TM 11-2386

R DEPARTMENT TECHNICAL MANUAL

CAMERA

PH-274

WAR DEPARTMENT • *FEBRUARY 1946*

WAR DEPARTMENT

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Refer to FM 21–6 for explanation of distribution formula.

CONTENTS

PART FOUR. AUXILIARY EQUIPMENT.

PART FIVE. REPAIR INSTRUCTIONS.

DESTRUCTION NOTICE

WHY—To prevent the enemy from using or salvaging this equipment for his benefit.

WHEN—When ordered by your commander.

HOW—1. Smash—Use sledges, axes, handaxes, pickaxes, hammers, crowbars, heavy tools.
2. Cut—Use axes, handaxes, machetes.
3. Burn—Use gasoline, kerosene, oil, flame throwers, incendiary grenades.
4. Explosives—Use firearms, grenades, TNT.
5. Disposal—Bury in slit trenches, fox holes, other holes. Throw in streams. Scatter.

USE ANYTHING IMMEDIATELY AVAILABLE FOR DESTRUCTION OF THIS EQUIPMENT.

WHAT—1. Smash—All lenses, batteries, sunshade and matte box, viewfinder, cases, magazines, and the motor.
2. Cut—All cords and connections, straps, and belts.
3. Burn—All film, tripods, triangle, barney, fabric cover, changing bag, and this manual.
4. Bend—All reels and cans.
5. Bury or scatter—All that remains.

DESTROY EVERYTHING

Figure 1. Camera set up for normal operation.

PART ONE
INTRODUCTION

Section I. DESCRIPTION

1. General

Camera PH–274 (Mitchell Standard Silenced) (fig. 1) is a 35-millimeter motion picture camera with accessories designed for studio and field production work. It is driven by a motor to which power is supplied by a 12-volt storage battery. It is not entirely silent in operation but, as the alternate gears are fiber, it is silent enough to be used with double-system sound recording provided the microphone is not placed too near the camera, and provided the camera is encased in the barney supplied. For this purpose Recording Equipment PH–346–A may be used. Camera PH–274 includes all accessories necessary for photographing silent pictures, as well as those required to adapt it for use with a sound recorder.

2. List of Components (figs. 2, 3, 4 and 5)

The following is an itemized list of the equipment with the components grouped according to the cases in which they are carried. This list is based upon current procurement and issue control estimates. Actual issues may vary from time to time depending upon the availability of items and the needs of particular assignment units.

a. Camera Case. The camera case is 10 inches high by 11 inches wide by 21½ inches long, and weights 45 pounds fully packed.

1 camera with 4 lenses, lens caps, dust plate, and rubber visor for focusing telescope.
1 camera crank.
1 tripod crank.
1 oiler, ½ ounce.
1 bottle, camera oil.
1 bottle, lens cleaner.
1 magazine drive belt, spare.

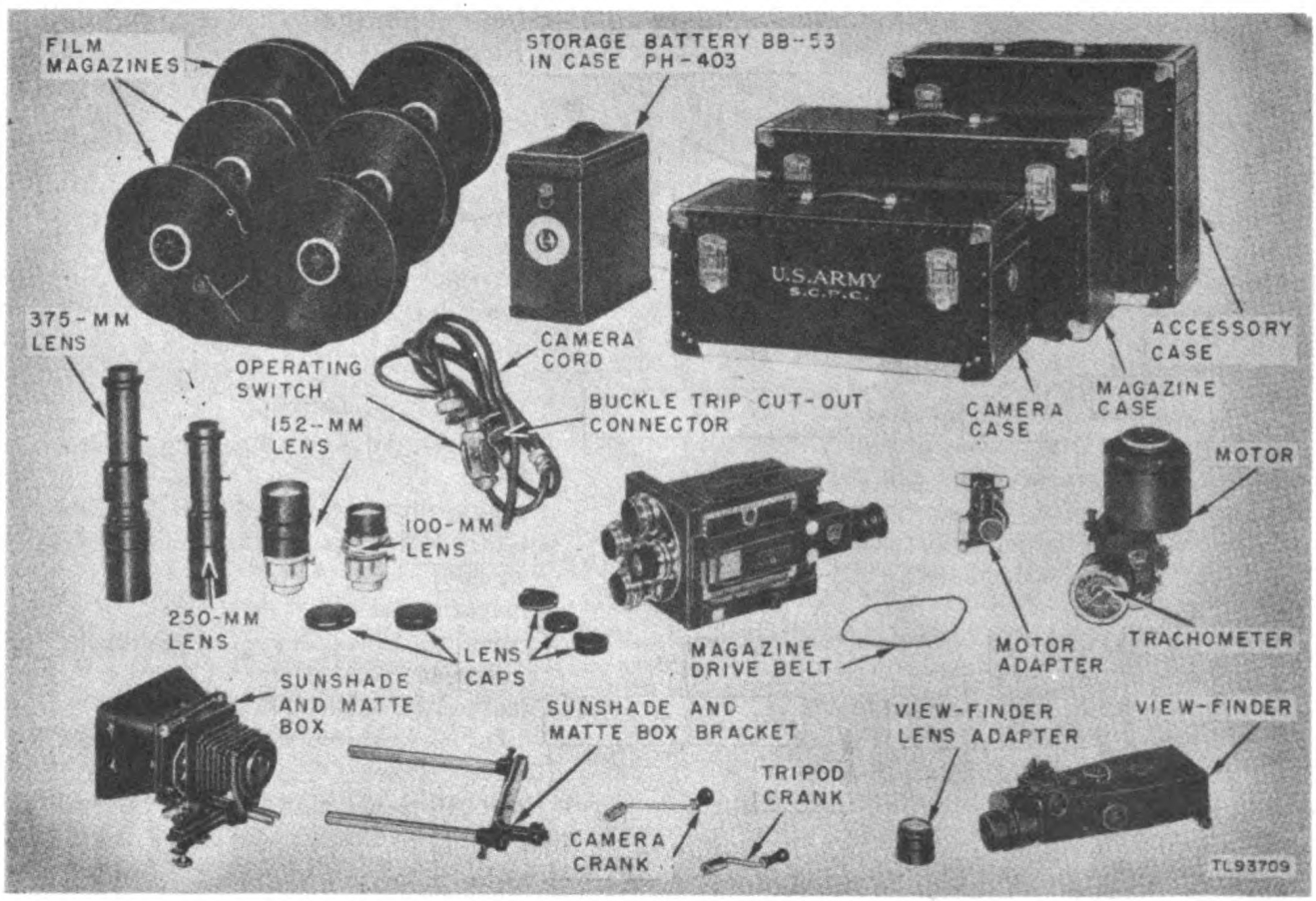

Figure 2. Components of Camera PH–274.

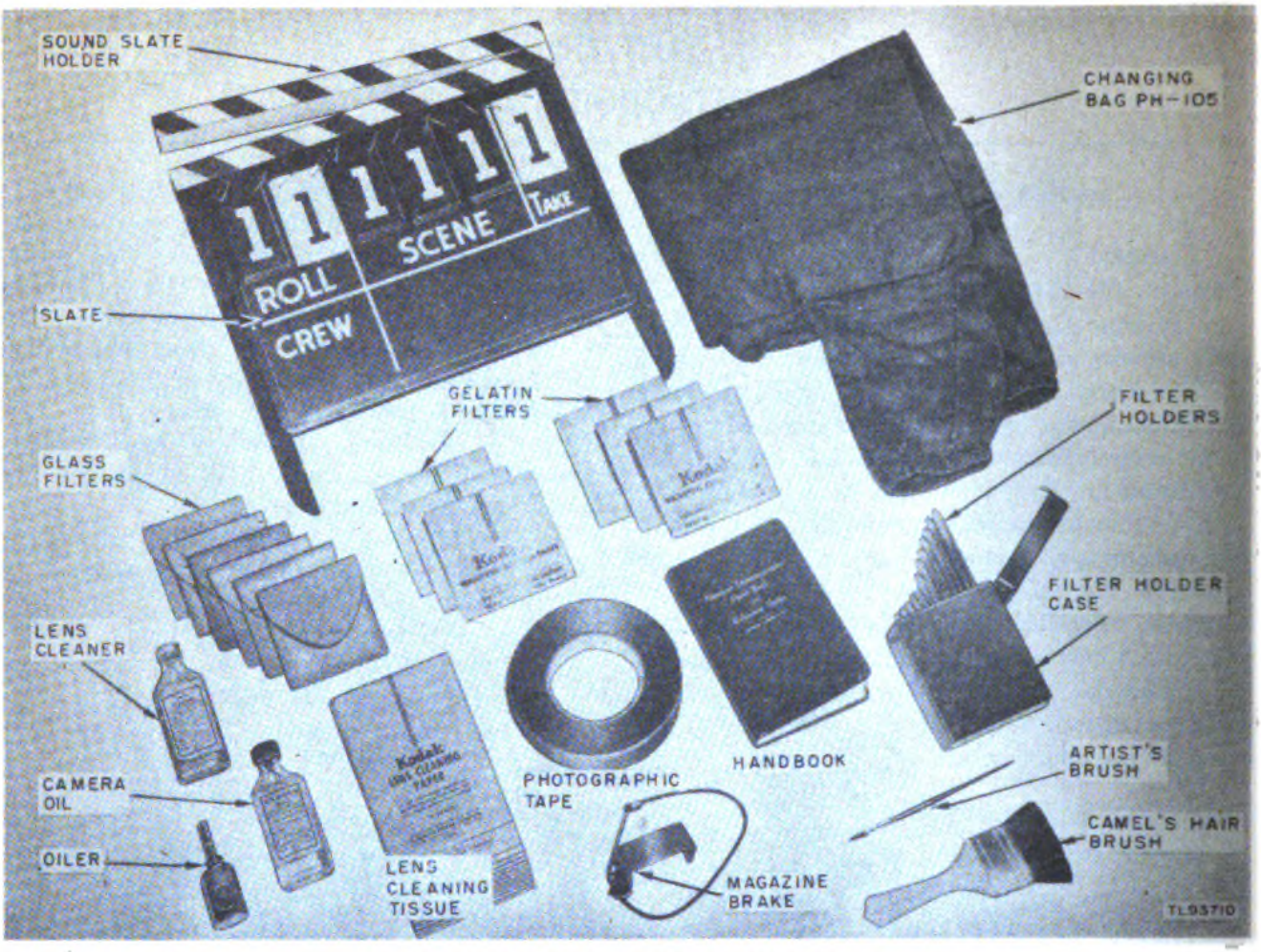

Figure 3. Components of Camera PH–274.

b. MAGAZINE CASE. The magazine case is 14 inches high by 10½ inches wide by 23 inches long, and weighs 45 pounds fully packed, with magazines unloaded.

3 film magazines, 1,000 feet.
3 film cores (inside magazines).

c. ACCESSORY CASE. The accessory case consists of several compartments and drawers. It is 17½ inches high by 9½ inches wide by 20½ inches long, and weighs 55 pounds fully packed.

1 motor with tachometer.
1 motor adapter.
1 camera cord with buckle trip cut-out connector.
1 view-finder with parallax adjustment.
1 view-finder lends adapter, 152-mm.
1 view-finder lens adapter, 25-mm.
1 sunshade and matte box, with holding bracket.
1 lens, with lens cap, 152-mm.
1 pan handle for tripod head.
1 camel's hair brush.
1 artist's brush.
1 air syringe.
1 package, lens tissue.
1 roll, photographic tape.
1 filter set, B glass, including 6 filters in cases.
1 gelatin filter set, including 6 filters.
1 filter holder set, including 12 filter holders in case.
1 magazine brake.
1 American Cinematographer Handbook and Reference Guide.
2 instruction books, TM 11–2386.
1 100-foot steel or cloth measuring tape.

d. BATTERY CASES. The two battery Cases PH–403 are 6½ inches high by 13 inches wide by 6¾ inches long, and weigh 45 pounds each fully packed.

2 storage Batteries BB–53 (one in each case).

e. Tripod Head Case. The tripod head case is 12 inches wide by 12 inches high by 12 inches long, and weighs 33 pounds fully packed.

1 tripod head.
1 hi-hat (low mount).

f. Items Not Packed in Cases. The following items are not packed in cases:

1 camera cover, fabric.
1 silencing cover (barney).
1 changing Bag PH–105.
1 standard tripod (weight, 24 lb).
1 baby tripod (weight, 8 lb).
1 set of hold-down chains with stage screw.
1 triangle (weight, 3 lb).
1 slate PH–384–A.
1 sound slate holder.
1 25-mm lens
1 250-mm lens } In individual boxes.
1 375-mm lens

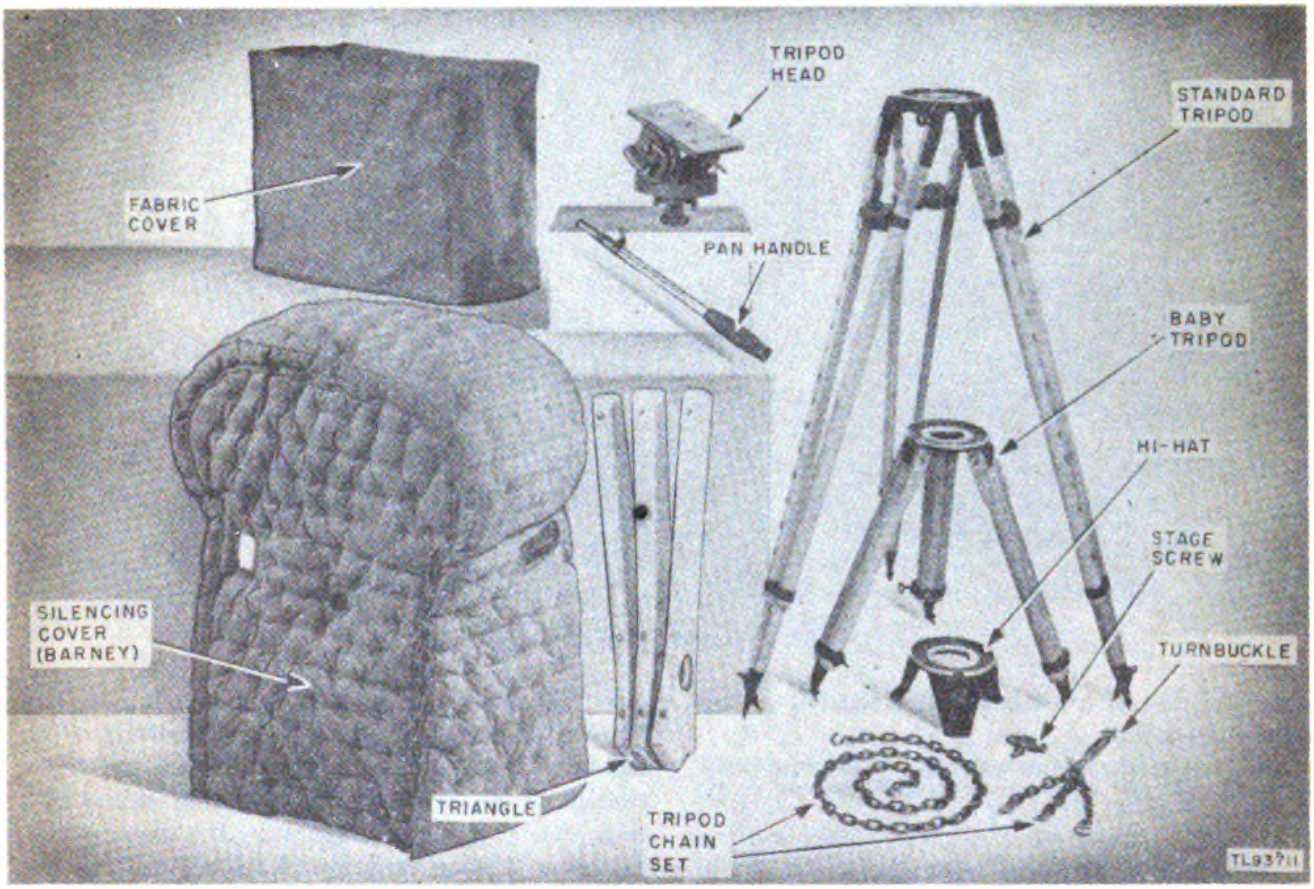

Figure 4. Components of Camera PH–274.

3. Camera Frame

The camera frame is made in two sections, the base frame and the camera box (fig. 8) each of which is cast in one piece from aluminum alloy. The base frame is an **L**-shaped casting consisting of the base plate and the front plate. Mounted on the front plate are the lens turret and the shutter. The base plate contains the rack-over gibs and mechanism for racking the camera box from side to side. The camera box may be shifted from the photographing position (left) to the focusing position (right) by operating a handle and release button (fig. 7) on the rear of the base plate. The camera box is divided longitudinally into two compartments. The left-hand, or operating side, contains the film moving mechanism and the intermittent movement. (See fig. 12.) The right-hand side contains the camera driving mechanism. (See fig. 10.) The operating side has a door hinged at the bottom. The focusing telescope (fig. 6) is an integral part of this door. The drive side is protected by a removable cover fastened by a latch. On top of the camera box is a recessed plate for attaching the film magazine and an opening through which the film is drawn from the magazine to the film compartment of the camera. This is covered by a fiber dust plate when a magazine is not in place. The magazine

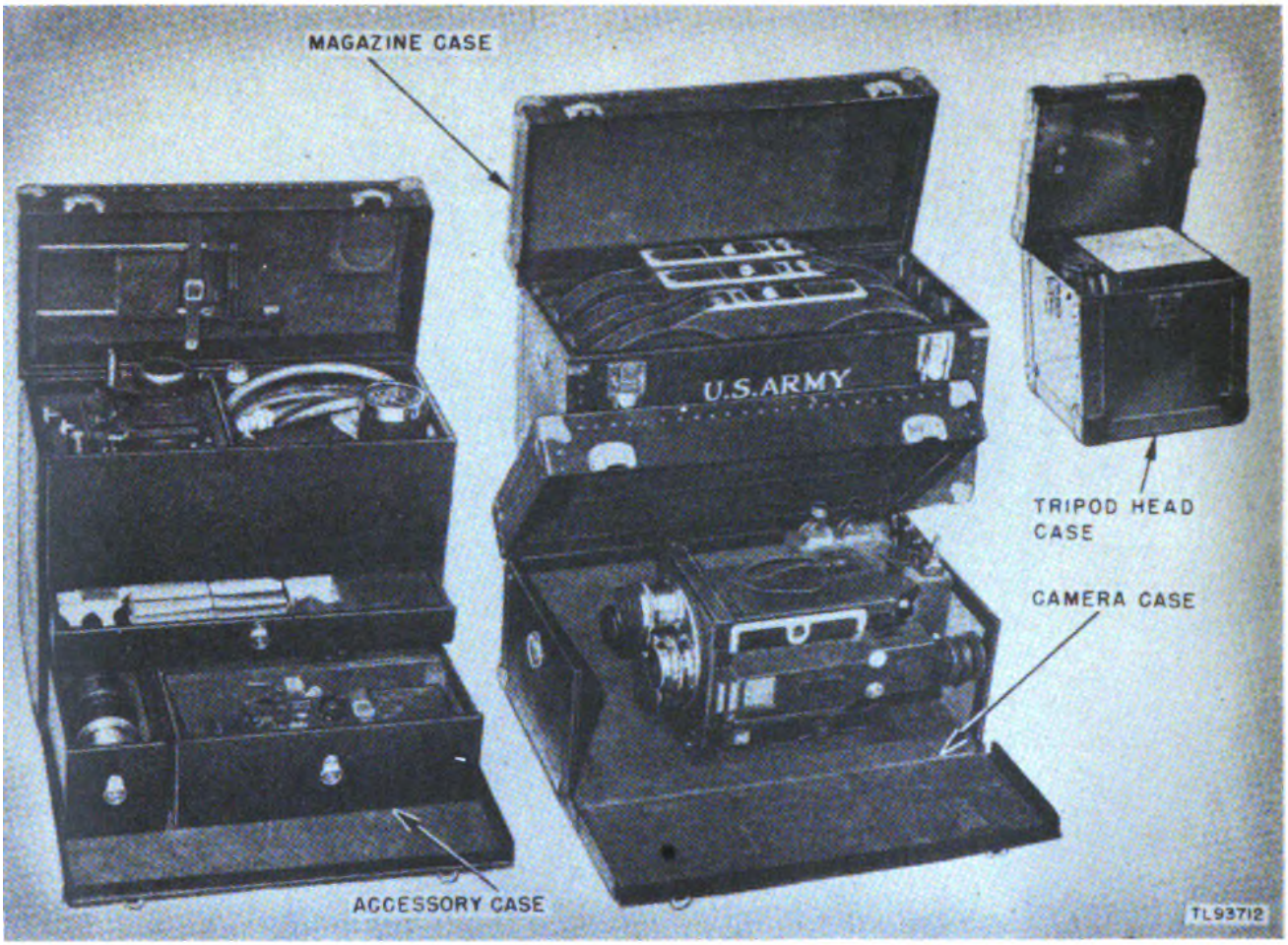

Figure 5. Principal carry cases open.

lrive assembly with a fabric belt is located on top f the camera box.

Note. Throughout this manual right and left refer to the perator's right and left when standing at the rear of the amera.

4. Motor and Power Connections

a. The 12-volt d-c motor (figs. 7 and 8) mounts ertically on the camera box, coupling with the nain drive shaft, and is secured by two thumb- crews. It can be adjusted to operate forward or ackward and will drive the camera at any speed up o 24 frames per second. The camera cannot be perated faster as the fiber gears and plain bearings vill not stand the strain of high-speed operation. A tachometer indicates the frames per second and eet per minute at which the motor is running. The notor automatically takes care of variations in urrent and load so that constant camera speed is ssured. A hand-operating knob on the side of the notor permits the motor to be turned by hand for onvenience in threading.

b. Two Batteries BB–53 (fig. 2), each in a Case PH–403, are supplied to provide power to drive the motor. These are aircraft type, 34-ampere hour, storage batteries. Ordinarily only one is used at a time, one being used for operating the camera while the other is being charged. A battery will last for about 10,000 feet of film on one charging. In cold weather the two batteries may be connected in parallel to increase the current output.

c. The motor is connected with the battery by a 12-foot, rubber-jacketed cord (fig. 2) with a Hubbell twist-lock male connector at one end to plug into the battery receptacle. At the other end a four-contact female connector plugs into the motor receptacle. A six-pole female connector in the cord plugs into the camera receptacle to operate the buckle trip cut-out switch. A toggle switch in the cord serves to turn the motor ON and OFF.

d. A motor adapter (fig. 2) is supplied to connect various flexible shaft drives and specially mounted motors to the camera, such as may be required for synchronous work. The output shaft of the motor

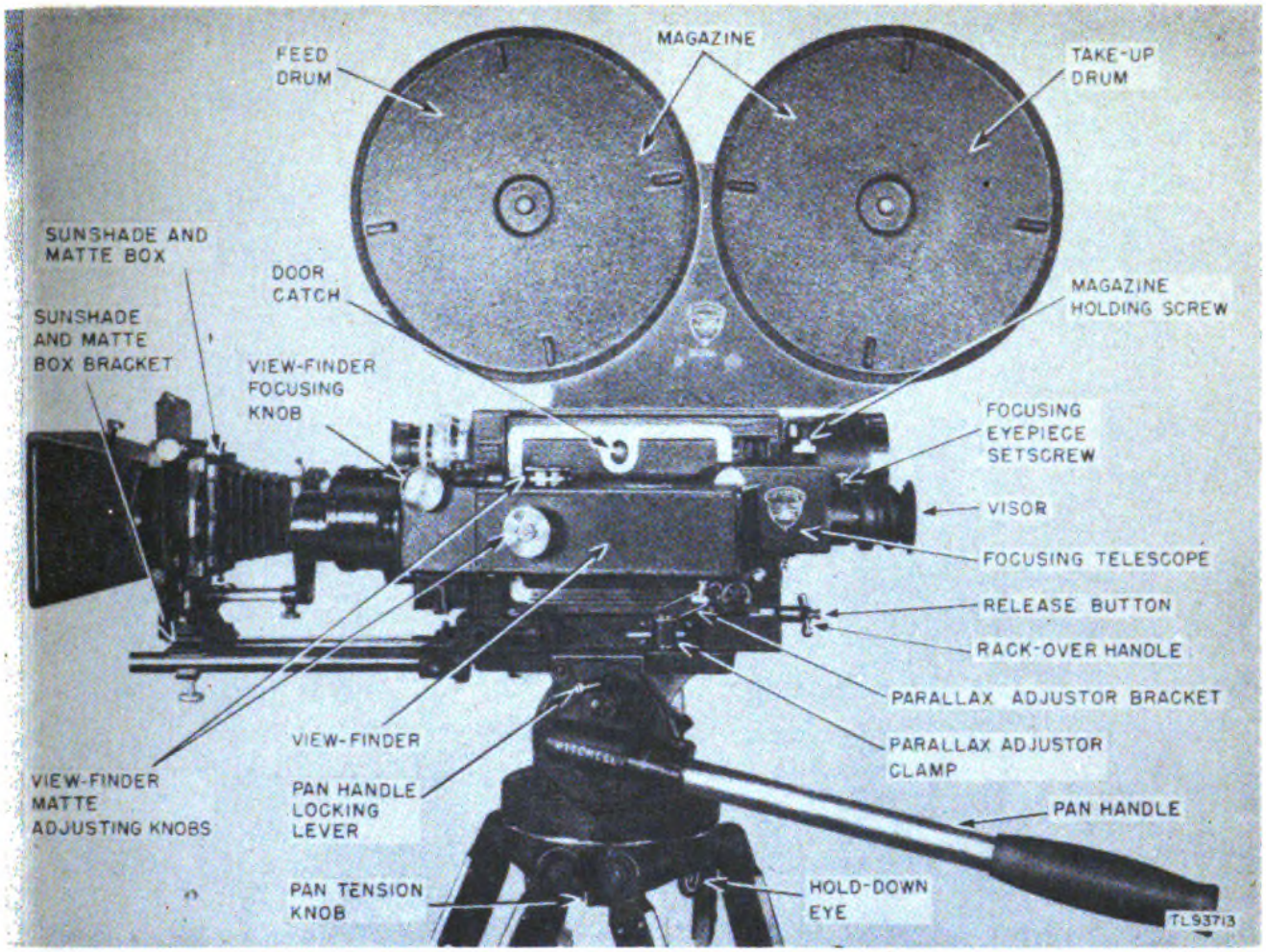

Figure 6. Camera, left side.

adapter connects with the main drive shaft of the camera. The adapter mounts on the camera box in the same way as the motor.

5. Drive (fig 10)

a. To reduce operating noise, each alternate gear throughout the camera is made of micarta, and ball bearings are used only when essential.

b. Two drive shafts project through openings in the right-hand camera box cover. (See fig. 8.) One, the main drive shaft, to which the motor is attached, operates the camera at the rate of one frame per turn. The other, the sprocket drive shaft, operates the camera at the rate of eight frames per turn and is intended for use with a hand crank. The hand crank is to be used only in emergencies, or for rewinding film, as there is no governor in the camera mechanism to regulate speed.

c. Film is drawn from the magazine and fed to the intermittent by a sprocket (fig. 12) with 32 teeth. The film is held against the sprocket by 2 sprocket guide assemblies.

d. A buckle trip is provided to stop the camera immediately in case film breaks or buckles in the camera. The buckle trip lever actuates a switch, on the inside of the right-side cover, which cuts off the power.

6. Intermittent and Aperture Plate (fig.12)

The intermittent moves the film intermittently and holds it in position for the exposure of each successive frame. A pull-down claw draws the film into place behind the aperture, and registration pins on a horizontal shaft actuated by a cam hold the film stationary at the moment of exposure. A pressure plate with two rollers held in place by a spring exerts a slight pressure and holds the film flat at the aperture. The aperture plate has an academy aperture. It is steel with chrome plate and has raised surfaces at the sides of the film path which allow the film to touch the plate only along its edges. A matte slot in front of the aperture allows the insertion of mattes for multiple exposure work.

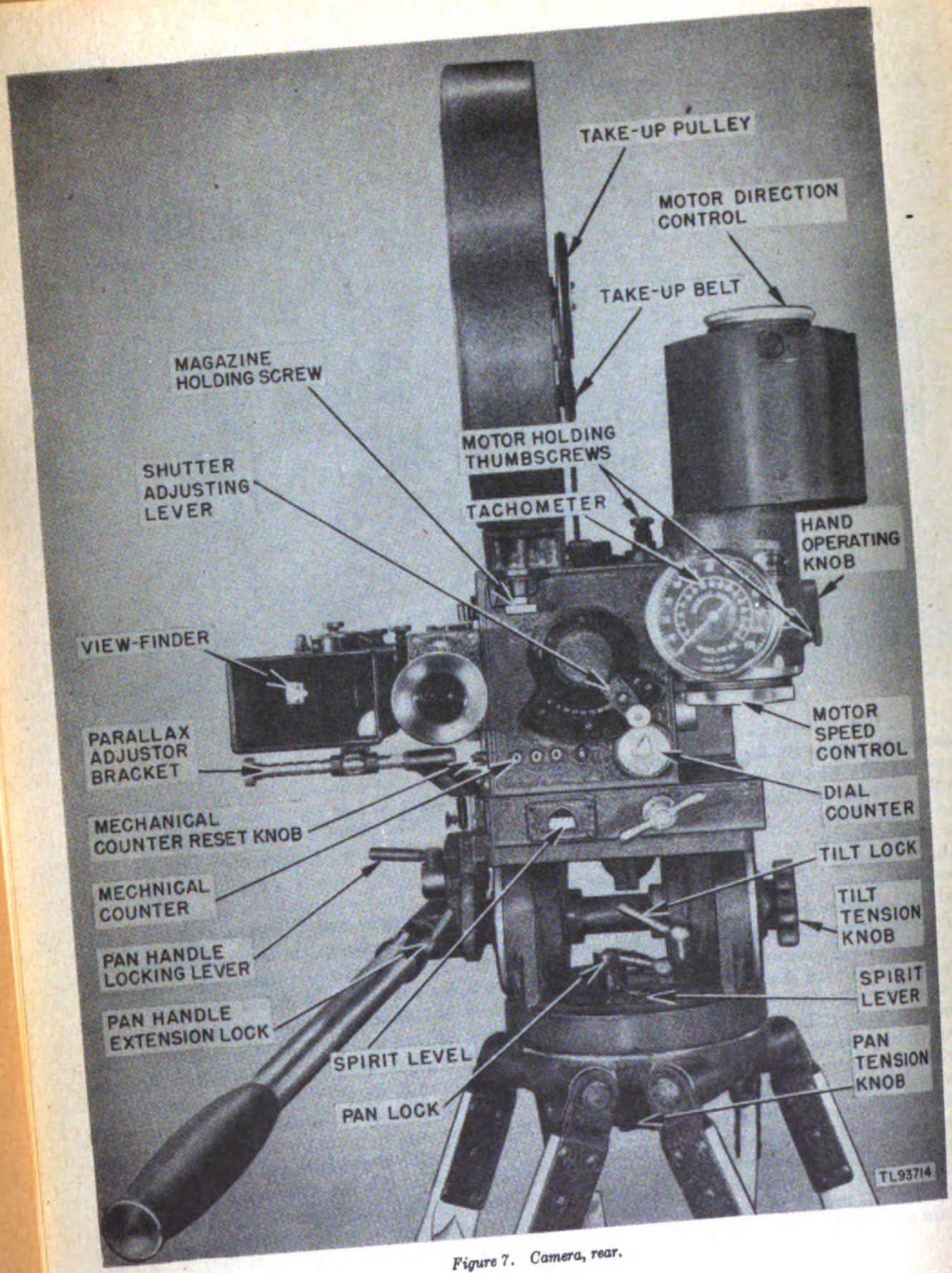

Figure 7. Camera, rear.

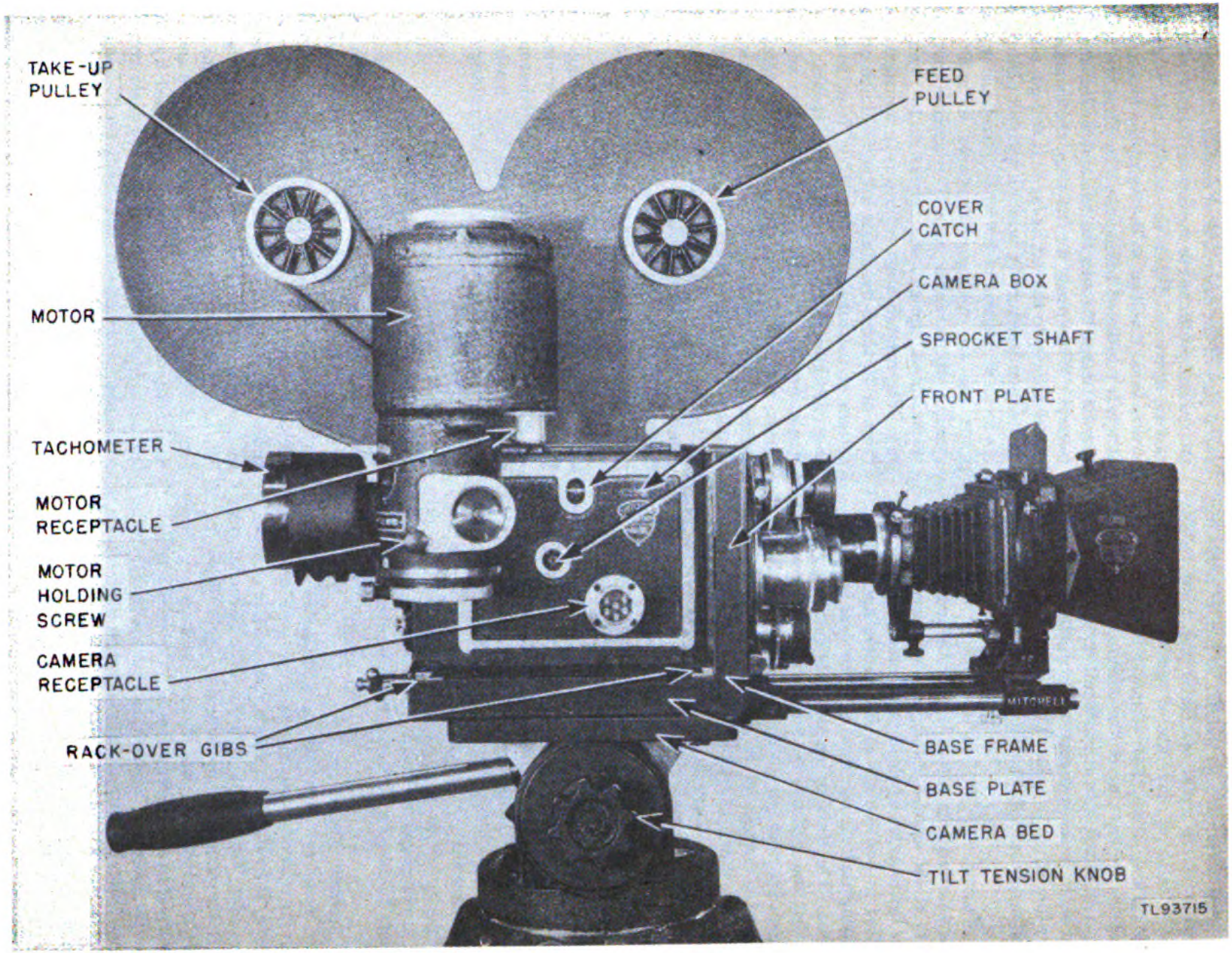

Figure 8. Camera, right side.

7. Shutter

The rotary dissolving shutter is designed for hand-operated dissolves and fades. It has a maximum opening of 170°, and can be closed down to any smaller angle at any rate of speed. The shutter opening scale and shutter adjusting lever (fig. 7) are mounted on the rear of the camera. The shutter is synchronized with the intermittent movement so that when its open segment is in front of the aperture the film is at rest. The film moves while the opaque segment of the shutter covers the aperture.

8. Turret (fig. 9)

The rotating lens turret is mounted on the front plate of the camera frame, and will accommodate four lenses at once, which can be easily and quickly shifted to position before the camera aperture. A locating pin locks the turret when the lens is correctly placed. The locating pin assembly can be adjusted so that the lens will be centered exactly over the camera aperture (when the zero marks are aligned), or so that the lens will be centered slightly above or below the center of the camera aperture. The latter positioning produces the effect of a rising and falling front. The rising and falling front can be used only with lenses of 75-mm focus or longer. It should be used sparingly, and limited to architectural subjects or the like. Immediately after using the rising and falling front, the zero lines of the locating pin assembly should be realigned and the setting knob securely tightened so that the turret will be positioned properly for normal use. Three lenses are fixed in the turret apertures by four screws each. In the fourth aperture interchangeable lenses may be attached by means of key catches. (See fig. 69.) If no interchangeable lens is in place, the aperture should be covered with the aperture cover.

9. Lenses (fig. 2)

The lenses are mounted in micrometer focusing mounts with iris diaphragms, and have focus setscrews, individual lens hoods, and rubber or metal lens caps. The mounts consist of a male mount and a female mount and the threads vary with the different focal lengths. Eight lenses are supplied. The focal lengths are 25-mm, 35-mm, (or 40-mm), 50-mm, 75-mm, 100-mm, 152-mm, 250-mm, and 375-mm. Three lenses are permanently attached to the turret by four screws each. The others are interchangeable and have key catches with setscrews, for quick insertion in the turret.

10. Focusing Telescope (fig. 6)

The focusing telescope is used for accurate focusing and framing through the taking lens. It is an integral part of the camera door casting. Its aperture is sized and positioned to correspond exactly with the camera aperture. When the camera box is racked over as far as it will go to the right, the focusing telescope is positioned behind the lens. Thus, the scene may be framed through the lens and the lens may be focused. When ready for the take, the camera box is racked over to the left as far as it will go, placing the camera aperture in position without disturbing the focus or position of the lens. The focusing telescope has an eyepiece, adjustable to individual eyesight, with a rubber visor. The image is seen on a ground glass, upright and correct as to right and left. The magnification ratio can be adjusted to 5 times or 10 times by sliding a knurled knob on the bottom of the tube. (See fig. 77.) With 10-times magnification the entire field is not visible. Two monochromatic viewing filters, one green and one amber, are built into the tube to aid in judging exposure and contrast. Each is placed in position by turning a knurled button on the outside of the tube. (See fig. 79.) A sliding door in the tube gives access to the ground glass for cleaning and to a matte slot, directly in front of the ground glass, into which celluloid or negative film mattes may be inserted for matte shots and special effects. This matte slot is identical in size and positioning with the matte slot in the aperture plate. After viewing the effect of the matte in the focusing telescope, it may be transferred to the aperture plate matte slot and the camera box racket over in the photographing position for the take.

11. View-finder (figs. 6 and 7)

The magnifying prismatic view-finder with a ground glass screen, is dismountable and is attached to the left-hand side of the camera beside the focusing telescope by means of a dovetail bracket. Adjustable hairline mattes, controlled by two calibrated knobs on the top and side of the finder, may be set to mark the fields of lenses of various focal lengths. The image seen on the ground glass is upright and correct as to right and left. It has a picture area of about 1⅞ inch by 3⅝ inches when magnified by the optical system. Without mattes, the field corresponds to that of a 35-mm lens. With the 25-mm and 152-mm lenses, front element adapters are used on the view-finder lens to change the actual size of the image. When the 25-mm lens adapter is used, the entire area of the ground glass represents the field covered by the taking lens. When the 152-mm lens adapter is used, the adjusting knobs must be set

on the yellow calibration for 152. No provision is made for adapting the view-finder for lenses of longer focal length. The erecting prism objective in the finder is mounted in a sliding mount which is moved in and out for focusing by a manually operated knob on the side of the finder. A parallax adjustor bracket is provided at the rear of the finder which can be fastened quickly to the base frame by a clamp. An independent throw-out permits opening of the camera door. Locking nuts on the throw-out bracket preserve the correct parallax angle so that the view-finder can be swung away from the camera and back without altering the parallax adjustment.

12. Counters (fig. 7)

The camera contains two film counters, located on the rear of the camera box.

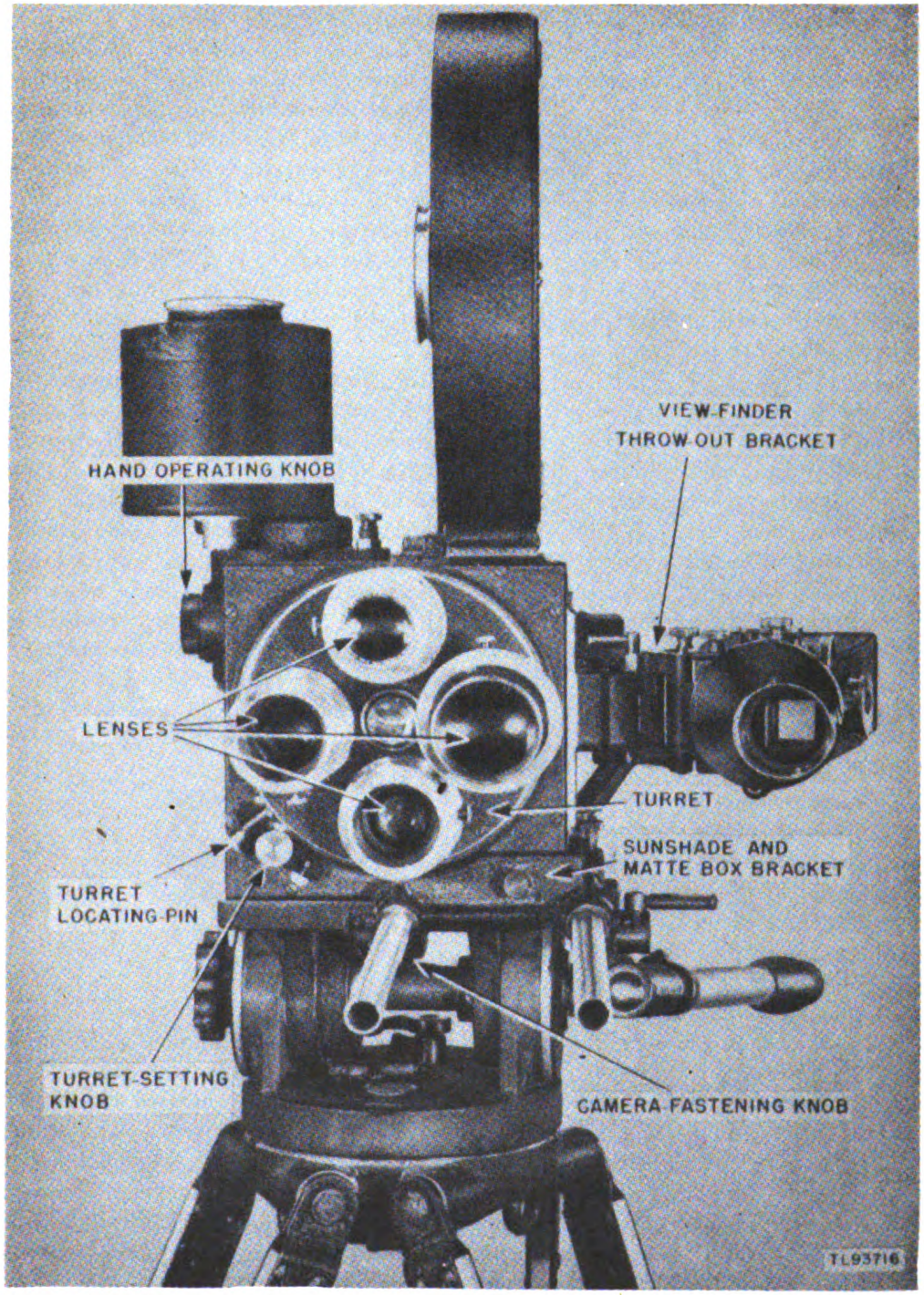

Figure 9. Camera, front, without sunshade and matte box.

a. A mechanical footage counter measures scene lengths and must be set at zero for each new scene by the reset knob (wingnut) on the left side of the camera box. The first three indicators count the feet of film used up to 999, and the fourth indicator counts the number of frames shot within 1 foot of film. The frame counter registers from 1 to 16 only, for the 16 frames in 1 foot of 35-mm film, and cannot be reset.

b. A dial footage counter shows the footage used from the roll of unexposed film in the 1,000-foot magazine. This counter is reset by a knob in the center of the dial whenever a new magazine is put on the camera.

13. Spirit Level (fig. 7)

A spirit level, located on the rear end of the base plate, insures the level positioning of the camera.

14. Magazines (figs. 6, 8, 11)

The film magazine is a separate unit from the camera proper, and is mounted on top of the camera box and secured by a single holding screw. Three magazines of 1,000-foot capacity each are supplied with the equipment. The magazine has a feed drum and spindle and a take-up drum and spindle. The film passes from the magazine to the camera and back through a light trap composed of three velvet covered rollers held in contact at even pressure by means of spring tension bearings. As the film is drawn out of the magazine these rollers turn, eliminating any chance of film friction. A contractible take-up core expands when pushed upon the spindle and contracts when removed, permitting the core to be removed easily from a tightly wound roll of film. The take-up spindle is turned by a belt and pulley on the outside of the magazine, connecting with the main drive shaft of the camera. An automatic tension roller holds the belt tight. The feed spindle also has an outside pulley to which a brake (fig. 60) with a spring belt can be attached if needed to retard the unwinding of film from the feed reel. Magazines are constructed of cast aluminum alloy and the drums are lined with corduroy. The covers of the drums screw in, making a lighttight fit.

