechaniam is in operation, so that part of the finger will also touch either the round or square upright rod. If the tension is too loose your finger will detect en up and down vibration of the sliding frame.

To correct the tension should be equilized as much as possible at all four points, and should be sufficient to prevent vibration of the frame while the mechaniam is in operation. The tension should not be so tight that the framing device is hard to operate.

The screws regulating the tension of the sliding frame on the round rods are reached through the holes provided on the front of the mechanism. The upper hole in the front plate of the mechanism and the lower hole in the front of the machaniam base casting.

SETTING HORIZONTAL SHUTTER

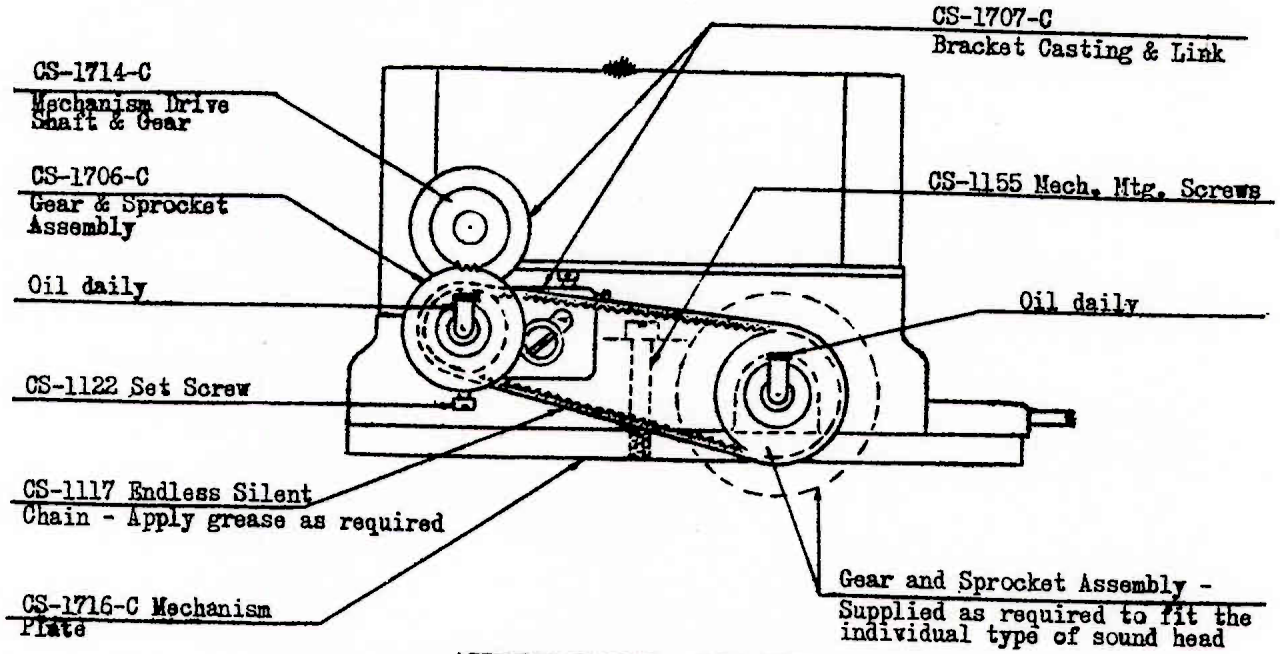
This operation is only necessary at such times as the Intermittent movement has been removed from the mechaniam.

Insert the movement in the mechaniam, locking it firmly in position, paying no attention at this time to the correct setting of the shutter.

After the movement is in place, remove the cover over gearing of horizontal shutter. This is accompolished by slightly loosening the knurled screw with oil cap at the top of the gear cover.

This will disclose a large flat-headed screw retaining the drice gear on the shutter shaft. Loosen this screw one turn holding the shutter blades with the fingers to prevent the shutter turning. This will free the shutter from the gear and the shutter may be revolved.

Immediately under the gear on the shutter shaft is another gear called "gear on shutter drive shaft". Before attempting to set the shutter see that this gear is positioned so that it is centered directly under the gear on the shutter shaft. This is accomplished by loosening the clamping handle over the shutter drive shaft bearing. Then by turning the knurled shutter setting knob on the opposite side of the shutter housing, this gear may he positioned as directed.--Tighten the clamping handle again and the setting of the shutter may be done as directed on the next chart.



ASSEMBLY LAYOUT - SIDE VIEW
MODEL H-U MECHANISM

SETTING HORIZONTAL SHUTTER (Continued)

Turn the balance wheel of the movement in its proper rotation until the intermittent sprocket is just starting to move. Hold balance wheel still in this position. See that the horizontal shutter is in the "open" position, that is, so that the light beam would pass through the aperture, then turn the shutter so that top vane turns towards you until the first edge appearing is in line with the two indicating points on either side of the rectangular opening of the shutter housing. Now tighten the large flat-headed screw retaining the gear on the shutter shaft, and the operation is completed.

SETTING SHUTTER DURING OPERATION.

Finer setting of the shutter may be accomplished while the mechanism is in operation by first grasping the knurled shutter setting knob and then loosening the clamping handle on the shutter drive shaft bearing, and adjusting the shutter as desired. Turn the knob clockwise to correct "up" travel ghost and counter clockwise for "down" travel. Tighten the clamping handle when completed.

REMOVING FILM GATE.

First loosen the lock nut on the friction holder and stop arm for film gate. Remove the large-headed screw entirely To remove film gate, pinch the two small hinge pins at the upper part of the gate together. At the same time lift up the door latch at the bottom of the gate and bring the entire gate assembly straight out towards the lamphouse. Then move slightly towards you to the right which will disengage the gate slide hook. The shutter drive shaft of the horizontal shutter will also come free on this operation.

ADJUSTING TENSION OF STOP ARM AND FRICTION HOLDER.

The friction holder and stop arm for film gate door is provided with adjustment for tension to compensate for different angles of projection. The tension should be adjusted so that it is just sufficient to hold the film gate door in open position and yet permit the door to be closed easily and without great effort. The adjustment is simple;--Loosen the lock nut and turn the large headed screw clockwise to increase tension or turn counter clockwise to decrease tension. Retighten the large screw.

TO REMOVE MECHANISM. Model H.

The Model H projector, the mechanism is mounted by means of four screws inserted upward into the base of the mechanism. When mounted on sound equipment it is first mounted to an attachment plate by means of the four screws and this assembly--mechanism and attachment plate--is then mounted on the sound head.

On Deluxe equipments the mechanism is mounted on an attachment plate having three slotted sections, one forward and two to the rear. The mechanism is attached to the sound head by screws and washers inserted in the three slotted sections.

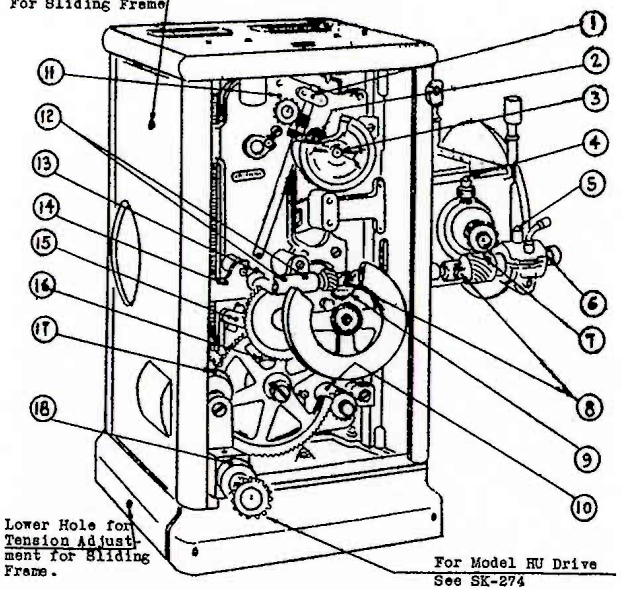
On other sound equipments the attachment plate is provided with two threaded holes and the assembly is mounted by two screws or bolts inserted upward through the sound head into these threaded holes.

The Model H mechanism is removed by removing either the three screws and washers, or the two screws, according to whichever sound head is used.

MODEL H-U.

This is mounted to an attachment plate by two screws inserted downward through the mechanism base casting into threaded holes provided. In removing the mechanism, tip it toward you on the operating side in order to clear it from the lug on the mechanism plate.

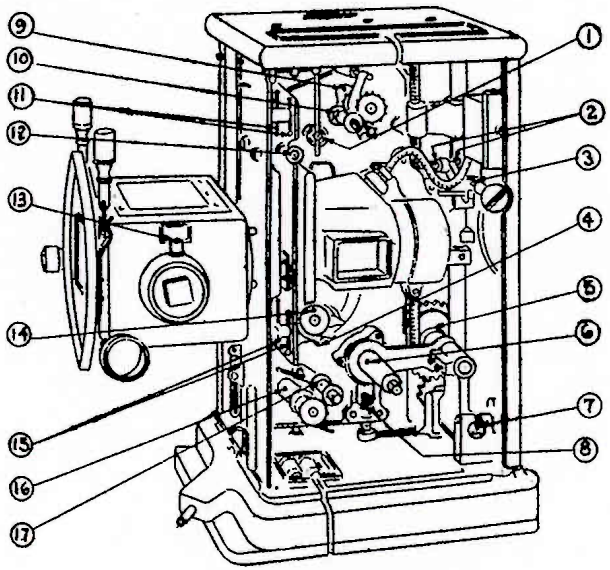
OILING CHART FOR THE MOTIOGRAPH DE LUXE
MODEL H AND MODEL HU
MECHANISMS



GEAR SIDE OF MECHANISM

1,2,10,11,12,13,14,15,16,17,18 - Mechanism Oil Holes -- Oil Daily
3-Governor Bearing--Oil Daily
4-Shutter Ball Bearing. Use Heat Resisting Lubricant as required.
5&6-Shutter Drive Shaft Bearing--Grease as required.
7&8-Shutter Bearing, Gears & Universal Joint--Oil Daily
9-Grease Plug-Intermittent Movement--Grease once a week if needed.