15. Sunshade and Matte Box (figs. 6 and 86)

The combination sunshade and matte box is fastened to the front of the camera. It is supported by a bracket of two steel tubes, has an adjustable bellows, and has provision for both horizontal and vertical adjustment. The small end fits over the lens and can be easily freed to permit rotation of the turret. With the bellows fully collapsed the sunshade clears a 35-mm lens. It cannot be used with lenses of shorter focal lengths. If desired, the bellows can be removed entirely. In the matte box are holders for filters or diffusion disks, gauze slides, solid mattes, and a pola screen. Nearest the lens is an opening for various types of diffusion disks. Next forward is a slot with a frame to hold 2-inch Wratten, or similar glass filters. In front of the bellows is a compartment for 3-inch glass filters, then a slot for the adjustable gauze slide in which several gauzes may be inserted and adjusted. Then a slot to receive slides with clipped edges for holding gauze to soften edges, and finally a slot to receive solid mattes, which can be inserted from the top, bottom, and both sides. In addition, the matte box can be disassembled and various adaptations made. There are holding screws and other devices and adjustments by means of which the matte box can be adapted for any conceivable type of matting. This manual will not attempt to describe the various ways in which it can be used.

16. Filters and Filter Holders (fig. 3)

Two sets of six filters each are supplied, one consisting of plain gelatin filters, the other consisting of gelatin cemented between B glass. The glass filters are used in the matte box. A set of 12 filter holders is supplied for the gelatin filters. The gelatin filters are to be cut and mounted in the holders and inserted into a filter slot behind the lens (fig. 87), the opening of which is in the viewfinder mounting bracket that projects from the side of the front plate. The glass filters are 3 inches square and the plain gelatin filters are 4 inches square. The following types are furnished in both sets:

Light filter 50 ND.
Light filter 100 ND.
Light filter aero 2.
Light filter 5N5.
Light filter A.
Light filter G.

17. Tripods (fig. 4)

Three tripods are supplied with the equipment: the standard, the baby, and the hi-hat (low mount). A friction head can be used with all three.

a. Standard Tripod. The standard tripod is 3 feet 10 inches high when lowered, and 6 feet 4 inches high when extended. The legs are seasoned maple impregnated with oil, and are attached to a metal top casting. The base shoes are cast aluminum with steel points screwed in and locked with a nut. On the inner side of each shoe, set at a 45°

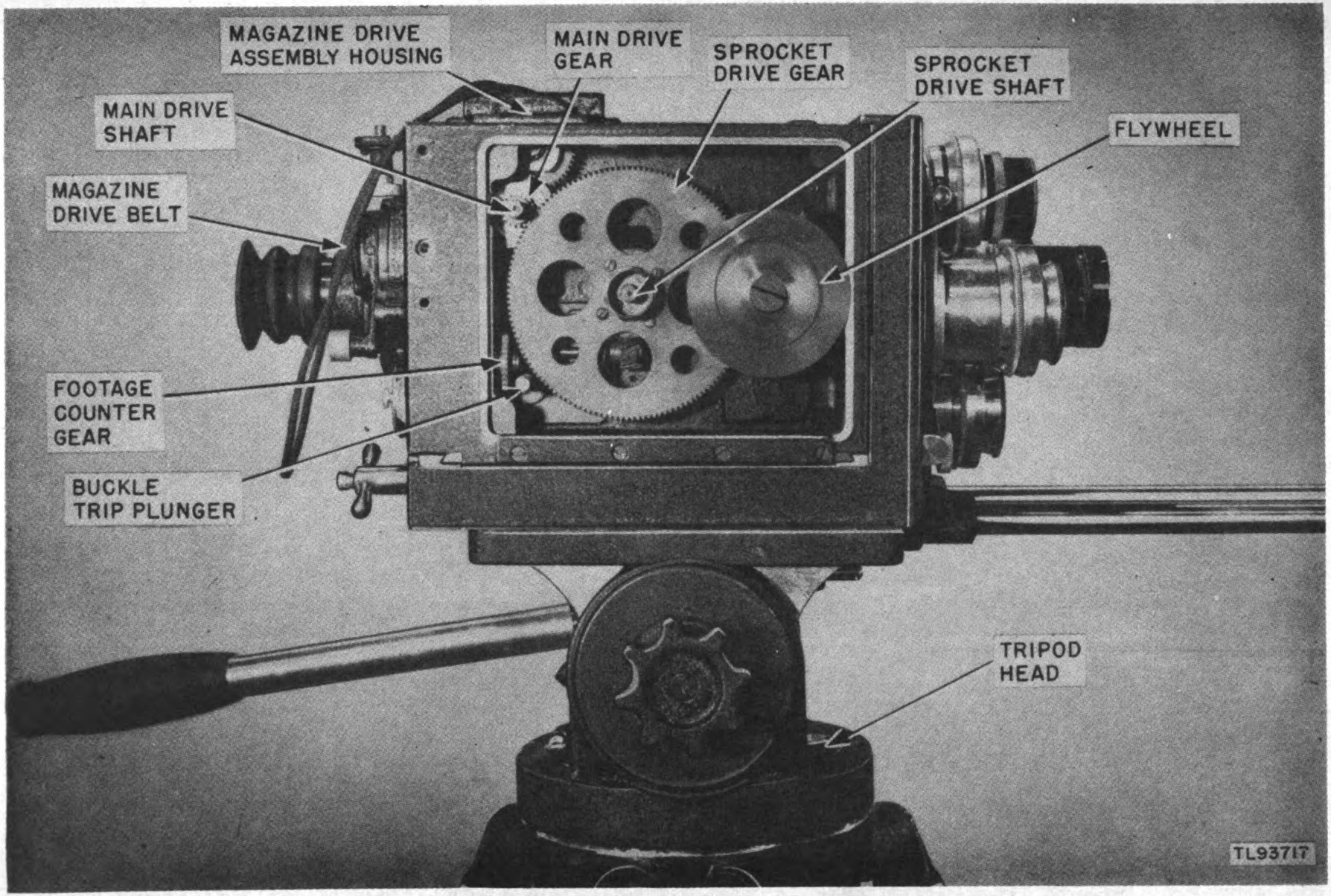

Figure 10. Camera, right side with cover removed showing gears.

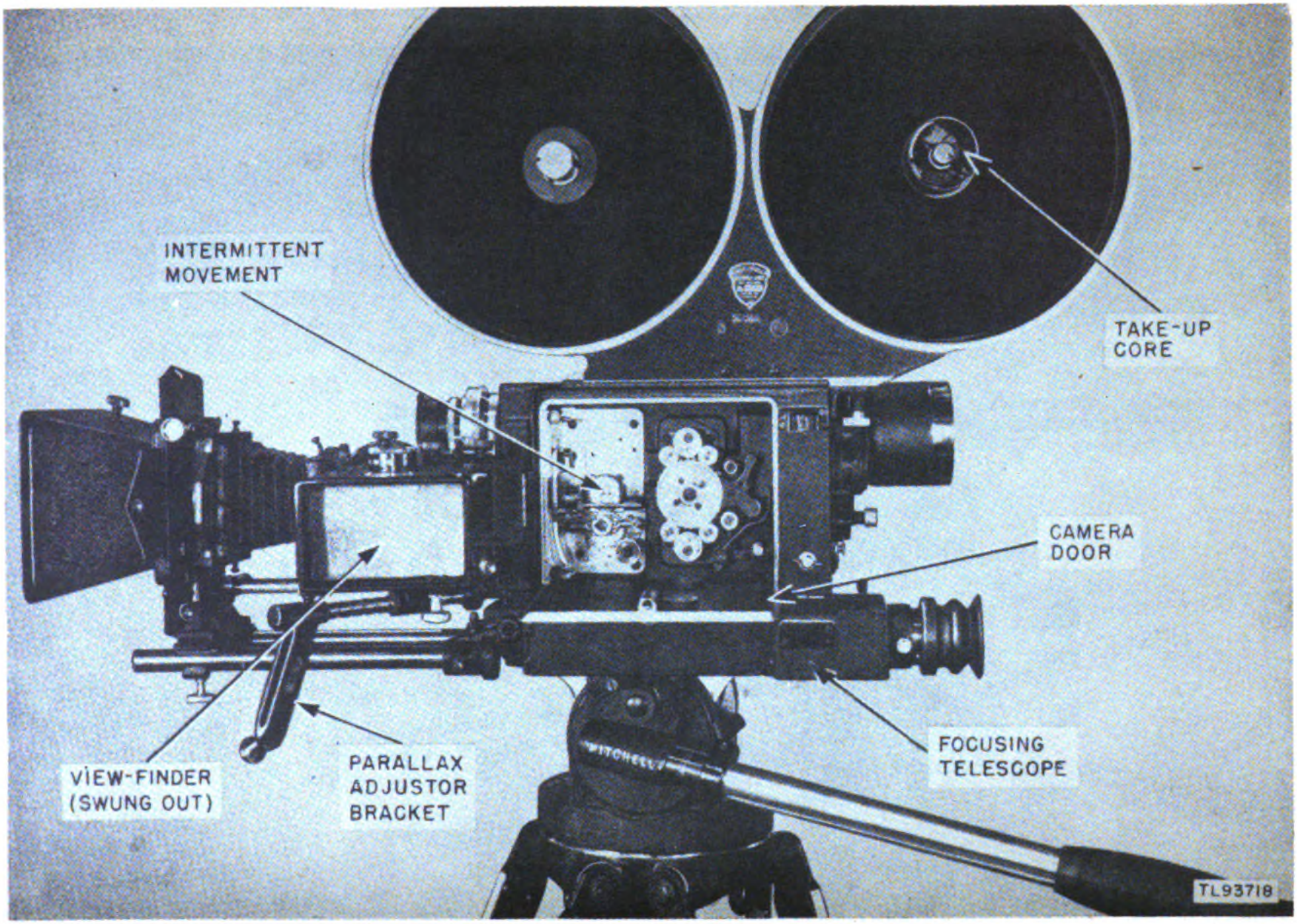

Figure 11. Camera, left side with door open.

angle, is a second point, which will engage and lessen chances of accident in case the tripod leg slips, especially when set low. By turning large aluminum knurled locknuts in the tripod legs, the legs may be tightened at any desired height.

b. Baby Tripod. The baby tripod provides a range in height from 1 foot 10 inches to 3 feet. It is similar in construction to the standard tripod, except that its legs are tightened by a single clamp with a thumbscrew, and the second point in the base shoe is omitted.

c. Hi-hat. The hi-hat (low mount) is 4½ inches high. It is of all metal construction and is not adjustable. Holes are provided in the feet for screwing it to a wooden base. It is used to mount the camera on airplanes, motor boats, and other places where a regular tripod cannot be used.

d. Tripod Head. The friction pan and tilt head are used with all three tripods. It can be panned around an entire circle and has a wide range of tilt upward and downward. Both the pan and tilt action can be made rigid by means of locks, and their tension can be regulated by tightening or loosening adjusting knobs. The pan and tilt movements are independent of each other, but can be used at the same time as they are operated by a single pan handle. A two-way spirit level is mounted on the tripod head. Large friction surfaces in the head provide easy, smooth operation, and inclosed springs help counterbalance the weight of the camera. A hand crank is provided for tightening the camera securely on the tripod head.

e. Pan Handle. The telescopic pan handle is adjustable for both length and angular position, and may be dropped out of the way for focusing or working on the camera by releasing a locking lever.

f. Triangle. A wooden triangle is provided for use on hard, smooth surfaces where the points on the base shoes cannot take hold. It is hinged to permit folding when not in use, and its sections may be extended to accommodate wide spacing of the tripod legs.

g. Chain Set. A hold-down chain set with a turnbuckle is provided for rigid anchoring of the tripod after it is positioned for the take. Chains hook into eyes on the under side of the tripod top casting and are anchored to the floor with a stage screw and tightened with the turnbuckle. The hold-down chain is used when shooting from a moving truck or car or when quick pans or tilts are to be made.

18. Camera Covers (fig. 4)

a. Fabric Cover. A waterproof fabric protective cover is provided to cover the camera when it is left mounted on the tripod for a considerable period of time. The same cover can also be used when operating the camera in the rain, as it is equipped with zipper-closing slits to give access to operating parts.

b. Silencing Cover. A silencing cover barney is used to reduce the operating noise of the camera when used in conjunction with a sound recorder. This has openings for the taking and view-finder lenses and for access to the operating parts of the camera.

19. Miscellaneous Items (figs. 2 and 3)

Other items issued with Camera PH–274 include Changing Bag PH–105, which can be used for loading film magazines in lieu of a darkroom; Slate PH–384–A and a sound slate holder, used for identifying takes and for synchronizing picture and sound track; and American Cinematographer Hand Book and Reference Guide, containing lens, film, filter, and other technical data; brushes and an air syringe for cleaning the camera; photographic tape for sealing loaded magazines; a measuring tape to measure camera-to-object distance for focusing; extra drive belt, cranks, oilers, lens cleaning tissue, etc. A ditty bag is often supplied which may be hung under the tripod head to hold extra lenses, filters, exposure meters, etc.

Section II. UNCRATING AND UNPACKING

20. Uncrating

a. Method of Crating. For oversea shipment, Camera PH–274 is ordinarily packed in four shipping cases, sturdily constructed of wood to withstand moisture and rough handling. The cases are lined with waterproof paper which is cemented to the interior walls of the case with water-resistant adhesive. Each component, whether it is a unit, such as a camera carrying case, or an individual item like the hold-down chains, is wrapped in water-resistant paper and encased in a close-fitting corrugated cardboard carton. Inclosed in the carton are bags of silica gel to absorb any moisture that may have been sealed into the carton. Tissue paper is used to fill all unoccupied space within the carton so that the encased equipment is unable to shift. Each carton is covered by a sealed bag made of foil-lined airtight material. The bagged equipment in its wooden shipping case is surrounded by excelsior to insure a tight fit inside the case. The cover of the case is sealed with water-resistant sealing material.

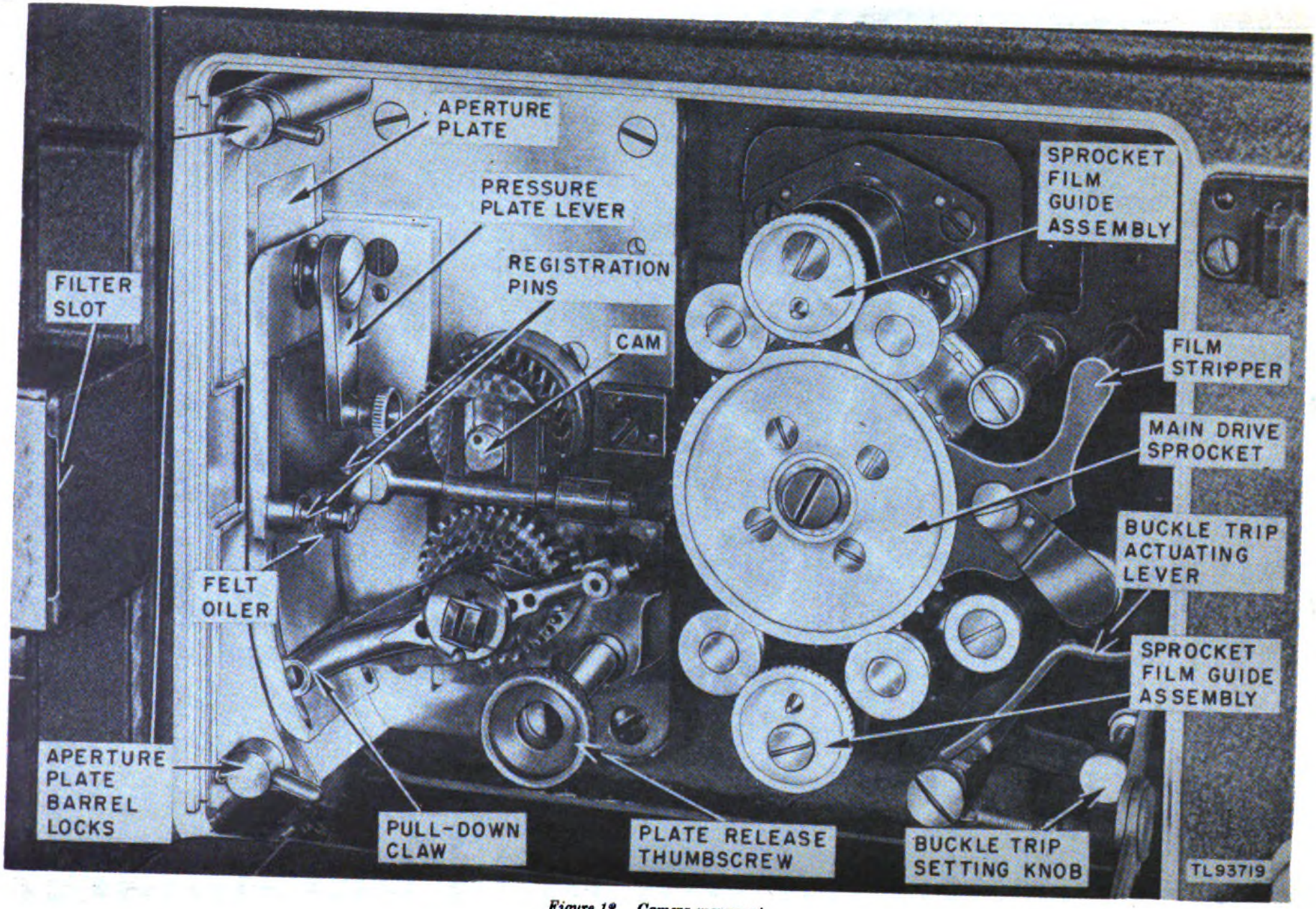

Figure 12. Camera movement.

b. DIVISION OF COMPONENTS. The four shipping cases that ordinarily make up an oversea shipment of Camera PH–274 contain the following combination of components:

(1) *Magazine case, camera case, and silencing cover (Barney).* These components are shipped in a case 27 inches long, 24 inches high, and 26 inches wide. The barney is laid over the two equipment cases and forms a cushioned packing. The case, when completely packed, weighs approximately 140 pounds, and occupies 9.75 cubic feet of space.

(2) *Accessory case and tripod head case.* These two equipment cases are shipped in a case 24 inches long, 22 inches high, and 25 inches wide. The spare space in the shipping case is filled with some of the miscellaneous parts listed in paragraph 2*f*. When completely packed, this case weighs approximately 125 pounds and occupies 7.63 cubic feet of space.

(3) *Tripods and triangle.* The standard tripod, the baby tripod, the triangle, and the balance of the miscellaneous parts listed in paragraph 2*f* are packed in one shipping case 55 inches long, 14 inches high, and 14 inches wide. The case, when packed, weighs approximately 120 pounds, and occupies 6.23 cubic feet of space.

(4) *Batteries.* Two Batteries BB–53 (each in a carrying case PH–403) are packed in a shipping case 17 inches long, 16 inches high, and 20 inches wide. The case, when packed with batteries filled with electrolyte, weighs approximately 125 pounds, and occupies 3.14 cubic feet of space.

Note. The battery-shipping case must be shipped and stored right side up, as the batteries are shipped wet-charged. The top is plainly marked, but to eliminate the possibility of error, the case is equipped with either a pointed cover (like the roof of a house) or with cleats and carrying handles that make it impossible to stand the case any way but upright.

c. UNCRATING. To uncrate the equipment, place the shipping cases on a level surface and carefully remove the tops of the cases. Remove the excelsior packing from around the sealed bags, and remove each bag from the case, laying them out on a table or other clean surface. Look through the excelsior carefully to make sure that no small parts have been overlooked.

d. UNPACKING. When all the sealed bags have been removed from the shipping cases, slit the bags open one by one, laying out the inclosed cartons. Examine the bags carefully to make sure that no small parts have been left in the bags. Open each carton and remove the tissue paper stuffing carefully so as not to throw out any small parts. Remove the silica gel bags and place them to one side. Next, remove the water-resistant paper from around each part and lay the parts out on a table for checking against the list of components given in paragraph 2.

21. Removal of Parts from Cases

Upon first removing the parts from their cases, note carefully the way each component fits into its compartment. Be careful to replace the components in the same way. Note that the camera box must be racked over in the photographing position in order to fit. Figure 5 shows the cases packed in the proper manner.

PART TWO
OPERATING INSTRUCTIONS

Note. For information on destroying this equipment to prevent enemy use, see the destruction notice at the front of this manual.

Section III. STEP-BY-STEP OPERATING PROCEDURE

22. General

The steps in the setting-up and operation of Camera PH–274 are fully shown in the proper sequence in figures 13 through 111. The method of unloading and dismantling the camera is easily understandable and can be performed by reversing the steps shown for loading and setting up. The directions cover the handling of the camera for field use by one or two operators. Procedure for handling by production crews is not covered.

Figure 13. Loading magazine: threading film through light trap.

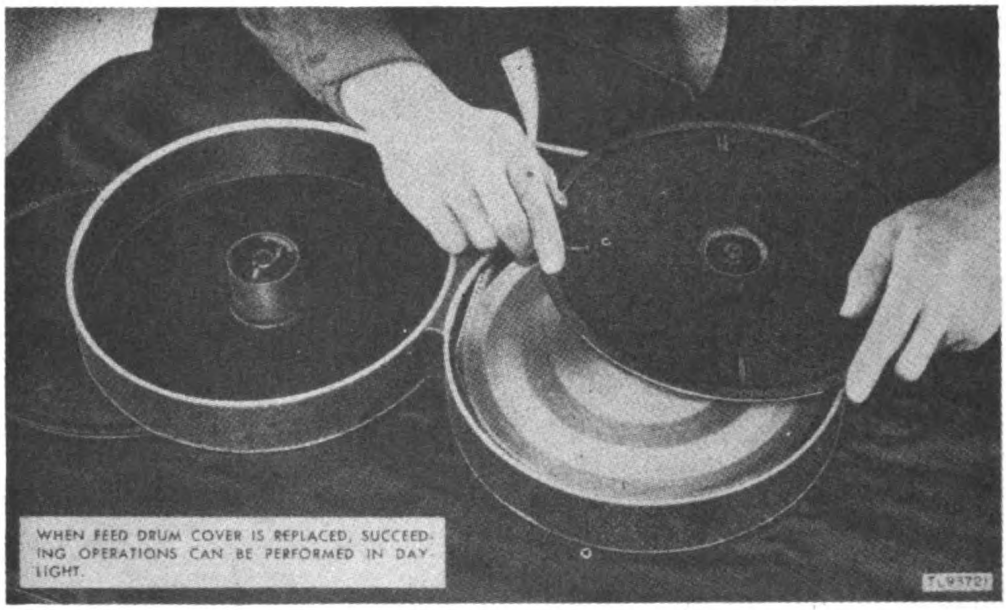

Figure 14. Loading magazine: replacing feed drum cover.

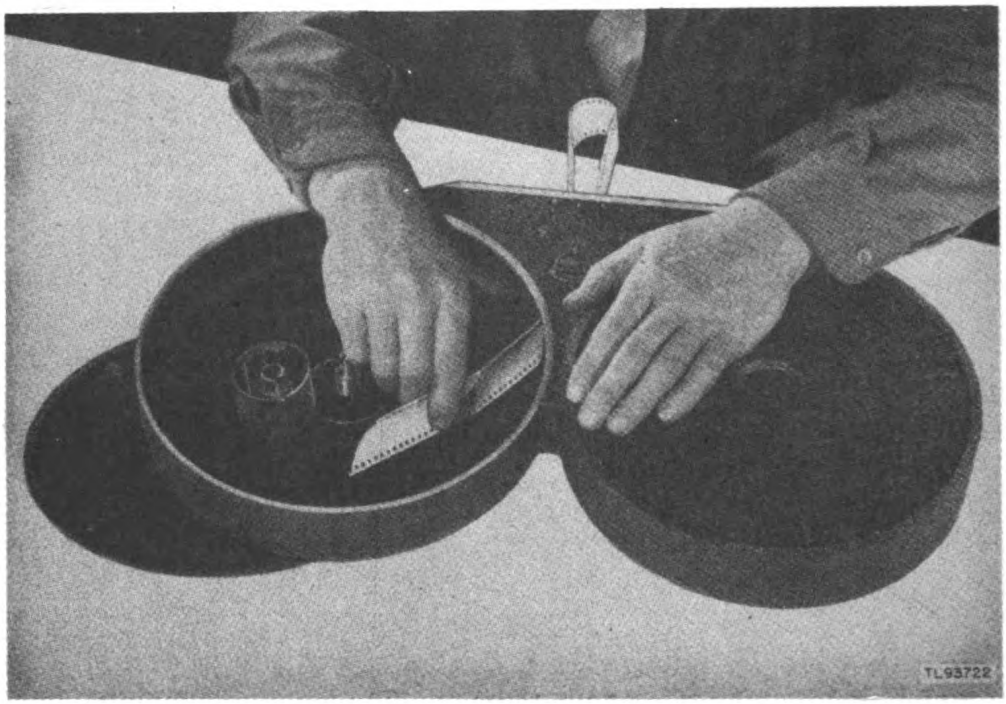

Figure 15. Loading magazine: drawing film into take-up drum.

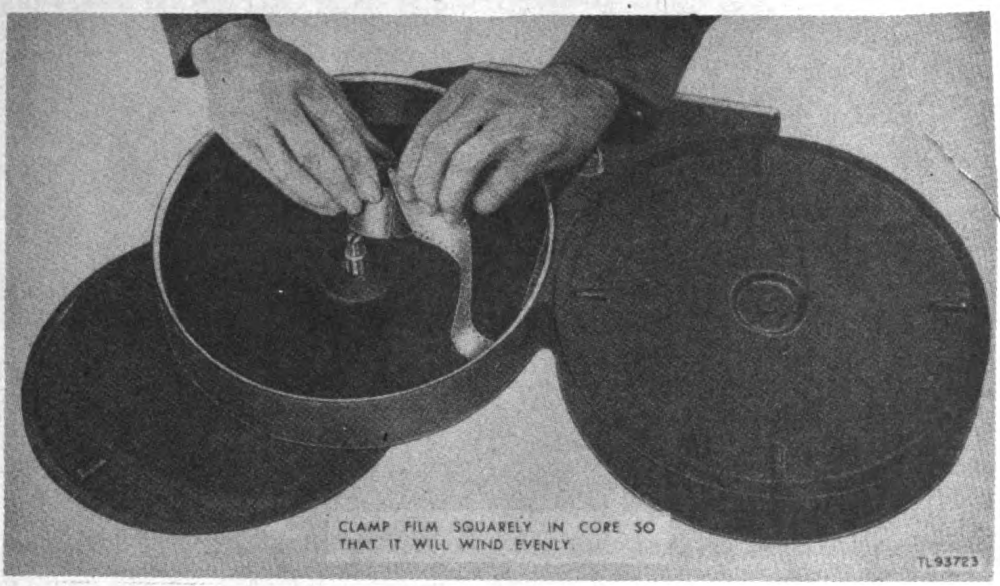

Figure 16. Loading magazine: attaching film to take-up core.

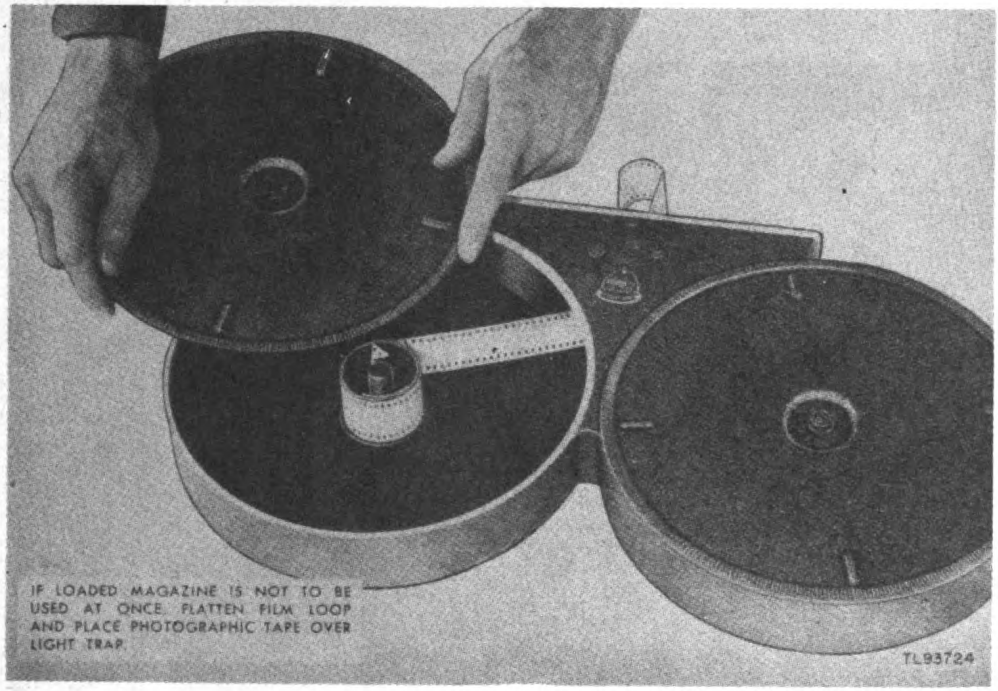

Figure 17. Magazine loaded: replacing take-up drum cover.

Figure 18. Placing triangle.

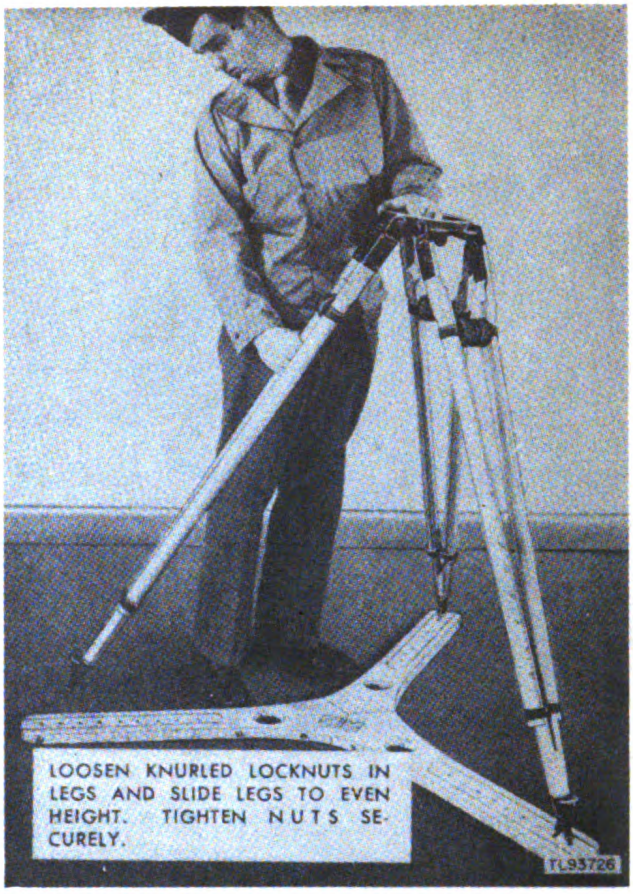

Figure 19. Extending triangle.

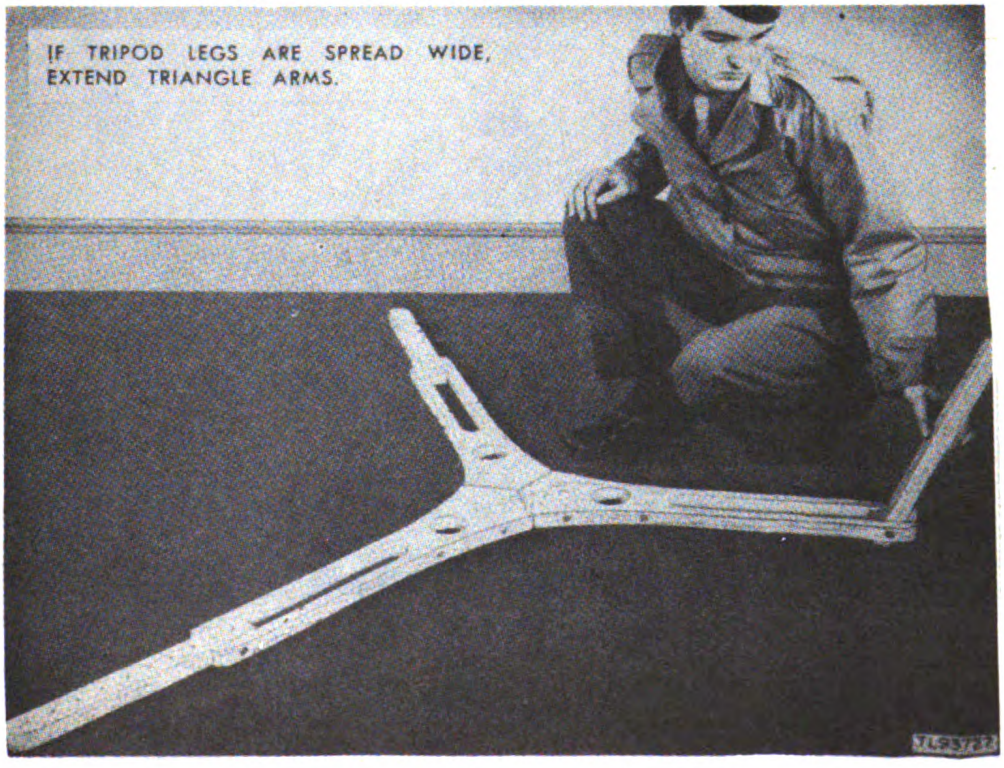

Figure 20. Setting up tripod.

Figure 21. Mounting tripod head on tripod.

Figure 22. Securing tripod head to tripod with locking nut.

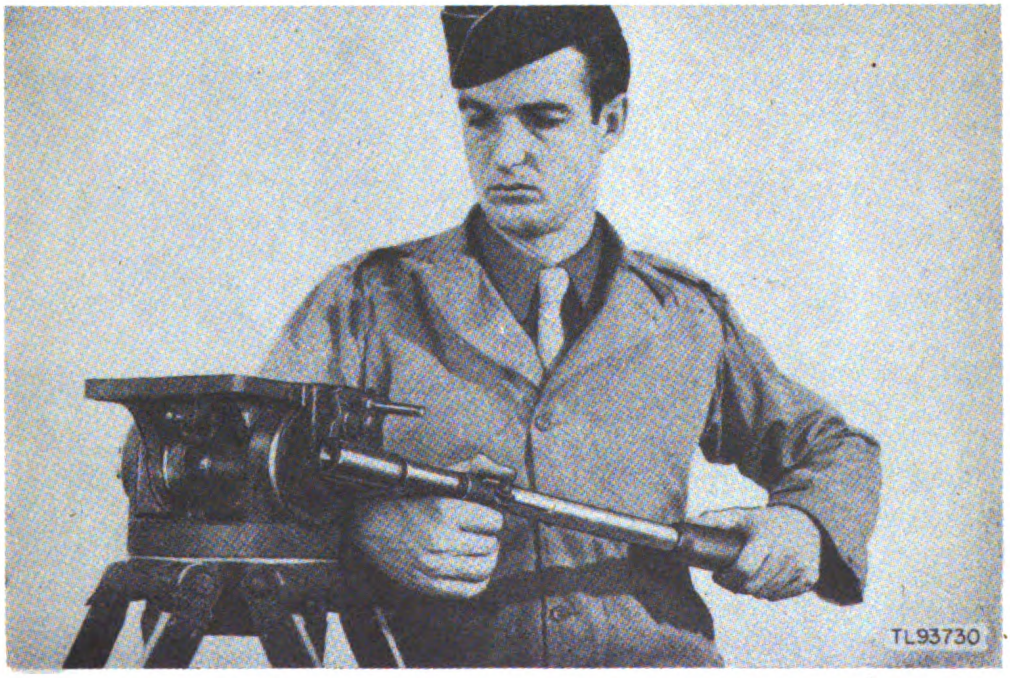

Figure 23. Attaching pan handle.

Figure 24. Mounting camera on tripod.

Figure 25. Hand-tightening camera on tripod head.

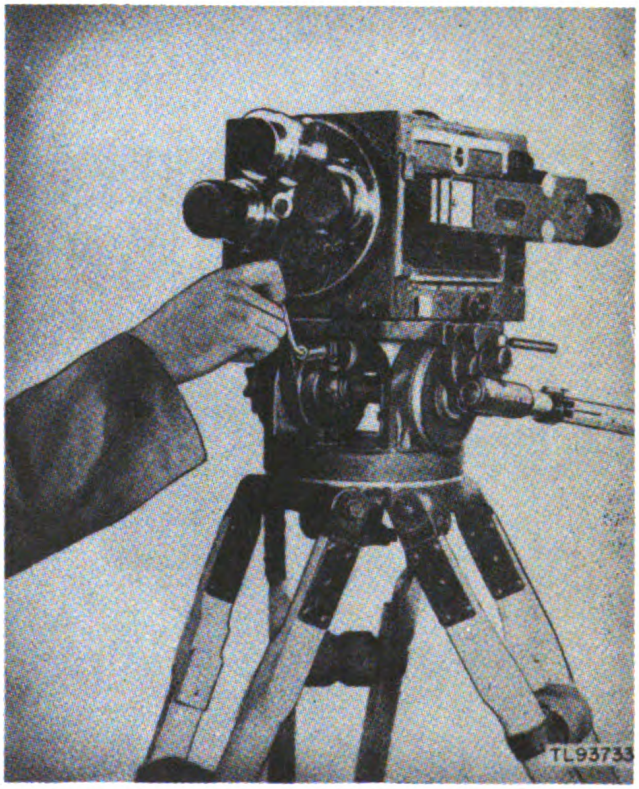

Figure 26. Tightening camera on tripod head with crank.

Figure 27. Camera and tripod levels.

Figure 28. Attaching sunshade and matte box bracket.

Figure 29. Attaching sunshade and matte box.

ADJUST BELLOWS SO THAT SUNSHADE WILL CLEAR FIELD OF LENS IN USE. DO NOT USE THIS SUNSHADE WITH 25-MM LENS. WITH 35- AND 40-MM LENSES BELLOWS MUST BE COMPLETELY CONTRACTED.

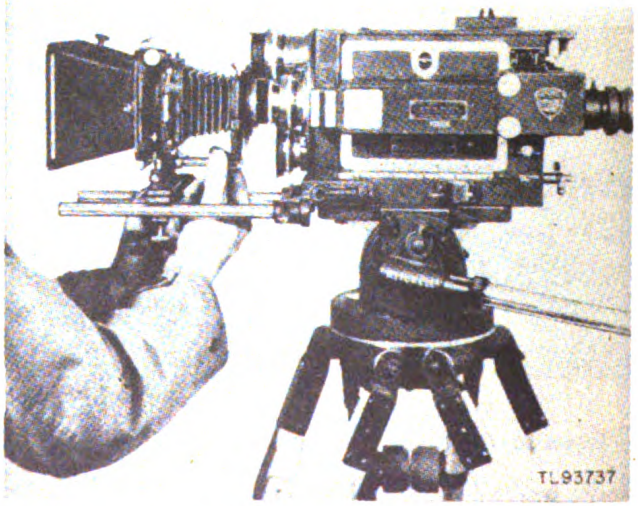

Figure 30. Adjusting sunshade and matte box.

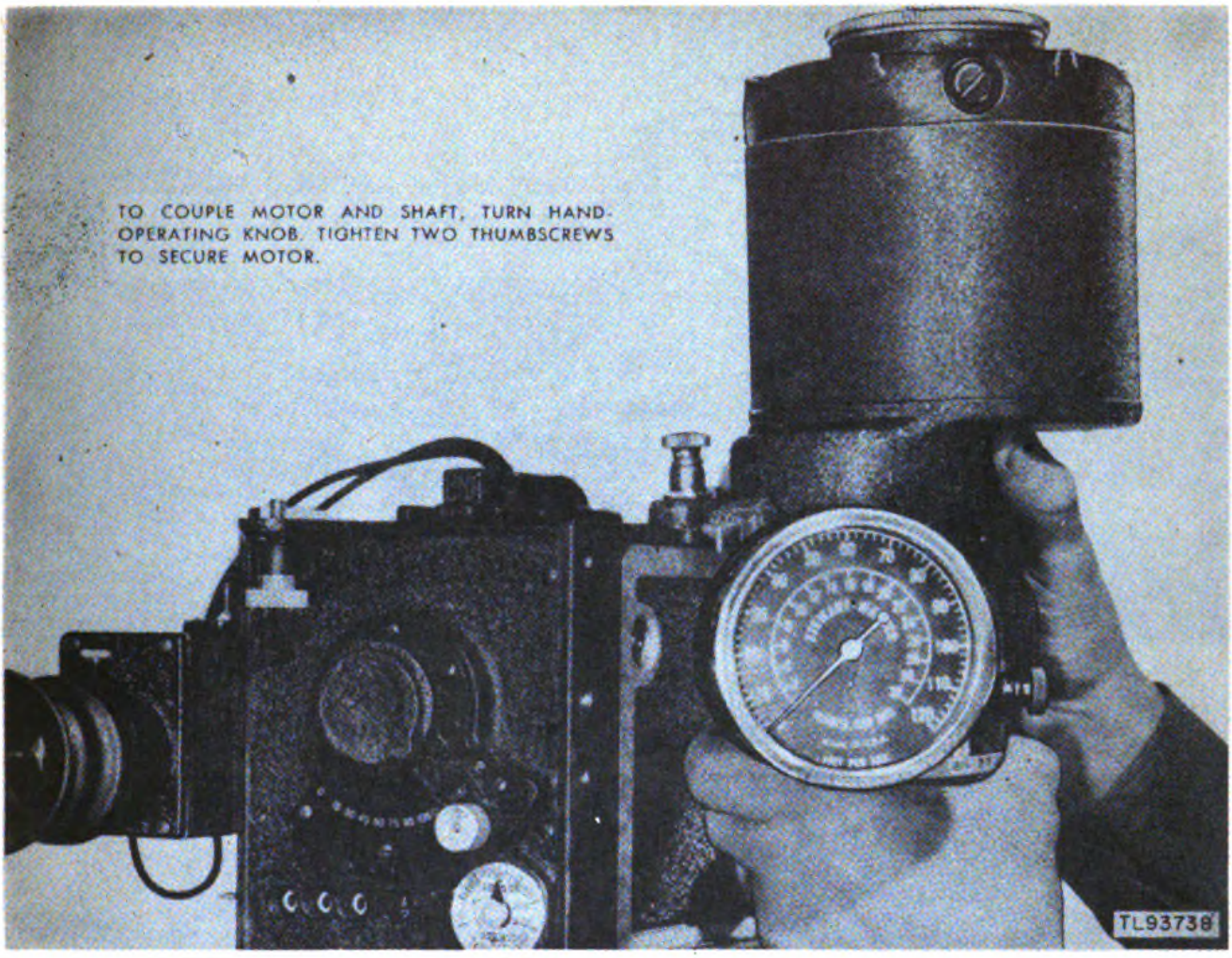

Figure 31. Mounting motor.

Figure 32. Setting motor direction.

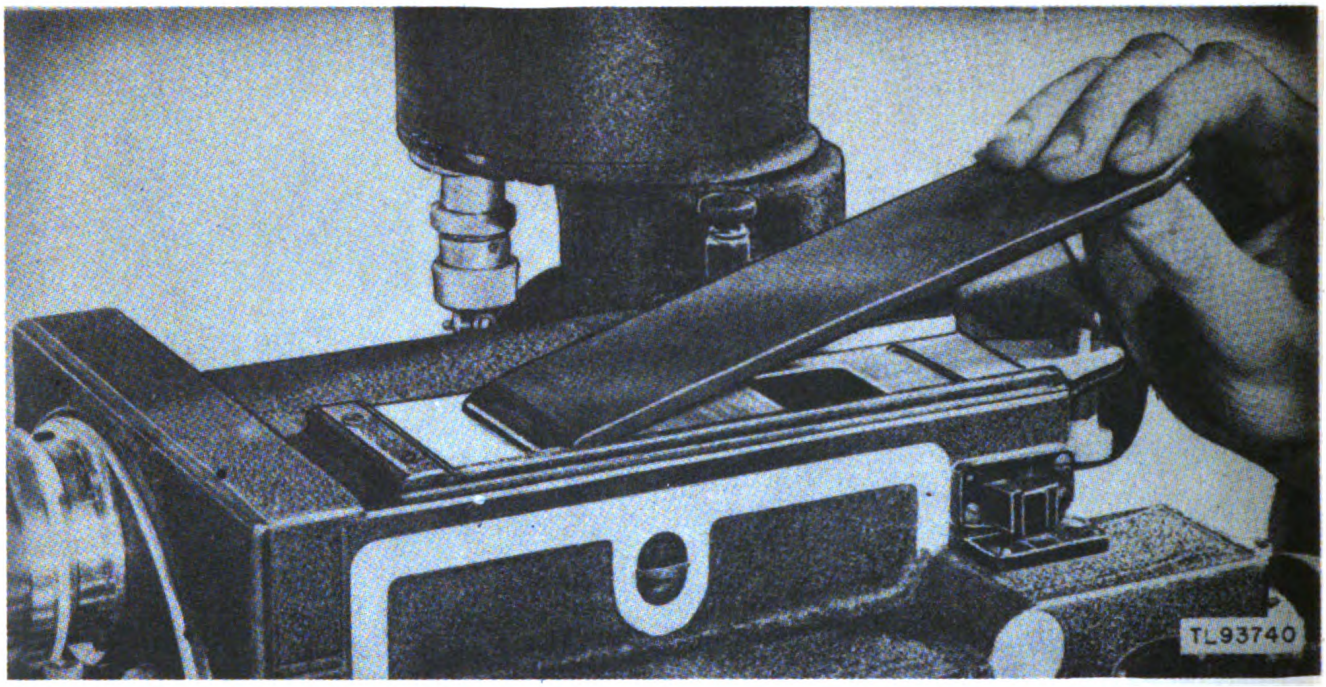

Figure 33. Removing dust plate before mounting magazine.