OILING CHART FOR THE MOTIOGRAPH DE LUXE
MODEL H AND MODEL HU
MECHANISMS



FILM SIDE OF MECHANISM

1,2,3,4,5,8,10,11,12,15 & 17 - Mechanism Moving Parts--Oil Daily
6,7,9,14 & 16-Mechanism Oil Holes--Oil Daily
For #13-Shutter Ball Bearing--USE MOTIOGRAPH DE LUXE HEAT RESISTING LUBRICANT AS REQUIRED

SIMPLEX PROJECTOR ---------- OPERATING INSTRUCTIONS.	
TO REMOVE INTERMITTENT MOVEMENT.	Open both doors on gear side of mechaniam. Remove the screw marked S-209-G in Plate number 203. Pull down right rear cover D-9, Plate 206. Place heavy object on this cover to prevent its flying back into upright position. Open film gate B-4 Plate number 205. Loosen the screws marked S-157-B on Plate 202 and push both clamps C-294-BB, Plate 202, out of the way so that they no longer engage framing cam ring R-133-A, Plate 201. Turn flywheel until set screw in collar C-192-G, Plate 202 is facing front of mechanism. Loosen this set screw and grasp fly wheel with right hand and gear G-12, Plate 203 with left hand and pull towards you, thus removing entire intermittent casing anf G-12 with spindle.
REPLACING INTERMITTENT MOVEMENT.	Set framing device in central position. Hold intermittent movement by fly wheel in right hand and gear G-133-G Plate, 203 in left hand with gear G-12, Plate 203 and fly wheel gear G-148-B, Plate 204 meshed together. Insert intermittent casing into framing cam opening A-7, Plate 204, and shaft S-444-G, Plate 204 into its bearing. Push both casing and G-12, Plate 203 in place together. In returning these two gears into position it is necessary to see that the gear teeth on the G-12 mesh with the teeth on the fly wheel gear, in exactly the same relation Examination will disclose a "O" marked on the rim of the fly wheel and another "O" on the metal plate forming part of the G-12, the former denoting a particular gear tooth on the fly wheel gear, and the latter the corresponding gear tooth on the G-12. These two marks must be brought into line when meshing the two assemblies together. This is done by turning gear G-12 around towards fly wheel and after pulling fly wheel outward until gears are disengaged by turning "O" mark on fly wheel until it exactly lines up with the "O" mark on G-12. When the "O" marks are lined up, pull gear G-12 outward and turn vertical shaft gear G-120-G, Plate 204, until large end of taper pin P-107-G, Plate 204, is lined up with "O" mark on gear G-12, after which push G-12 into place, making sure that locating pin on the upper part of A-7, Plate 204 enters its engaging hole in intermittent casing rim, thus placing the movement in its proper position. Replace gear G-112-G, Plate 204, making sure that the finished milled half of the inner hub meshes correctly with the corresponding milled half of the driving clutch C-126-A, Plate 204, this may be accompolished by turning main drive shaft back and forth until the two parts properly mesh and the gear teeth are completely meshed over their entire width. Replace screw S-209-G Plate 203, and the operations on the gear side of the mechanism are now complete. Push clamps C-294-BB, Plate 202, back into place, engaging them with framing ring R-133-A, Plate 201, and tighten up screws S-157-B, Plate 202. Place collar C-192-G Plate 202, over intermediate gear shaft S-444-G, Plate 204, being sure to remove all lateral play while tightening set screw in collar against flat surface of shaft.
ADJUSTING STAR AND CAM.	To adjust, loosen two screws S-125-B,Plate 201, being careful not to loosen them to far so they drop out, then apply the fork end of Simplex spanner wrench to hexagon nut on eccentric bushing B-4, Plate 204, and turn slightly either forward or backward until lost motion which is determined by rocking intermittent sprocket is taken up. Nowxtighten screws S-125-B Plate 201, which completes the operation, but if tightening the screws should bind the star against cam, loosen screws again and allow for binding space.