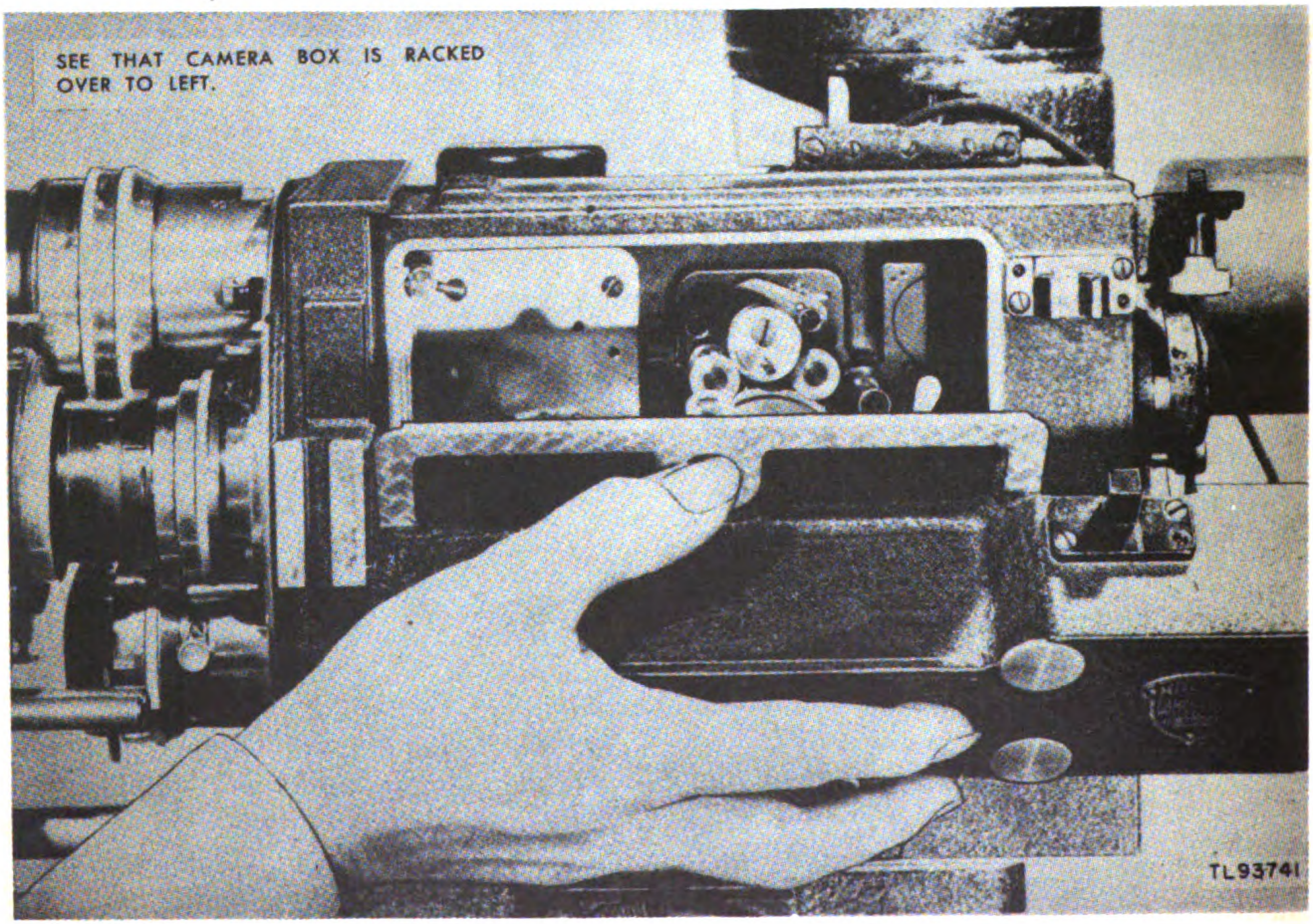

Figure 34. Opening camera door.

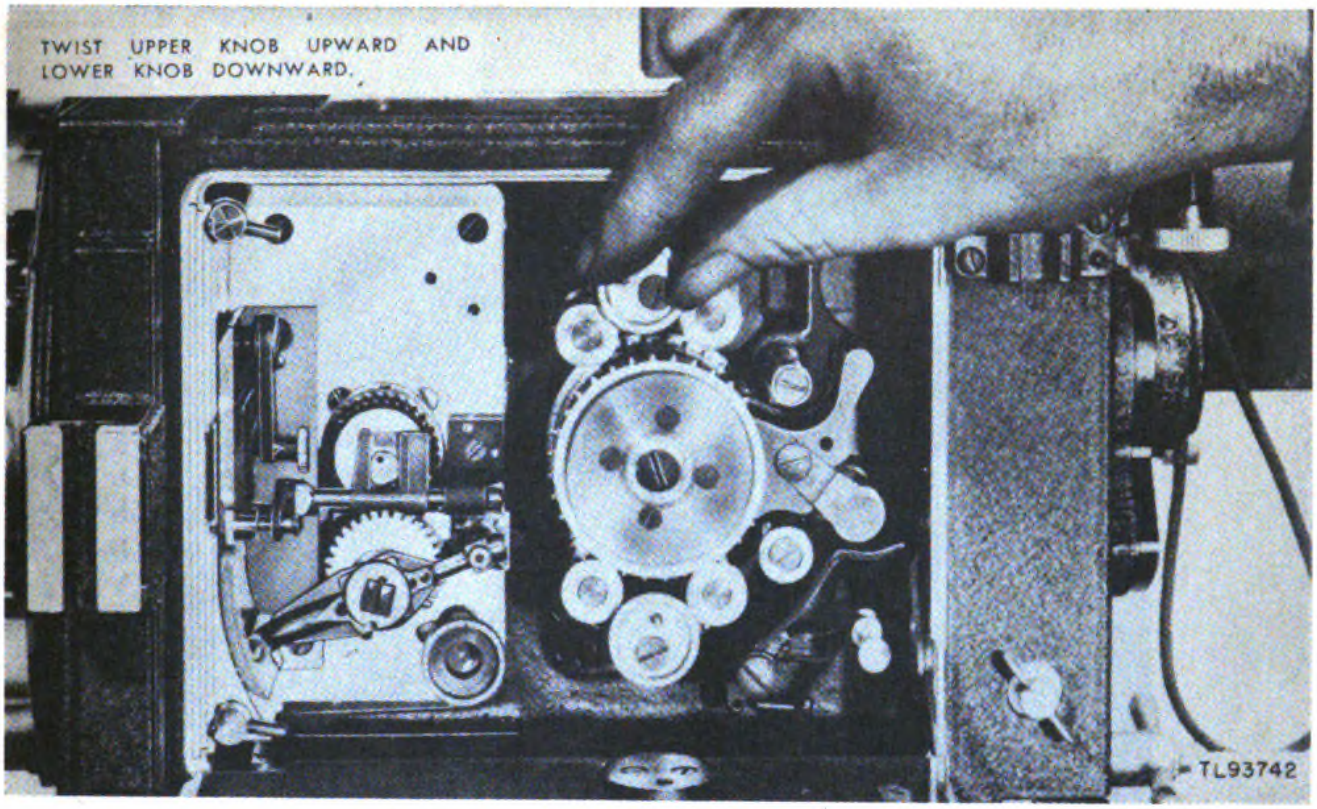

Figure 35. Opening sprocket film guide.

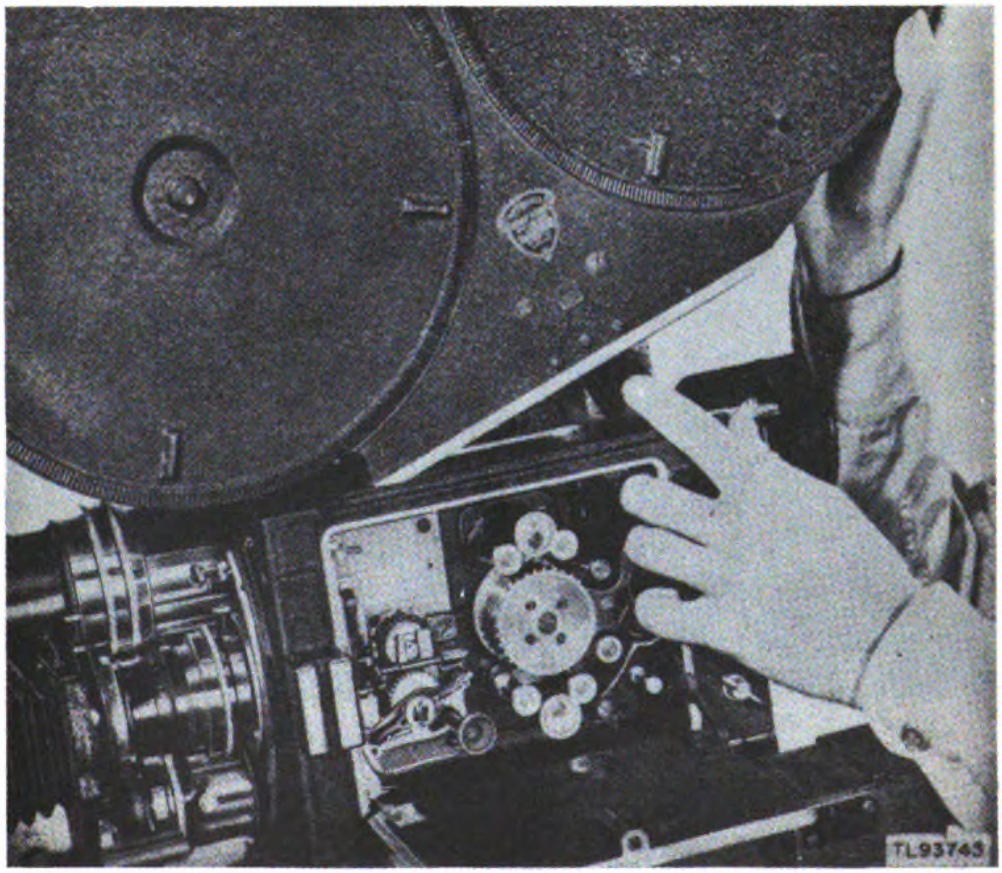

Figure 36. Mounting magazine.

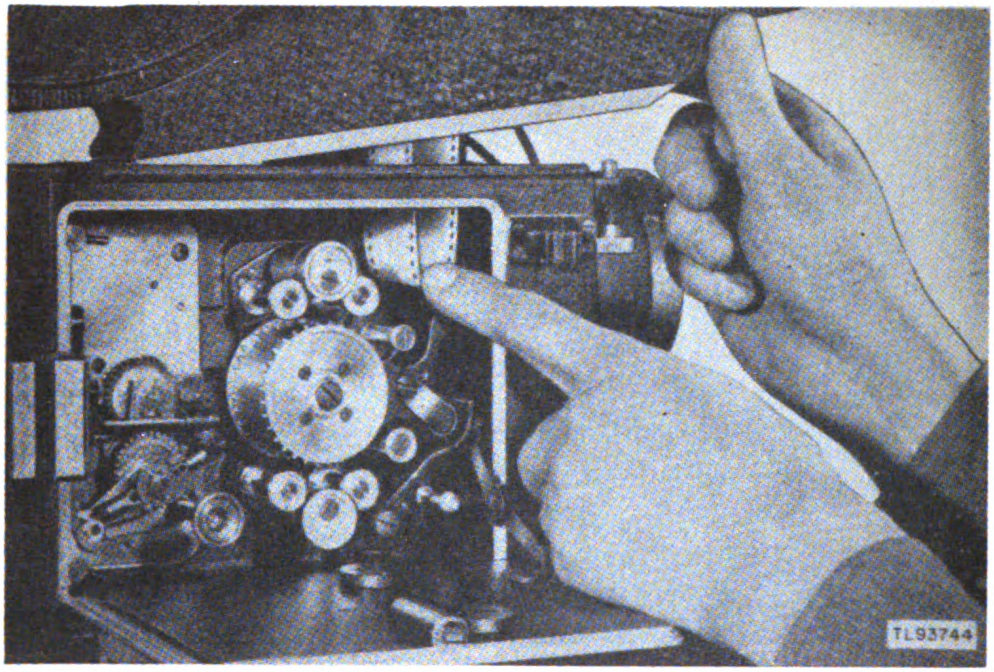

Figure 37. Inserting film loop in camera.

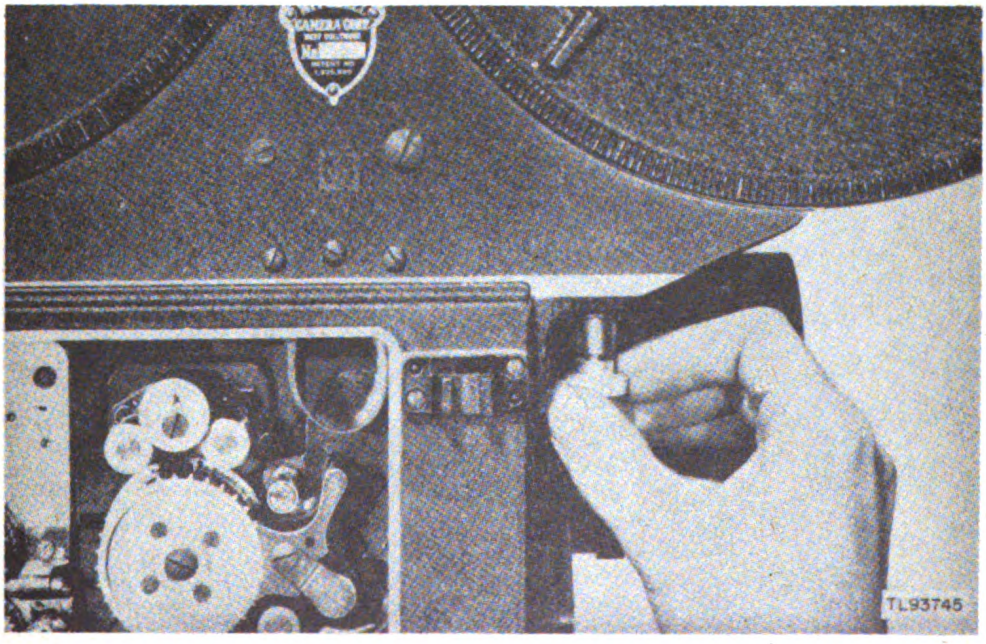

Figure 38. Tightening magazine holding screw.

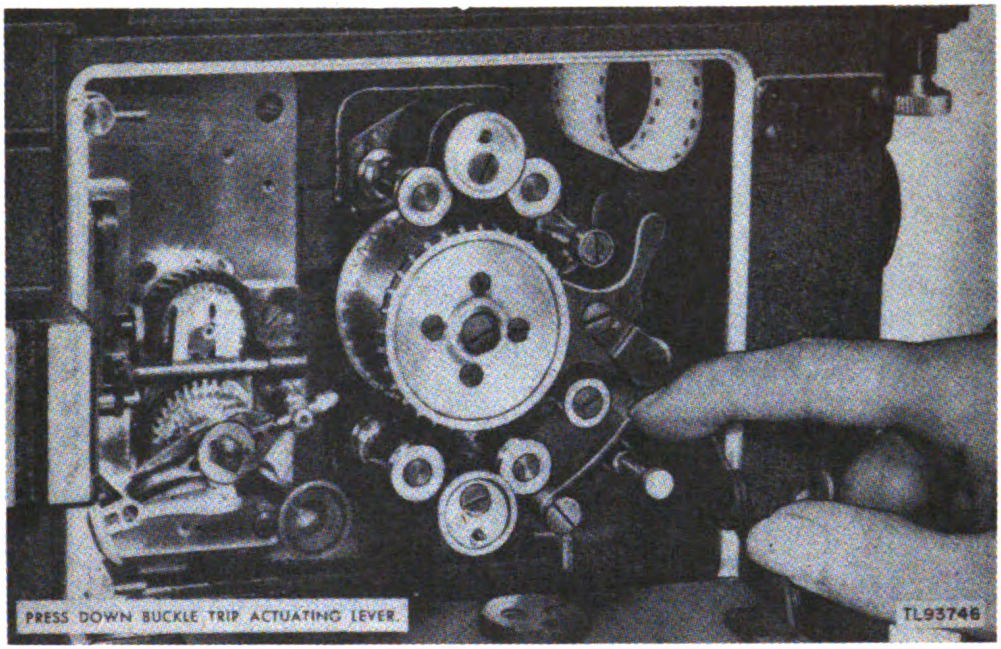

Figure 39. Tripping buckle trip.

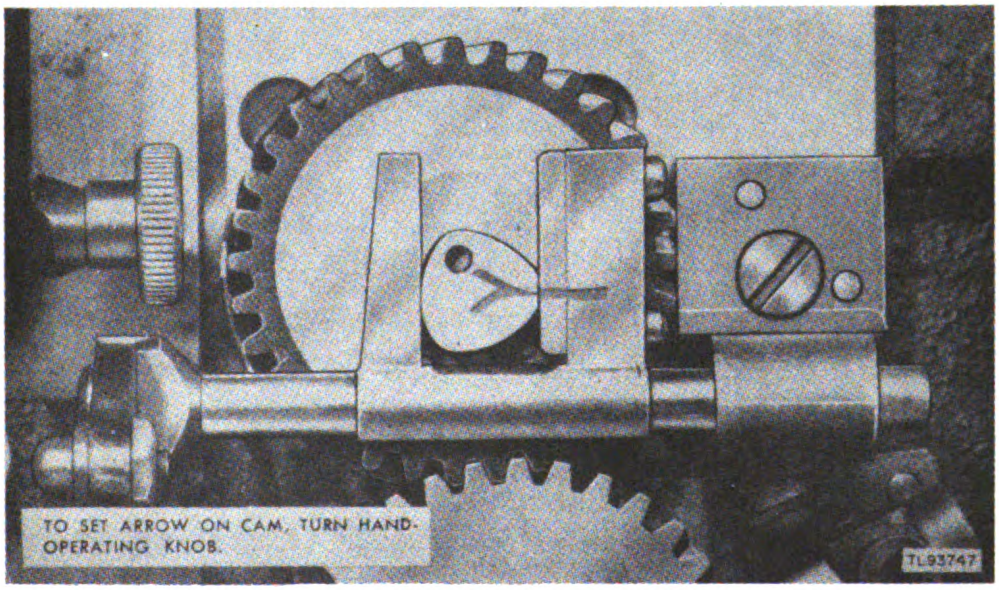

Figure 40. Correct position of cam before threading.

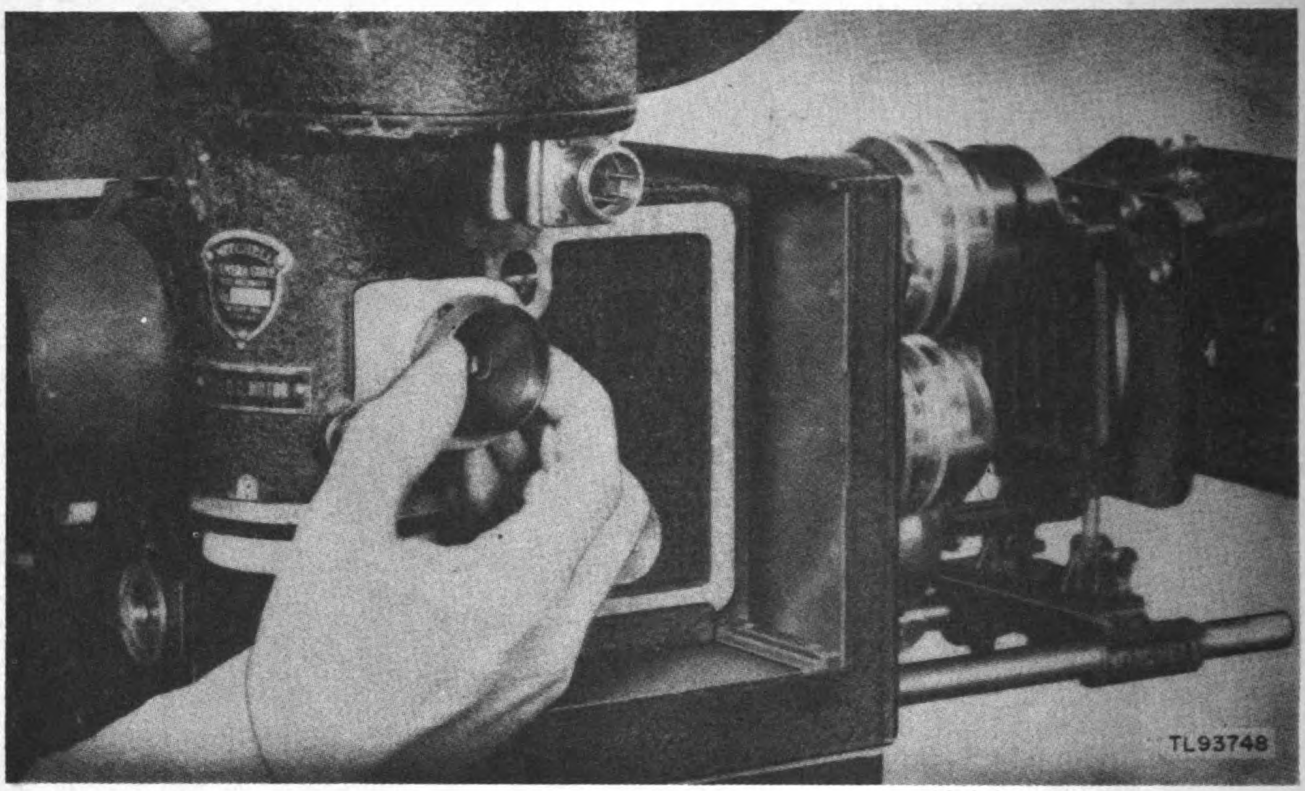

Figure 41. Hand-turning motor to set cam.

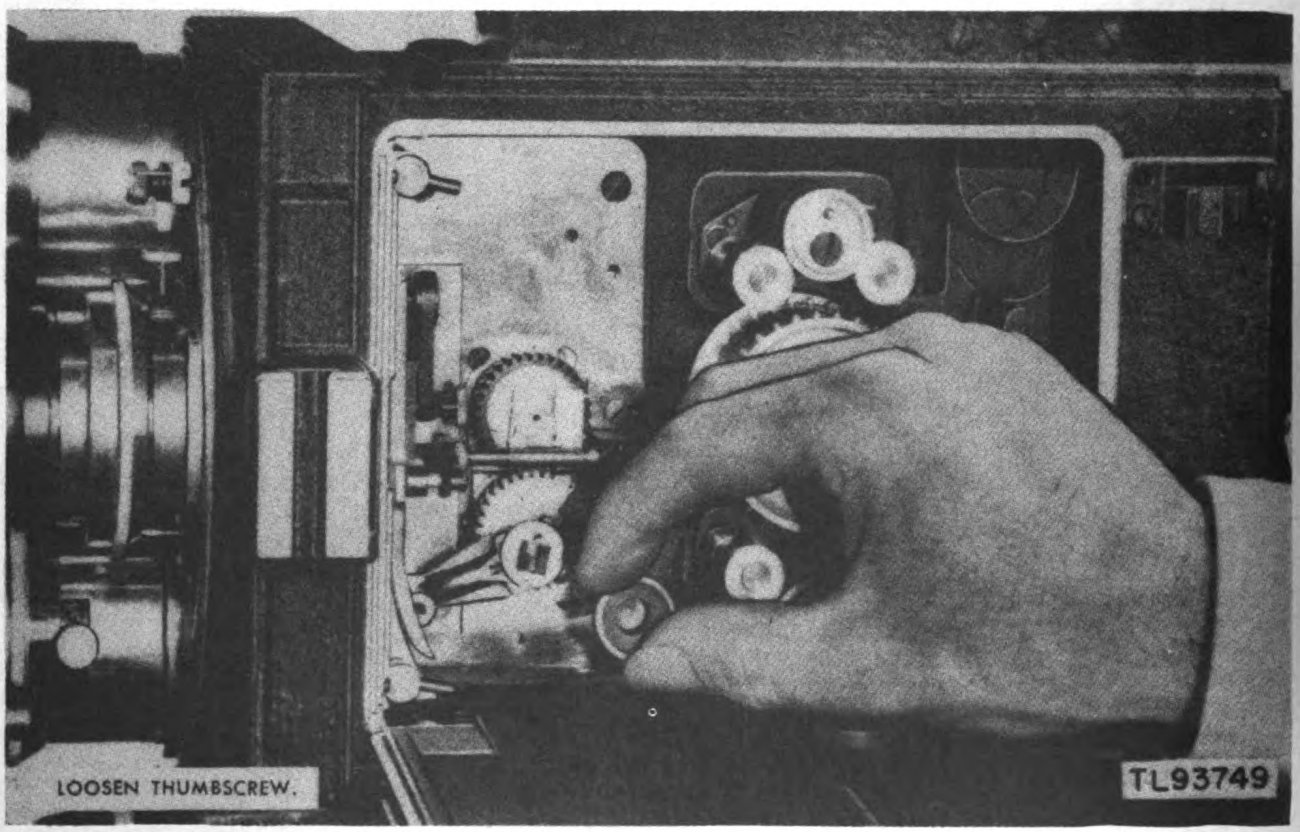

Figure 42. Releasing pull-down claw arm.

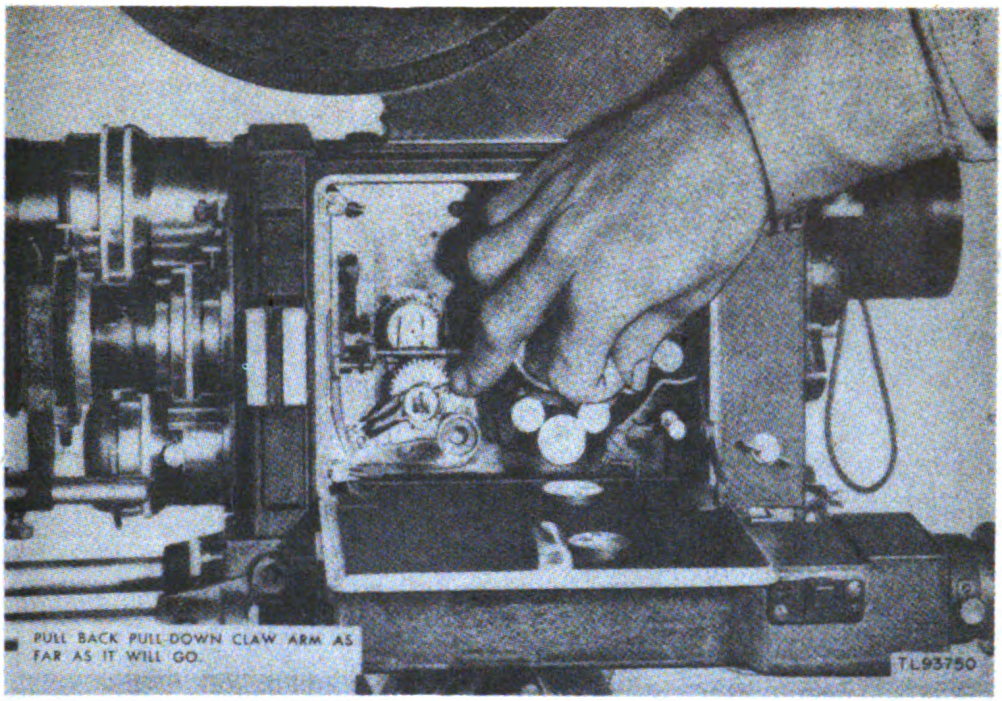

Figure 43. Disengaging pull-down claw arm.

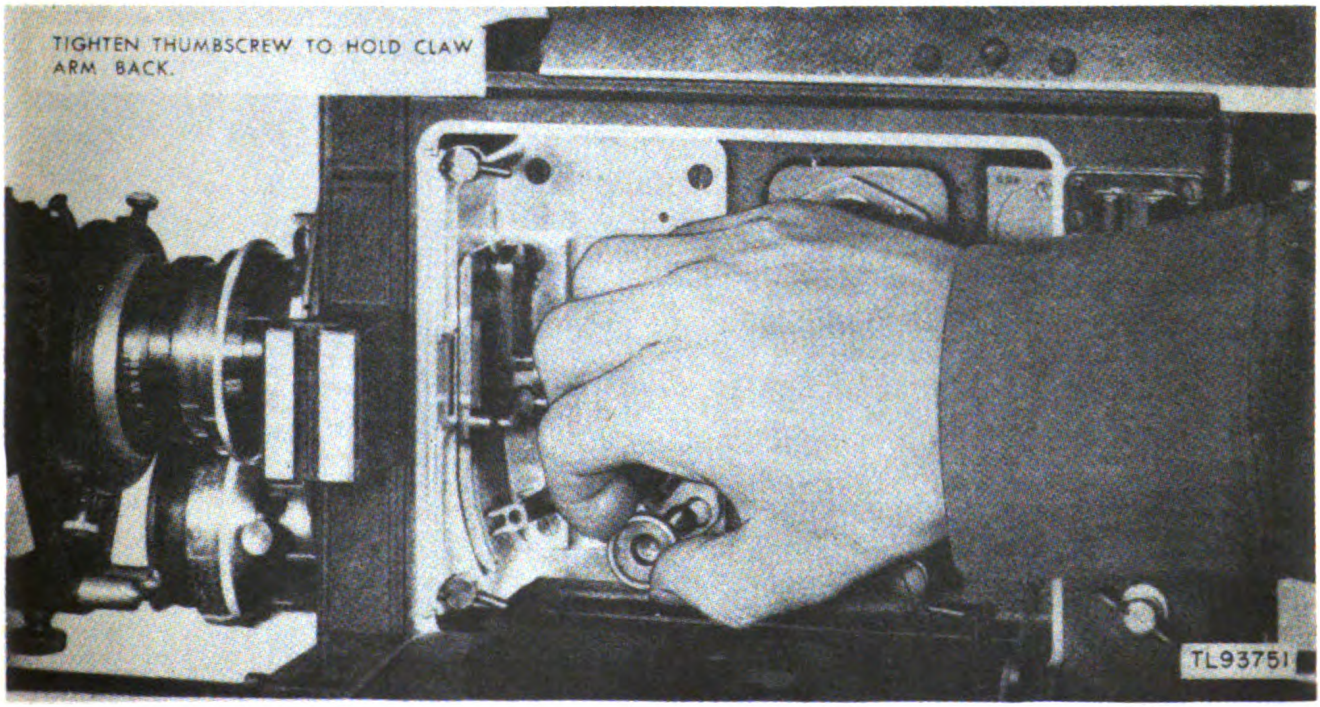

Figure 44. Retaining pull-down claw arm in disengaged position.

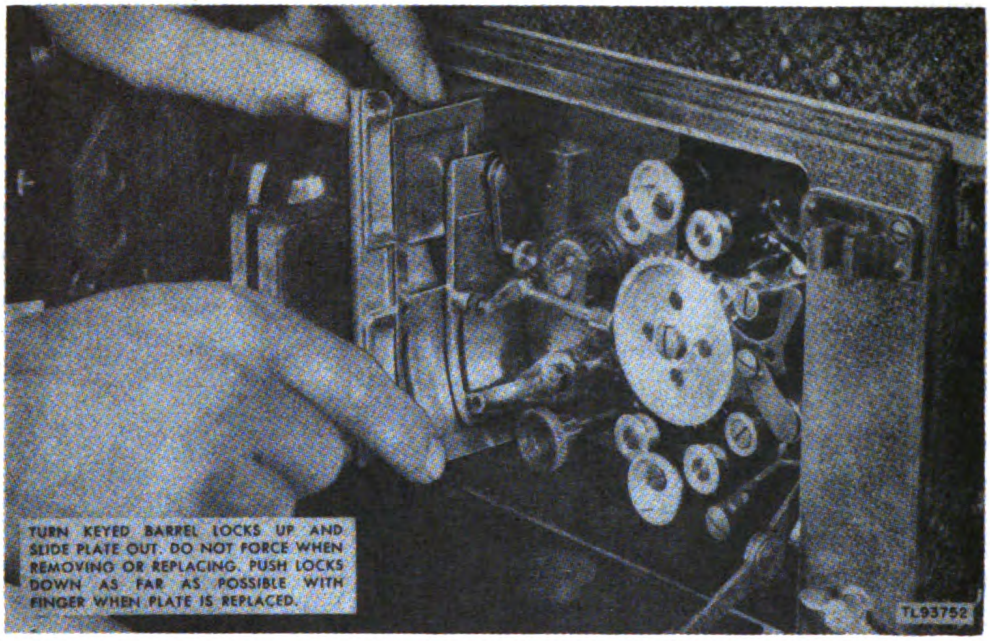

Figure 45. Removing aperture plate.

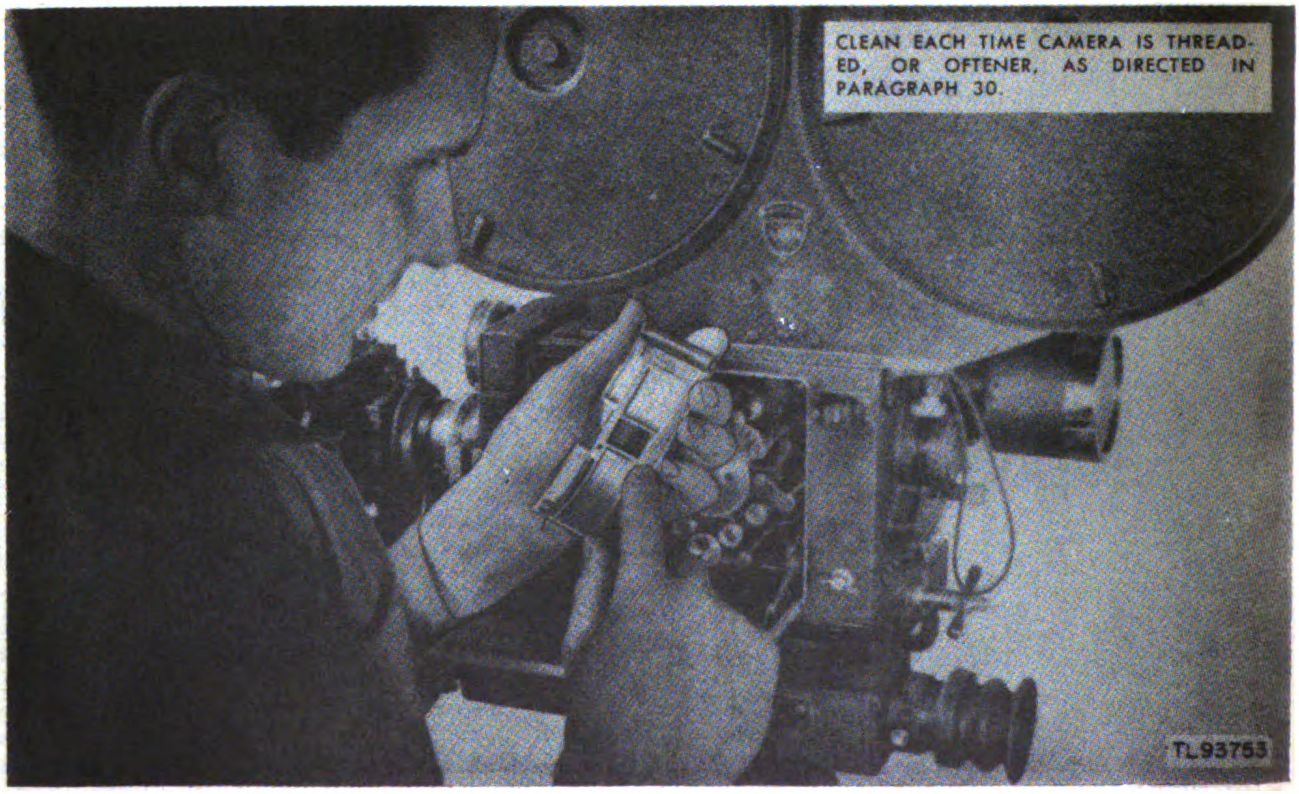

Figure 46. Cleaning aperture plate.

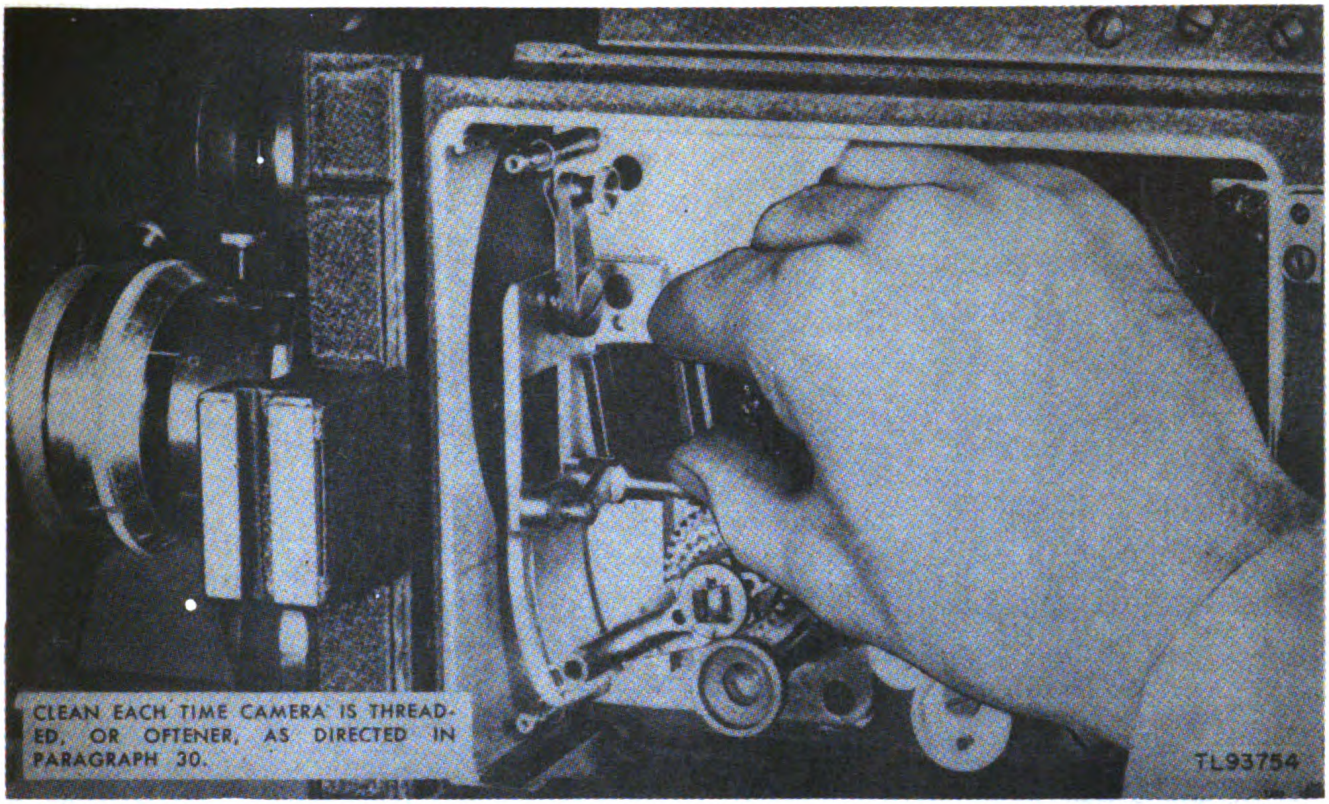

Figure 47. Removing pressure plate.

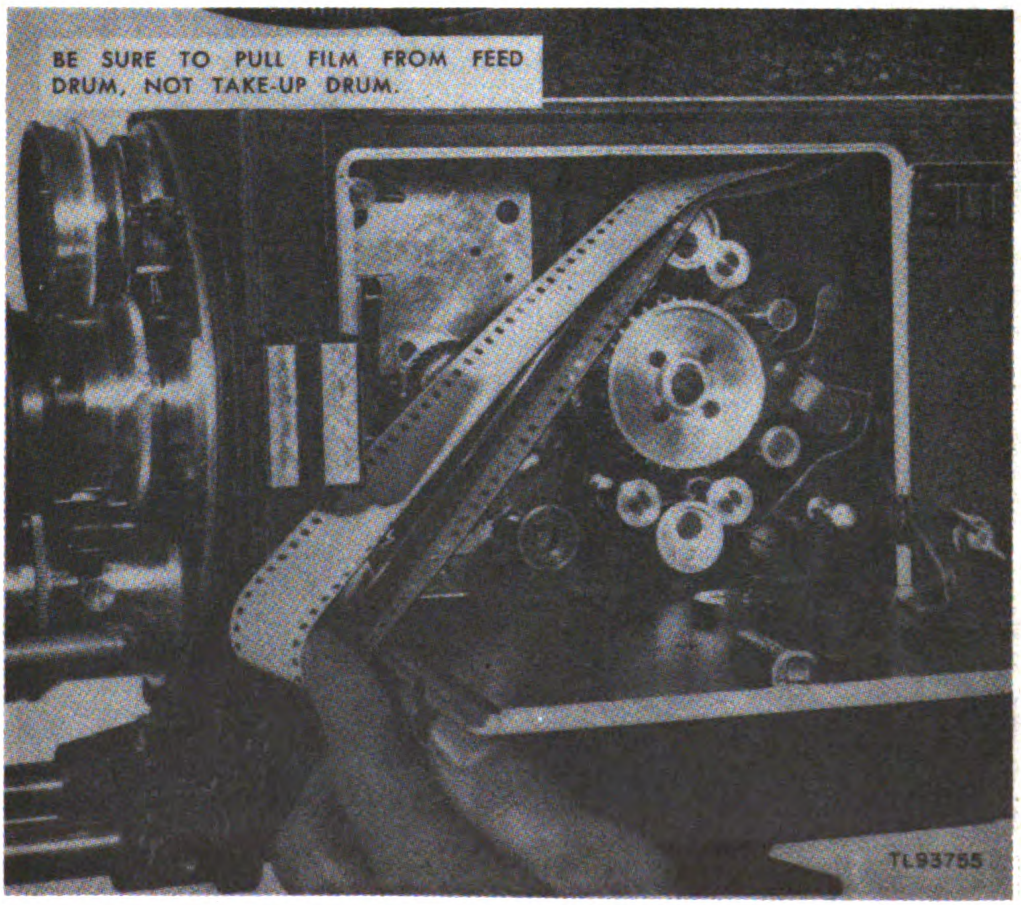

Figure 48. Pulling film through light trap.

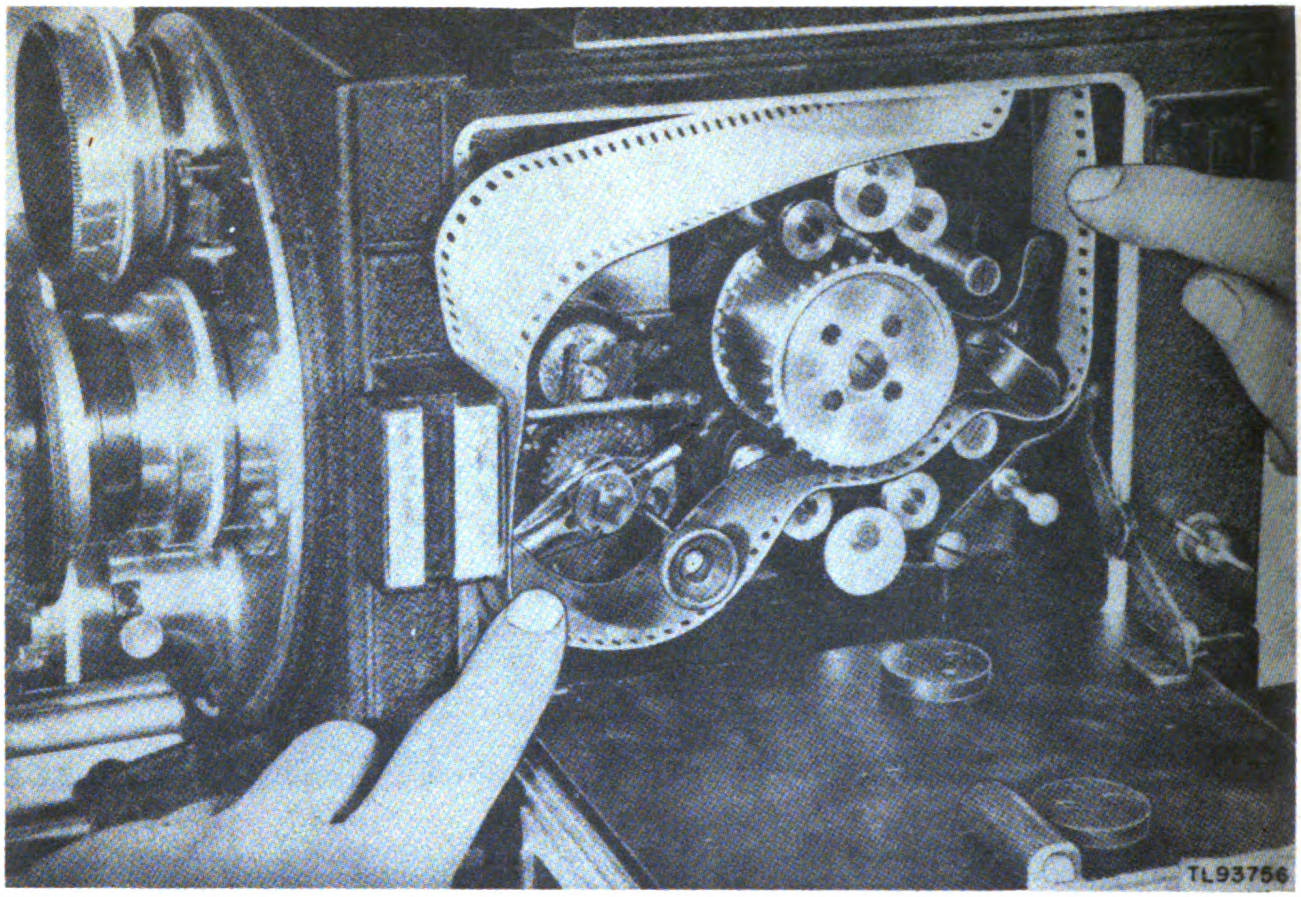

Figure 49. Fitting film over lower sprocket teeth.

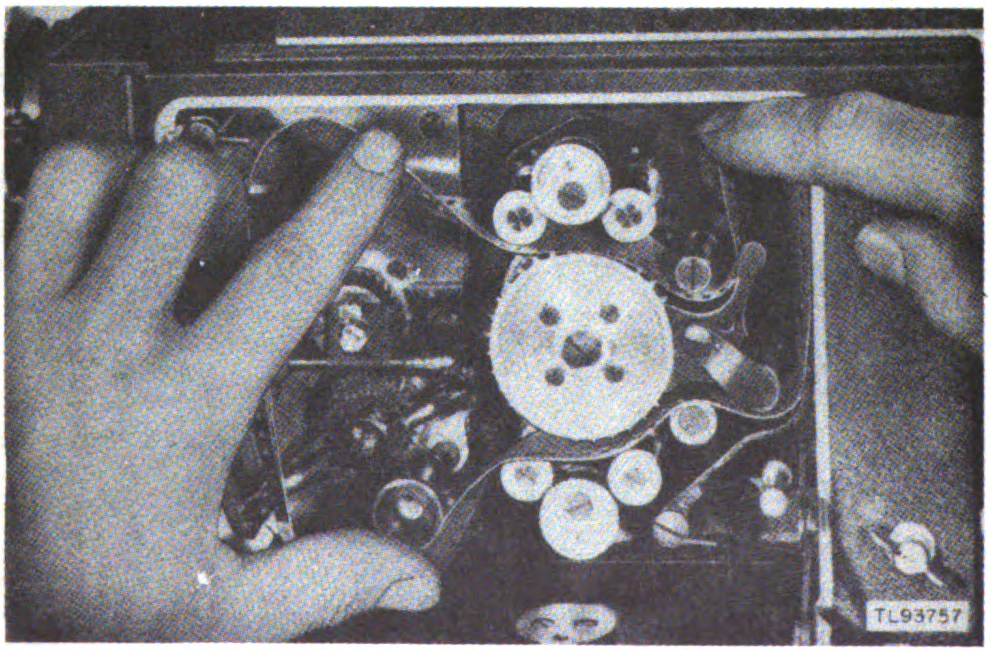

Figure 50. Fitting film over upper sprocket teeth.

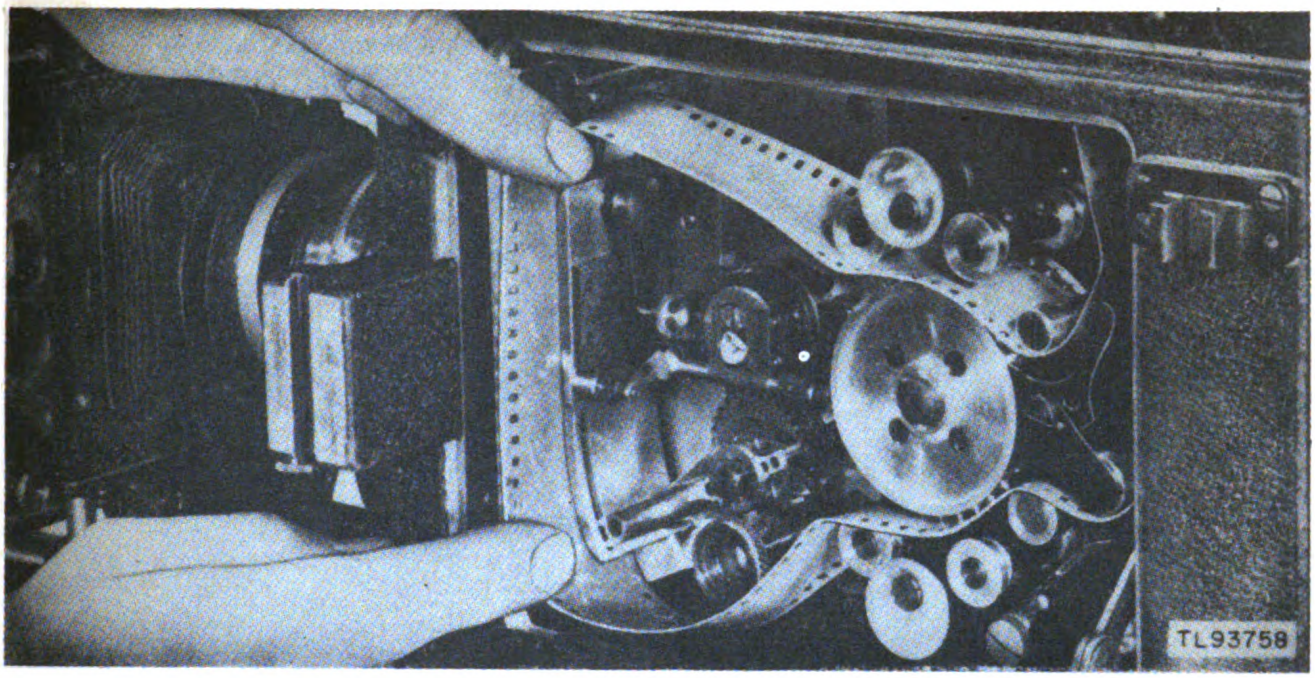

Figure 51. Placing film in film gate.

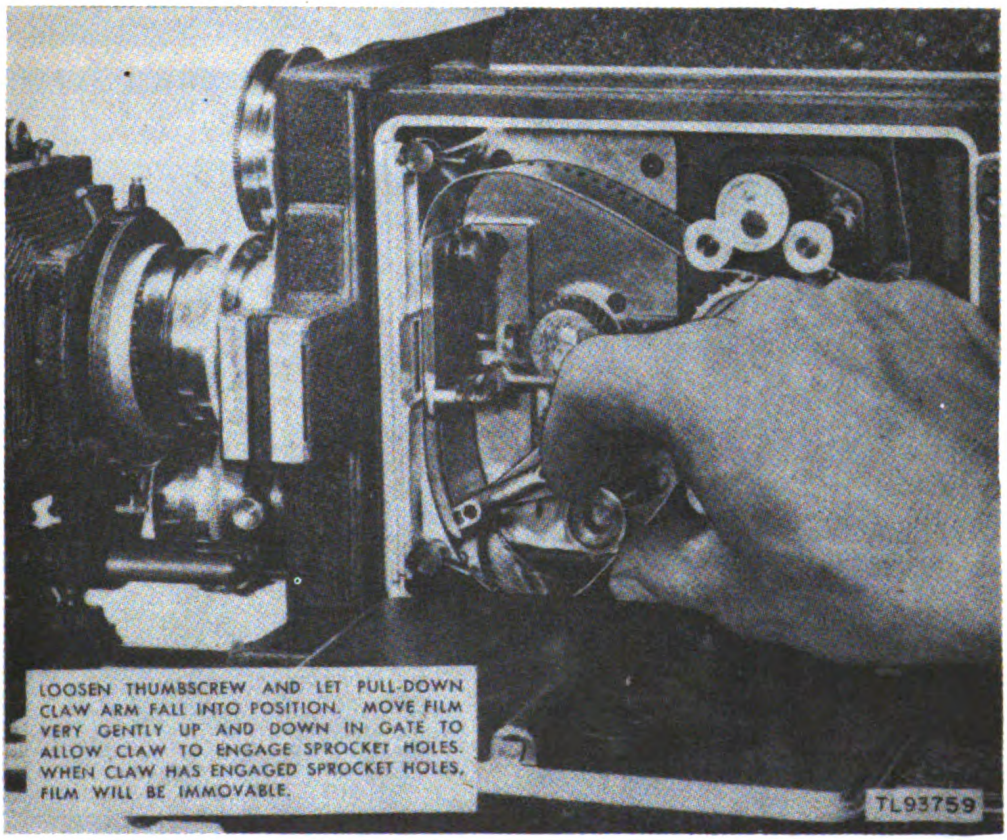

Figure 52. Resetting pull-down claw.

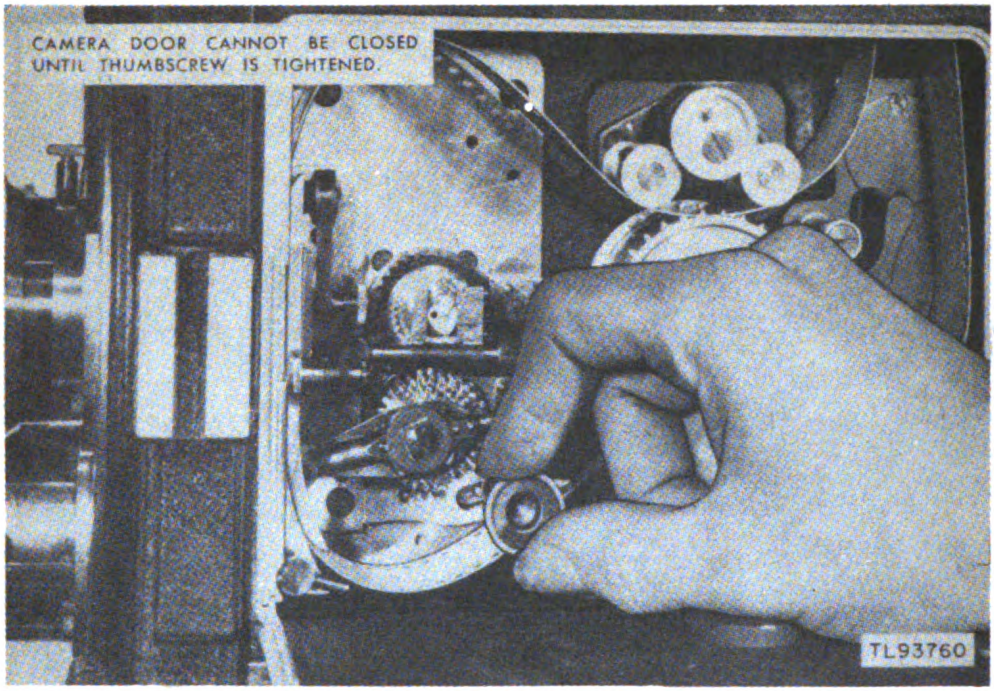

Figure 53. Tightening thumbscrew.

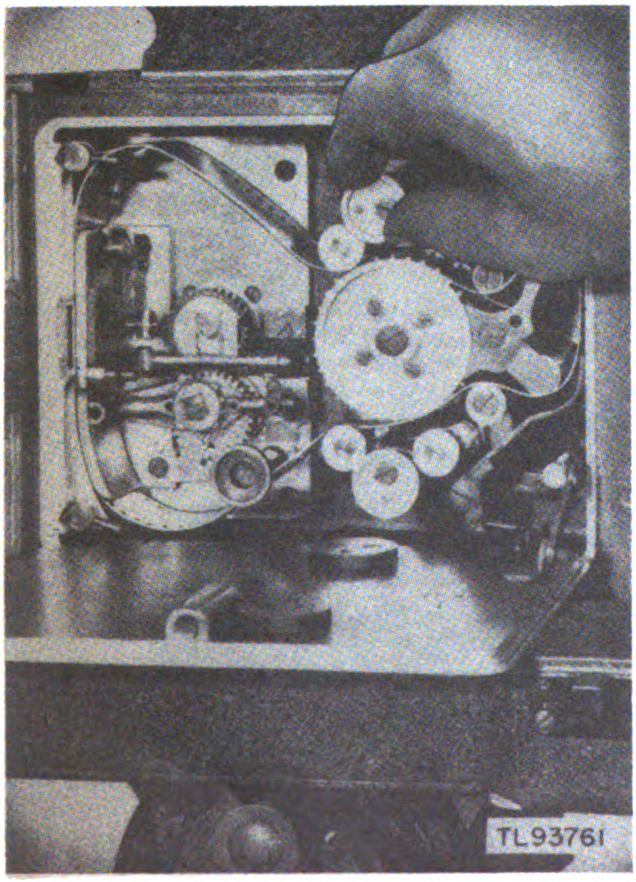

Figure 54. Locking film in upper sprocket film guide.

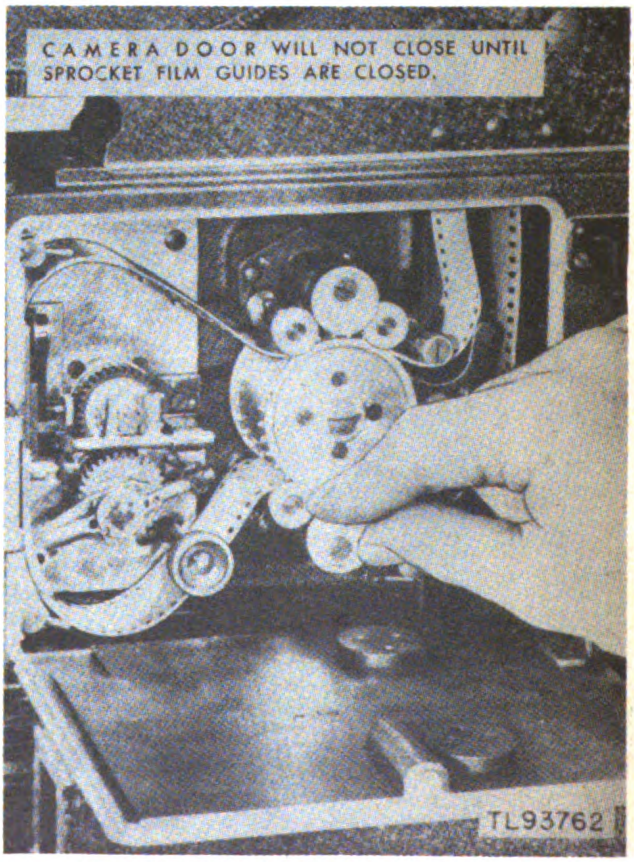

Figure 55. Locking film in lower sprocket film guide.

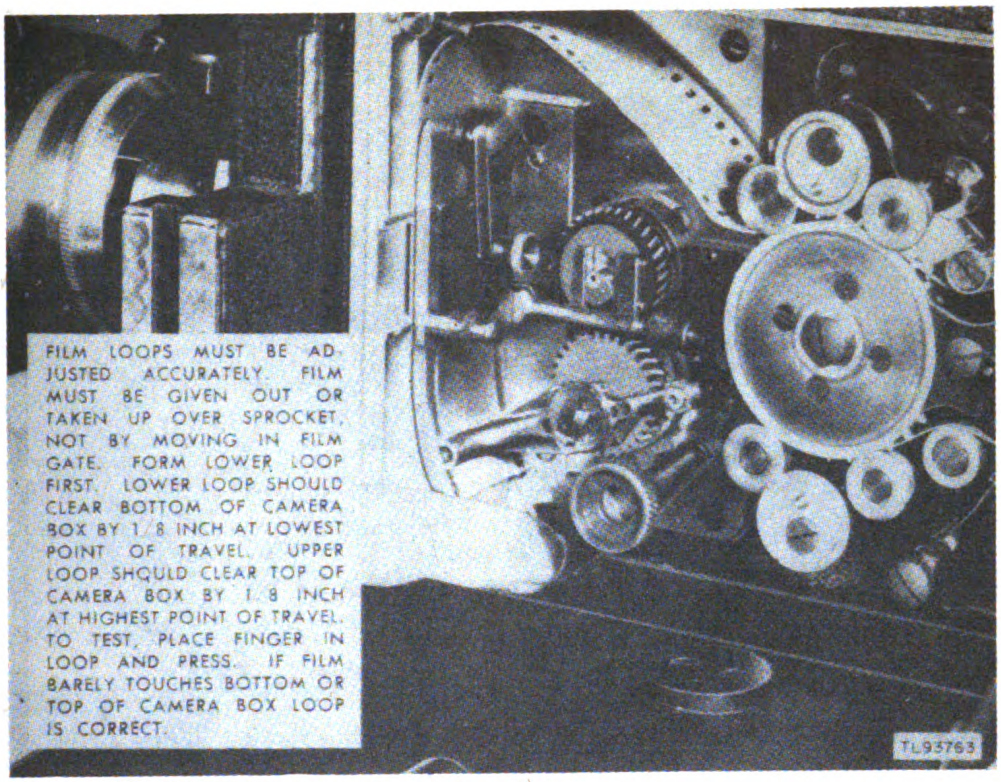

Figure 56. Adjusting film loops.

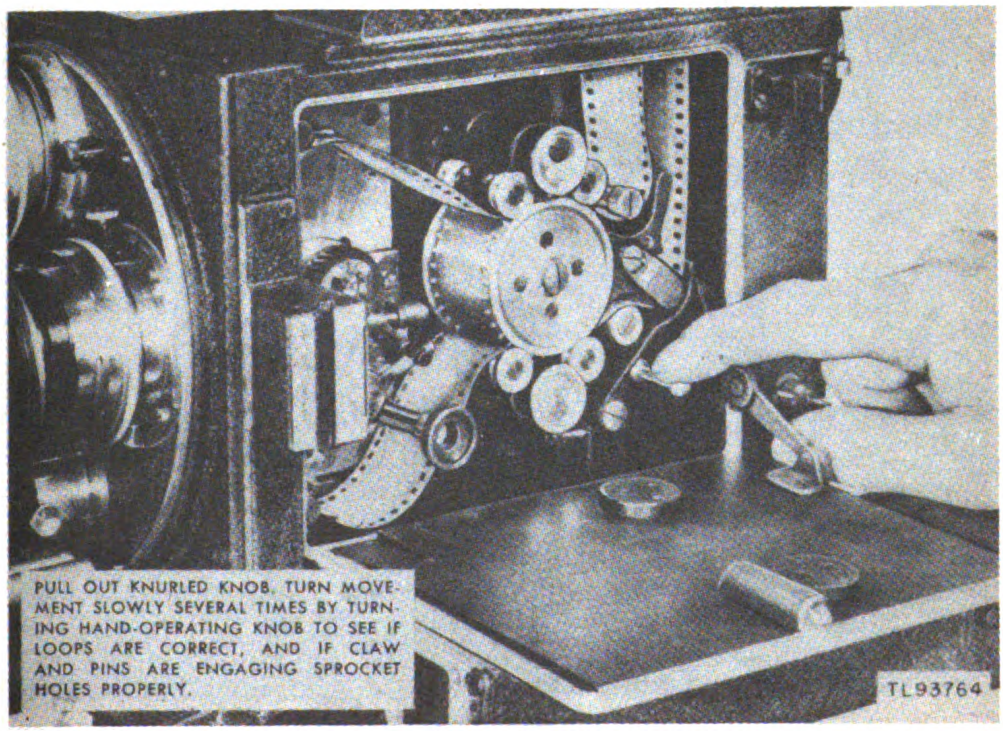

Figure 57. Resetting buckle trip.

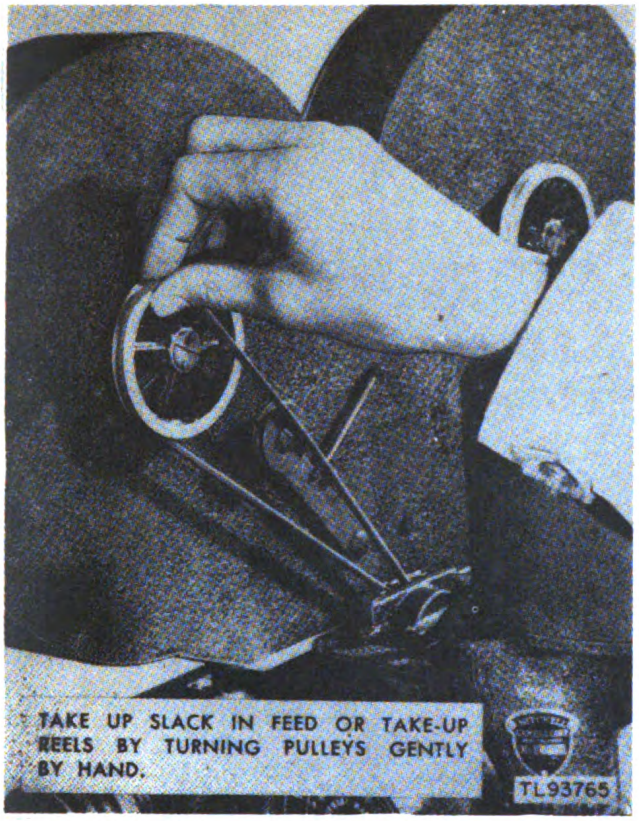

Figure 58. Placing take-up belt on pulley.

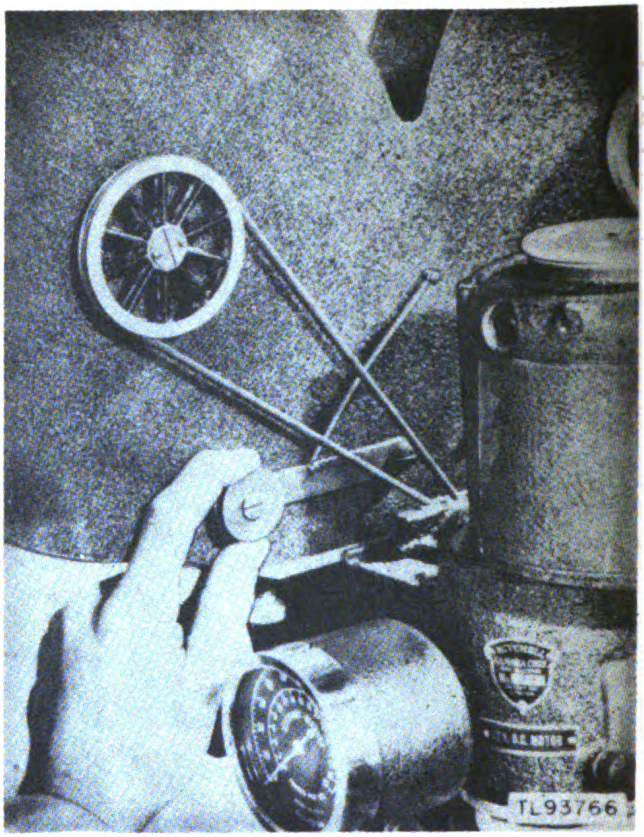

Figure 59. Placing spring tension roller on take-up belt.

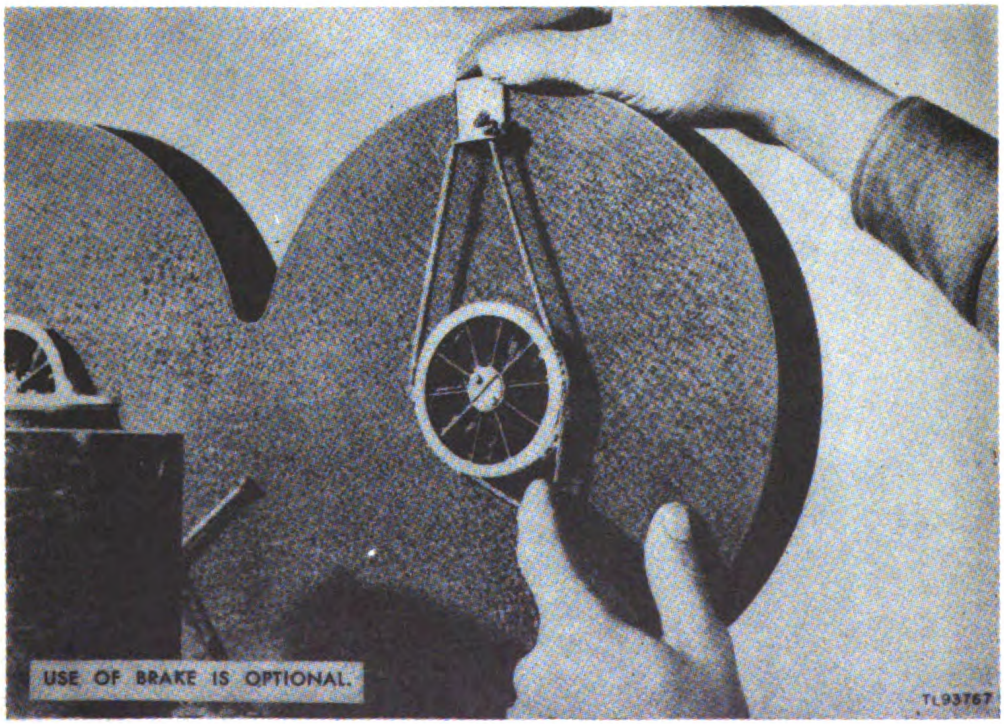

Figure 60. Attaching magazine brake.

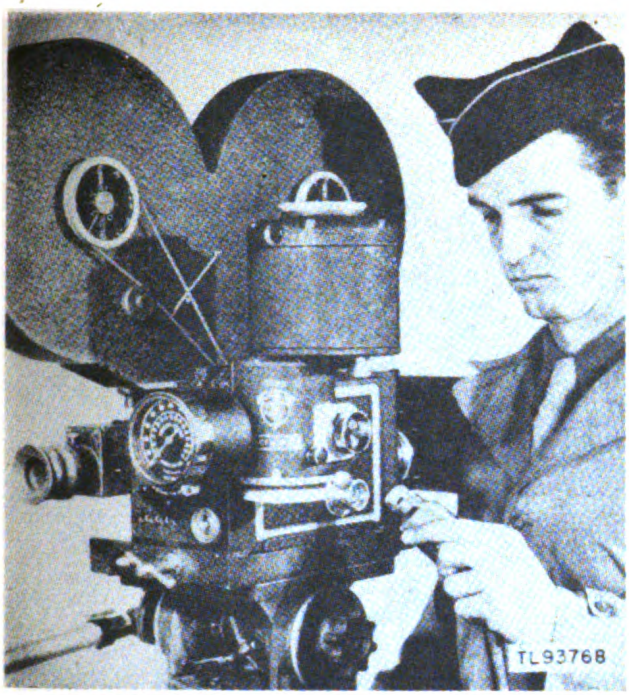

Figure 61. Connecting cord to camera: plugging in buckle trip cut-out connector.

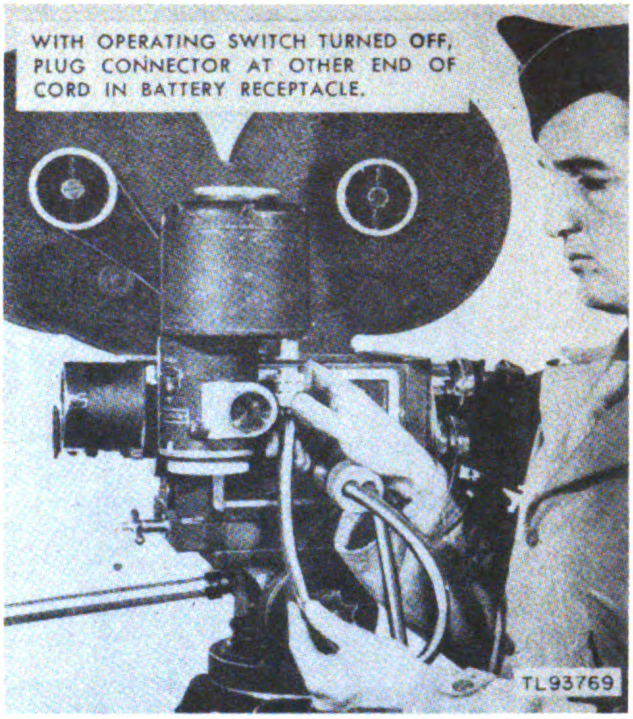

Figure 62. Connecting cord to motor: plugging in motor connector.

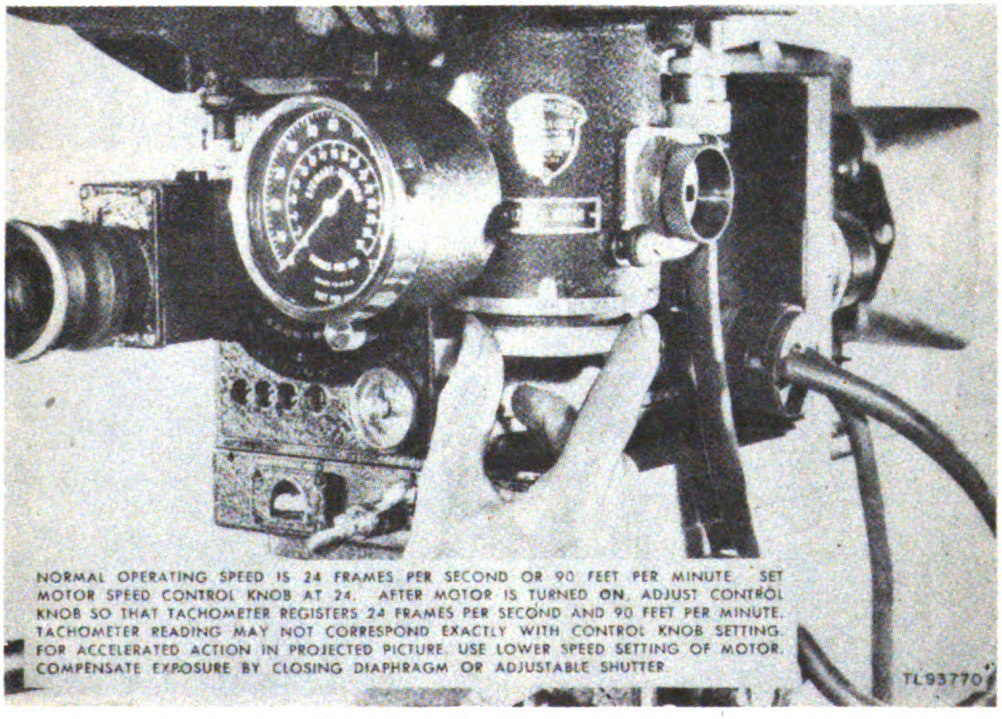

Figure 63. . Setting motor speed.

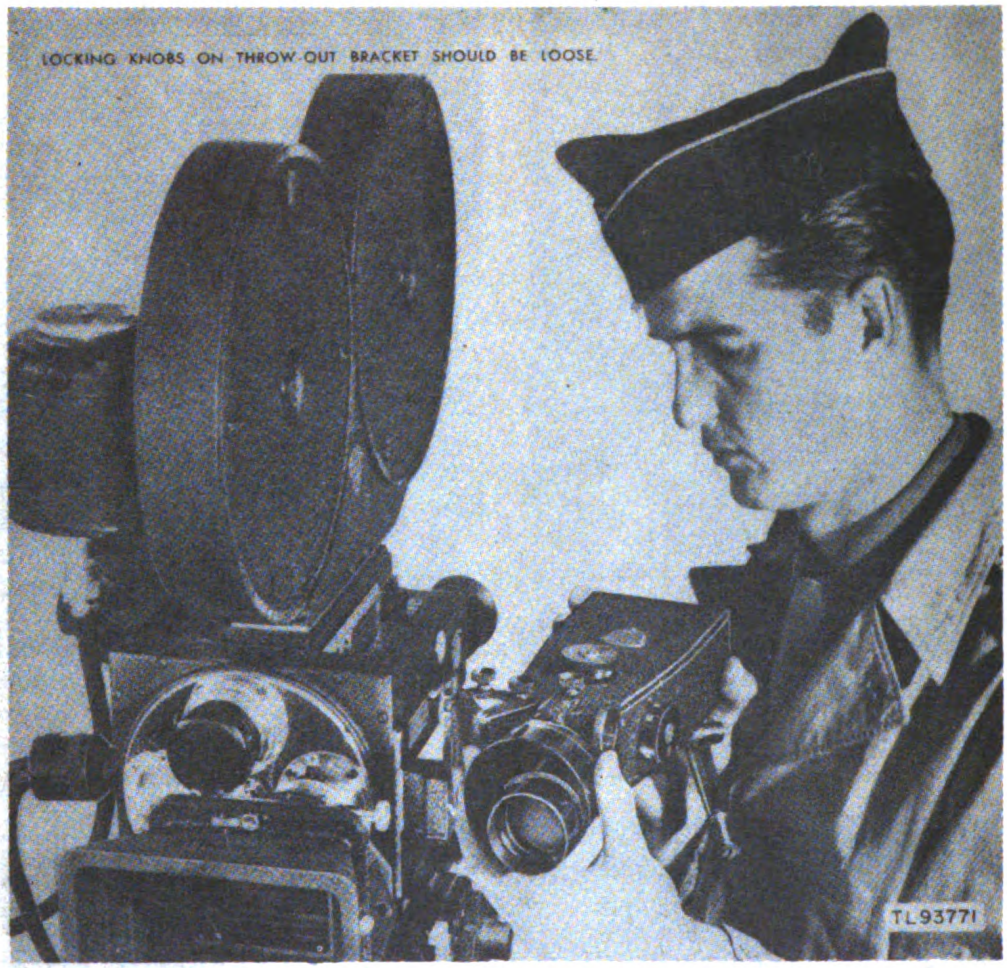

Figure 64. Mounting view-finder.

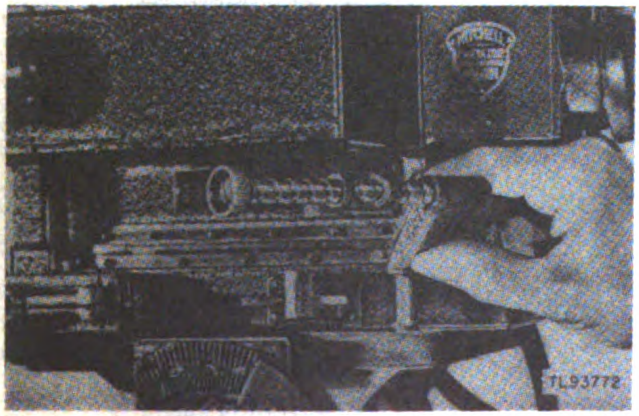

Figure 65. Parallax adjustor bracket.

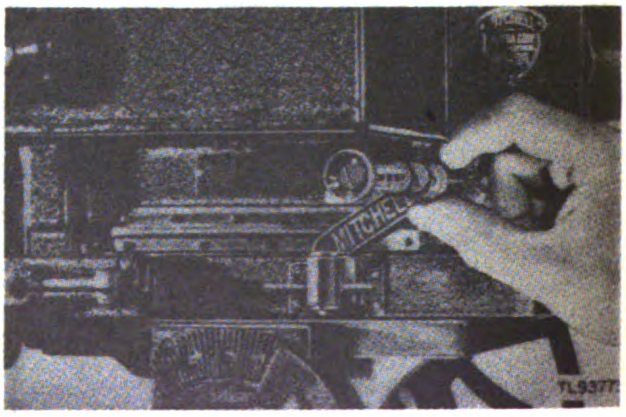

Figure 66. Parallax adjustor bracket fastened in clamp.

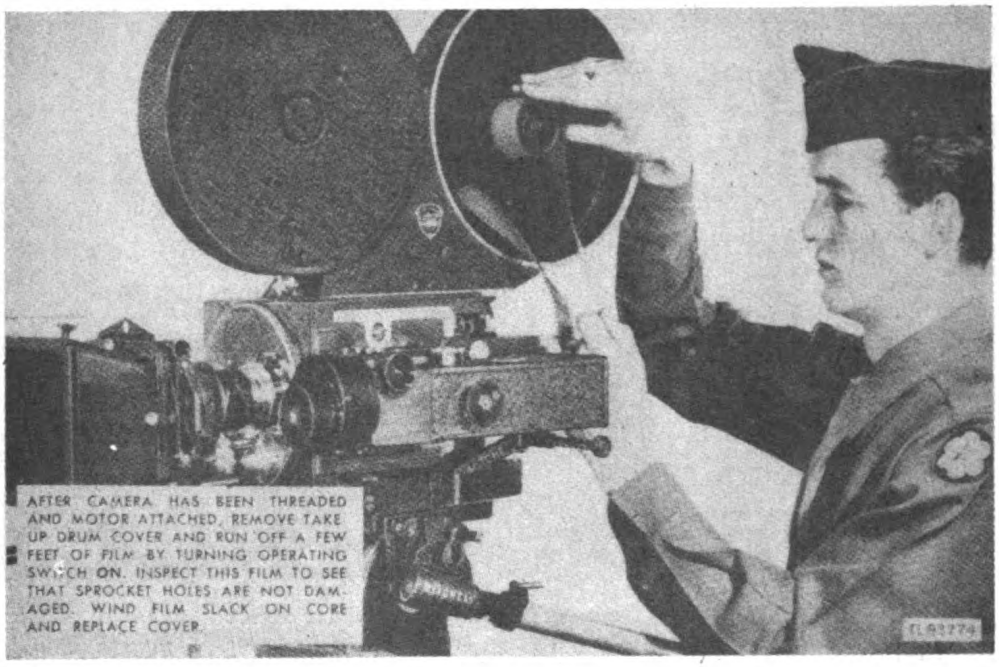

Figure 67. Checking film for proper threading.

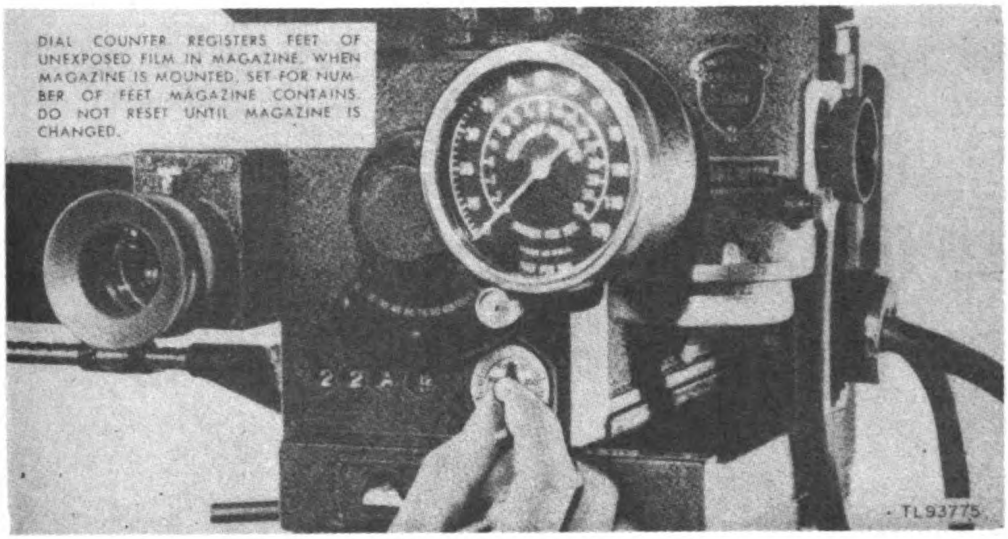

Figure 68. Setting dial counter.

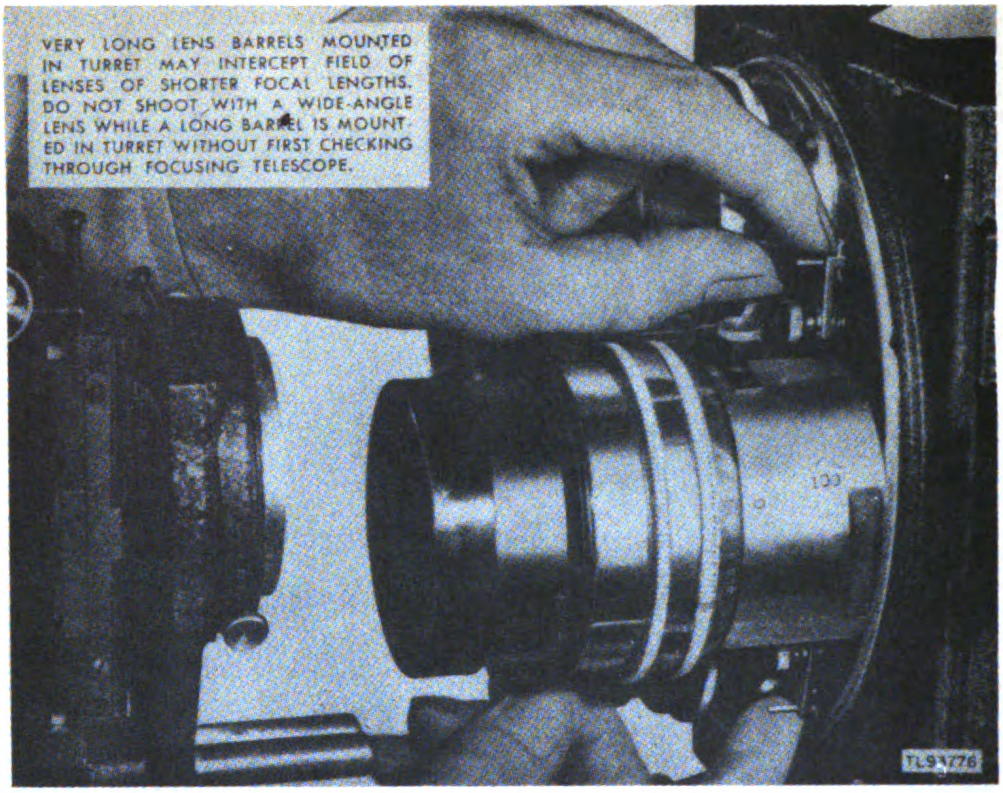

Figure 69. Attaching interchangeable lenses to turret.

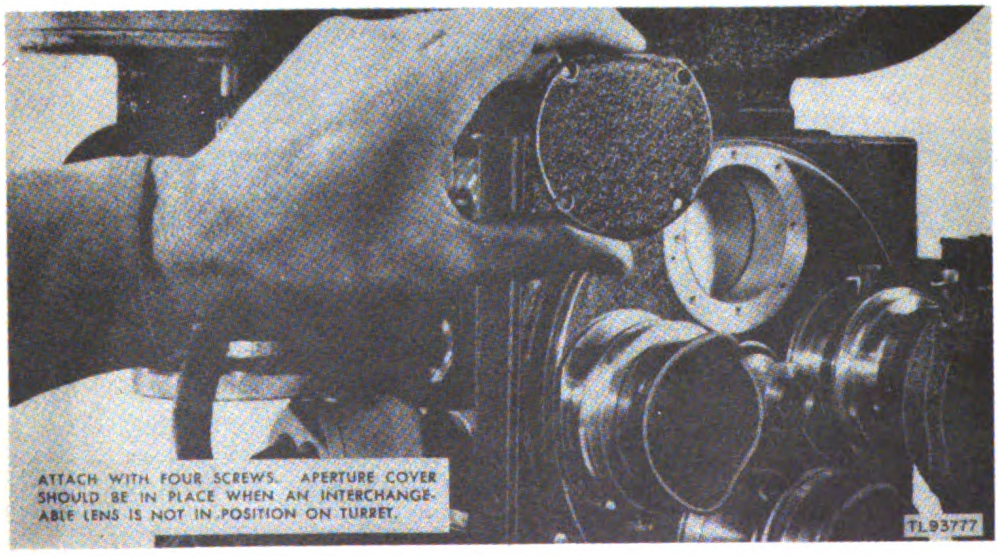

Figure 70. Fitting aperture cover

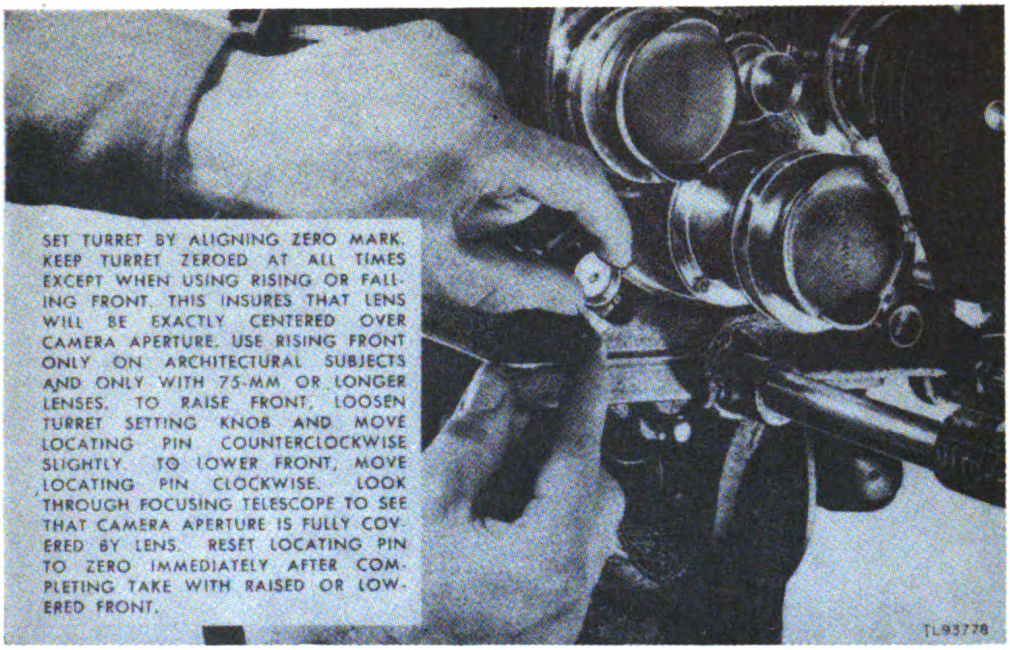

Figure 71. Setting turret locating pin.