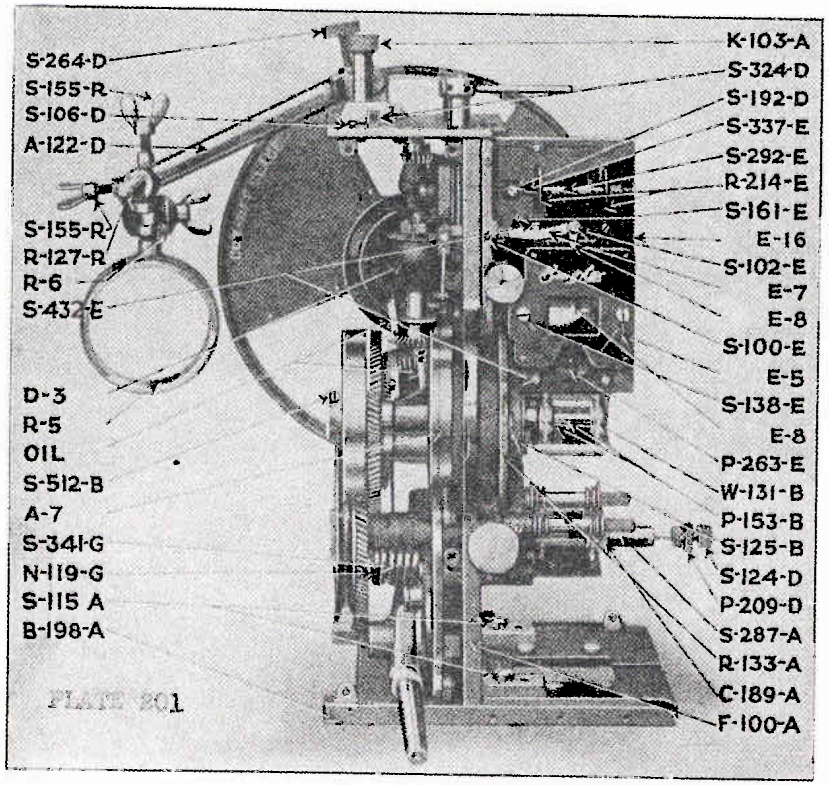


PLATE 201

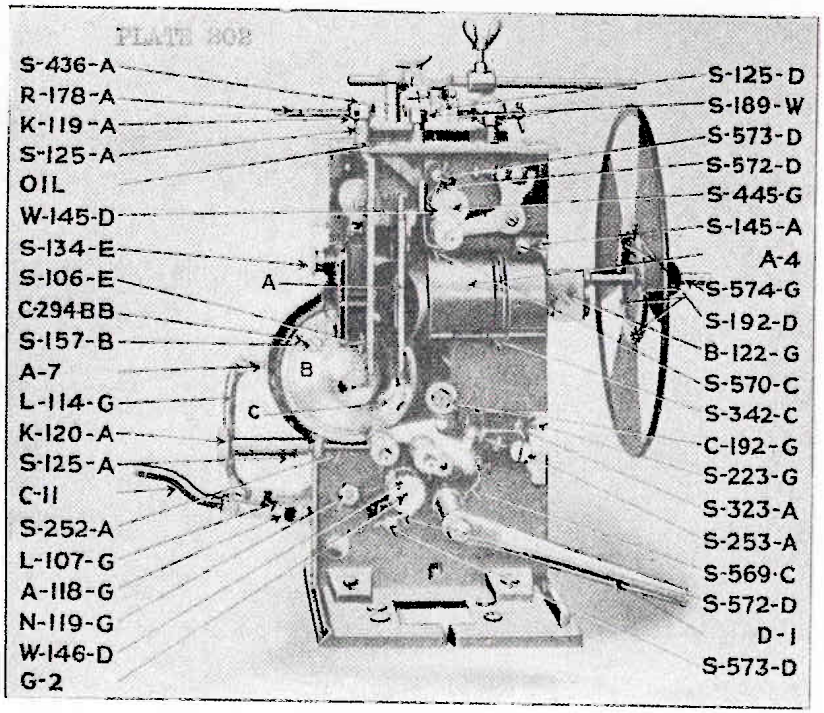
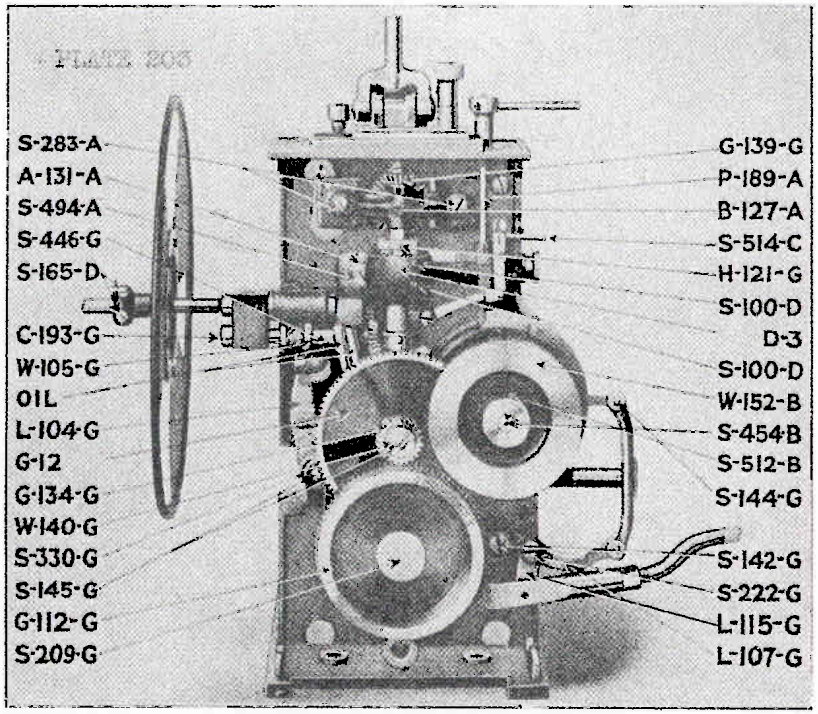
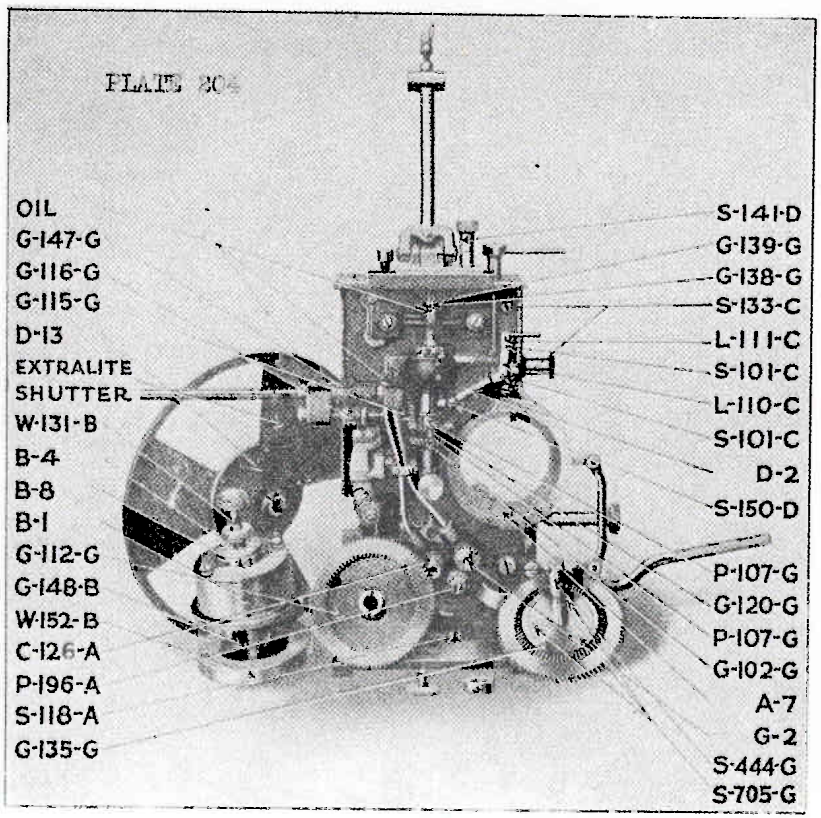