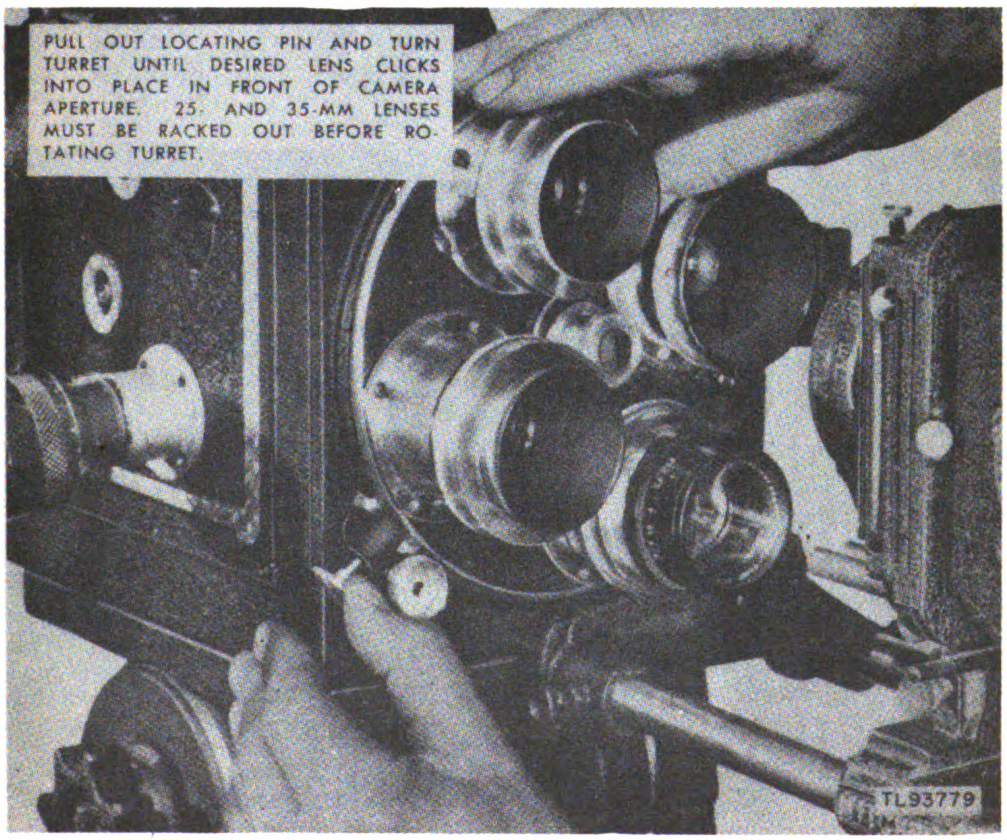

Figure 72. Rotating turret to change lenses.

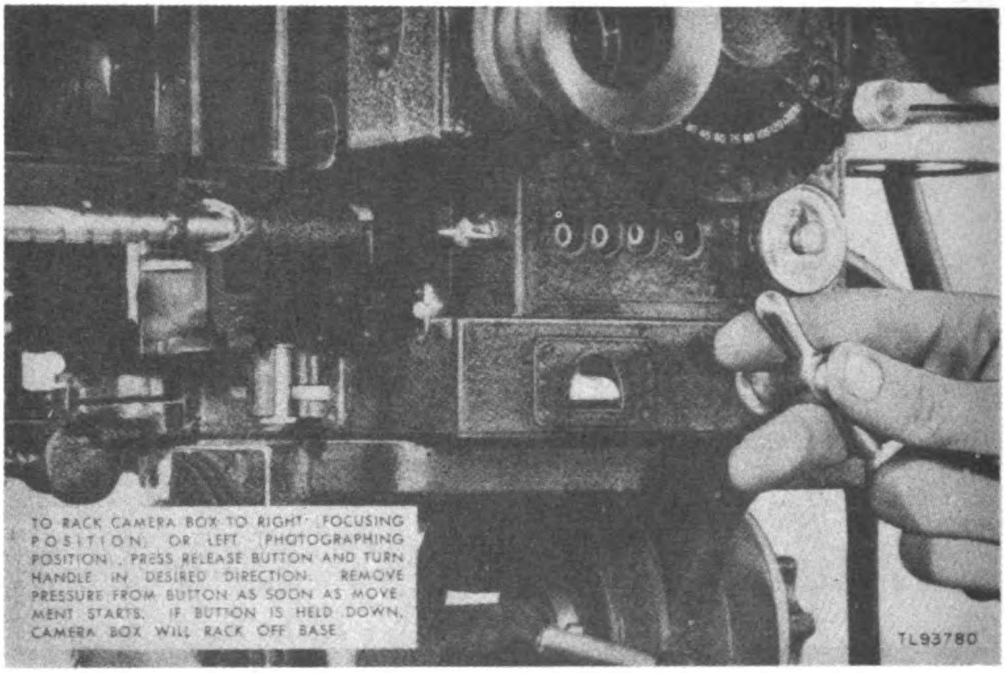

Figure 73. Operating rack-over release button.

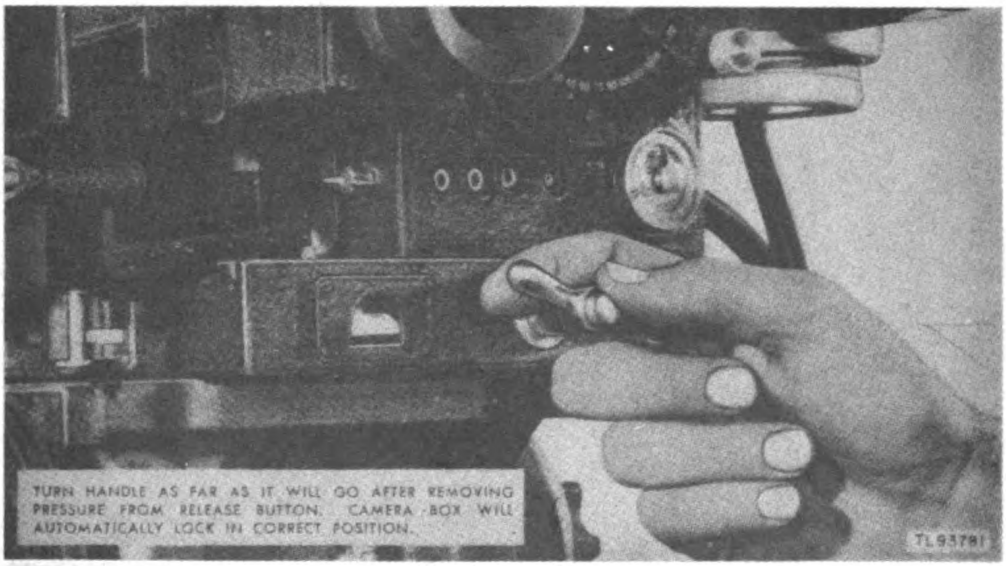

Figure 74. Operating rack-over handle.

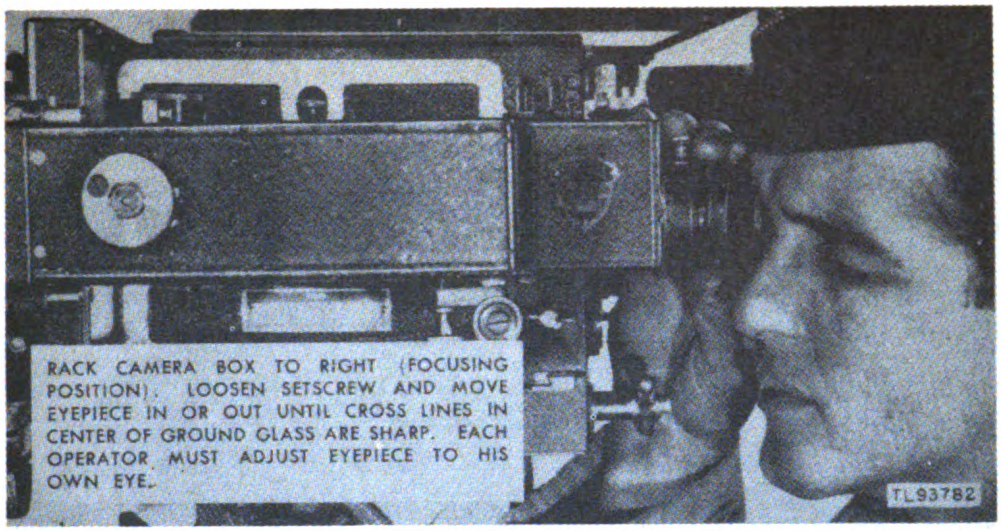

Figure 75. Adjusting focusing telescope eyepiece.

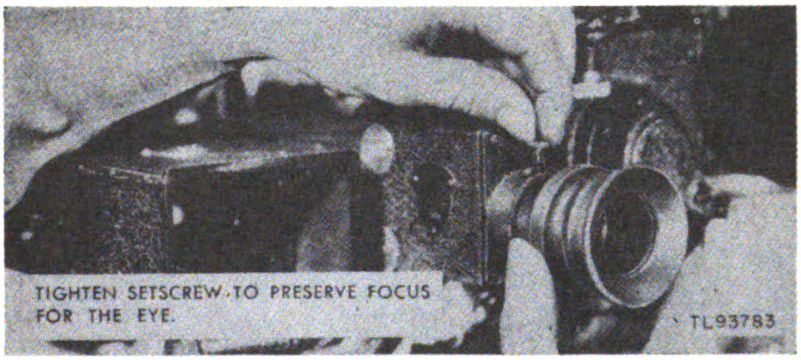

Figure 76. Tightening setscrew on focusing telescope eyepiece.

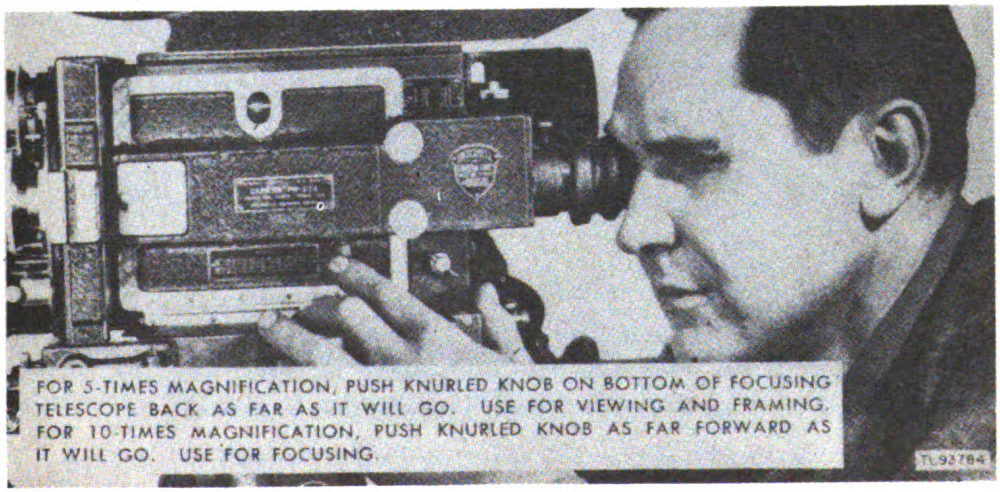

Figure 77. Adjusting image magnifier of focusing telescope.

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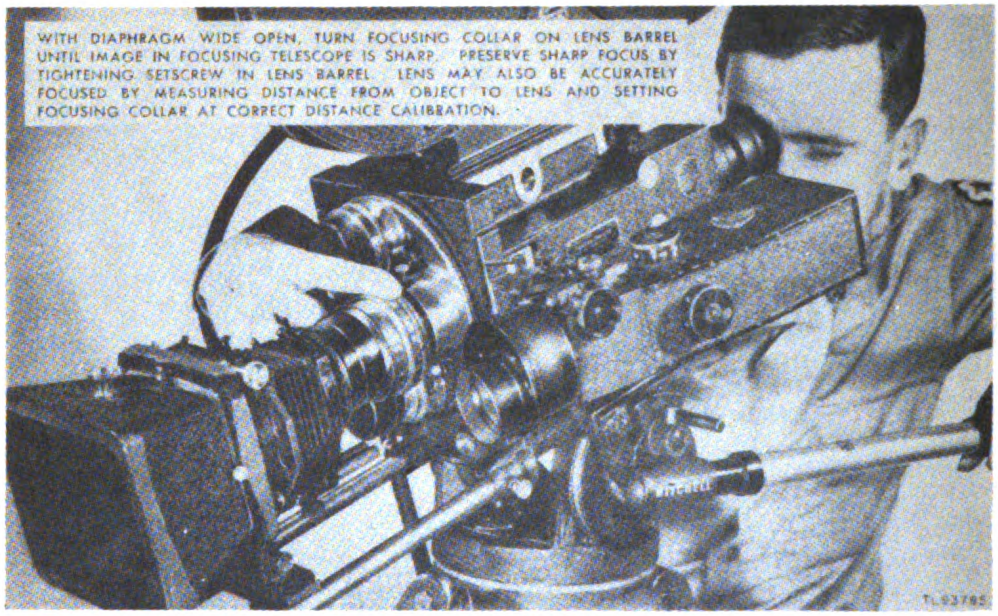


Figure 78. Focusing taking lens.

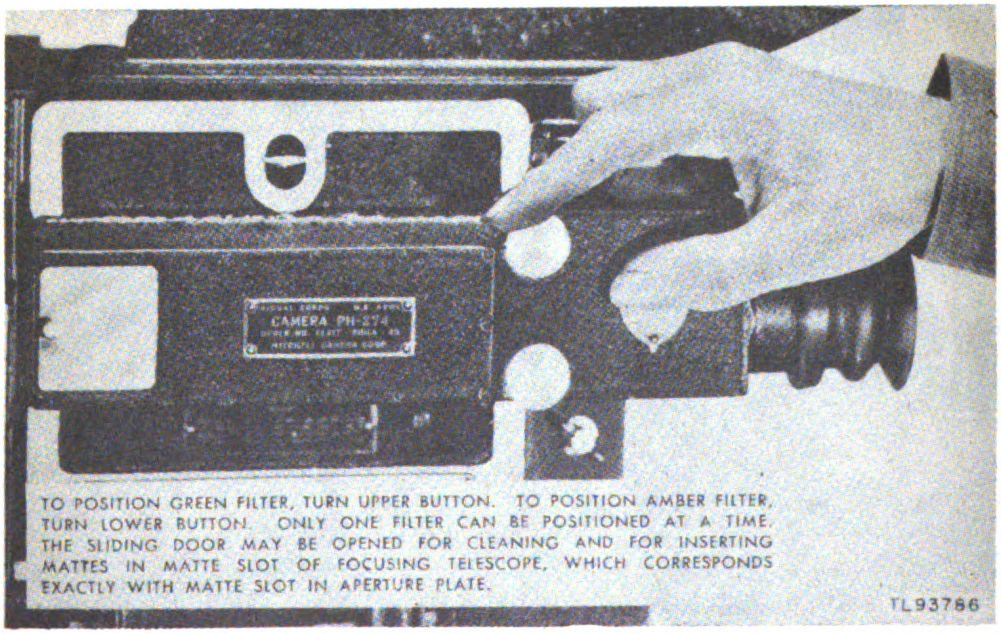


Figure 79. Placing focusing telescope viewing filters in position.

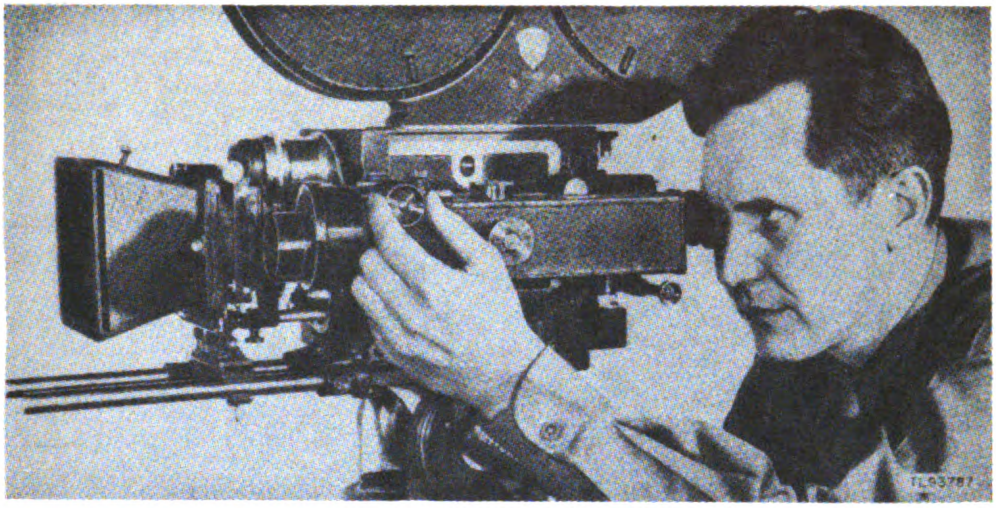


Figure 80. Focusing view-finder lens.

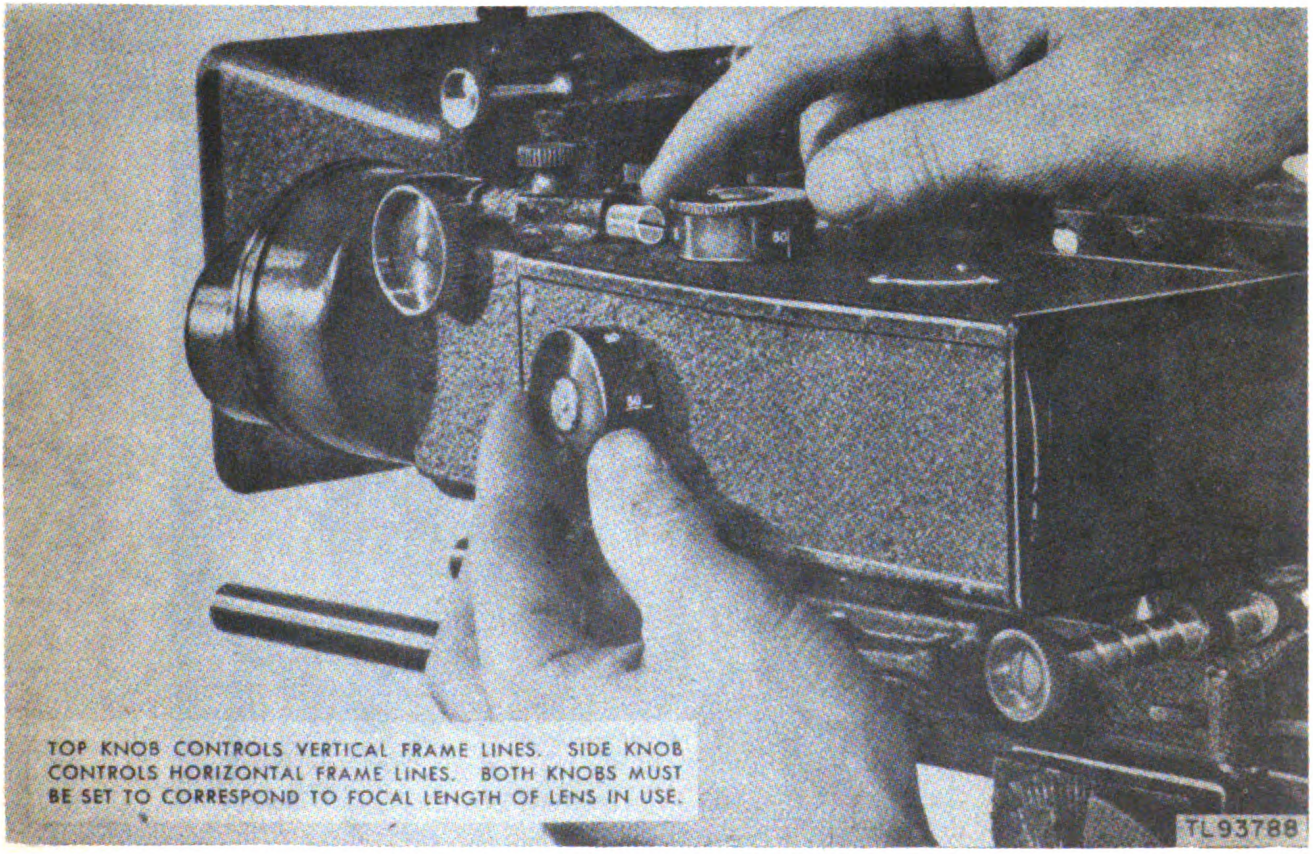


Figure 81. Adjusting view-finder mattes to match taking lens.

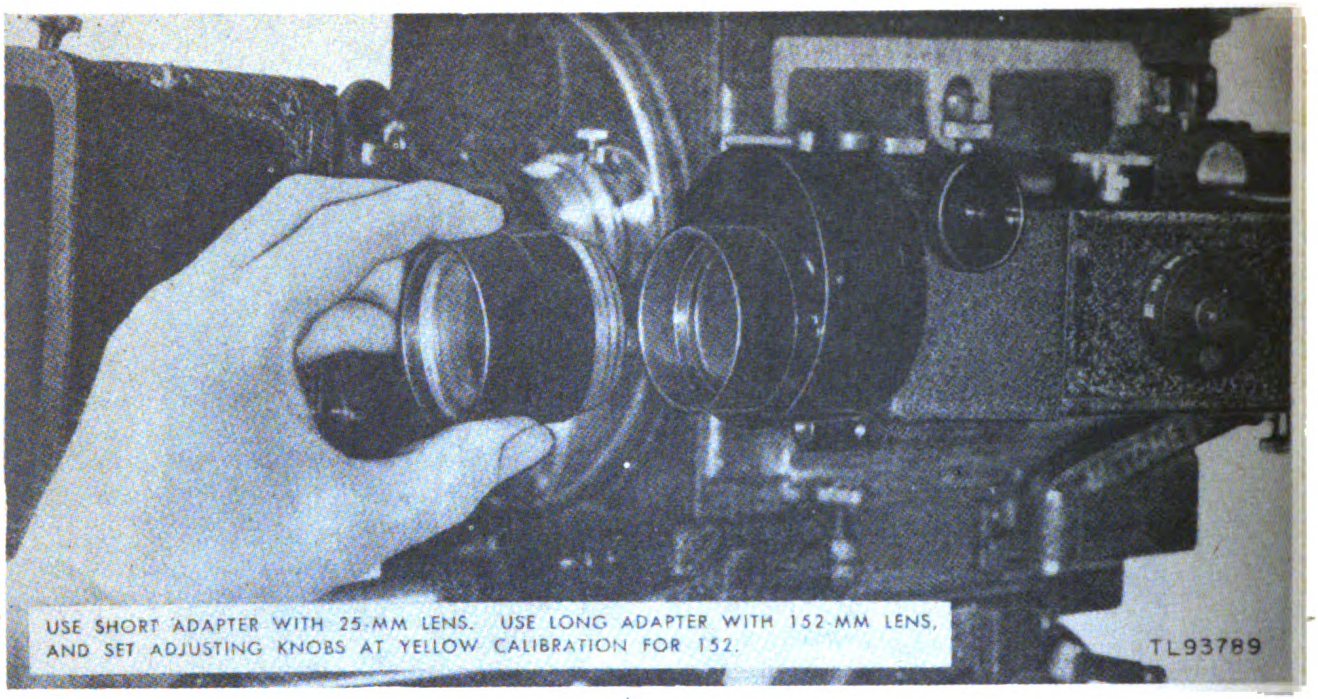


Figure 82. Attaching view-finder lens adapter.

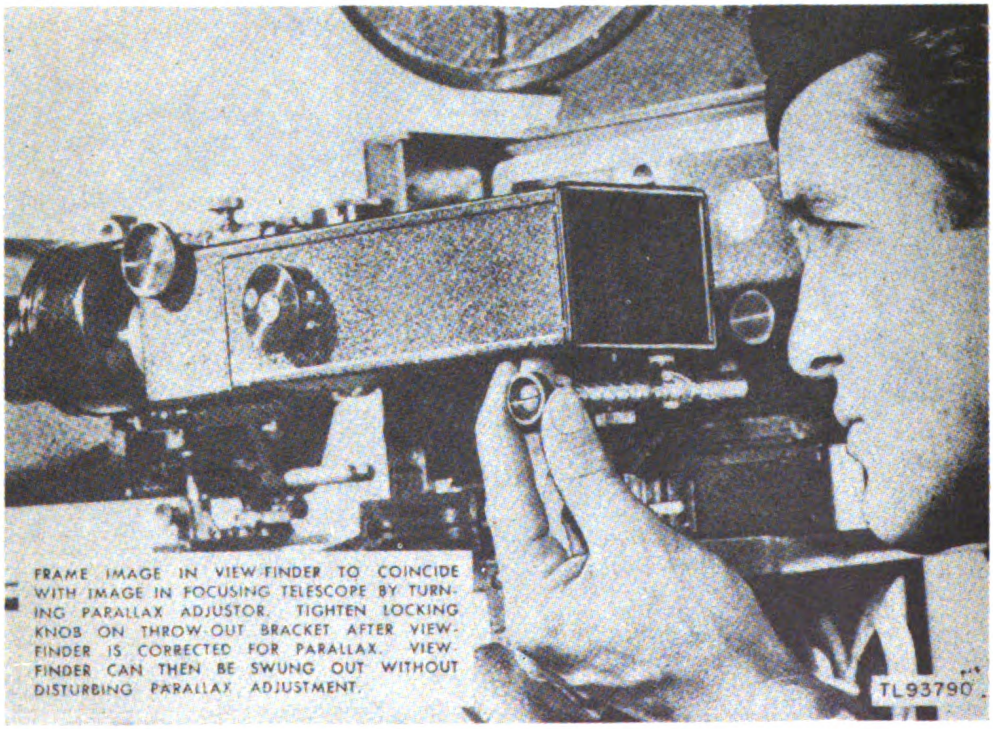


Figure 83. Adjusting view-finder for parallax.

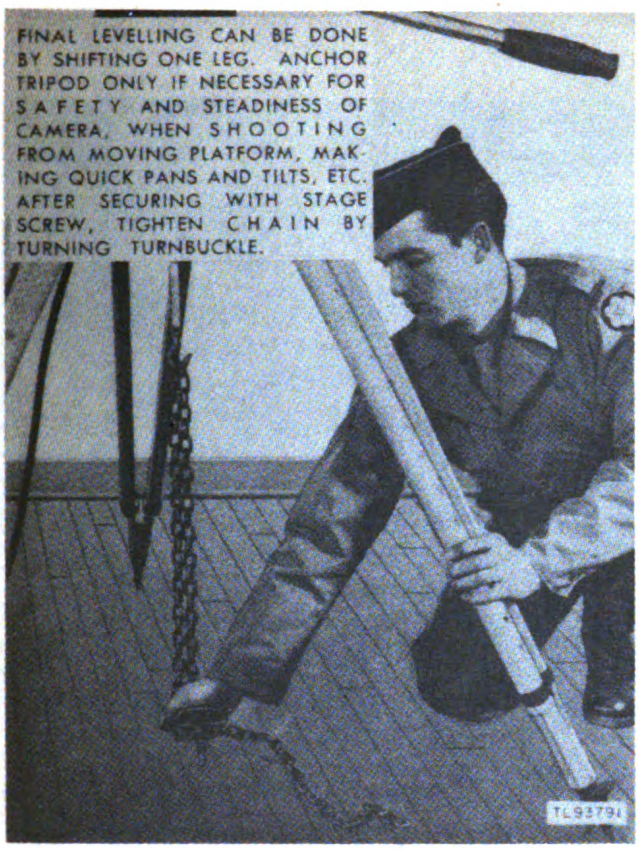


Figure 84. Anchoring tripod after final positioning of camera.

Figure 85. Inserting mattes in sunshade and matte box.

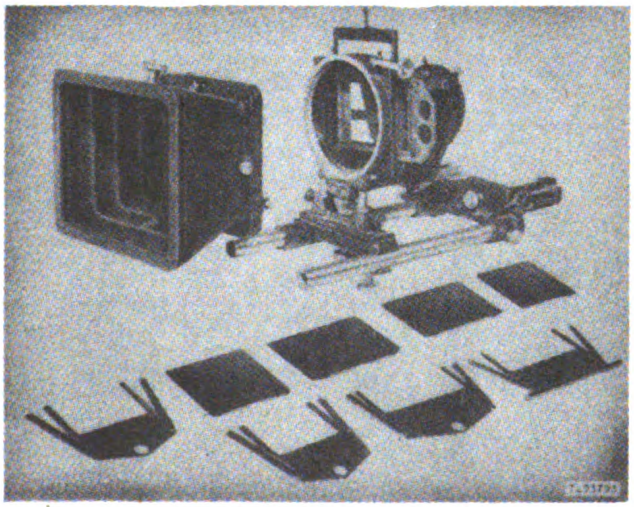


Figure 86. Sunshade and matte box partially disassembled.

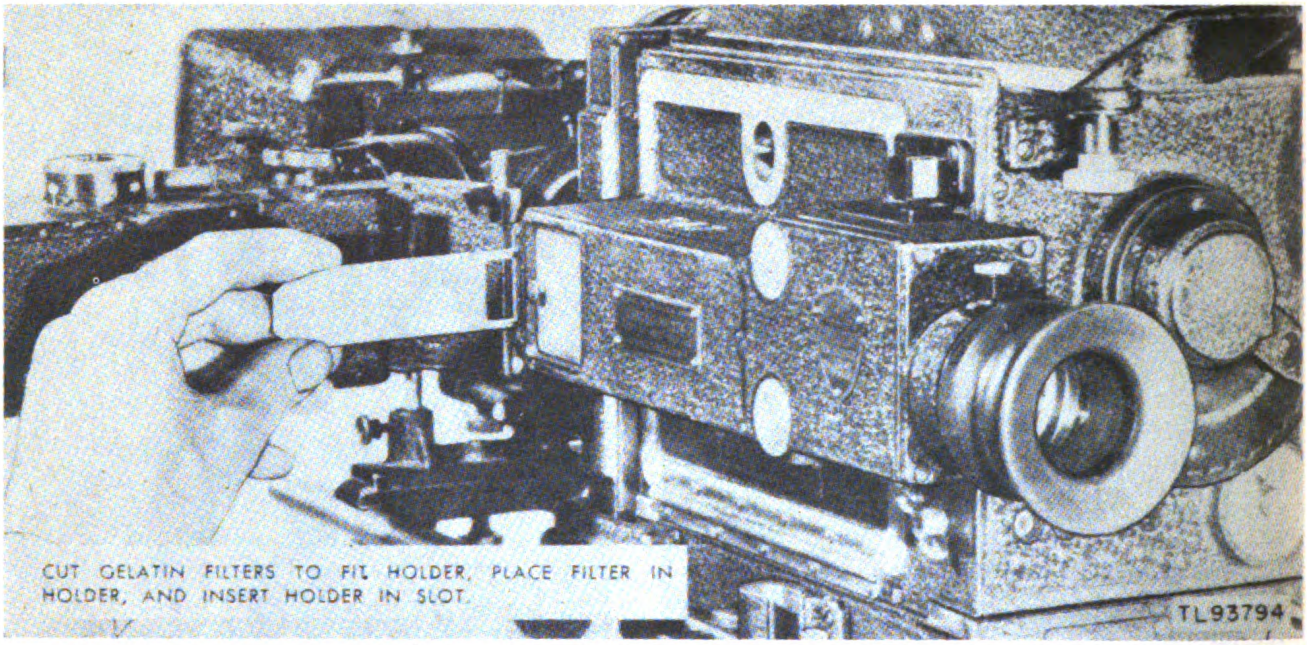


Figure 87. Inserting gelatin filter holder.

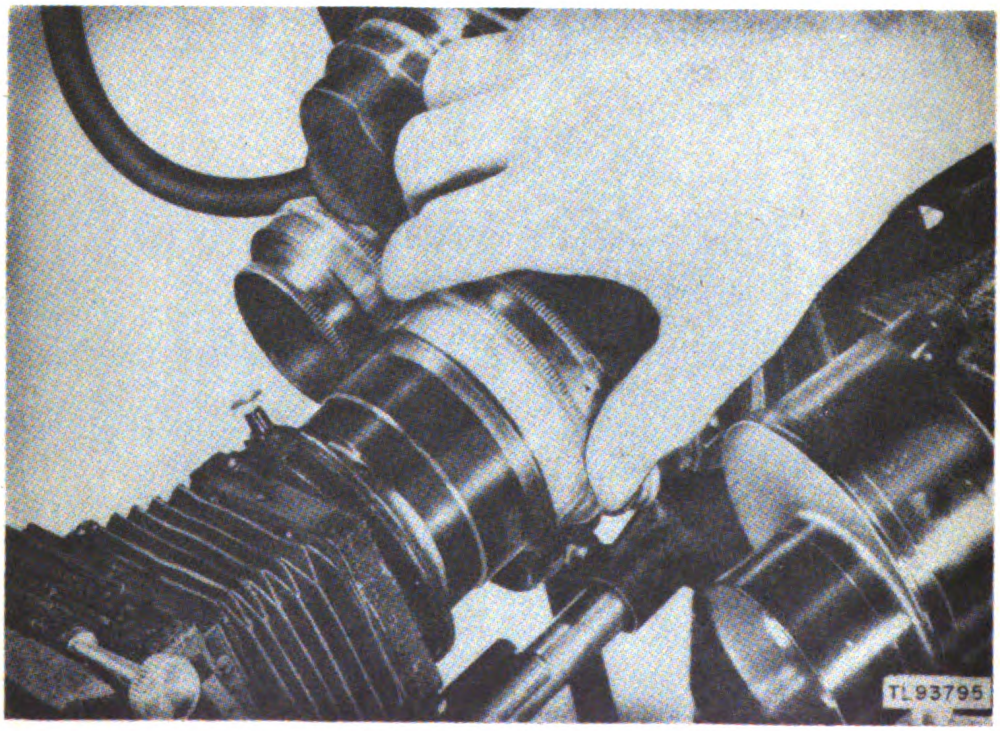


Figure 88. Setting lens diaphragm.

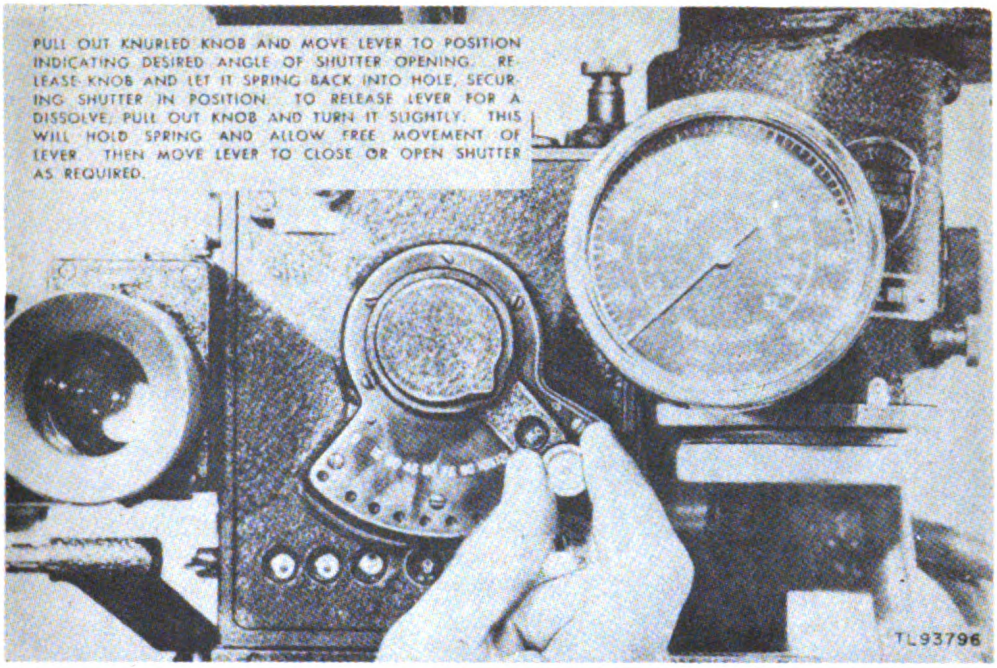


Figure 89. Setting shutter angle and using dissolving shutter.

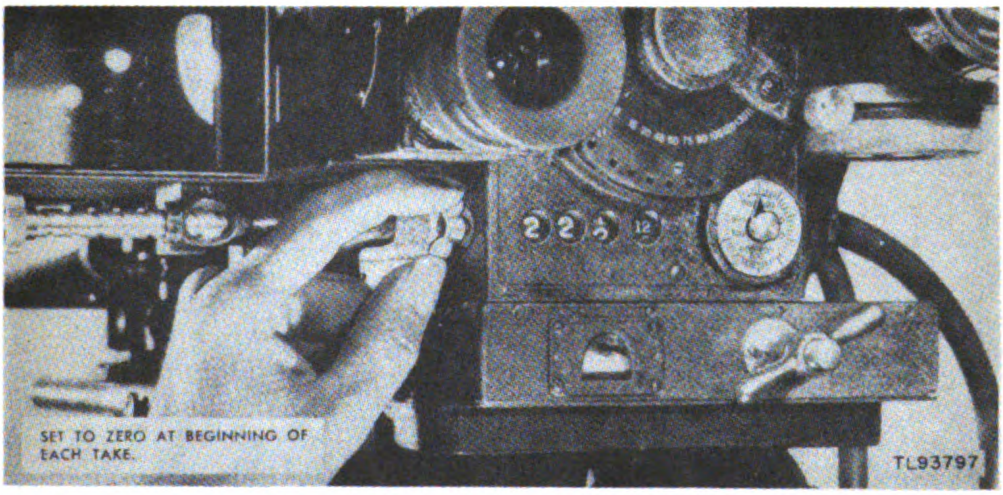


Figure 90. Setting mechanical footage counter.

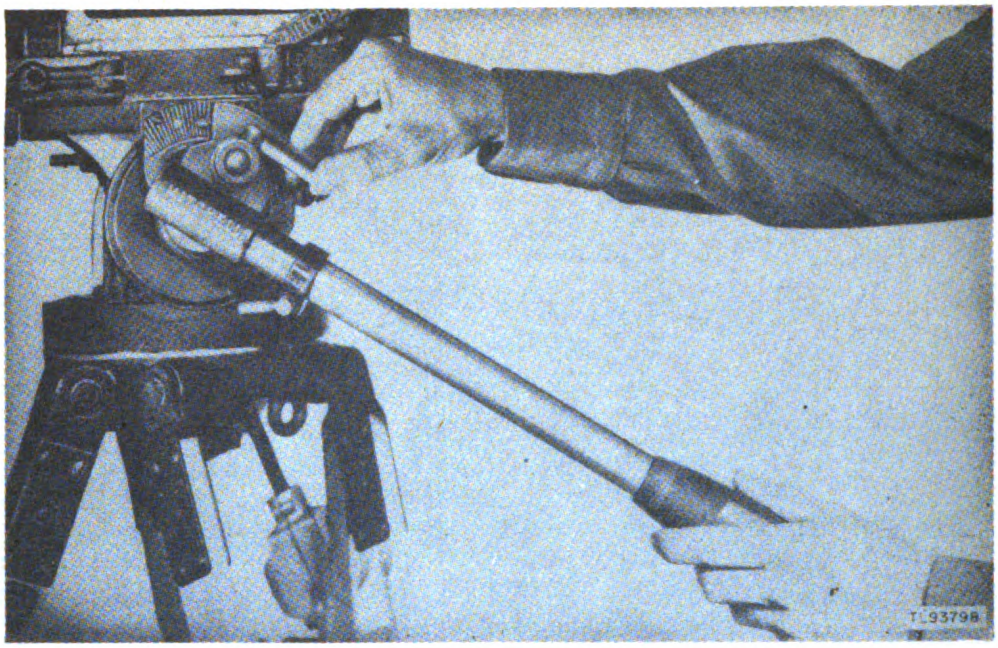


Figure 91. Adjusting pan handle position.

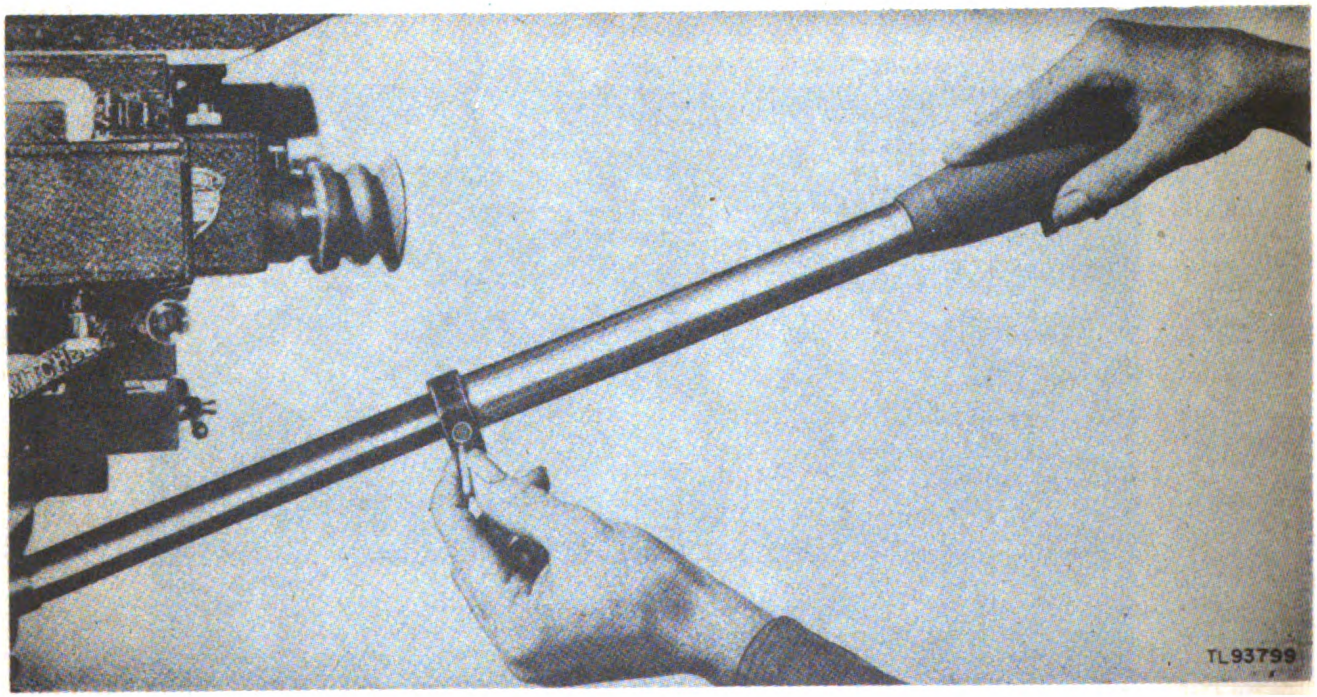


Figure 92. Adjusting length of pan handle.

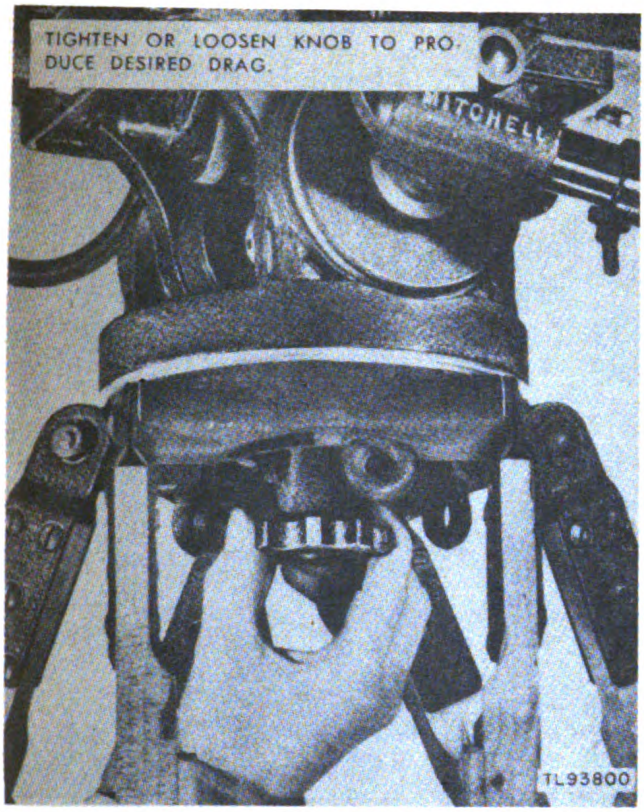


Figure 93. Adjusting pan tension.