PLATE 202

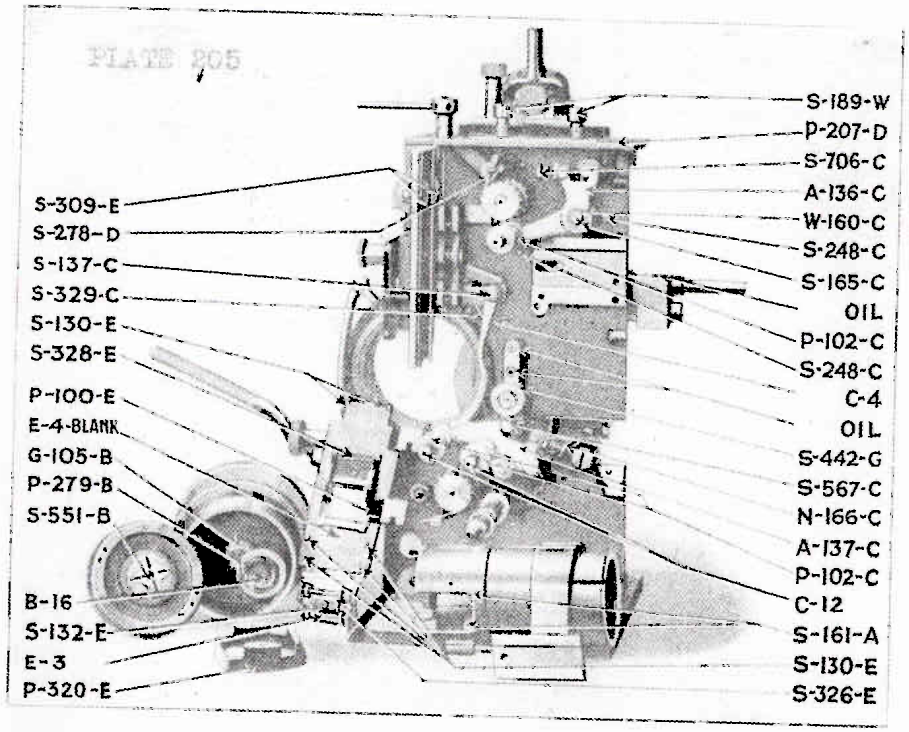
ADJUSTING DOUBLE BEARING STAR AND CAM.	Loosen two screws S-728-BB, shown in Plate 207, and four screws S-729-BB, about one complete turn. The BB-22 star wheel arm will of its own weight adjust itself when the screws are loosened. Before tightening screws be sure there is no lost motion between star and cam radii. Lost motion is determined by rocking the intermittent sprocket when the intermittent movement is in a locked position. If tightening the screws S-728-BB and S-729-BB to complete the operation should bind star against cam, loosen a trifle and allow for binding space.
TO REPLACE BEARINGS IN DOUBLE BEARING MOVEMENT ARMS.	Remove the intermittent movement complete. Remove screws S-724-BB. Push out old bearings and replace with new bearings by forcing them into arm with your hand. Line up screw holes and replace screws tightly.
TO REPLACE BEARING IN INTER-MITTENT CASING.	Remove intermittent movement complete. Remove screws S-728-BB and S-729-BB thus removing double bearing arm complete. Remove screws S-724-BB holding old bearings and replace with new bearings. Reassemble double bearing arm BB-22 and then reassemble intermittent to mechanism.
TO REMOVE DOUBLE BEARING INTERMITTENT CASE ARM.	Remove intermittent casing. Remove two screws S-728-BB shown on Plate 207, and four screws S-729-BB, when arm may be readily removed.
TO REMOVE FILM TRAP DOOR OR GATE.	Open gate in the usual way, lift upward against film protector P-320-E, shown on Plate 205, until gate is lifted entirely free from confining pins. Should the gate bind apply a heavy screwdriver against lower outside corner of gate and tap upward. Do not exert any pressure against film guide E-3, Plate 205, during the operations.
TO REMOVE COMPLETE GOVERNOR UNIT OF VERTICAL SHAFT AND GEARS.	The entire assembly must be removed as follows.--Scratch mark all gears to insure the same mesh when replacing. Remove screws holding top plate P-207-D, shown on Plate 206, loosen set screw S-141-A, Plate 202, and lift off focusing knob K-119-A, shown on Plate 202. Remove left door link screw S-181-D, Plate 206, removing top plate, and complete intermittent movement. This will expose the governor unit as shown in plate 204, carefully drive out the taper pins from gears G-102-G, Plate 204 and G-120-G, Late models equipped with a formica gear have only one taper pin. Remove center screws from governor upper link holder H-121-G, Plate 203, then grasp bevel gear G-138-G Plate 204, and pull upward, pulling vertical shaft out and releasing other connecting parts. Do not loose the washers, and when reassembling be sure the thinner washers seats below gear G-138-G.
TO REMOVE BROACHED HOLE SPIRAL GEAR.	This is shown on Plate 204, G-116-G. Follow the instructions given in the above paragraph, loosen the set screw in collar C-193-G, shown on Plate 203, and grasp bevel gear G-115-G, Plate 204, pulling same to right, releasing shaft and gear in one unit.
TO REMOVE SPIRAL SHUTTER GEAR.	This is shown on Plate 204, G-147-G. Loosen set screw on this gear sufficiently to pull out shutter shaft S-574-G, Plate 202, Remove left door link screw S-181-G Plate 206, and upper and lower screws holding left front cover C-152-D, Plate 206, by removing cover the spiral gear can be lifted out. To remove intermittent movement from rear shutter mechanism, remove two screws S-987-D. Pull film trap gate lever backward so that gate is open.