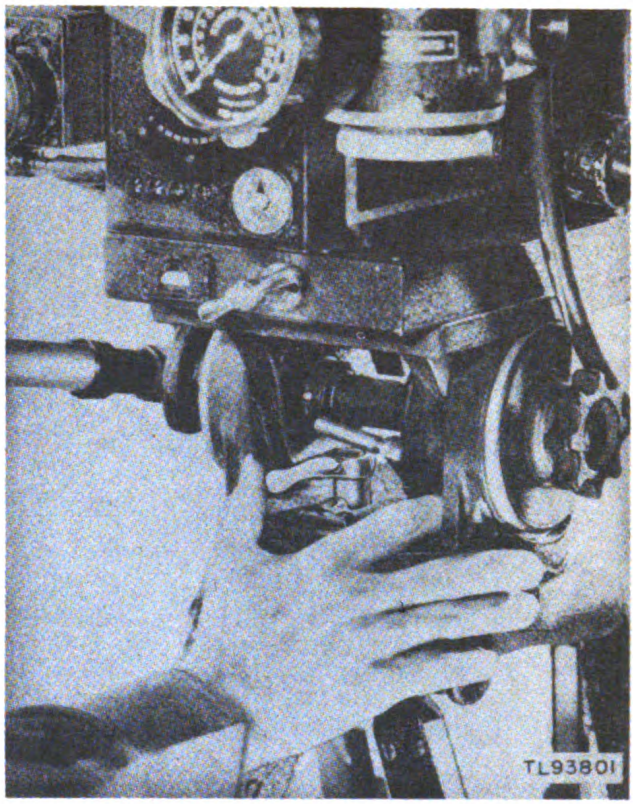


Figure 94. Locking pan movement.

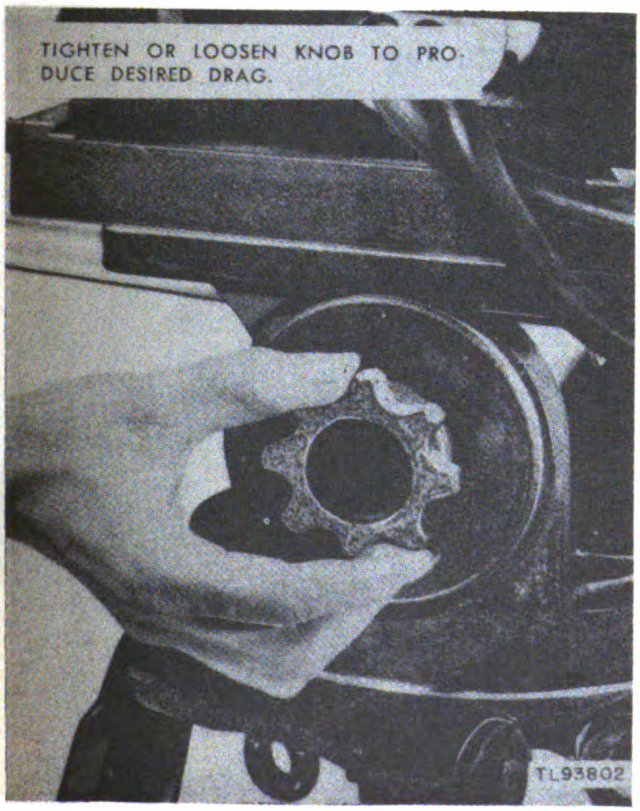


Figure 95. Adjusting tilt tension.

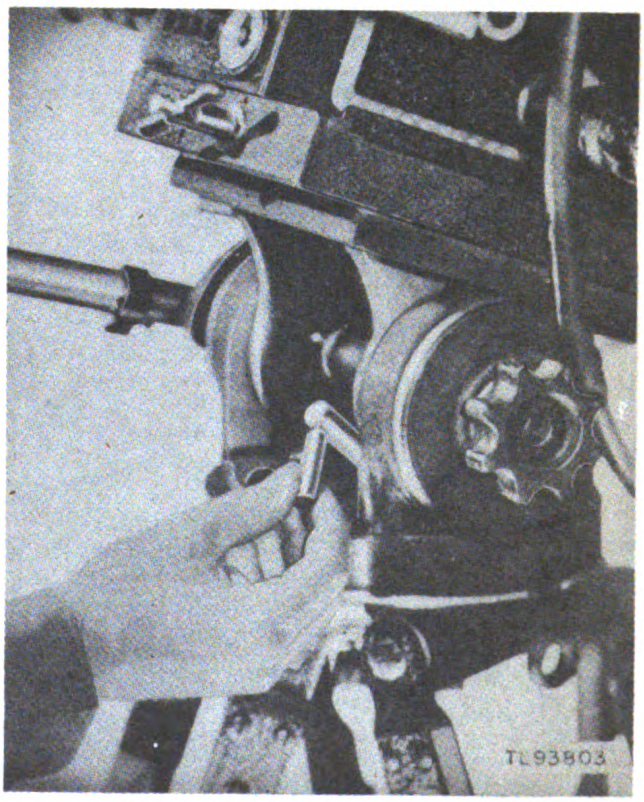


Figure 96. Locking tilt movement.

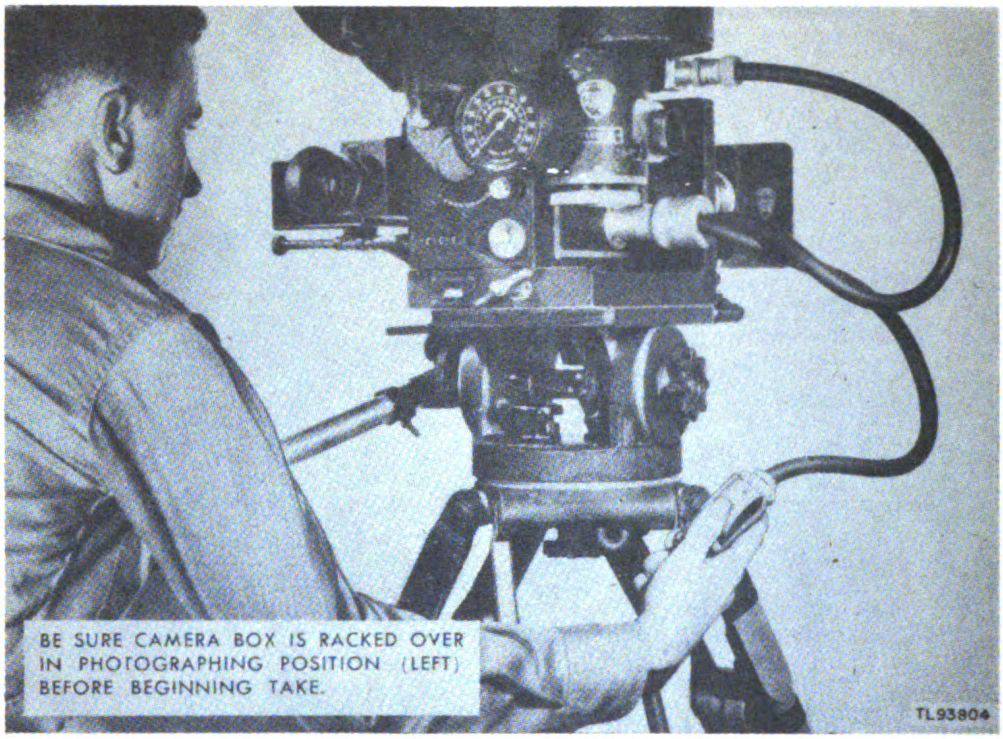


Figure 97. Turning operating switch ON.

Figure 98. Operating camera: downward tilt movement.

Figure 99. Operating camera: upward tilt movement.

Figure 100. Preparing to carry camera.

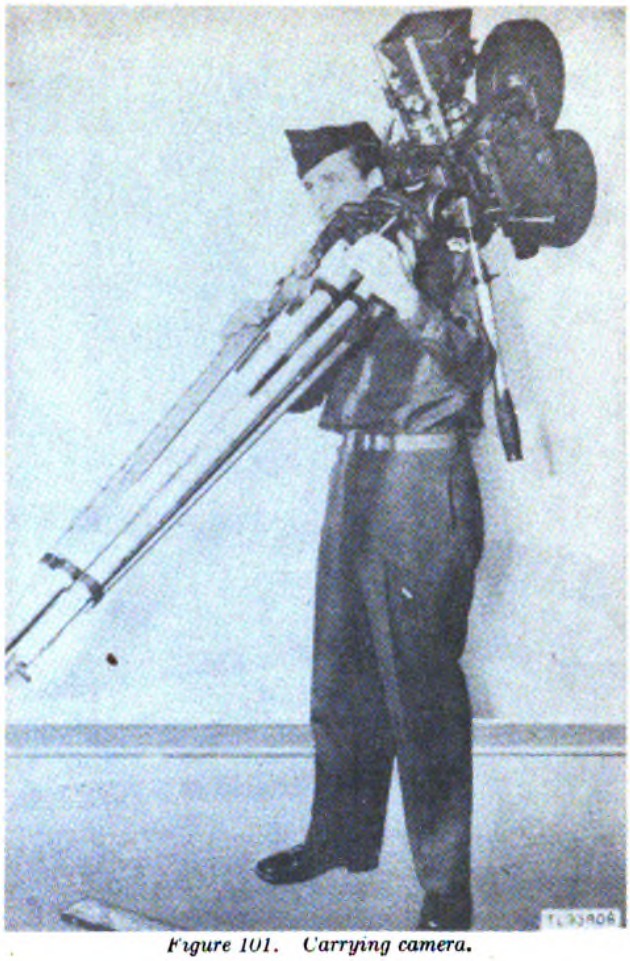


Figure 101. Carrying camera.

Figure 102. Placing barney on camera.

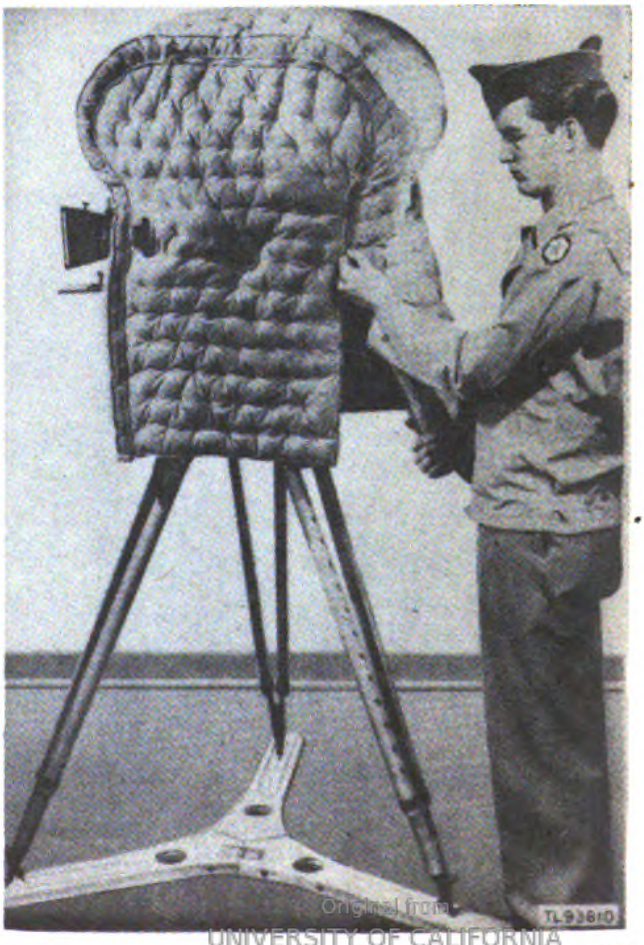


Figure 103. Barney in position.

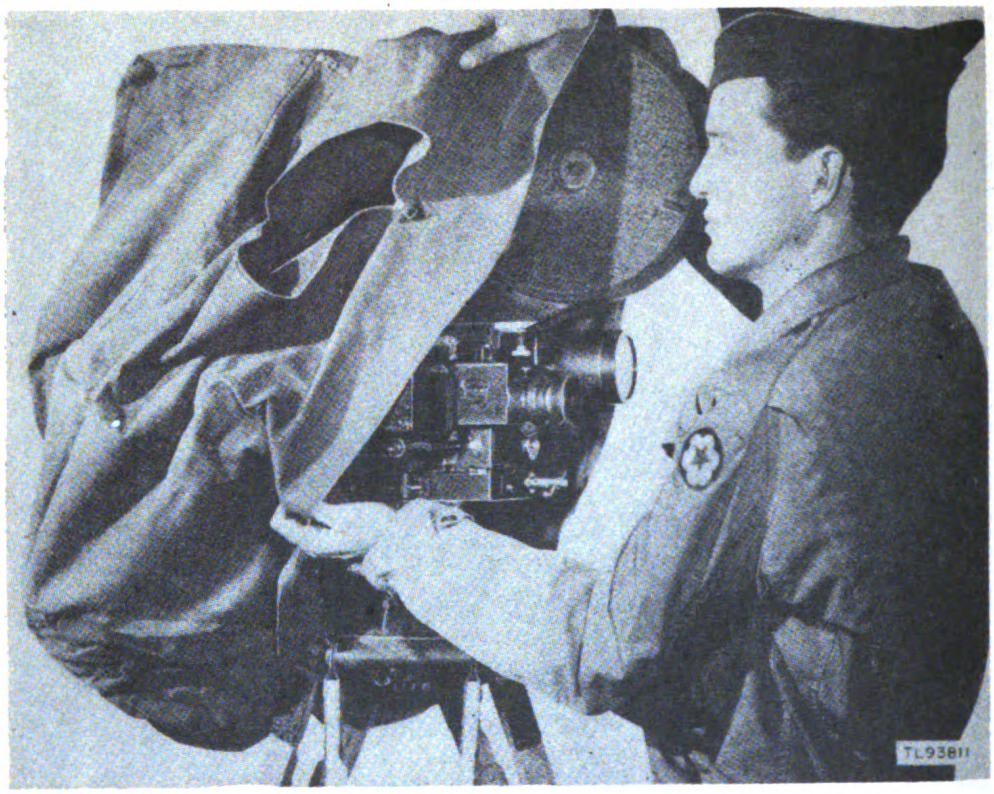


Figure 104. Placing fabric cover on camera.

Figure 105. Fabric cover in position for operating camera.

Figure 106. Fabric cover in position to protect camera.

Figure 107. Using baby tripod.

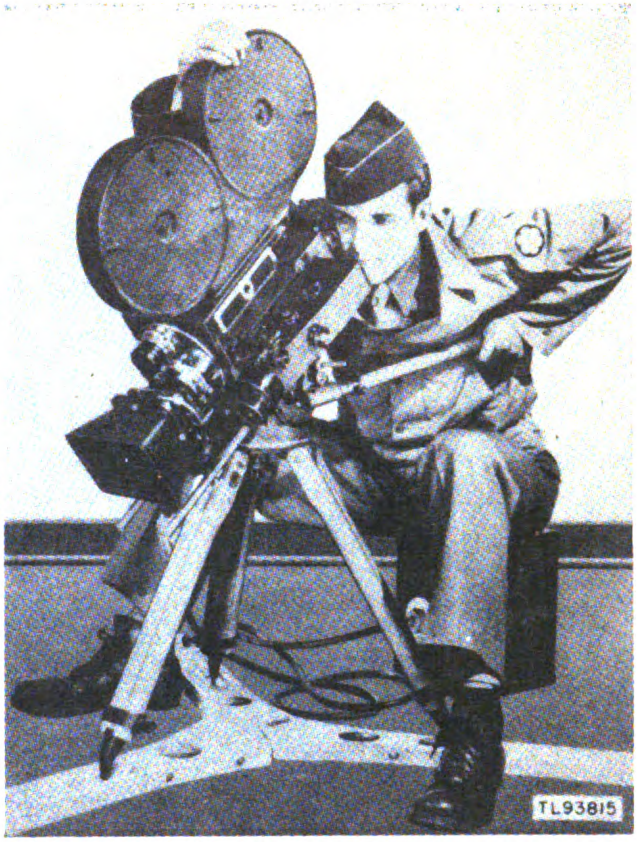


Figure 108. Using baby tripod for tilt movement.

Figure 109. Using hi-hat.

Figure 110. Hand-cranking camera.

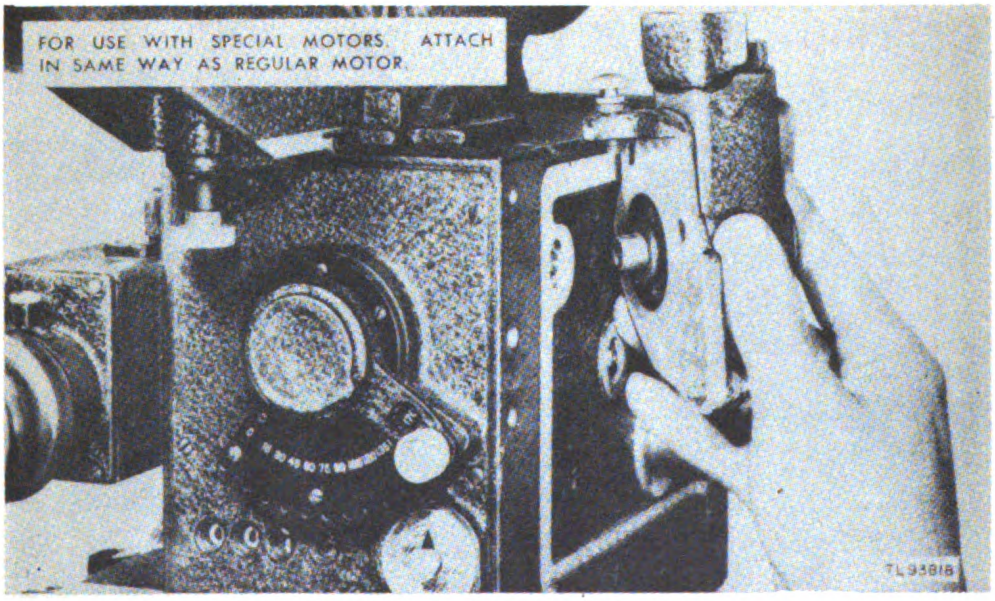


Figure 111. Attaching motor adapter.

23. Short Check List for Operating Procedure

No.	Operation	Fig. ref.
1	Load magazines	13–17
2	Set up tripod and triangle	18–23
3	Mount camera on tripod	24–27
4	Attach sunshade and matte box	28–30
5	Mount motor	31,32
6	Mount magazine	33–38
7	Thread camera	39–57
8	Attach drive belt and magazine brake (if needed)	58–60
9	Connect cord	61–62
10	Set motor speed and direction	63,32
11	Mount view-finder	64–66
12	Check film for proper threading	67
13	Set dial counter	68
14	Attach interchangeable lens to turret (if needed).	69
15	Rotate turret to place desired lens in position	72
16	Rack camera to focusing position (right)	73,74
17	Focus lens and frame scene	75–79
18	Focus view-finder lens, set mattes, and adjust for parallax.	80–83
19	Anchor tripod (if necessary)	84
20	Insert mattes and filters (if needed)	85–87
21	Set lens diaphragm	88
22	Set shutter angle	89
23	Set mechanical footage counter	90
24	Set pan and tilt mechanism as desired	91–96
25	Rack camera to photographing position (left)	73–74
26	Turn operating switch ON	97

Section IV. OPERATING PRECAUTIONS

24. Precautions During Camera Operation

The most common cause of trouble during operation is the buckling or breaking of film.

a. Film Buckles. Film buckling will immediately be apparent to the cameraman because the buckle trip switch will stop the camera. Buckling must be corrected immediately. No attempt should be made to turn the camera by hand or serious damage, such as bent pull-down claws, bent register pins, misalignment of sprocket roller assemblies, or the stripping of the micarta gears, may result. Any of these damages will require expert precision repair or replacement and will necessitate the removal of the camera to a repair shop. Buckling usually is caused by one of the following:

(1) Film break.
(2) Failure of the take-up mechanism.
(3) Incorrect threading.
(4) Gummed pressure plate.
(5) Excessive pressure on pressure plate.
(6) Camera out of synchronization.

Note. The correction of items (5) and (6) above, should be undertaken by highly trained camera repairmen equipped with the proper tools.

b. Remedy for Buckling. The occurrence of buckling will be indicated by the noise of film crumpling inside of the camera before the motor is stopped by the action of the buckle trip switch. As soon as the motor stops, proceed as follows:

(1) Throw the operating switch to OFF.

(2) Remove the belt from the take-up pulley and take up the excess film in the camera by turning the pulley by hand.

Caution. Do not allow the magazine belt to move the mechanism inside the camera while taking up the excess film. Movement of the intermittent at this time may cause serious damage. If the film is so tightly jammed that it cannot be taken up by moving the pulley, it will be necessary to open the camera door and free the film before winding it up on the take-up core.

(3) Open the camera door and remove the aperture and pressure plates. Examine the film aperture to be sure that no pieces of torn film are obstructing the light passage. Examine the registration pins and the pull-down claws to make certain that they have not been bent. Examine the the slots and holes in the aperture to make sure that punched pieces of film have not lodged there. Make certain that all torn pieces of film are removed from the camera.

(4) Rethread the camera.

c. Film Breaks. Film breakage is usually caused by improper threading, particularly in the forming of the loops. If a film breaks, the camera must be cleaned as described above and then rethreaded. Be sure to make the loops the proper size or the film will break again, or be scratched in passing through the camera.

PART THREE
MAINTENANCE INSTRUCTIONS

Section V. PREVENTIVE MAINTENANCE TECHNIQUES

25. Meaning of Preventive Maintenance

Preventive maintenance is a systematic series of operations performed at regular intervals on equipment to eliminate major breakdowns and unwanted interruptions in service, and to keep the equipment operating at top efficiency. To understand what is meant by preventive maintenance, it is necessary to distinguish between preventive maintenance, trouble shooting, and repair. The prime function of preventive maintenance is to *prevent* breakdowns and, therefore, the need for repair. The prime function of trouble shooting and repair is to locate and correct *existing* defects. The importance of preventive maintenance cannot be overemphasized. The usefulness of an entire photographic system depends upon each piece of photographic equipment in the system being ready to operate at peak efficiency when needed. It is vitally important that operators and repairmen of photographic equipment maintain their equipment properly. (See TB SIG 123.)

Note. The operations in section V are first and second-echelon (organization operators and repairmen) maintenance. Some operations in section VI are higher echelon maintenance.

26. Description of Preventive Maintenance Techniques

Most of the parts of this photographic equipment require routine preventive maintenance which differs in amount and kind required. Because maintenance techniques cannot be applied indiscriminately, definite and specific instructions are needed. This section of the manual contains specific instructions and serves as a guide for personnel who perform the basic maintenance operations. The selection of operations is based on a general knowledge of field requirements. Field use without continuous inspections and continuous performance of necessary cleaning and adjustment will result in most equipment becoming operationally erratic, undependable, and subject to breakdown when it it is most needed.

27. Materials for Preventive Maintenance

The materials listed below must be at hand before performing preventive maintenance.

Air syringe.
Camel's hair brush.
Lens tissue.
Lintless cloth.
Orange stick.
Solvent, Dry Cleaning (SD).
Oil, Preservative Lubricating, Special (PS).
Toothpicks.
Artist's brush.
Ammonia or bicarbonate of soda.
Distilled water (or water as pure as is obtainable).

Note. Only dry-cleaning solvent (SD) will be used as a cleaning fluid for Camera PH–274.

28. Cleaning Lenses

The lenses of Camera PH–274 must be inspected regularly and cleaned when necessary to prevent the possibility of diffused or fuzzy images due to dust, finger marks, condensation, or other obstructions on the glass surfaces. Generally, a lens or any other optical glass on the equipment should be handled as little as possible because the surfaces are easily scratched by abrasive dust or etched by the acid present in perspiration. Always handle lenses by their mounts, and other glass parts, such as the ground glass in the focusing tube, by the edges. Clean only those surfaces that need cleaning. Do not dismantle a lens to clean the inner elements because the inner elements are adequately protected from dust. To clean glass surfaces, proceed as follows:

a. Blow or brush all loose dust from the glass surface with an air syringe or a camel's hair brush. Do not use the brush used for cleaning the camera.

b. Inspect the surface carefully to make sure that there are no fingerprints, condensation, or oil streaks on the glass.

c. If the glass surface is smeared or streaked, dampen a sheet of lens tissue with lens cleaner, and wipe the glass surface gently to remove stains. Allow the lens to dry and then inspect it for cleanliness. If some stains persist, repeat the procedure.

d. After cleaning, remove any lint by gently brushing the surface of the glass with a clean camel's hair brush.

29. Cleaning Camera Box

The interior of the camera must be cleaned after each period of use. The cleaning is usually done with an air syringe to blow off loose dust, a camel's hair brush to dislodge clinging foreign material, and lintless cloth for wiping polished surfaces. To clean the camera interior, proceed as follows:

a. Place the camera in a room that is free from drafts and dust. If the cleaning must be performed on location, use the fabric cover as a hood to protect the mechanism while the camera door is open.

b. Open the camera door and remove the aperture plate and the pressure plate.

c. Use the air syringe to blow all loose dust from the mechanism and out of the corners of the camera case.

d. Use the camel's hair brush to get into corners and around the sprocket and guide rollers. Make sure that all bits of emulsion or film are removed.

e. Wipe the polished metal surfaces carefully with soft lintless cloth, being careful not to catch the cloth on the teeth of the sprocket or on other sharp projections.

f. With a camel's hair brush, remove from the mechanism and interior of the case any threads or foreign material that may have been loosened by the cloth.

g. Close the camera door to keep the camera interior clean while cleaning the aperture plate and the pressure plate.

30. Cleaning Aperture and Pressure Plates

a. Aperture Plate. The aperture plate should be cleaned every 1,000 feet or oftener, or each time camera is threaded. To clean the plate, proceed as follows:

(1) Remove the plate from the camera.

(2) Clean the aperture and film channel with a camel's hair brush to remove any foreign material.

(3) Remove accumulated emulsion from the film channel, the registration pin holes, and the pull-down claw travel slots by using an orange stick, or any other type of pointed, soft, wooden prod.

(4) Blow through the registration pin holes and the claw slots with an air syringe.

(5) Polish the film channel with the heel of the hand. Place a drop of preservative oil (PS) on the film channel and rub it in thoroughly with the thumb or the heel of the hand, to remove all excess oil. The hand must be free of grit and perspiration. Be sure that the registration pin holes and the claw slots are dried completely.

(6) Reinstall the aperture plate into the camera.

b. Pressure Plate. The pressure plate should be inspected and cleaned each time the aperture plate is cleaned. To clean the pressure plate, proceed as follows:

(1) Use a camel's hair brush to remove all loose dust and bits of emulsion.

(2) Wipe the polish film track with the ball of the thumb to remove any lint or dust that may be adhering to the surface.

(3) Test the rollers to see that they revolve freely in the plate. If the rollers show a tendency to stick, immerse the pressure plate in clean, dry-cleaning solvent (SD), revolving the rollers while they are in the fluid. Dry the plate thoroughly with a clean, soft, lintless cloth, and then use an air syringe to evaporate the dry-cleaning solvent (SD) that may be adhering to the roller bearing pins. When the plate is dry, apply a minute amount of preservative oil (PS) to the roller bearings with a toothpick. Wipe off all excess oil.

(4) Reinstall the pressure plate in the camera.

31. Cleaning Lens Mount Threads and Turret

The threads of the lens mounts are made tight fitting to insure smooth operation. When the camera has been operated under dusty conditions, the lubricant on the threads and on the inner face of the turret will catch and retain dust particles, which if left on the threads will eventually cause excessive wear. To clean, proceed as follows:

a. Loosen the knurled focus setscrews and unscrew the male component of the mount completely.

b. Clean the lubricant off the threads of the lens mount with a soft cloth very lightly dampened with dry-cleaning solvent (SD).

c. Dry the threads thoroughly.

d. Lubricate the threads as directed in the lubrication order. (See fig. 144.)

e. Repeat the operation on the female component of the lens mount.

f. Reinstall the male lens mount and tighten the knurled focus setscrews.

g. Remove the turret knob locking screw and then remove the turret knob completely.

Note. The turret knob locking screw is left-hand threaded.

h. Remove the turret spring.

i. Pull out the turret locating pin as far as it will go and ease the turret off the turret spindle.

j. Clean and relubricate the inner face of the turret as described in the lubrication order. (See fig. 144.)

k. Reassemble the turret by reversing the disassembly procedure.

32. Cleaning Magazines

The film magazines should be cleaned each time they are unloaded. To clean the magazines, proceed as follows:

a. Place the magazines on a table in a room free from dust.

b. Remove both magazine covers, placing the corduroy side up.

c. Use an artist's brush to remove dust, bits of film, pieces of emulsion, or other foreign matter that may be in the drums or on the covers and make sure that the *light-trap rollers are cleaned thoroughly.*

d. Blow all loosened material out of the magazine chambers with an air syringe.

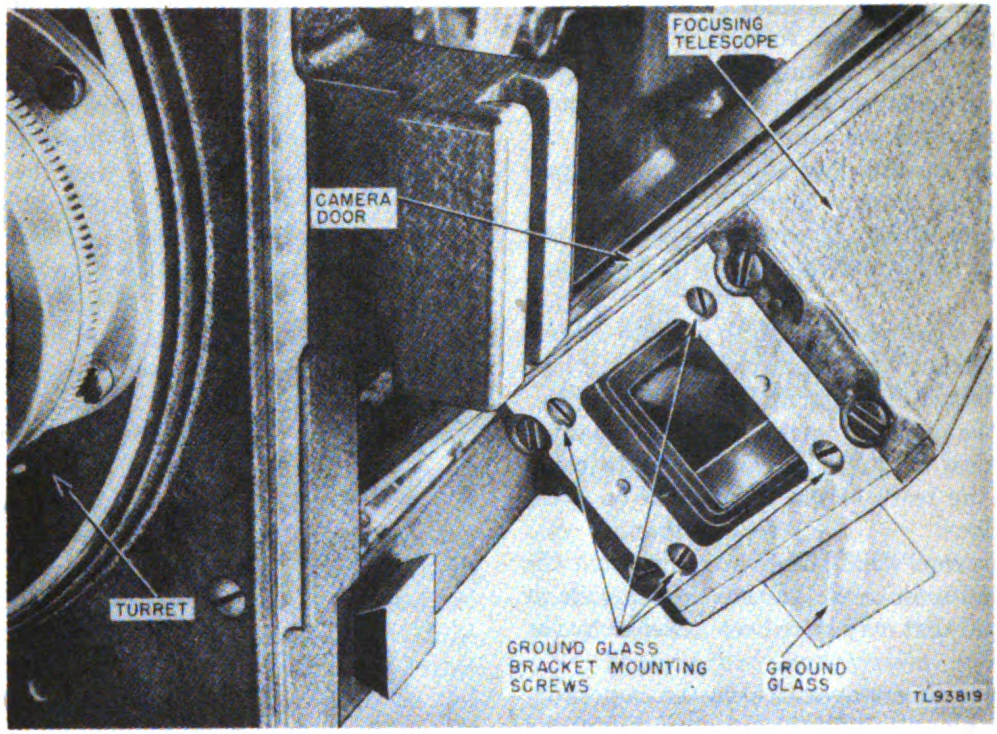


Figure 112. Removing ground glass from focusing telescope for cleaning.

33. Cleaning Focusing Ground Glass

To remove the ground glass for cleaning, proceed as follows:

a. Open the door of the camera.

b. Slide open the sliding door of the side of the focusing telescope.

c. Slide the ground glass out of the focusing tube by sliding the glass downward from the front of the focusing tube.

d. Clean the glass as directed in paragraph 28.

e. Clean the lens behind the ground glass with an air syringe, lens tissue, and cleaner.

f. Reinstall the ground glass into its slot and push it into place, being careful to handle the glass by its edges only, and being certain that the ground surface of the glass faces toward the *front* of the camera.

g. Close the sliding door, and shut the camera door.

34. Cleaning Rack-over Mechanism

The rack-over mechanism requires frequent cleaning to remove the dust and grit that has collected on the lubricated surfaces of the mechanism. To clean the rack-over mechanism, proceed as follows:

a. Set the camera on a table, and rack the camera as far to the right as it will go by turning the rack-over handle clockwise until the rack-over gears are disengaged from the gear tracks.

b. Ease the camera entirely off the base plate by pushing it gently and evenly.

c. Lay the camera on its side so that the rack-over gear tracks are accessible.

d. Use a soft cloth dampened with dry-cleaning solvent (SD) to remove all lubricant from the gears and the gear tracks.

e. Clean the upper surface of the base plate, and the lower surface of the camera box thoroughly with dry-cleaning solvent (SD). Dry the surfaces

well. While the box is off the base plate, clean the aperture felts, the front base plate, and the front plate of the box.

f. Lubricate the rack-over mechanism as directed in the lubrication order. (See fig. 146.)

g. Fit the camera into the gibs (rails) of the base plate and ease it onto the base plate until the rack-over gears engage the rack-over gear tracks. The handle should be vertical at the point of engagement.

h. Continue racking the camera onto the bed by turning the rack-over handle counterclockwise.

35. Cleaning Tripod Head

The moving parts of the tripod head clutches are well protected from dust and grit, but operation under dusty conditions will cause the dust to eventually work its way into the clutch mechanism. When this occurs, it will be necessary to dismantle the tripod head mechanism as described in paragraphs 82 and 83. Clean the various parts thoroughly in dry-cleaning solvent (SD), and relubricate the mechanism as directed in the lubrication order. (See fig. 147.) Under normal working conditions such a procedure will not be necessary, and the tripod head should ordinarily be cleaned as follows:

a. Set the head on a table and loosen both pan and tilt adjusting knobs to permit the head to be tilted and swung easily. Wipe the entire head with a soft cloth dampened in dry-cleaning solvent (SD) to remove any oil that may have leaked out of the clutch mechanism.

b. Use an artist's brush to remove dust from the threads of the various studs.

c. Lubricate the exterior of the tripod head as described in the lubrication order. (See fig. 147.)

36. Care of Storage Batteries

The storage batteries supplied with Camera PH–274 will give continued good service if kept clean and charged. The following is the maintenance procedure to be followed:

a. The normal starting rate for charging these batteries is 2.5 amperes. After being under charge for approximately 6 hours, the batteries will begin to bubble and gas. At this time the charging rate should be reduced to 1 ampere, at which rate they should continue to charge until the specific gravity of the electrolyte is approximately 1.280, which indicates a fully charged condition.

Caution. The cell vent hole covers should be unscrewed and left on top of the vent holes as soon as charging begins. This allows the liberated gas to escape freely without spattering acid over the case.

b. Discharge Limit. Batteries should not be allowed to discharge below a specific gravity of 1.180 or excessive sulfation will result. Excessive sulfation increases the time necessary for fully charging the battery, and also shortens the battery's life.

c. Overcharging. Do not allow the batteries to continue being charged after the electrolyte reaches a specific gravity of 1.280 as this will result in excessive gassing, bubbling, and heating which will damage the battery.

d. Replacing Electrolyte. In the event that the battery is tipped over and the electrolyte is lost, it must be refilled as follows:

(1) Add distilled water (or water as pure as can be obtained if distilled water is not available) until the liquid in the cell is ⅜ inch above the plates.

(2) Place the battery on charge and continue charging until the battery exhibits the normal charged signs.

(3) Empty all the liquid out of the cell, and refill the cell with fresh electrolyte of the proper specific gravity (1.280).

e. Acid Corrosion. The battery tops must be kept clean of acid and dirt. Clean the battery tops with a cloth dampened in a dilute solution of ammonia or bicarbonate of soda to neutralize any acid present. Wipe the batteries dry and apply a thin coating of petroleum to the battery tops and terminals. The inside of the metal battery cases should be painted with acid-resistant paint.

f. Idle Batteries. Batteries will not retain their full charge if left idle for several weeks. If not used, batteries should be charged at a low rate (½-ampere) every week in order to keep them fully charged and ready for use at any time.

g. Adding Water. The water content of the electrolyte evaporates as the battery stands. It is necessary, therefore, to check the level of the liquid in the cells at regular intervals and add sufficient distilled water (or water as pure as is obtainable if distilled water is not available) to bring the level of the liquid ⅜ inch above the tops of the plates.

37. Care of Camera PH–274 Under Excessively Hot or Cold Conditions

The close fit of the moving parts of the camera makes it particularly susceptible to sluggishness of operation under excessive cold weather conditions due to the contraction of the bronze bearings and bushings and the thickening of the lubricating material. For special instructions on operating the camera in cold weather, see the lubrication orders, figures 144 through 147. Operating the camera under excessively hot weather conditions also demands

special procedures which are described in the lubrication orders. Additional information on operating Camera PH–274 in extreme heat or cold is available in TB SIG 189 and 190.

38. Preventive Maintenance Check List

No.	Item	Operation	Agent	Frequency
1	Lenses	Cleaning (par. 28)	Lens tissue, lens cleaner, air syringe, camel's hair brush.	When needed.
2	Camera box	Cleaning (par. 29)	Air syringe, lintless cloth, camel's hair brush.	After each period of use.
3	Aperture plate	Cleaning (par. 30a)	Camel's hair brush, orange stick, oil (PS), air syringe.	Every 1,000 feet of film.
4	Pressure plate	Cleaning (par. 30b)	Camel's hair brush, soft cloth, drycleaning solvent (SD), air syringe, oil (PS).	Every 1,000 feet of film.
5	Lens mount threads and turret.	Cleaning (par. 31)	Soft cloth, drycleaning solvent (SD), grease (GL).	When needed.
6	Magazines	Cleaning (par. 32)	Artist's brush, air syringe, soft lintless cloth.	Before loading.
7	Ground glass and lens behind ground glass.	Cleaning (par. 33)	Lens tissue, lens cleaner, air syringe, camel's hair brush.	When needed.
8	Rack-over mechanism, aperture felts, front base plate, front plate of box.	Cleaning (par. 34)	Soft cloth, drycleaning solvent (SD), artist's brush, syringe.	When needed.
9	Tripod head	Cleaning (par. 35)	Soft cloth, drycleaning solvent (SD), artist's brush.	When needed.
10	Storage batteries	Cleaning, replacing electrolyte, protecting terminals and case against corrosion (par. 36).	Pure water (distilled), sulfuric acid (specific gravity 1.280) cloth, ammonia or bicarbonate of soda, grease, acid-resistant paint.	When needed.

Section VI. LUBRICATION

39. War Department Lubrication Orders

War Department Lubrication Orders are illustrated, numbered, and dated cards or decalcomania labels which prescribe approved lubrication instructions for mechanical equipment which requires lubrication by using organizations. Current War Department Lubrication Orders which are available are listed in the latest edition of FM 21–6. Lubrication orders should be requisitioned in conformance with instructions and lists in FM 21–6.

40. Compliance with War Department Lubrication Orders

Instructions contained in War Department Lubrication Orders are mandatory and supersede all conflicting lubrication instructions of an earlier date. Applicable War Department Lubrication Orders which are available will be obtained, carried with the equipment at all times, and fully complied with. Difficulties experienced in obtaining and complying with such orders will be reported through technical channels to the Commanding General, Army Service Forces, Attention: Maintenance Division.

41. Location of War Department Lubrication Orders

a. The War Department Lubrication Orders for Camera PH–274 will be kept with the equipment at all times.

b. Figures 144 through 147 are facsimiles of the War Department Order for Camera PH–274.

Section VII. MOISTUREPROOFING AND FUNGIPROOFING

No moistureproofing and fungiproofing procedure is required for Camera PH–274.

PART FOUR
AUXILIARY EQUIPMENT

Section VIII. AUXILIARY EQUIPMENT USED WITH CAMERA PH–274

42. Recording Equipment PH–346–A

Camera PH–274 and Recording Equipment PH–346-A, when used together, comprise a double-system sound recording outfit. A camera drive motor, synchronous with the sound recording motor, is a part of the recording equipment, and can be attached to the camera by means of the motor adapter. As the camera mechanism is not entirely silent in operation, the camera must be inclosed in the barney, and the microphone must be placed at least 6 to 8 feet away from the camera. A directional microphone must be used and must be turned away from the camera. If the camera is blimped, the microphone may be as close to the camera as desired. Complete instructions for the use of this recording equipment are contained in TM 11–2350.

43. Camera Equipment Mounting PH–515/MF

Camera Equipment Mounting PH–515/MF is a mounting device consisting of two wooden platforms for mounting the standard or baby tripods on a U. S. Army truck, ¼-ton, 4 by 4, Model MB or GPW (Jeep). Instructions for the use of this equipment are contained in TM 11–2360.

44. Other Auxiliary Equipment

Other items that will increase the usefulness of Camera PH–274, or adapt it for use under specialised conditions, include motors that operate on 110- or 220-volts of line current; a blimp for completely silencing the camera for sound recording; a dolly on which the tripod can be mounted for moving shots. These are not standard items of Signal Corps equipment and must be obtained on special procurements. Exposure Meter PH–252–A is useful for accurate determination of exposures. Instructions for its use are included in TM 11–2351.

PART FIVE
REPAIR INSTRUCTIONS

Note. Failure or unsatisfactory performance of equipment used by Army Ground Forces and Army Service Forces will be reported on WD AGO Form 468 (Unsatisfactory Equipment Report); by Army Air Forces, on Army Air Forces Form 54 (Unsatisfactory Report). If either form is not available, prepare letter containing the data elicited by the sample form shown in figure 143 without reproducing copies of the form.

Section IX. THEORY OF EQUIPMENT

45. Theory of Operation

Essentially, Camera PH–274 is a device for intermittently driving a continuous length of 35-mm film so that the exposures, which are made when the film is stationary, form a succession of images on the film. The process involves three basic operations: the feeding of the film from the feed drum to the exposure aperture; the exposure of the film through a lens while it is motionless before the aperture; and the rewinding of the exposed film on a take-up core. To accomplish these operations, the camera is equipped with a film magazine which houses the film feed and take-up cores; an electrically driven motor which drives the intermittent mechanism as well as the shutter, take-up mechanism, constant motion sprocket and the footage counters; and necessary lenses, four of which may be mounted on a revolving turret so that any of the lenses may be quickly and easily swung into the photographing position in front of the aperture.

a. Optical System. The optical system of Camera PH–274 consists of the turret and lenses which are accurately set to focus on the plane of the film, a focusing tube which is equipped with a ground glass, and a view-finder adjustable for parallax and for field of view to accommodate the lenses of various focal lengths used with the camera. The camera is so designed that it can be racked over to position the focusing tube behind the aperture. Since the ground glass is in the same focal plane as the film, the cameraman is certain that if he focuses properly on the ground glass, the image on the film will also be properly focused.

b. Film Drive System. Motive power for driving the film through the camera is derived from the electric motor of the camera through a gear train which supplies power take-off to operate the footage counters as well as the film drive mechanism. The movement of the film is continuous when it leaves the feed drum. The feed drum may be equipped with a magazine brake which keeps the film taut as it is unwound. The continuously rotating main drive sprocket feeds the film to the intermittent movement which by means of a pair of cam operated pull-down claws transforms the continuous motion of the film into an intermittent motion, thus allowing the film to remain motionless during its period of exposure. To insure stability while the film is being exposed, the intermittent is equipped with a pair of registration pins which advance forward to protrude through the sprocket holes in the film. The movement of the registration pins is so synchronized with the pull-down claws that the film is never free to shift of its own accord: either the claws or the pins engage the film at all times. Also synchronized with the pins and the claws is the rotary shutter. The timing is so arranged that the shutter blocks the aperture whenever the film is being moved by the claws: conversely, the shutter is open whenever the registration pins are engaged to hold the film motionless for exposure. When the film has progressed past the intermittent, it is again placed in contact with the continuously moving sprocket which transforms the intermittent movement into continuous movement to enable the film to be wound on take-up core smoothly. The take-up core is driven by a belt kept taut by a spring-loaded idler pulley. The slippage in the belt drive compensates for the gradually increasing diameter of the take-up roll so as to keep a constant tension on the film as it is wound.

c. Electrical System (fig. 113). Power to run the camera is provided by a 12-volt storage battery which is connected by rubber-covered cables and connectors to the motor and to the buckle trip switch inside of the camera box. An operating switch cut into the main feed cable near the camera

affords an accessible means for turning the camera motor on and off. To protect the mechanism inside the camera from damage in case of the film buckling, the film is directed past the buckle trip switch lever, which is displaced from its normal position whenever the film buckles. As the lever is displaced, it trips a switch which is located on the inside of the right cover of the camera, and cuts off the current to the motor thus stopping the camera.

d. Light Control. The amount of light striking the film is controlled by means of lens diaphragms and by means of the adjustable shutter. The opening in the shutter is easily and conveniently adjusted by a lever at the rear of the camera. The shutter is adjustable through a range of from 0° to 170°. Besides affording a means of varying the light, this shutter adjustment is used to fade out and fade in scenes.