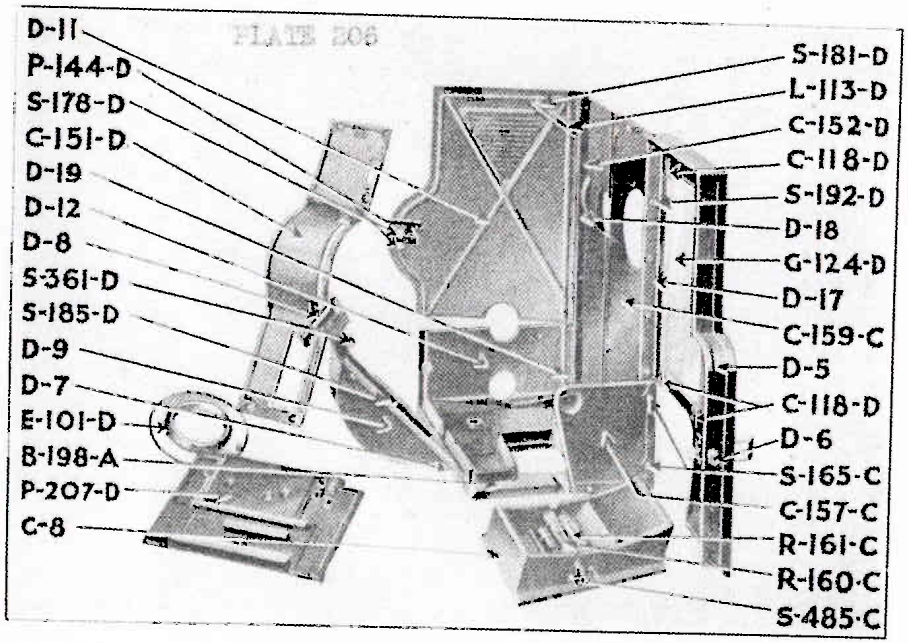




SIMPLEX PROJECTOR. ---------- OPERATING INSTRUCTIONS.

TO REMOVE REVOLVING SHUTTER SHAFT.	Shown on Plate 202, S-574-G. Remove set screw in large spiral gear G-147-G, Plate 204, and pull shaft outward. The set screw in shutter shaft is quite short and is fitted with a pointed end which engages in a counter-sunk hole in shutter shaft. It is advisabl to take this screw entirely out, in order to avoid demaging the bearing end of shutter shaft. Remember on account of its small size this screw is easily lost in handling.
TO REMOVE SHUTTER BLADE.	Remove the ten screws from shutter blade if using old style shutter, and five screws S-192-D, Plate 202 if the new type shutter is being used.
TO REMOVE SHUTTER ADJUSTING SLIDE BLOCK.	This is shown on Plate 202, S-323-A. Remove intermittent casing complete. Remove covers C-157-C, Plate 206, C-152 -C, C-159-C, and roller holder C-8. Remove link screw S-181-D and take out framing slide lever L-104-G, Plate 203, drive out entirely the stop pin which is located near upper edge of lowwr track in which the slide block operates. Loosen set screw S-253-A, Plate 202, and turn shutter adjusting knob until all the thread on adjusting screw S-252-A, Plate 202, is entirely disengaged from within sliding block, when the block may be pulled out.
TO REMOVE SHUTTER ADJUSTING SCREW OR SHAFT.	Shown on Plate 202, S-252-A. Remove pad roller arm washer screw S-165-C, Plate 205, on lower pad roller, lifting the pad roller up in order that rollers will clear sprocket teeth, pull entire pad roller unit outward and off its containing stud. Loosen lock nuts on threaded portion of shutter adjusting screw, and the shaft may be pulled out by grasping knob K-120-A, P 202.
TO REMOVE FRAMING CAM.	Remove complete intermittent casing. Then remove connecting link screw S-144-G, Plate 203, take out screws holding left back cover C-151-D, Plate 206 and remove cover. Insert thumb of left hand into mechanism and push framing slide lever L-104-G, Plate 203, forward as far as it will go, then insert block of wood about one inch thick between broached hole spiral gear G-116-G, Plate 204, and the inner edge of shutter gear bracket. This block will effectively hold framing slide lever to one side relieving pressure of tension block from edge of eccentric framing cam. Loosen with a long slender screw driver set screw in framing cam adjusting ring R-133-A, Plate 201, which operation unlocks ring when it may be unscrewed and framing cam may be slowly worked around until free of ring, when it is lifted to the left.
TO REMOVE LATERAL GUIDE ROLLER UNIT.	To remove any of the parts of the lateral guide roller unit, it is necessary to go through the same general operation. To remove;-Loosen set screw S-192-D Plate 201, and set screw in stop collar on operation end of shaft, insert screw driver against left hand end of shaft, starting same outward, grasp free end of shaft with plyers and pull out entirely. This operation will cause all of the lateral guide roller units to become disconnected. In replacing make sure that they are in alignment with film travel path.
TO REMOVE AUTOMATIC FIRE SHUTTER AND LEVER.	These are shown on Plate 201, E-8. Remove link retain screw S-102-E, Plate 201, and entire lateral guide roller unit as described in last paragraph, then lift fire shutter out of confining track.

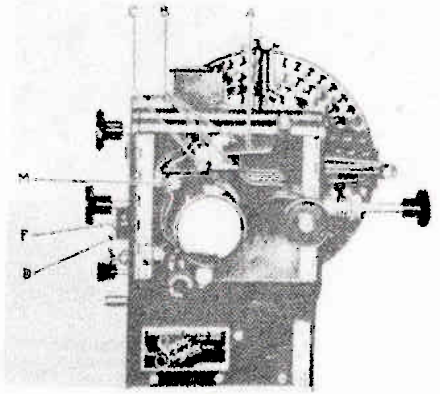




SUPER SIMPLEX PROJECTOR. OPERATING INSTRUCTIONS.

LENS CENTERING DEVICE.

On the top and front of the lens mount, outside of the mechanism is a lever which may be thrown laterally from left to right. This lever is shown at A in the photograph. In the position as shown the lens is accurately centered on the standard or proportional sound film aperture, when thrown over to the left it will be centered for the standard silent or disc aperture.



"A" shows the position of lever to center the lens on the proportional sound film aperture.

Just within the glass door of the mechanism in the upper right hand corner will be found a lens holder lock screw This screw is attached to a clamp provided in order that the lens centering lever may, if desired, be locked in fixed position and also to apply a slight tension that eliminates vibration of the lens centering unit.

REVOLVING SHUTTER.

To set the revolving shutter, bring the intermittent sprocket from rest down two teeth, using the lower end of the film shoes as a guide, then set the center of the shutter on the optical axis, locking it in this position See that the throw of the shutter adjusting screw is set centerally in order that the shutter may be adjusted in both directions if it is not set at directly the proper position on the shaft. The entire shutter may be exposed by removing the front shutter guard, this is done by removing the three nuts and washers and slipping the front shutter guard from its supporting studs.
The shutter adjusting knob is connected through a train of gears and shafts to the shutter shaft and turning it in either direction will revolve the shutter shaft to the right or left respectively, so that the shutter may be accurately set while the projector is in operation, after it has been temporarily set and locked on the shutter side.

LENS FOCUSING KNOB.

The lens focusing knob projects out through the front of the mechanism and is of the micrometer type.
One complete turn of this knob moves the lens mount forward or backward approximately .040 inches, depending upon the direction of rotation.

OILING.

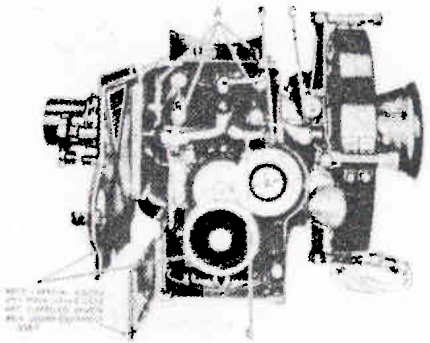
All bearings in the frame are reached by means of oil tubes, located on the gear side of the mechanism, these can be seen on the photograph.
The rear bearing of the shutter shaft, marked C on the photograph, has a direct oil hole.
All oil holes should receive oil at least once a day.

OILING INTERMITTENT MOVEMENT.

To place oil in the intermittent casing proceed as follows--

1st--Set the framing handle to the position which brings the red line on the oil sight to a horizontal position.

2nd--Immediately above the flywheel, in the shutter shaft support casing, marked E on the photograph, will be found a window or hole milled through the casing, through this can be seen a portion of the shutter shaft.
Just in front of the shutter shaft is the oil hole marked B on the photograph, leading to the intermittent casing. Sufficient oil should be inserted through this tube to bring the level in the oil case up to the red sight line.



Photograph showing location of oiling tubes and holes on Simplex Super Projector.

There are other oil holes which should receive oil occasionally, two which provide lubrication to the bearings of the Film Gate opening shaft, one that provides lubrication to the rear bearing of the Frame shaft and two which provide lubrication to the bearing of the Shutter Adjusting Shaft

SOUND APERTURE AND PICTURE CENTERING DEVICE.