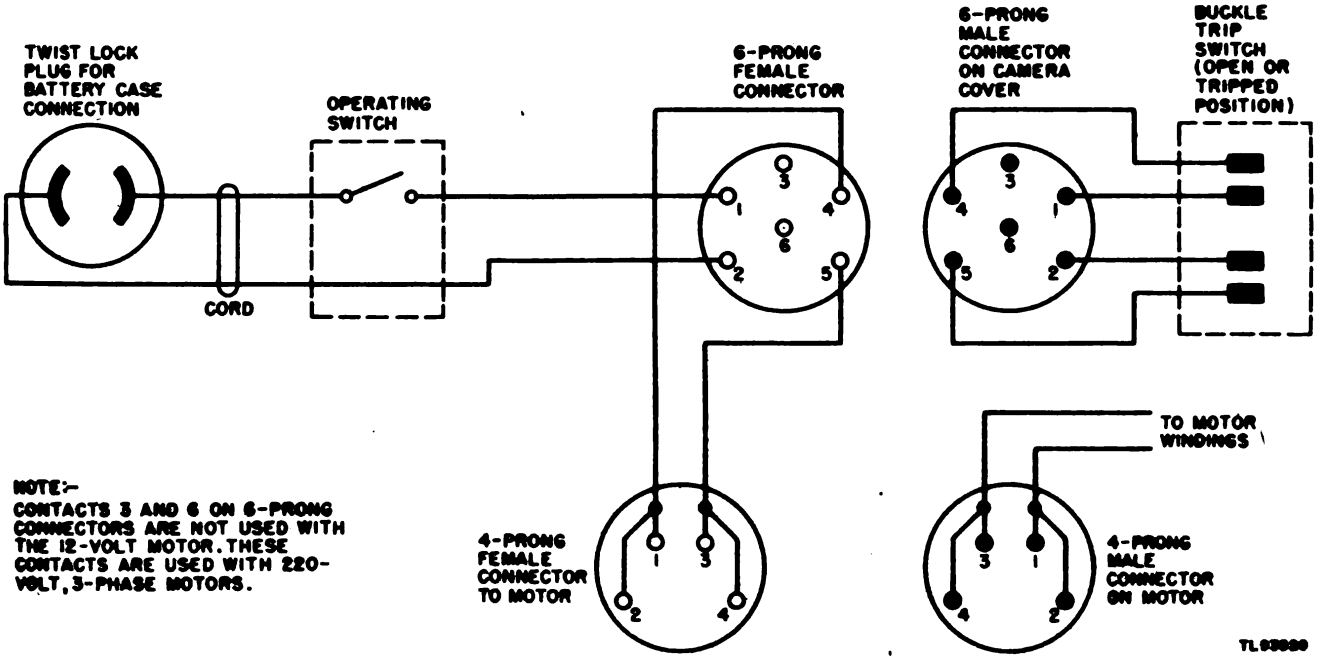


Figure 113. Wiring diagram.

Section X. TROUBLE SHOOTING

46. Trouble Chart

a. Troubles Encountered During Operation.

Trouble	Probable cause	Remedy
Film will not enter aperture in threading.	Intermittent not swung back	Loosen plate release thumbscrew and swing intermittent toward rear of camera.
	Registration pin cam not zeroed	Zero cam by aligning mark on cam with line on registration yoke.
Camera door will not close.	Intermittent not returned to normal position after threading.	Swing intermittent toward front of camera and tighten thumbscrew.
	Sprocket film guide not closed	Swing sprocket film guide knobs to place upper and lower guide rollers in contact with film sprocket.
Blurred image or no image in focusing telescope.	Magnifier knob in midway position.	Move magnifier knob all the way forward or to the rear.
	Magnifying lens out of bracket	Remove focusing telescope side plate and remount lens in bracket. Tighten setscrew.
Motor will not run	Buckle switch not closed	Pull buckle switch, reset plunger until buckle switch lever rises and clicks into proper operating position.
	Run down battery	Check battery and replace with charged unit.
	Defective connecting cable or poor plug connections.	Check cable for breaks, and check connectors for damaged or corroded pins. Repair as necessary.
	Temperature too low for proper operation.	Remove motor from camera and test. If motor runs when idle, but will not drive camera, it may indicate that the close-fitting parts of the camera have tightened due to the cold. Connect two batteries in parallel to increase the current output. If camera runs too sluggishly as indicated by the tachometer (with two batteries), the temperature is probably too low for operation and some means of warming the camera and batteries will have to be provided. (See lubrication order, fig. 146, for cold weather procedure.)
Film does not take up	Take-up belt broken or slipping	Examine belt, clean or replace as necessary.
	Film not entered properly into take-up core.	Open take-up drum (if only leader has been run) and insert end of film into core properly. If several scenes have been shot before the trouble is noticed, the magazine will have to be opened in a darkroom or in a changing bag to correct the trouble.
Film being scratched	Dirty aperture plate	Remove aperture plate and clean as described in paragraph 30a.
	Pressure plate rollers jammed	Remove pressure plate and clean and lubricate rollers as described in paragraph 30b.
	Loop too large or too small	Correct loop size. (See fig. 56.)
	Dirty magazine or dirty magazine rollers.	Clean magazine and magazine rollers.
Film being torn	Improper threading	Check upper and lower loops. (See fig. 56.)
Film being punched, or perforations being torn.	Improper threading	Rethread properly.
	Registration pins out of line, or defective intermittent.	Send camera to fifth-echelon repair depot.
Tripod unsteady	Leg brackets loose on head	Loosen locknut and tighten cones to remove play. Retighten locknuts.
Tripod head operates erratically.	Sand or other foreign matter in clutch mechanism.	Dismantle tripod head as described in paragraphs 82 and 83. Clean all parts and lubricate all parts as described in lubrication order.

b. Troubles Apparent On Examining Processed Film.

Trouble	Probable cause	Remedy
No image on film	Camera left in focusing position	Rack camera over to photographing position before taking.
	Shutter entirely closed	Check shutter setting before taking.
	Lens cap not removed	Remove lens cap before taking.

b. TROUBLES APPARENT ON EXAMINING PROCESSED FILM—(Continued).

Trouble	Probable cause	Remedy
Picture obstructed	Sunshade and matte box improperly adjusted or used with 25-mm lens.	Check position through focusing telescope.
	Wrong lens complement (using short focus lens while a long focus lens is on turret).	Remove interfering lens from turret.
	Matte left in matte box	Remove mattes when making straight shot.
Picture incorrectly framed	View-finder not adjusted for parallax.	Check view-finder parallax adjustment.
	View-finder matte adjusting knobs not set to match lens in use.	Set adjusting knobs properly.
	View-finder matte adjusting knobs incorrectly calibrated.	Correct calibration as follows: Position knobs to agree with lens in use. Draw two lines crossing each other at right angles on a piece of white paper, and mount paper on wall about 10 feet from camera. Focus camera through focusing telescope until crosshairs in telescope are superimposed on cross lines on paper. Pan camera to right until left edge of picture frame is superimposed on vertical cross line on paper. Loosen setscrew on top of top adjusting knob and turn knurled disk until left edge of image in finder is superimposed on vertical cross line on paper. Make sure that knob calibration is set to match focal length of lens in use, then tighten setscrew. Pan camera to the left to check positioning of right edge of image in view-finder. Repeat above operations to position horizontal mattes by tilting camera up and down. When mattes are properly adjusted for one focal length, they will be in adjustment for all focal lengths marked on adjusting knobs. If mattes can be properly adjusted for only one focal length, send view-finder to fifth echelon for repair.
Pictures in faulty focus	Lens not properly focused	Focus lens before taking.
	Lens not correctly calibrated when focusing with measuring tape.	Check focus on ground glass to check lens calibration. If necessary, recalibrate lenses as follows: Use focusing telescope to focus accurately on an object exactly 8 feet from lens. Draw a pencil line opposite 8-foot mark on lens barrel. Remove lens from mount and loosen knurled-edged ring. Shift collar with zero mark on it until the mark is directly opposite pencil line. Tighten knurled-edged ring being sure that collar does not shift. Install lens. Move camera exactly 10 feet from object and focus by setting lens at 10 feet. Check focus through focusing telescope. If focus is faulty, reset the etched collar as described above. Then recheck camera at 8, 10, and 12 feet. If lens calibrations are correct at these distances, zero mark has been properly adjusted. If it is impossible to get more than one distance correctly set, lens should be sent to fifth echelon for repair.
Film light struck	Film fogged during loading	Load magazines in darkroom or changing bag. Check darkroom and changing bag for leaks.
	Magazine covers not securely screwed in.	Check covers and tighten securely.
	Camera door not completely closed.	Be sure camera door is completely closed before taking. Check door latch.
	Camera door sprung	Check door edges for light leak.
Picture fuzzy or blurred	Lenses or filters dirty or covered with moisture.	Clean lenses and filters as described in paragraph 28.
Pictures unsteady when projected.	Tripod not steady	Be sure tripod is securely positioned before taking. If tripod leg brackets are loose, tighten as described above.
	Intermittent mechanism worn, or registration pins out of register.	Return camera to fifth-echelon repair depot for installation of new intermittent mechanism.
	Film loops too small	Rethread and adjust film loops properly.
	Improper panning technique	Rehearse panning before taking.
Frames partially exposed, unevenly spaced, or vertically blurred.	Camera out of synchronization	Synchronize camera as described in paragraphs 54 and 55.
Harmonic beat (picket fence effect in pan shots).	Shutter closed down too far	Keep shutter open 90° or more for pan shots.

Section XI. REPAIR

47. General

Repair or replacement of parts (except those supplied to using organizations) are to be undertaken only by fifth-echelon repair depots. Replaced parts that require fitting must be machined to within 0.0005 inch of the required size. Some of the simpler repairs to the camera and the tripod can be made by the using organization. Disassembly instructions for cleaning and lubricating the camera and tripod are given in the lubrication orders. (See figs. 144 through 147.)

48. Tools and Equipment

In addition to the usual machine shop tools and equipment, the following special tools and material are required for the repair and replacement of parts of Camera PH–274, as described in this manual.

Depth micrometer.
Micrometer block (steel) to replace the pressure plate for measuring camera depth.
Feeler gauge, 0.006 inch thick.
Feeler gauge, 0.0065 inch thick.
Shim stock, 0.001 to 0.010 inch thick.

49. Replacing Turret Locating Pin Assembly (fig. 114)

To replace the turret-locating pin assembly, proceed as follows:

a. Rack the camera to the right completely off the base plate.

b. Loosen the turret-setting knob and shift the turret-locating pin assembly as far as it will go in a counterclockwise direction.

c. Remove the eight screws that fasten the front base plate to the base and remove the front base plate.

d. Unscrew completely, and remove the turret-setting knob.

e. Withdraw the turret-locating pin and lift the entire pin assembly off the front base plate. The turret-setting stud with plate attached can be removed from the rear of the front base plate.

f. Reinstall the turret-setting stud and plate on the rear of the front base plate. Install the new pin assembly being sure that the pin assembly fits into the slot on the front of the front base plate, and that the turret-setting stud and place assembly is properly seated on the rear of the front base plate.

g. Shift the turret-locating pin assembly as far as it will go in a counterclockwise direction and tighten the turret-setting knob.

h. Reinstall the front base plate on the camera base plate, and tighten the eight screws.

Caution. One of the eight screws is shorter than the rest. This screw is used in the hole directly to the left of the pin assembly, and is made shorter so that when completely tightened the screw head will clear the pin assembly. One of the eight screws has a flat head. This screw is installed in the bottom right hole and the head is countersunk so that the screw will not interfere with the installation of the sunshade and matte box holder.

50. Replacing Bearing Bushing (fig. 115)

The bearing bushing supports the sprocket drive shaft and is replaced as follows:

a. Open the door of the camera and remove the stripper mounting screw and the sprocket retaining screw. A flat guard plate will come off with the stripper mounting screw.

b. Ease the sprocket off its keyway slightly, and when the sprocket is loose on its shaft, the stripper may be removed.

c. Remove the sprocket.

d. Remove the right cover of the camera and remove the small locking screw from the flywheel retaining screw.

e. Remove the flathead flywheel retaining screw and remove the flywheel together with the intermittent steel spur gear which is keyed directly to the flywheel.

f. Remove the large micarta helical gear (sprocket drive gear) together with the sprocket drive shaft.

g. Loosen the bearing bushing Allen setscrew and push the bearing out of its housing.

h. Insert the new bearing bushing, pushing it into its housing until the positioning groove on the bushing is in line with the Allen setscrew.

i. Tighten the Allen setscrew to lock the bushing in place.

j. Insert the sprocket drive shaft into the bushing being sure to match the timing mark near the rim of the large micarta gear (sprocket drive gear) with the timing mark on one of the teeth of the steel main drive gear.

k. Place the flywheel on the intermittent drive shaft, and slip the flywheel all the way on the shaft, being sure that the timing mark on the rim of the flywheel matches the timing mark near the hub of the large micarta gear (sprocket drive gear).

l. Install the flywheel retaining screw, tightening it until the hole in the screw head matches the hole in the flywheel.

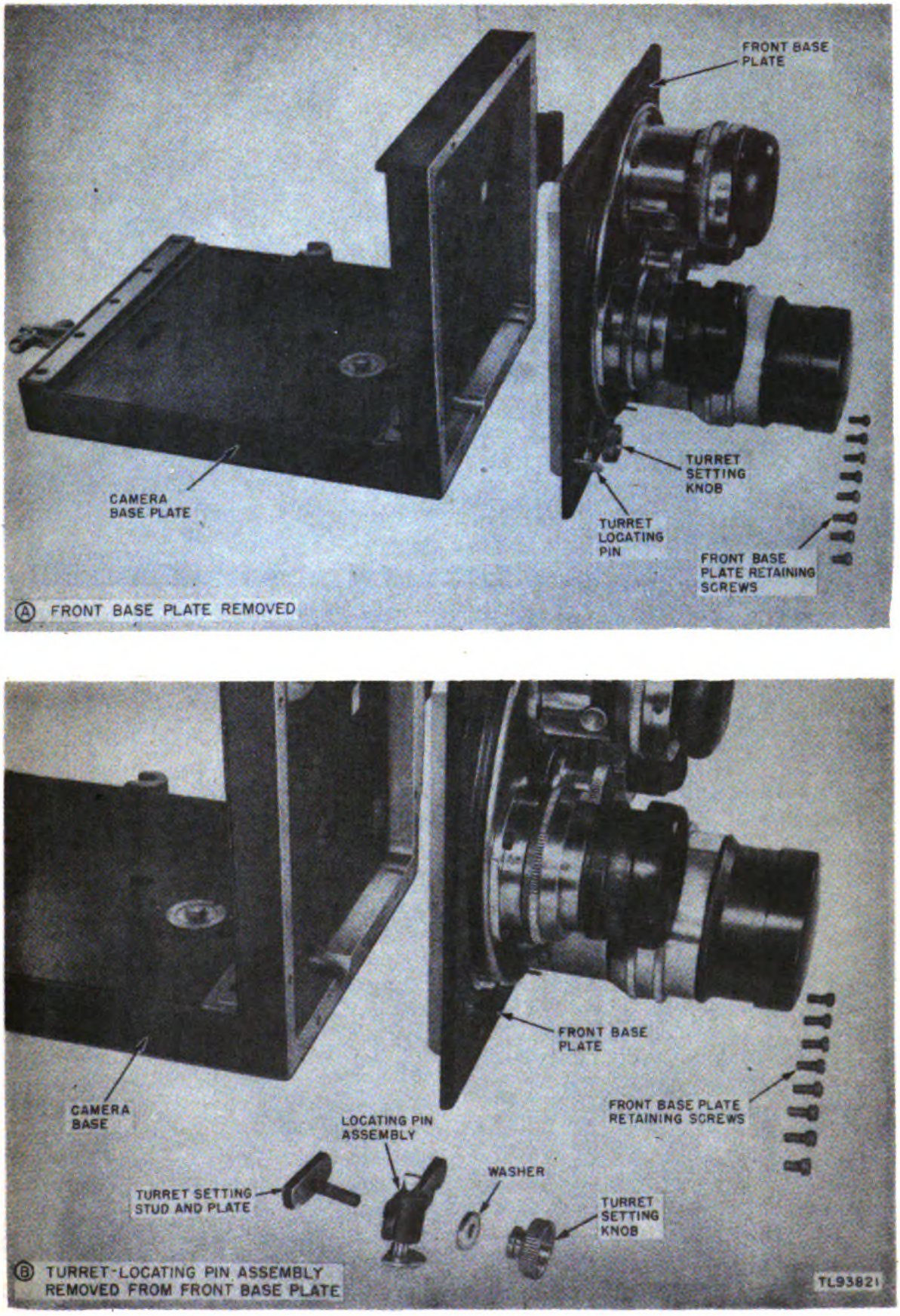
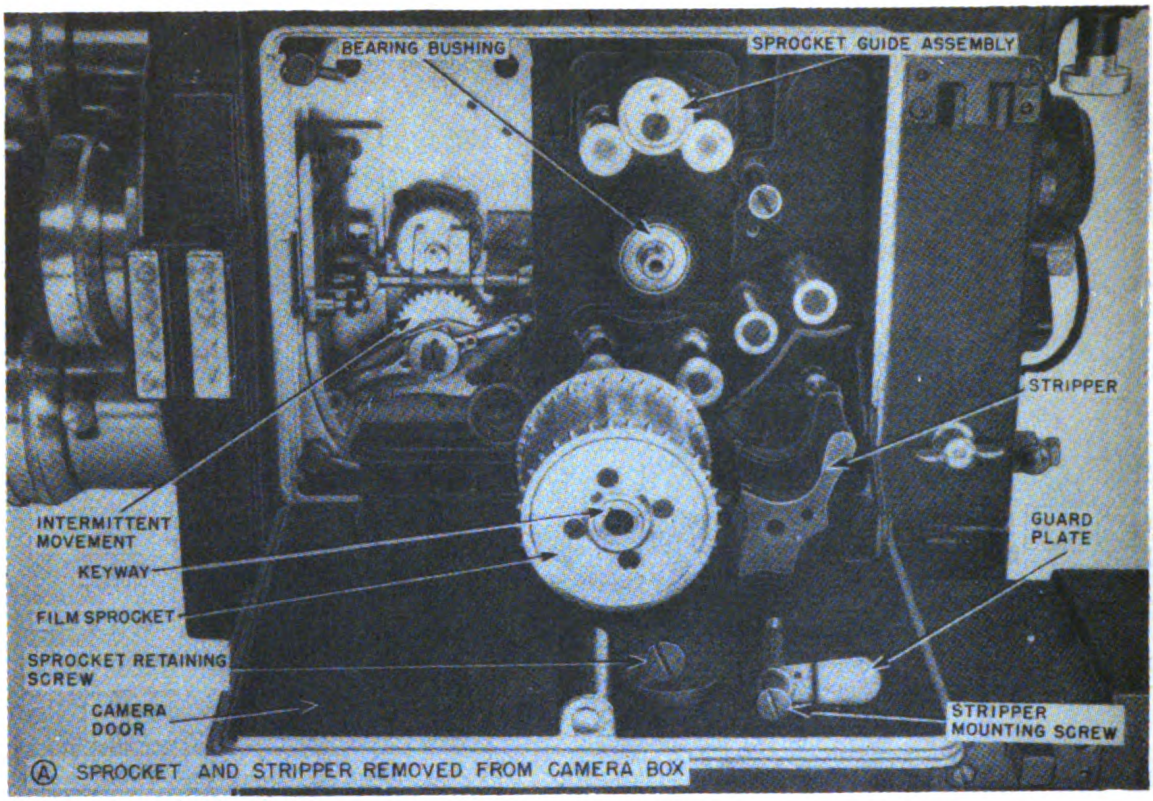


Figure 114. Removing turret-locating pin.



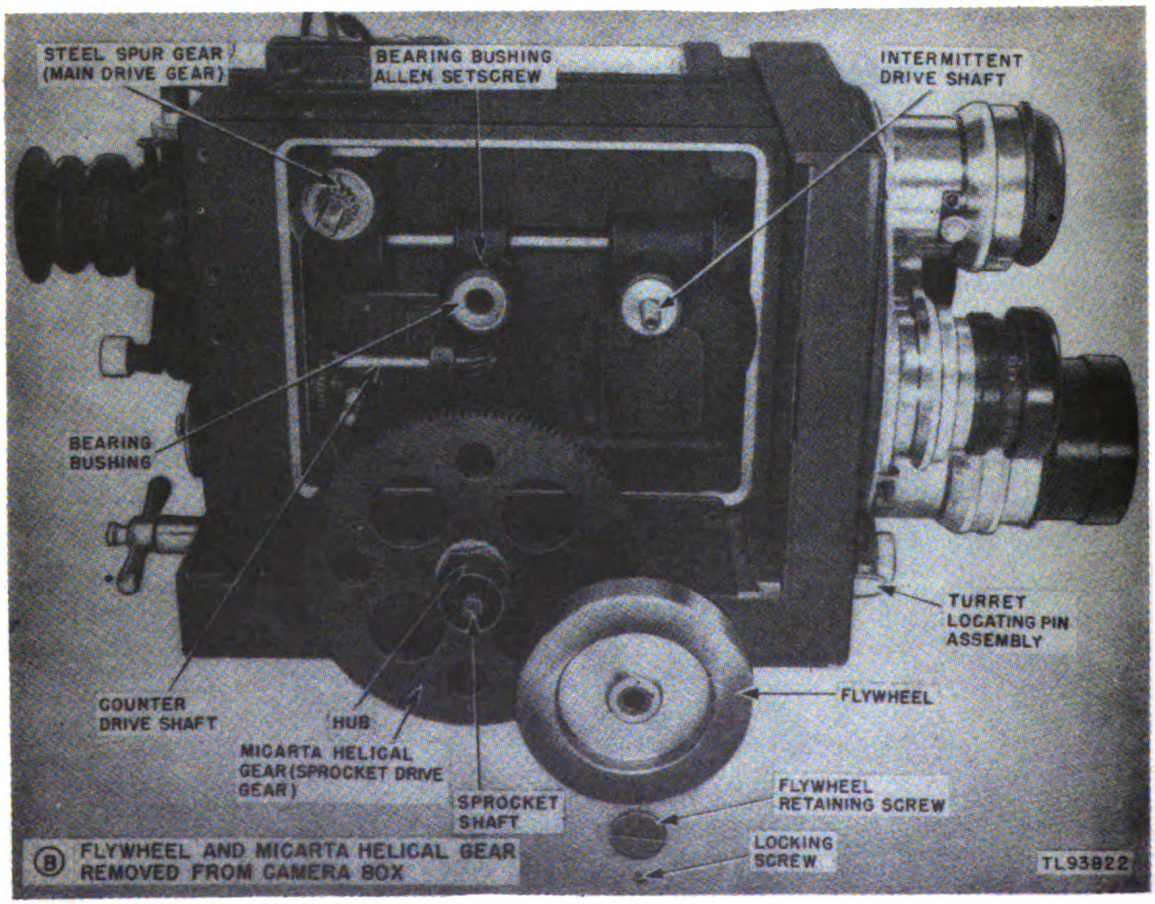


Figure 115. Removal of bushing bearing.

m. Install the small locking screw into the flywheel through the hole in the head of the flywheel retaining screw.

n. Install the sprocket over its shaft being sure that the keyway in the sprocket hub engages the key in the shaft properly. Do not push the sprocket all the way on its shaft.

Caution. Be sure that the sprocket is free from dirt which will prevent it from seating properly on the shaft. The sprocket must run true or the film will wobble as the camera runs.

o. Set the film stripper in position, being certain to position the grooves in the stripper over the teeth in the sprocket. When the stripper is in place, push the sprocket all the way onto the shaft.

p. Position the small guard plate on top of the stripper so that the hole in the plate fits over the dowel pin on the stripper.

q. Install the stripper mounting screw being sure that the stripper is in the proper position before tightening the screw.

r. Install the sprocket retaining screw.

s. Move the mechanism by hand to make sure that no parts are binding.

51. Replacing Micarta Spiral Spur Gear (Counter Shaft Drive Gear) (fig. 116)

The micarta spur gear is positioned on the sprocket drive shaft and is attached to the sprocket drive gear by four screws. The micarta spur gear drives the counter drive shaft (B, fig. 115) and is replaced as follows:

a. Proceed as directed in paragraph 50*e*.

b. Remove the hub-locking screw from inside the hub and unscrew the hub using a hexagonal wrench. Pull the micarta helical gear (sprocket drive gear) off the sprocket shaft.

c. Remove the four spur gear retaining screws that secure the spur gear to the large micarta helical gear (sprocket drive gear).

d. Ease the spur gear off the sprocket drive gear.

e. Install the new spur gear being sure that the four mounting holes line up properly.

f. Tighten the four screws and install the gear assembly by reversing the disassembly procedure, being certain to match the registration marks properly.

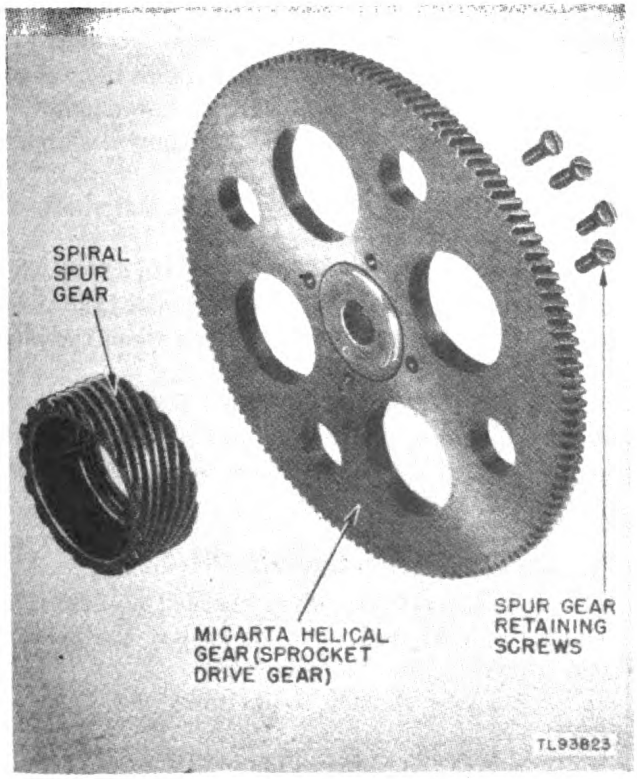


Figure 116. Removing spiral spur gear from micarta helical gear.

52. Replacing Steel Spur Gear (Intermittent Drive Gear) (fig. 117)

To replace the intermittent drive spur gear which is keyed to the flywheel, proceed as follows:

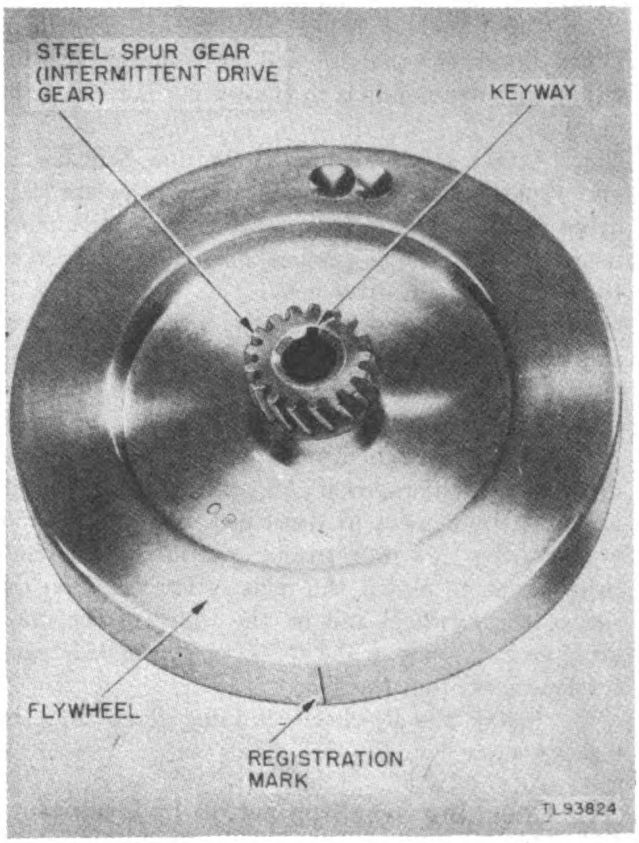


Figure 117. Rear face of flywheel showing steel spur gear.

a. **Proceed as directed in paragraph 50*d* and *e*.**

b. Remove the spur gear from the flywheel by pushing it out of the flywheel from the front.

c. Reassemble by reversing the disassembly procedure. Fit the new spur gear into the flywheel being certain that the key enters the keyway.

d. Tap the gear into position with a hammer handle or a block of wood.

e. Check the synchronization of the shutter and intermittent movement as directed in paragraph 54, and, if necessary, synchronize the camera as directed in paragraph 55.

53. Replacing Micarta Helical Gear (Sprocket Drive Gear) (fig. 116)

The large micarta helical gear is keyed to the sprocket drive shaft and is replaced as follows:

a. Proceed as directed in paragraph 50*d* and *e*.

b. Remove the hub locking screw from inside the hub of the large helical gear.

c. Use a hexagon wrench to unscrew the hub from the sprocket drive shaft.

d. Pull the helical gear (with micarta spur gear attached) off the sprocket drive shaft.

e. Remove the micarta spur gear from the large helical gear as directed in paragraph 51*a* and *d*.

f. Using the old helical gear as a guide, draw pencil lines near the rim and near the hub of the new gear corresponding to the timing marks on the old gear.

g. Attach the spur gear to the new helical gear and replace the assembled gears on the sprocket drive shaft, being sure to match the pencil mark near the rim of the new helical gear with the marked tooth on the main drive gear.

h. Install the flywheel on the intermittent drive shaft being sure that the timing mark on the rim of the flywheel lines up with the pencil line near the hub of the micarta helical gear.

i. Check the synchronization of the camera as described in paragraph 54. If necessary, synchronize the camera as described in paragraph 55.

j. Scribe new registration marks on the new helical gear to match the registration mark on the rim of the flywheel and on the tooth of the main drive gear. Remove the temporary penciled registration mark from the gear.

k. Install the flywheel retaining screw and the locking screw.

54. Checking Synchronization of Camera PH–274

The shutter and intermittent movement of the camera are synchronized so that the film can be advanced only when the shutter is closed. The shutter must be open to make an exposure whenever the registration pins are in their advanced position to keep the strip of film motionless. The camera, when it leaves the factory, is accurately synchronized and registration marks are scribed on the flywheel, the large helical micarta gear (sprocket drive gear), and the main drive gear. If the gear train is disassembled but no new gears are installed, it is necessary only to reassemble the gears so that the four registration marks match in order to achieve synchronization. However, since the synchronization may be disturbed if the gears are one tooth out of line, it is advisable to check the synchronization whenever the gears are removed. If a new gear has been installed, it will be necessary to check the synchronization and scribe registration marks on the new gear. To check the synchronization, proceed as follows:

a. Remove one of the lenses from the turret and swing the opening in front of the aperture.

b. Open the door of the camera, set the shutter to the 170° opening, and remove the pressure plate.

c. Move the flywheel by hand until the registration pins are as far back as they will go.

d. Insert a piece of film under the aperture plate so that the film obstructs the passage of the registration pins.

e. Move the flywheel slowly by hand until the advancing registration pins just touch the strip of film.

Caution. When the registration pins have come in contact with the strip of film, do not attempt to force the flywheel or the pins will punch through the film and may bend.

f. Look through the lens opening and check to see that the shutter is closed.

g. Reverse the direction of rotation of the flywheel and repeat the procedure outlined in *a* and *f* above. The shutter should be closed when the pins strike the film.

h. Remove the film and turn the flywheel to advance the pins a fraction of an inch. The shutter should open as soon as the pins advance after the film strip has been removed.

55. Synchronizing Camera PH–274

If the synchronization, when checked as described in paragraph 54, proves to be faulty, the camera must be synchronized as follows:

a. Open the shutter to its maximum opening (170°).

b. Remove the pressure plate.

c. Turn the flywheel slowly in the direction that will cause the claws to pull the film downward.

Continue turning the flywheel until the shutter, as seen through the pressure plate opening, just begins to open.

Note. The first opening will be visible in the lower right corner of the pressure plate opening.

d. Reverse the flywheel until the shutter backs up just enough to close the opening.

e. Check the registration pin opening by inserting a piece of film under the aperture plate so that the film obstructs the forward motion of the registration pins. *The pins should be on the point of entering their sockets in the aperture plate, and the film strip should bind slightly as it is pushed past the pins.*

f. If the pins are not in this position, remove the locking screw and the flywheel retaining screw. Disengage the steel spur gear, which is keyed to the flywheel, by pulling the flywheel part way off the intermittent drive shaft.

g. While keeping the shutter from moving, rotate the flywheel (with the gear behind it disengaged from the large micarta helical gear) until the registration pins are in the proper position as described above.

h. Push the flywheel back on its shaft all the way to engage the steel spur gear with the large micarta helical gear, *without rotating the flywheel.*

i. Install the flywheel retaining screw and check the synchronization as described in paragraph 54. If the intermittent is still not properly timed with the shutter, repeat the procedure outlined above, shifting the flywheel one tooth at a time (in either direction) until correct synchronization is achieved.

j. When proper synchronization is achieved, tighten the flywheel retaining screw and install the small locking screw.

k. If a new gear has been installed, or the position of the old gears shifted, it is necessary to scribe new registration marks and remove the old marks.

Note. The large helical micarta gear (sprocket drive gear) is marked with two registration marks: one line, near the rim of the gear is designed to match the marked tooth on the main drive gear: the mark near the hub of the helical gear is designed to line up with the line scribed on the rim of the flywheel. Since the adjustment was made by shifting the flywheel, it is usually necessary only to scribe a new mark on the flywheel and one near the hub of the large micarta gear to match it.

56. Replacing Sprocket Film Guide Assemblies (fig. 118)

The sprocket film guide assemblies include the aluminum castings, rollers, spring, shaft, and the eccentric. The assemblies are positioned one above and one below the film drive sprocket and are replaced as follows:

a. Open the door of the camera.

b. Remove the drive sprocket and stripper as described in paragraph 50*a* through *c*.

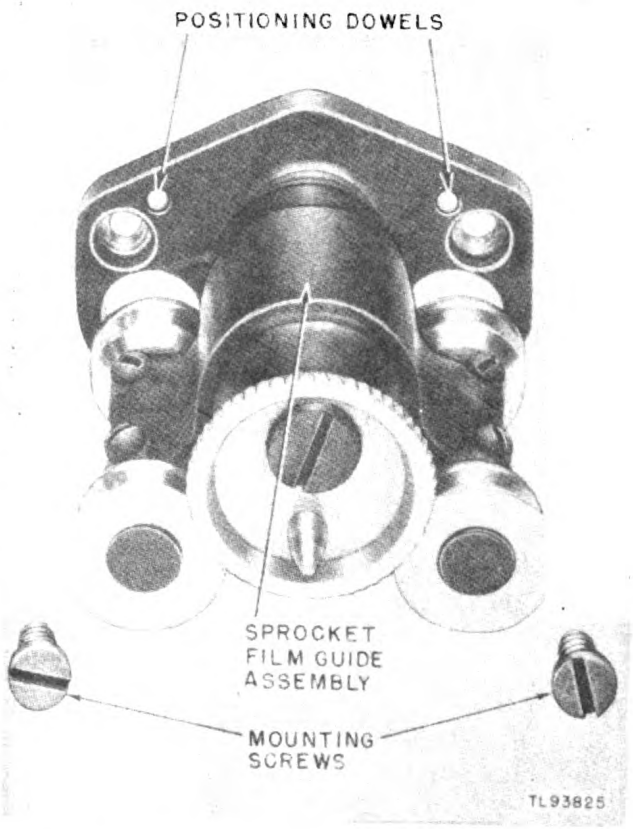


Figure 118. Sprocket film guide assembly removed.

c. Remove the two sprocket guide retaining screws and ease the assembly out of the camera, being careful not to bend or break the dowel pins that will be removed with the assembly.

d. Install the new assembly.

Note. If the new assembly comes fitted with dowels, make sure that they fit the holes in the camera casting before attempting to install the assembly. If the holes do not line up, remove the dowels and install the assembly without them, leaving the retaining screws loose enough so that the guide assembly may be shifted slightly.

e. Install the stripper and the film sprocket as described in paragraph 50*n* through *r*.

f. Position two layers of film over the sprocket and close the sprocket guide over the film. Shift the guide assembly until the rollers are bearing on the double thickness of film. Then tighten the guide assembly retaining screws.

g. Open the guide and remove the film.

h. Close the guide again. The rollers should be clear of the sprocket and should revolve freely.

57. Replacing Intermittent Movement (fig. 119)

The entire intermittent movement is removed from the camera as a unit and is replaced in the same manner. Camera PH–274 is a precision instrument,

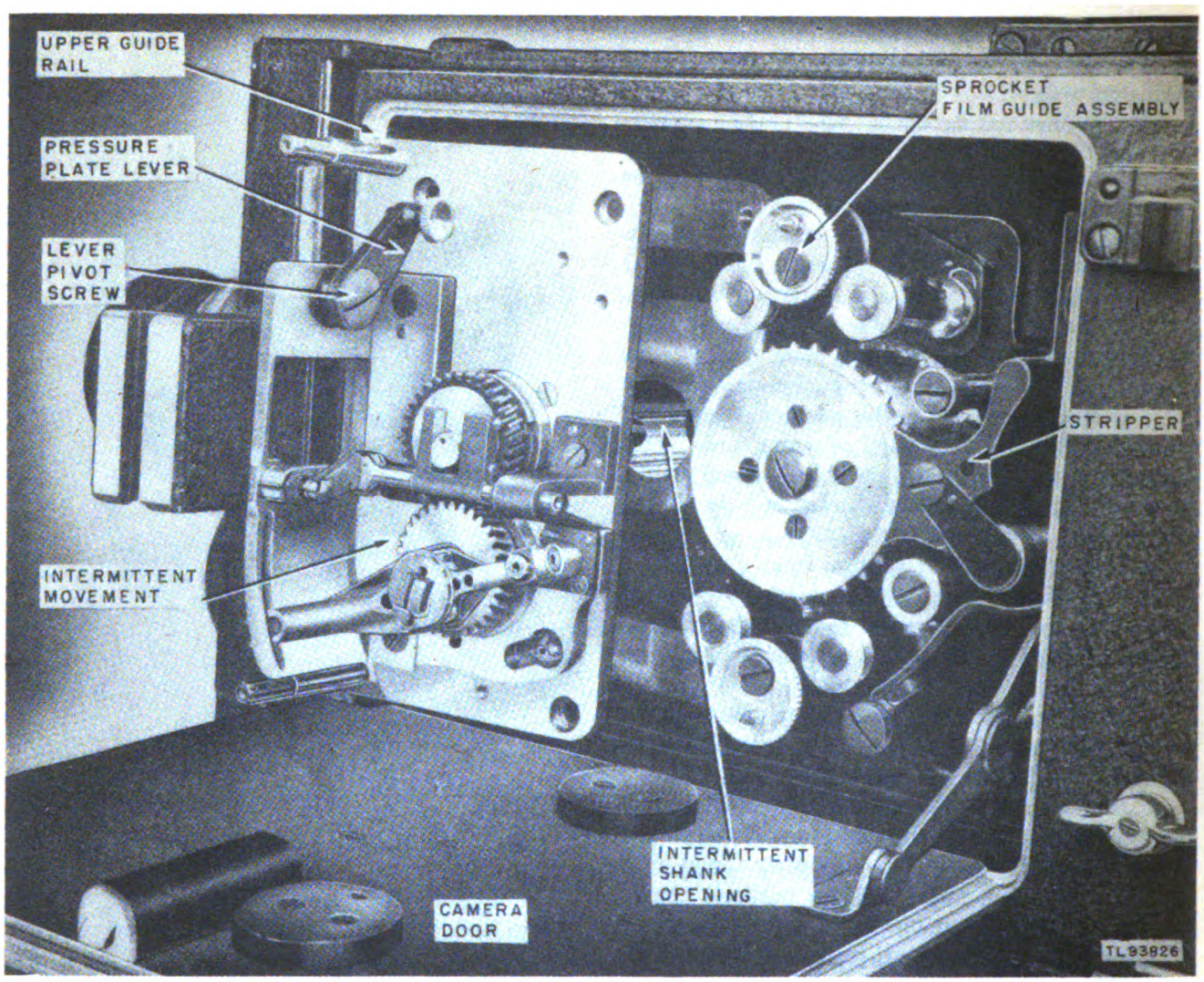


Figure 119. Intermittent movement partially removed.

and tolerances are so rigidly maintained that a new intermittent will fit into a camera with little difficulty. To replace the intermittent movement, proceed as follows:

a. Remove the right cover from the camera and open the camera door.

b. Remove the flywheel by removing the small locking screw and the flywheel retaining screw.

c. Remove the three intermittent retaining screws and the plate release thumb screw, and ease the intermittent movement out of the camera.

d. Fit the notches of the new intermittent movement onto the guide rails of the camera, and ease the new movement into position far enough to allow the shank of the intermittent to touch the rear wall of the camera. Check carefully to see that the shank is lined up with the hole in the camera wall.

e. Ease the new movement a bit further into the camera to start the shank into the hole. If the shank binds, do not force it. Remove the intermittent and *polish* the shank to reduce its size slightly. Proceed as directed above to install the intermittent movement. If the shank still binds, polish it again. Continue until the intermittent can be slid all the way back to the camera wall.

f. Install the three intermittent movement retaining screws.

g. Install the plate release thumbscrew into the camera through the hole in the intermittent.

h. Install the flywheel in the right side of the camera, being sure that the registration marks are matched.

i. Install the aperture plate and the pressure plate that came with the new intermittent movement.

Note. If the aperture plate is replaced separately, it must be carefully machined to fit the intermittent in which it is used.

j. Check the synchronization of the intermittent movement and the shutter as described in paragraph 54.

k. If necessary, synchronize the camera as described in paragraph 55.

58. Checking Camera Depth (figs. 120 and 121)

After installing a new aperture plate, it will be necessary to check the distance between the turret face and the film plane (camera depth) as follows:

a. Remove the pressure plate and install the micrometer block in its place.

Note. This block is so designed as to fit against the face of the aperture plate. The block, being rigid, presents a solid surface for measuring the distance between the lens seat on the turret face and the plane of the film.

b. Remove one of the lenses from the turret, and swing the opening in front of the camera aperture.

c. With the shutter open, use a depth micrometer to measure the distance between the lens seat on the turret face and the plane of the film as indicated by the micrometer block. *This distance must be 1.695 inches* plus or minus 0.0005 inch. If the registration is correct, the camera may be placed into operation. If the registration is off, the camera box must be shifted either closer to or further away from the turret by shifting the position of the gibs on the base plate, as directed in the following paragraph.

59. Correcting Camera Depth (figs. 120 through 123)

To correct the camera depth proceed as follows:

a. Measure the distance between the lens seat on the turret face and the film plane as described in the preceding paragraph. If the distance is greater than 1.695 inches, the camera box must be moved forward on the base plate; if the distance is less than 1.695 inches, the camera box must be moved toward the rear. The camera box is shifted on the base plate by changing the position of the rack-over gibs. The rear gib is adjustable by means of setscrews set along the rear edge of the base plate. The front gib must be removed and milled off before it can be shifted.

b. Rack the camera off the base plate.

c. Remove the front gib from the base plate by removing the gib retaining screws. If the camera has to be shifted forward 0.002 inch, for example, it will be necessary to mill down the forward edge of the gib 0.002 inch.

d. Replace the front gib, moving it as far forward as it will go and installing a 0.002 inch shim behind it, before tightening the retaining screws.

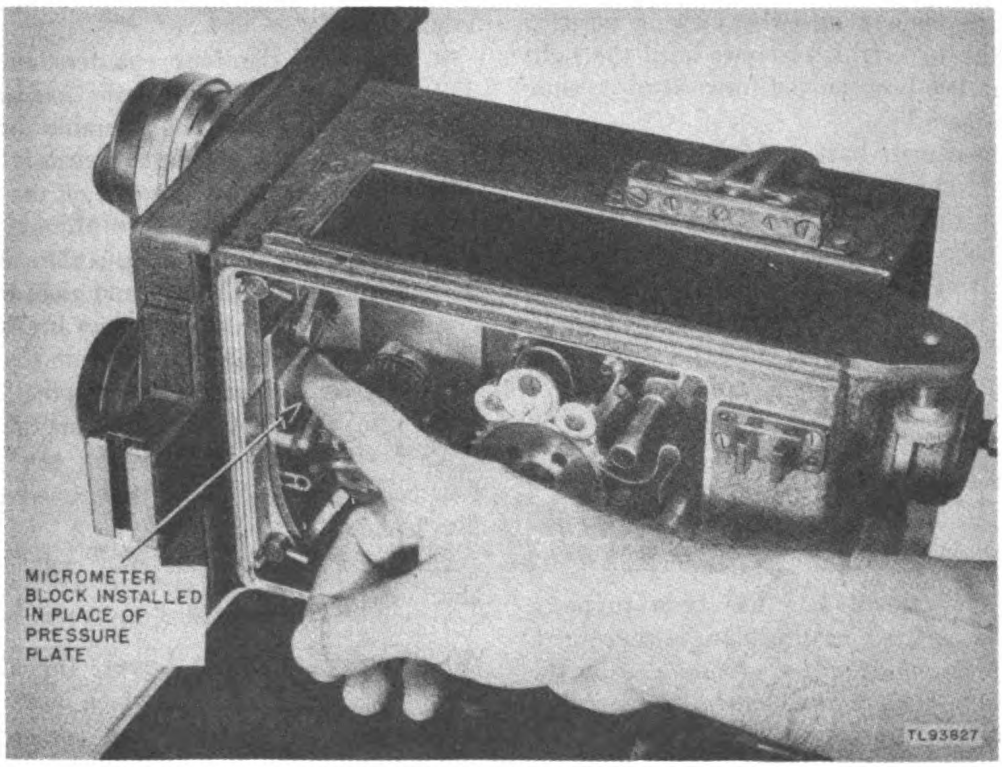


Figure 120. Positioning micrometer block.