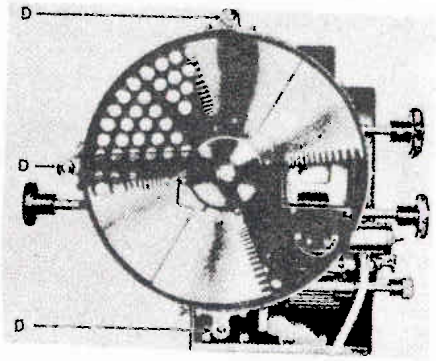
In the vertical sliding aperture plate there are two standard apertures, one for straight film projection the other for use with sound film.
When using the sound film aperture it is necessary to change to shorter focal length lenses.

APERTURE PLATE.

The aperture plate slides vertically behind the film tracks on the film trap. When located in its upper position it carries the standard silent film aperture. For use with sound film the aperture plate is used in its lower position.

SETTING LENSES.

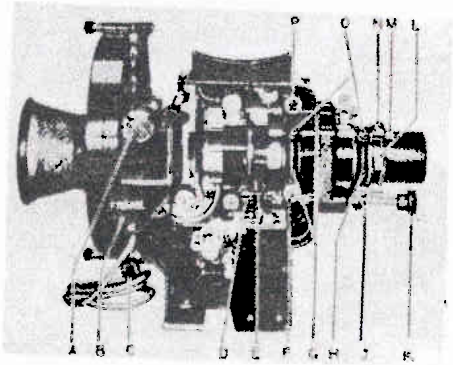
When setting lenses in the Super Simplex lens mount the following procedure must be observed--By turning the lens focusing knob, "K" in photograph on bottom of this page, set the focusing nut E centrally on the focusing thread D.
Loosen the lens clamps screws F and J. Slip the rear lens



SIMPLEX REVOLVING SHUTTER.

adapter (if one is necessary) over the rear combination lens without clamping it on the barrel. Slip the lens in through the front of the lens mount and bring it into approximate focus by sliding it back and forth in the mount. When in focus slightly tighten the front lens clamps screw J, so that the lens will not slip.
Slip the rear lens along the lens until it centers in the rear lens clamp G.
Loosen the front lens clamp screw J, and carefully remove the lens.
Tighten the clamp screws so that adapter will then be tightly clamped on the rear lens combination, the lens is then permanently assembled for future use and may be accurately focused by the focusing knob in the regular way.

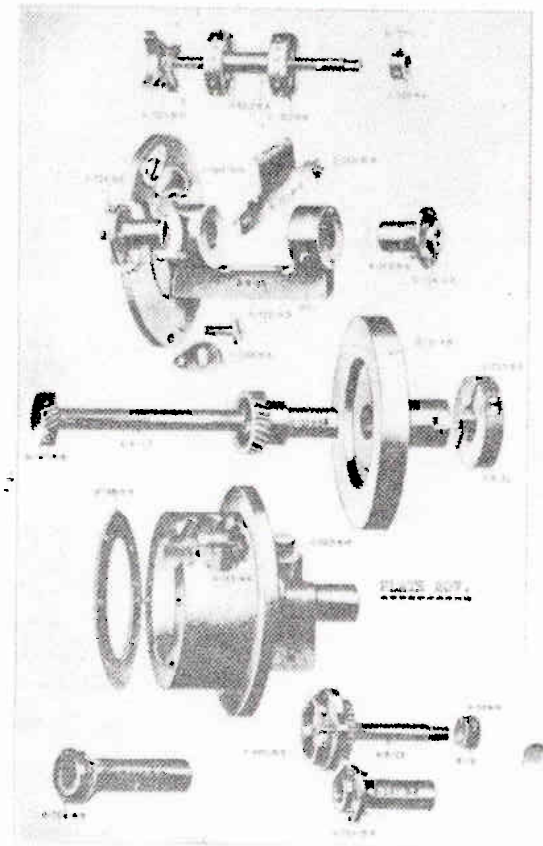
With some Ross lenses it may be necessary to shim them up in order to bring them up to the standard diameter to clamp them in the front lens clamp, and the shims provided should be used for this purpose.



SIMPLEX PROJECTORS. ---------- OPERATING INSTRUCTIONS.

TO REMOVE CAM FROM SUPER SIMPLEX MECHANISM.

To remove cam BB-38, Plate 207, first remove intermittent case complete. Remove the six screws on cover, two marked S-728 BB and four marked S-729-BB on Plate 207, this will dismantel BB-22 from case. Next loosen two flat head screws in flange of locking nut BB-39, Plate 207, and remove from cam shaft BB-38.
Grasp the cam, pulling it outward, removing the cam, gear and spindle complete, making sure that flange of cam does not interfere with the edge of the oil box.



TO REMOVE FLY WHEEL SHAFT AND GEAR. DOUBLE BEARING MECHANISM.

Loosen fly wheel lock nut screw S-725-BB, Plate 207, removing lock nut BB-30, by inserting a screwdriver in end of fly wheel shaft and turning shaft clockwise until threads of shaft are free from lock nut.
Pull fly wheel gear and lock nut away as a unit.
The shaft can now be removed from opposite side of case.

TO REPLACE INTERMITTENT MOVEMENT, DOUBLE BEARING.

Follow instructions given for the single bearing unit, except that part numbers are as follows instead of those shown---G-133-G, Plate 203 becomes G-181-G-------G-148-B Plate 204 becomes G-185-BB---G-120-G becomes G13, P-107-G Plate 204 becomes P-368-G and S-157-B becomes S-728-BB.