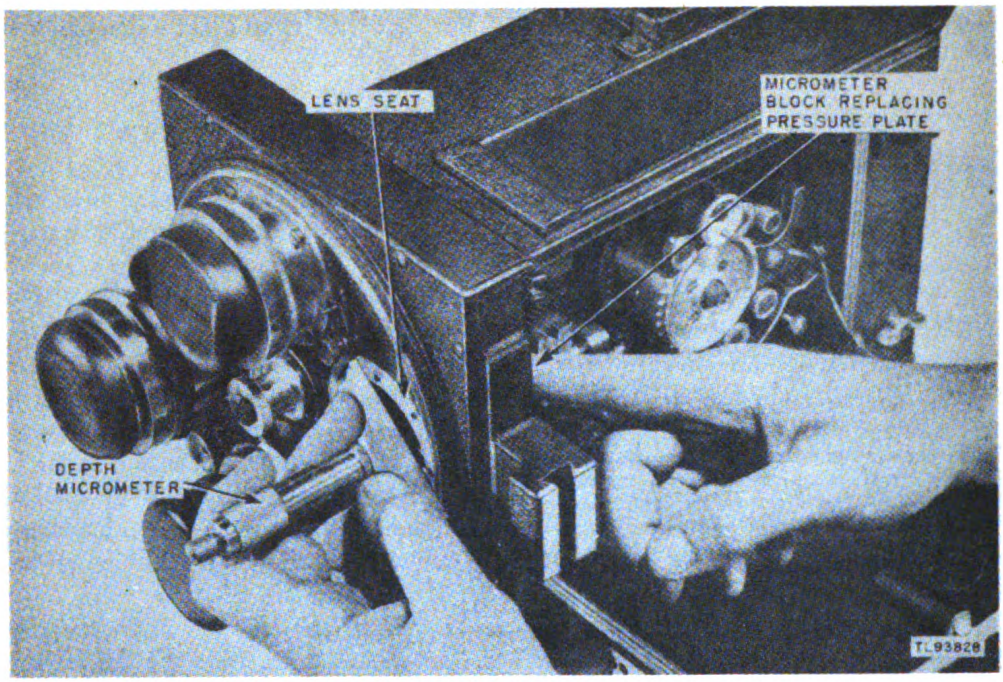


Figure 121. Measuring camera depth.

e. Loosen the retaining screws of the rear gib.

f. Rack the camera onto the base plate and swing it into the photographing position.

g. Tighten the two left setscrews to move the gib forward until it is snug against the camera base on the left side of the base plate.

h. Rack the camera into the viewing position and tighten the two right setscrews until the right end of the gib has been moved forward to be snug against the camera box.

i. Rack the camera back and forth to make sure that it is not binding.

j. Recheck the camera depth as described in in paragraph 58. If the distance between the lens seat on the turret face and the plane of the film is 1.695 (inches plus or minus 0.0005 inch), the depth is properly adjusted. If it is not yet properly adjusted, repeat the procedure described above.

Note. If the camera box must be shifted toward the rear, the procedure will be essentially the same except that in this case the rear edge of the front gib will have to be milled and the compensating shim installed at the front edge. The rear gib setscrews will have to be loosened and the gib shifted toward the rear before fitting the camera box on the base plate for rear gib adjustment as described in *g* through *i* above.

k. When the camera box has been properly adjusted as far as the aperture plate is concerned, it is necessary to reposition the ground glass in the focusing telescope. Rack the camera to the photographing position.

l. Use the depth micrometer to measure the distance between the surface of the lens seat and the front surface of the ground glass. This distance should be 1.695 inches (plus a minus 0.0005 inch). If the ground glass is not in the focal plane, note the distance it will have to be moved either forward or backward.

m. Open the door of the camera and remove the ground glass.

n. Remove the four countersunk screws (fig. 112) from the front end of the focusing telescope and ease the ground glass assembly out of the telescope. Moving the glass forward is done by machining the required amount off the front surface of the ground glass bracket. Moving the plate to the rear is done by installing a shim of the proper thickness in front of the ground glass bracket.

o. Reinstall the ground glass bracket and reinstall the ground glass, being certain that the ground surface faces the front of the camera.

p. Use the depth micrometer to recheck the ground glass position, checking the glass at the four corners to make sure that it is parallel to the film plane.

q. Reinstall the lens that was removed for checking purposes.

60. Replacing Spirit Level (fig. 124)

To replace the spirit level which is mounted in the camera base plate at the rear, proceed as follows:

a. Remove the four level-retaining screws.

b. Ease the level off the dowel pins.

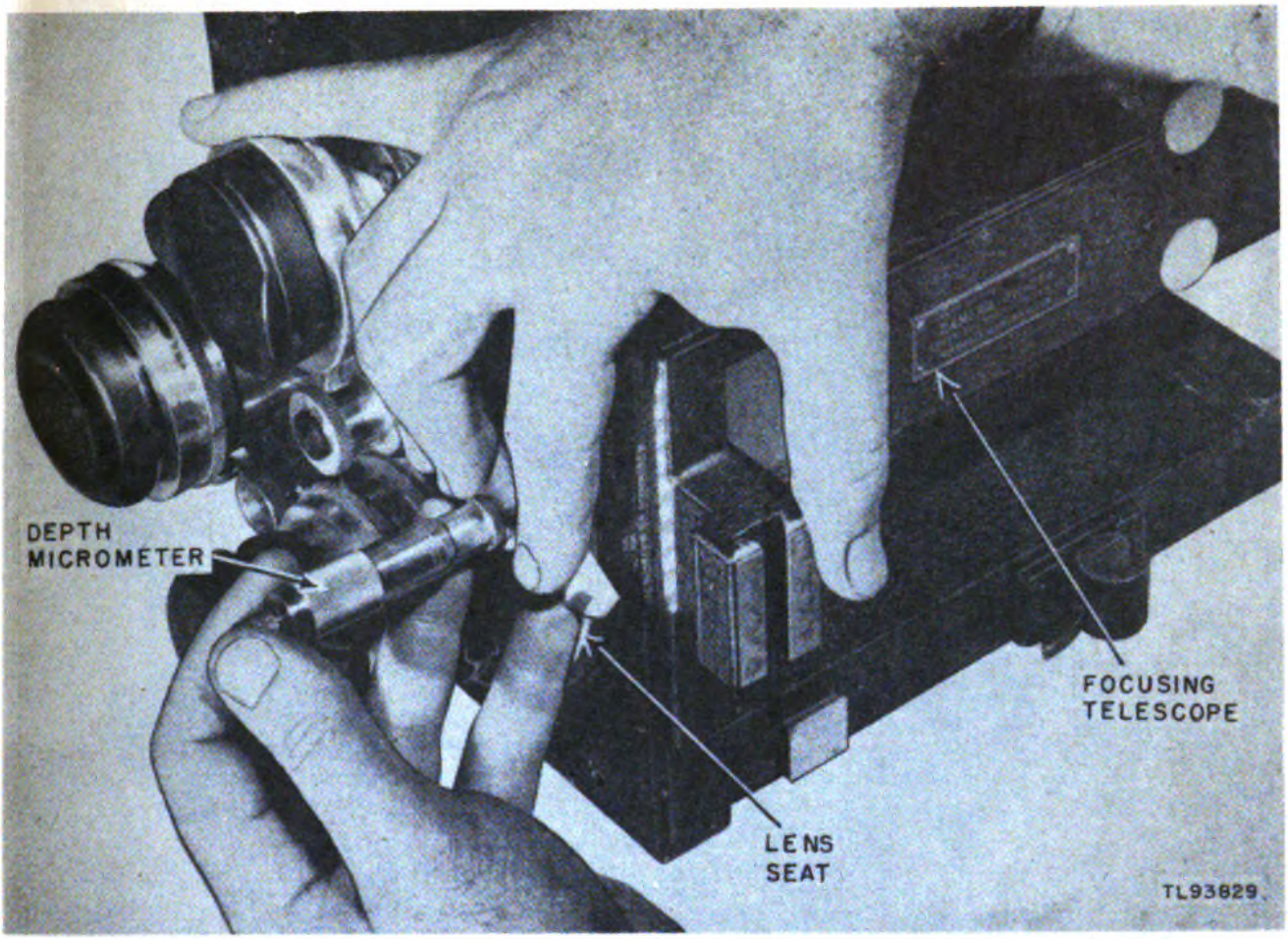


Figure 122. Measuring depth of ground glass.

c. Fit the new level over the dowel pins, and ease it into position.

d. Install the four level-retaining screws.

61. Replacing Pointer Assembly in Dial Counter (fig. 124)

The footage indicator pointer assembly is removed by withdrawing it from the footage indicator shaft. To install the new pointer assembly, fit it into the hollow shaft and push it in as far as it will go.

Note. The shank of the pointer assembly is split and sprung open slightly so that it will fit into the shaft snugly. If the new pointer fits into the shaft too loosely to be firm, remove the pointer and spread the split shaft slightly.

62. Replacing Pressure Plate Lever (fig. 119)

The pressure plate lever is fastened to the intermittent movement by a single screw that acts as a pivot. To replace the lever, remove the screw and remove the lever. Install the new lever and reinstall the retaining screw.

Note. Be certain that the tension spring on the under side of the lever is formed to exert a light pressure on the pressure plate. If the pressure on the plate is not sufficient to keep the plate properly seated, bend the spring slightly to increase the tension.

63. Replacing Pressure Plate (fig. 47)

The pressure plate replacement involves no dismantling or reassembly. The new plate is installed by removing the defective one as if for cleaning, and replacing it with the new plate. It is, however, essential to check the new plate for clearance, and, if necessary, to lap the plate to achieve the proper clearance as follows:

a. Check the clearance of each corner of the pressure plate by inserting a special feeler gauge 0.006 inch thick between the aperture plate and the intermittent assembly. There should be no drag on the gauge.

b. Recheck the clearance of each corner of the pressure plate with a special feeler gauge 0.0065 inch thick. There should be a slight drag on the gauge at each corner.

c. If the clearance is too small it indicates that the pressure plate is coming forward too far. To increase the clearance, remove the rails from the

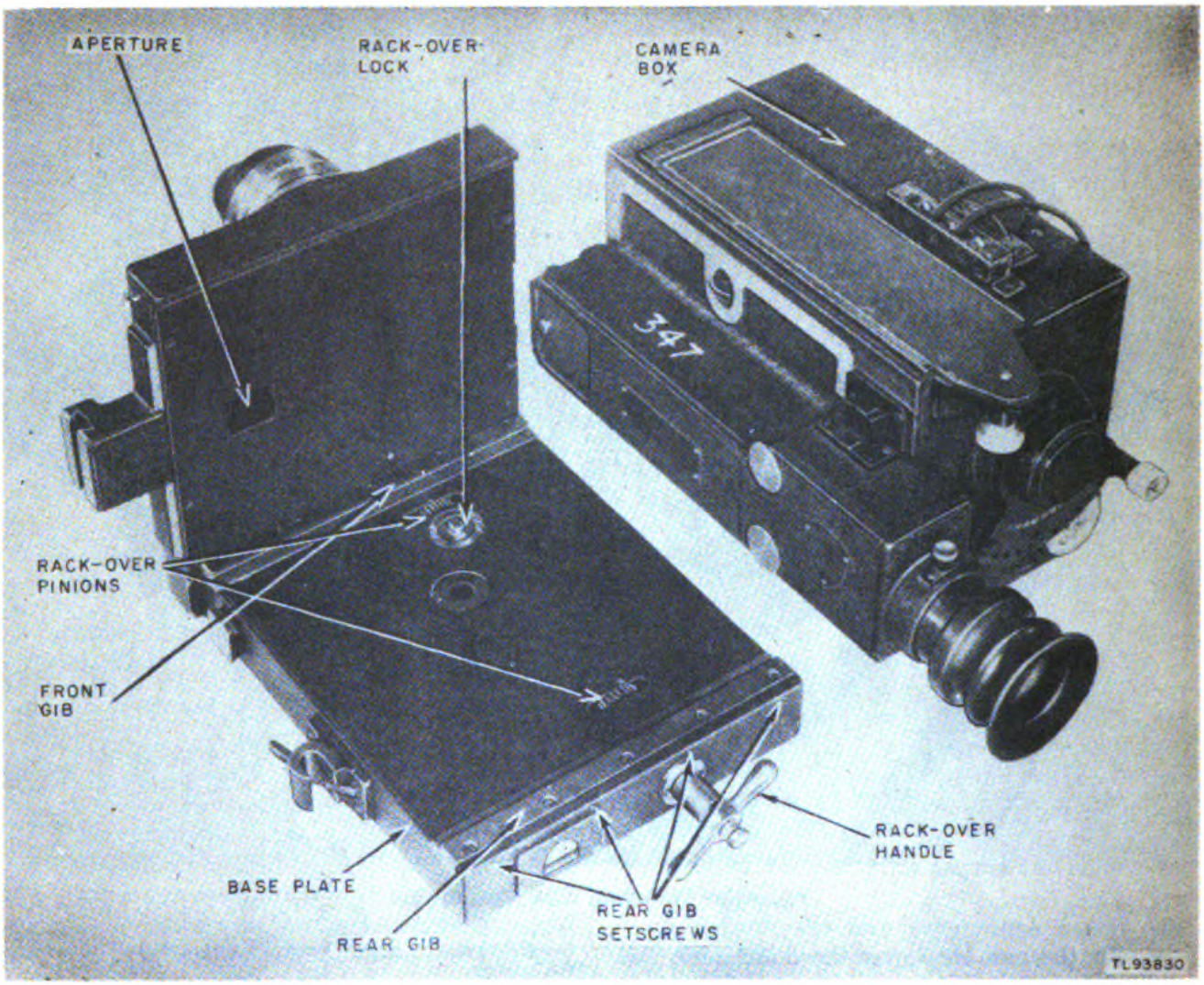


Figure 123. Camera box racked off base plate for gib adjustment.

pressure plate and lap the *back* of the rails with a fine abrasive.

Note. If the clearance is unequal, lap only the rail which is exerting the excess pressure. When the clearance is equalized, retest the pressure as described above.

d. Recheck the clearance after equalization, and if the rails need more cutting down, repeat the lapping operation, taking off very little metal at each lapping.

e. If the test shows that there is too much clearance, it indicates that the pressure plate is not coming forward far enough. In this case, file the corners of the pad to allow the plate to seat deeper into its recess.

Note. If the clearance is uneven, file the corners of the pad to equalize it by cutting more metal from the corner of the plate where the clearance is greatest.

f. Recheck the pressure and if the corners need more cutting, repeat the filing operation.

Caution. **Use a fine file and cut only a little at each operation to make sure that too much metal is not removed.**

64. Replacing Sprocket Shaft (fig. 125)

To replace the sprocket shaft, proceed as follows:

a. Open the door of the camera and remove the sprocket retaining screw.

b. Remove the right cover from the camera.

c. Remove the flywheel by removing the locking screw and the flywheel retaining screw.

d. Pull the large helical gear (sprocket drive gear) out of the camera together with the sprocket shaft.

e. Remove the hub locking screw from inside the hub of the large helical gear; remove the hub and pull the gear off the sprocket shaft.

Note. **The micarta spur gear will come off with the large helical gear.**

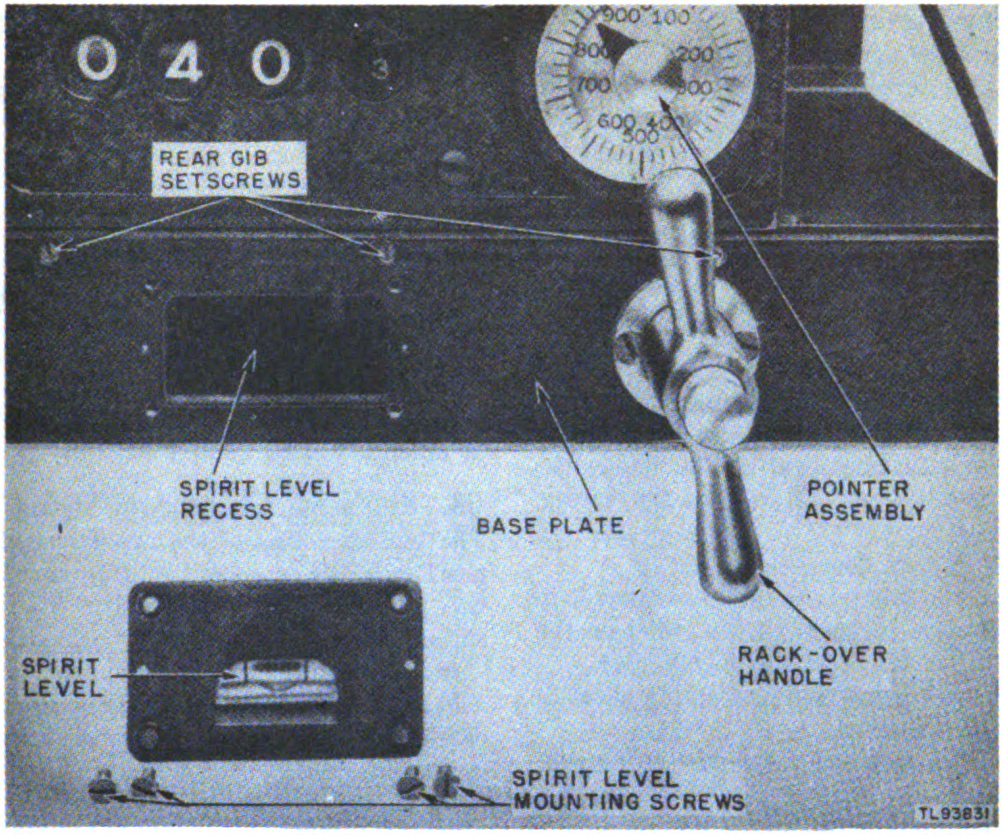


Figure 124. Spirit level removed from base plate.

f. Install the assembled gears on the new sprocket shaft and install the gear hub and the hub locking screw.

g. Insert the shaft into its bearing and into the sprocket while holding the sprocket to align it with the shaft.

Note. Be sure that the keyway in the sprocket lines up with the key in the shaft.

h. Install the sprocket retaining screw.

i. Install the flywheel being certain that the timing marks line up.

j. Check the synchronization of the camera as described in paragraph 54.

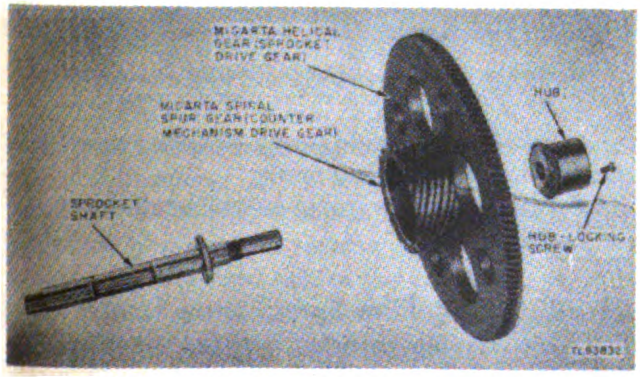


Figure 125. Sprocket shaft removed from gear assembly.

k. If necessary, synchronize the camera as described in paragraph 55.

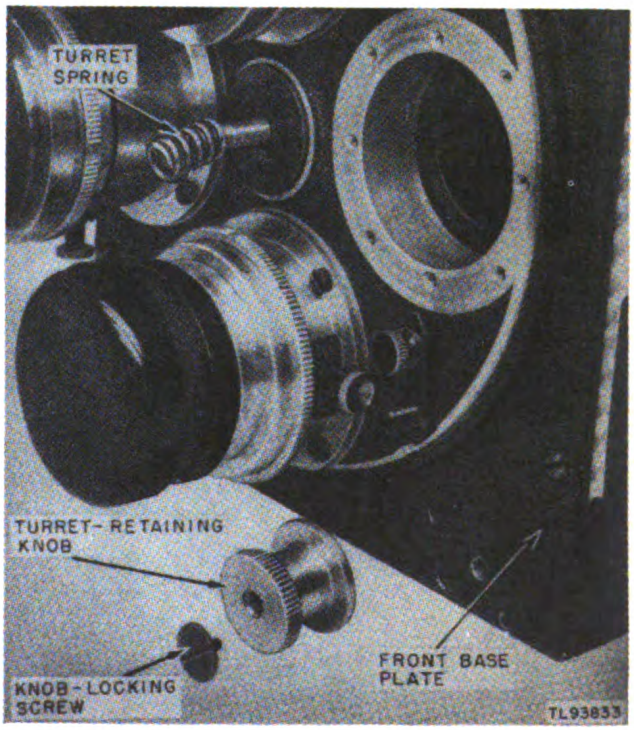


Figure 126. Turret spring partially removed.

65. Replacing Turret Spring (fig. 126)

To replace the turret spring, proceed as follows:

a. Remove the turret knob locking screw.

Caution. This screw is left-hand threaded.

b. Turn the turret retaining knob counterclockwise until it can be removed from the stud.

c. Remove the turret spring from the stud.

d. Install the new turret spring, and install the turret knob, turning it clockwise as far as it will go.

e. Install the left-hand threaded turret knob locking screw.

66. Replacing Buckle Trip Spring (fig. 12)

The buckle trip spring is located directly beneath the buckle trip actuating lever in the movement (left) side of the camera. To replace the spring, proceed as follows:

a. Open the camera door.

b. Use a pair of tweezers to disconnect the loop ends of the defective spring from the eyelet on the trip actuating lever and from the anchor post.

c. Slip one loop end of the new spring through the eyelet on the trip lever.

d. Slip the other loop end of the new spring over the anchor post.

e. Close the camera door.

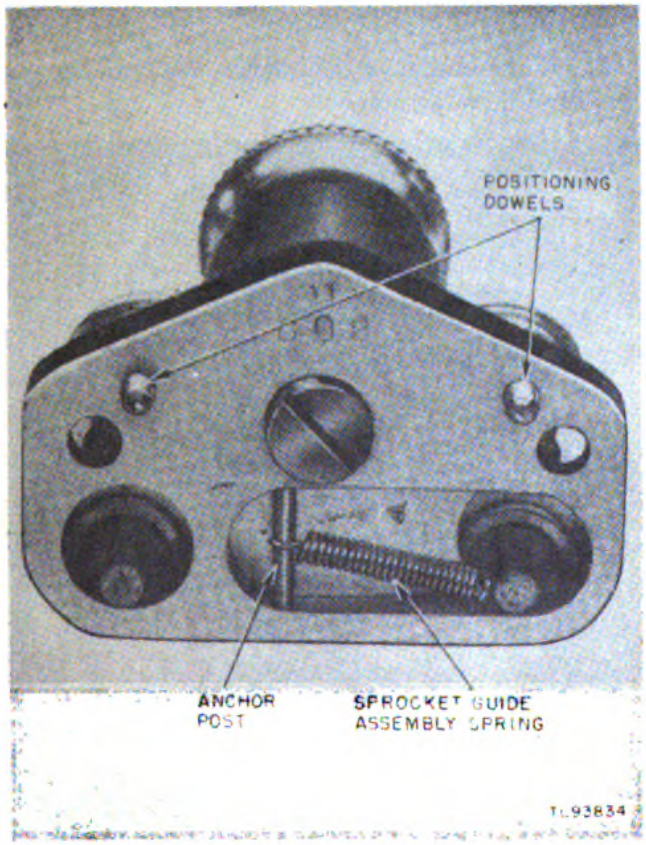


Figure 127. Rear view of sprocket film guide assembly, showing spring.

67. Replacing Sprocket Guide Assembly Spring (fig. 127)

The toggle spring that holds the sprocket film guide assemblies either in the open or closed position, is located in a recess in the rear plate of the assembly and is replaced as follows:

a. Remove the sprocket film guide assembly as described in paragraph 56*a* through *c*.

b. Disconnect the defective spring from the anchor post and from the eyelet.

c. Connect the new spring to the anchor post and to the eyelet.

d. Reinstall the sprocket film guide assembly as described in paragraph 56*d* through *g*.

68. Replacing Clamp Arm Spring (fig. 128)

The tension spring of the new-finder clamp arm is positioned in a recess cut into the rear of the parallax adjustor clamp assembly. To replace the spring, proceed as follows:

a. Remove the two clamp-mounting screws.

b. Ease the clamp off the base plate, being careful not to bend or otherwise damage the two dowel pins.

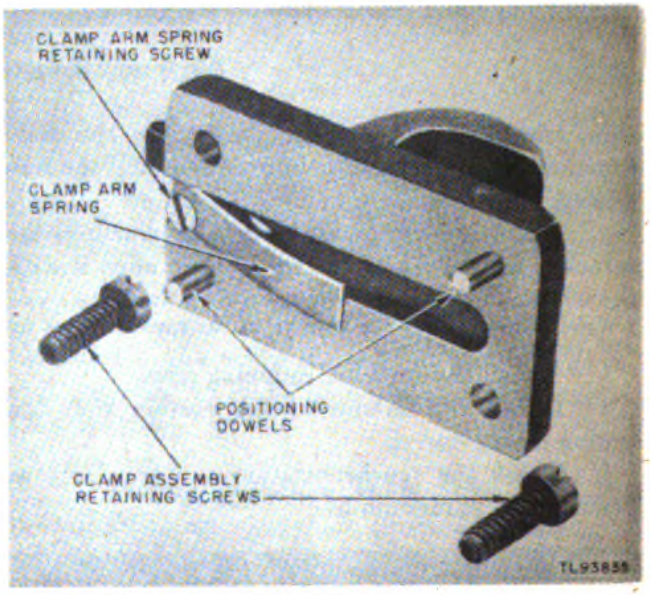


Figure 128. Parallax adjustor assembly removed from base plate, clamp arm spring partially removed.

c. Remove the single spring-retaining screw and remove the defective leaf spring.

d. Install the new spring and reinstall the clamp on the base plate.

69. Replacing Film Sprocket (fig. 129)

To replace the film sprocket, proceed as follows:

a. Remove the sprocket as directed in paragraph 50*a* through *c*.

b. Remove the four countersunk hub retaining screws and remove the steel hub from the sprocket by pushing it out of the sprocket from the front.

c. Install the hub in the new sprocket being certain that the tapped holes in the hub line up perfectly with the four holes in the new sprocket.

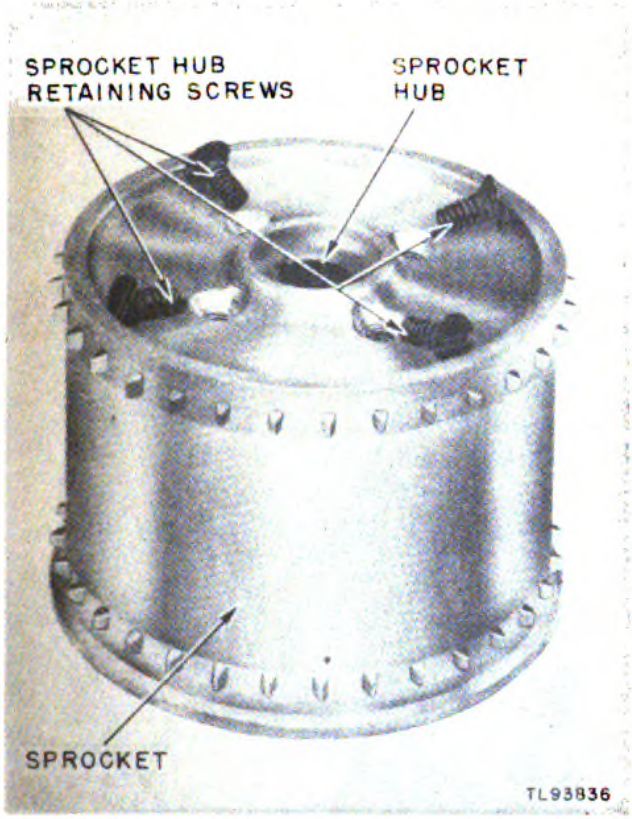


Figure 129. Sprocket, showing sprocket hub partially removed.

d. Install the sprocket assembly in the camera as directed in paragraph 50*n* through *s*.

70. Replacing Buckle Switch Trip Unit (fig. 130)

To replace the buckle switch trip unit, proceed as follows:

a. Open the door of the camera.

b. Remove the right cover from the camera.

c. Unscrew the buckle trip reset knob, while holding the switch-actuating plunger from the right side of the camera.

d. When the reset knob is removed, the switch actuating plunger and tension spring may be removed from the right side of the camera.

e. Fit the new spring over the new plunger and insert the plunger into its hole from the right side of the camera. It will be necessary to depress the trip actuating lever to allow the plunger to pass the lever. Hold the plunger in as far as it will go against the spring tension and screw the reset knob onto the plunger shaft from the movement (left) side of the camera.

f. When the reset knob is firmly attached, release the plunger and allow the spring to move it toward the right side of the camera.

g. Set and release the buckle trip actuating lever several times to make sure that the buckle switch trip unit has been properly installed.

71. Replacing Magazine Drive Assembly and Belt (fig. 131)

To replace the magazine drive assembly, proceed as follows:

a. Remove the four mounting screws and lift the assembly off the top of the camera.

b. Remove the two side plate retaining screws and lift the side plate off the magazine drive assembly.

c. Lift the drive belt from around the pulleys.

d. Remove the side plate from the new magazine drive unit and fit the belt around the pulleys.

e. Install the side plate on the new assembly.

f. Install the new assembly into the camera, being sure that the gears mesh properly.

g. When the assembly is in position, reinstall the four retaining screws.

72. Replacing Mechanical Counter (fig. 132)

To replace the counter, proceed as follows:

a. Remove the dust plate from the camera, and remove the right cover.

b. Remove the three screws that fasten the shutter control lever to the shutter shaft.

c. Remove the back of the camera by removing the five mounting screws.

d. Remove the single retaining screw from the center of the counter bevel gear.

e. Remove the retaining screw from the center of the counter reset knob and remove the knob.

f. Remove the roundhead brass screw that fastens the counter to the camera casting, and swing the counter unit out as far as it will go.

g. Pull the counter bevel gear off its shaft, and then remove the counter completely.

h. Remove the counter spur gear by removing the spur gear retaining screw, and install the spur gear on the new counter unit.

i. Install the new counter into the camera leaving it unfastened.

j. Fit the counter bevel gear onto its shaft being sure that the key in the gear hub is seated in the keyway in the shaft.

Note. Hold the end of the shaft from inside the right side of the camera while putting the gear on the shaft.

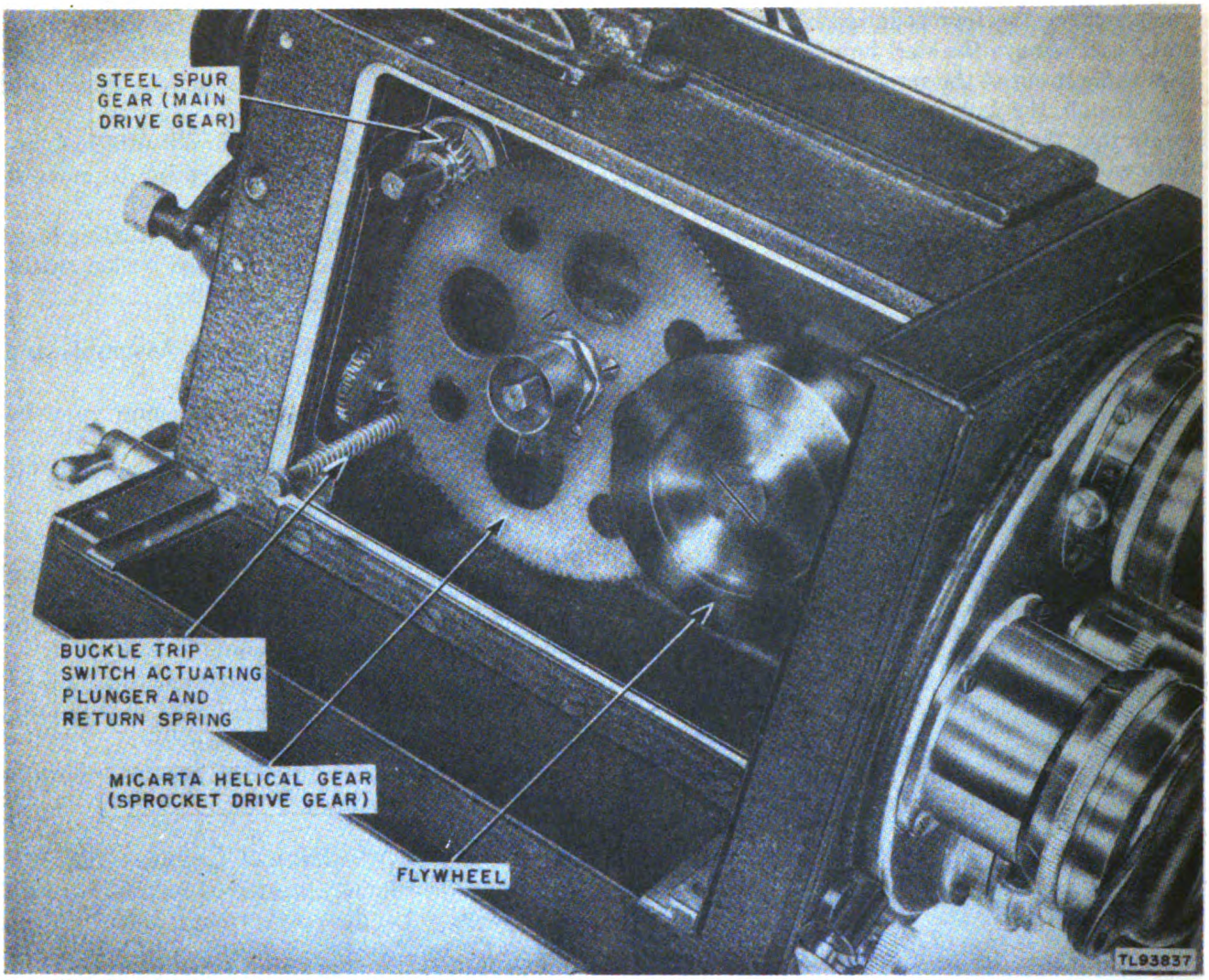


Figure 130. Right side of camera box, showing buckle switch trip unit partially removed.

k. Install the counter bevel gear retaining screw.

l. Install the roundhead brass screw to fasten the counter unit to the camera casting securely.

m. Install the counter reset knob and the knob retaining screw.

n. Install the camera back and tighten the five screws evenly.

o. Install the shutter control lever and tighten the three retaining screws evenly.

p. Install the dust plate, and install the right cover of the camera.

73. Replacing Drive Motor Brushes (fig. 133)

The drive motor brushes are located in the end plate of the motor and are replaced as follows:

a. Remove the brush-holder caps with a screw driver, being careful that the brush pressure spring does not throw the cap when the threads are completely disengaged.

b. Take hold of the brush pressure spring and withdraw the brush from the brush holder.

c. Insert the new brush with pressure spring into the brush holder, being sure that the rectangular brush fits into the slot in the brush holder properly.

d. Compress the pressure spring down into the brush-holder recess and reinstall the brush-holder cap.

74. Replacing Tachometer (fig. 134)

To replace the tachometer, proceed as follows:

a. Remove the two countersunk setscrews that fasten the tachometer shank into its socket on the motor assembly housing.

b. Withdraw the entire tachometer from the housing gently, being sure not to lose the bushing that is positioned in the tachometer socket.

c. Line up the setscrew holes in the bushing with the holes in the housing.

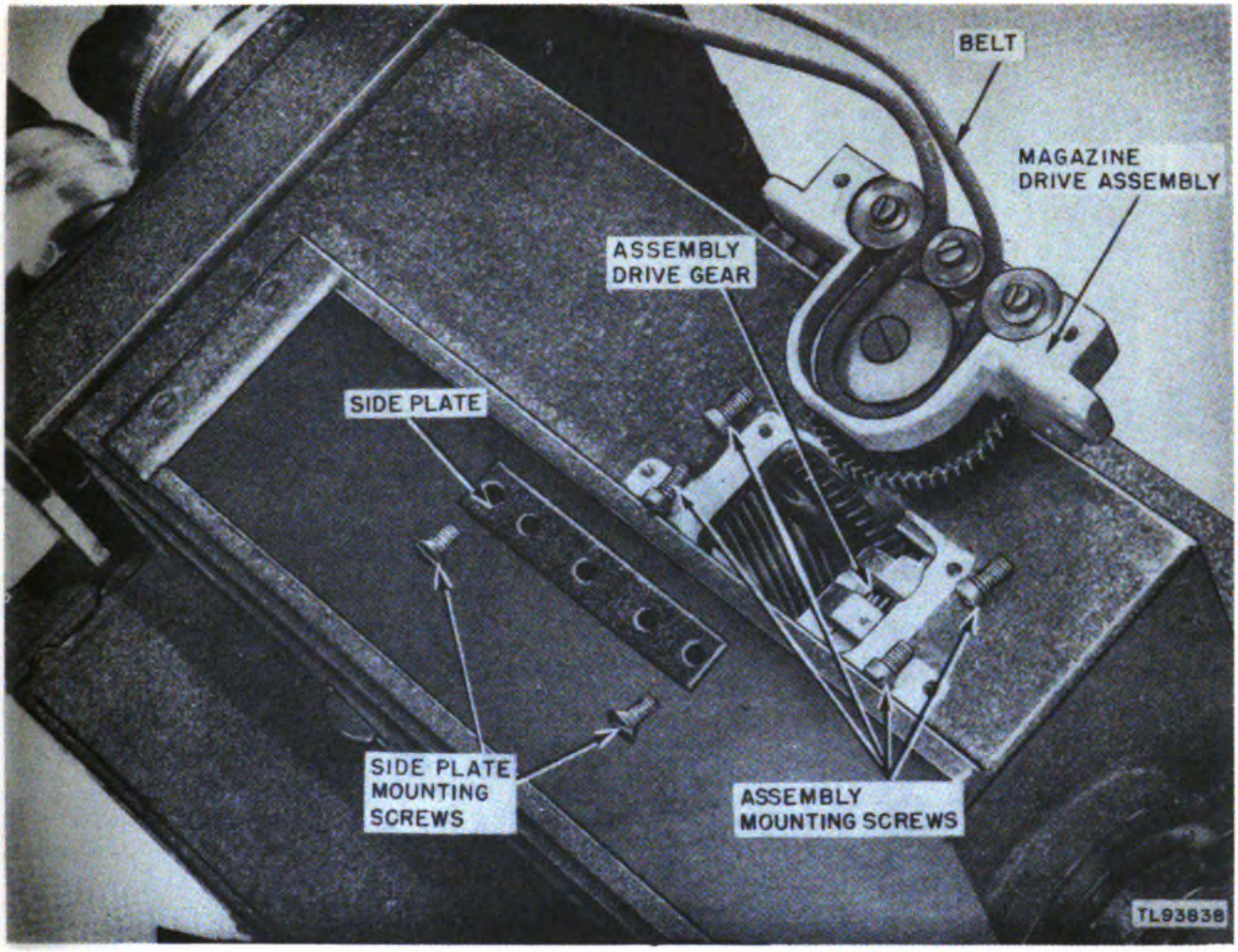


Figure 131. Top view of camera box, showing magazine drive assembly removed.

d. Insert the shank of the new tachometer into the socket being careful to line up the setscrew indentions of the tachometer shank with the setscrew holes in the housing and the bushing.

e. Reinstall the countersunk setscrews.

f. Spin the hand knob of the motor to see that the tachometer responds.

75. Replacing Tripod Head Camera Bed (fig. 135)

To replace the camera bed of the tripod head proceed as follows:

a. Remove the three countersunk screws that fasten the tripod bracket to the head.

b. Remove the tripod bracket by prying it off the bed gently to free the two positioning dowel pins.

c. Remove the four countersunk screws from the top of the camera bed and lift the bed off the tripod head.

d. Install the new bed and tighten the four screws evenly.

e Fit the positioning dowels of the tripod bracket into the holes in the new bed, and tap the bracket gently until it is snug against the bed.

f. Install the three countersunk screws to fasten the tripod bracket to the bed securely, being sure that the screws are seated below the level of the serrated surface to insure free movement of the panhandle.

76. Replacing Tripod Head Bracket (fig. 135)

To replace the tripod bracket (panhandle socket) proceed as directed in paragraph 75*a* and *b*. Install the new bracket as directed in paragraph 75*e* and *f*.

77. Replacing Tripod Clamp Assembly (fig. 136)

To replace the clamp assemblies which form the pivots that fasten the tripod legs to the tripod head, proceed as follows:

a. Remove the locknut from the leg pivot bolt. (See fig. 137.)

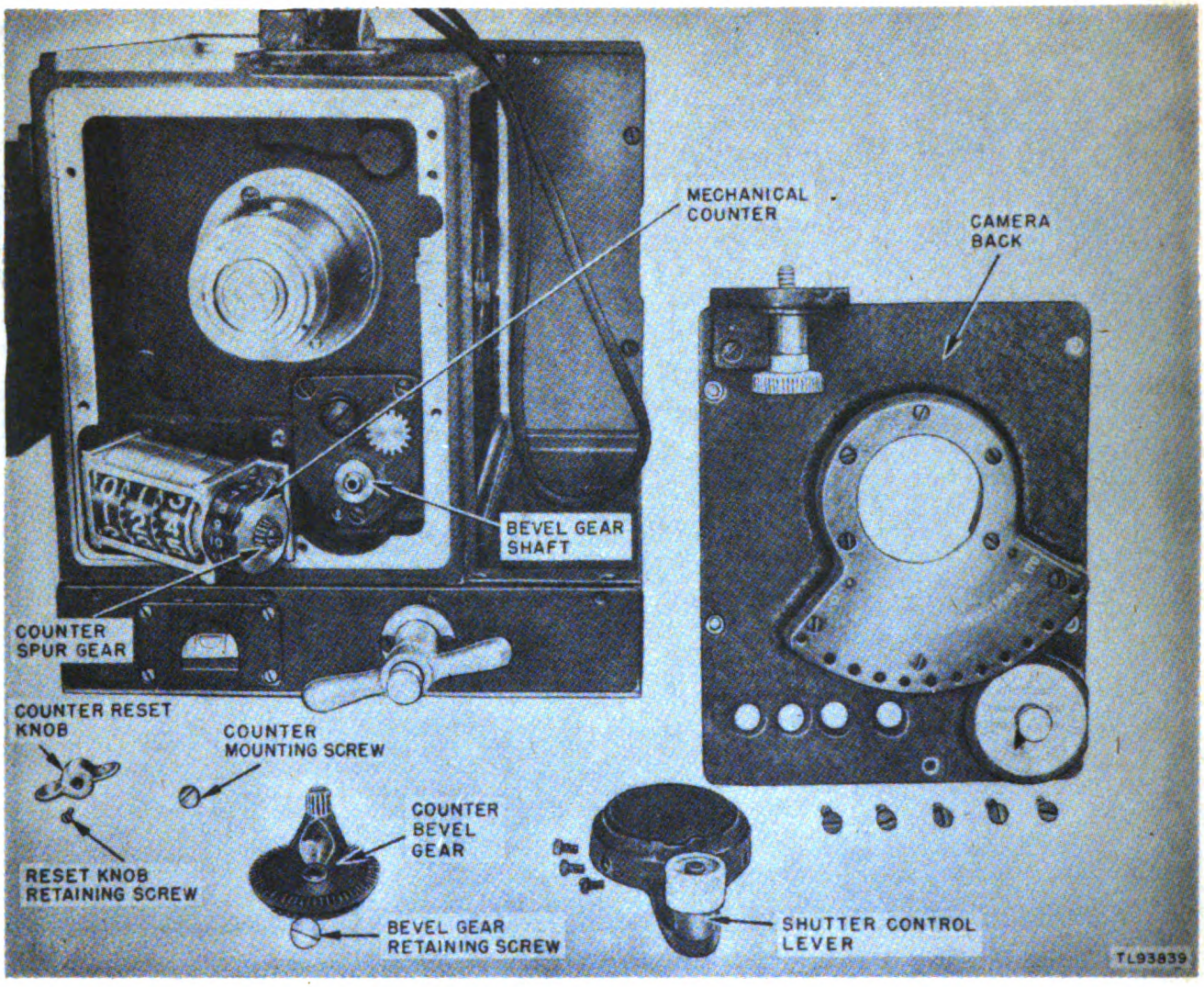


Figure 132. Rear view of camera box, showing mechanical counter partially removed.

b. Remove the slotted adjusting cone that is positioned beneath the locknut.

c. Remove the pivot bolt, catch the hold-down eye as the bolt is withdrawn from the leg, and remove the leg assembly.

d. Remove the five countersunk screws from one plate of the bracket assembly. This will release the five countersunk female screws on the other plate of the bracket assembly. Remove both plates.

e. Install two new plates, one on the inside and one on the outside of the leg, positioning the plates so that the five holes in each line up with the five holes in the leg and the offset ends of the plates come together at the top, with the cone of the plates facing inward.

f. Install the male and female screws to secure the plates to the leg.

g. Spring the upper ends of the leg apart slightly to engage the cones of the plates with the countersunk sockets of the tripod head.

h. Insert the pivot bolt from the left until the end of the bolt is about one-fourth entered.

i. Slip the hold-down eye over the end of the bolt from underneath the tripod head, and continue entering the bolt until it passes through the right plates.

j. Install the slotted locking cone, tightening it until there is no side play between the leg and the tripod head.

k. Install the locknut over the slotted locking cone and tighten the nut.

78. Replacing Tripod Leg Assembly (fig. 137)

To replace the tripod leg assembly proceed as follows:

a. Remove the leg pivot bolt as described in paragraph 77*a* through *c*, and remove the leg assembly from the tripod head.

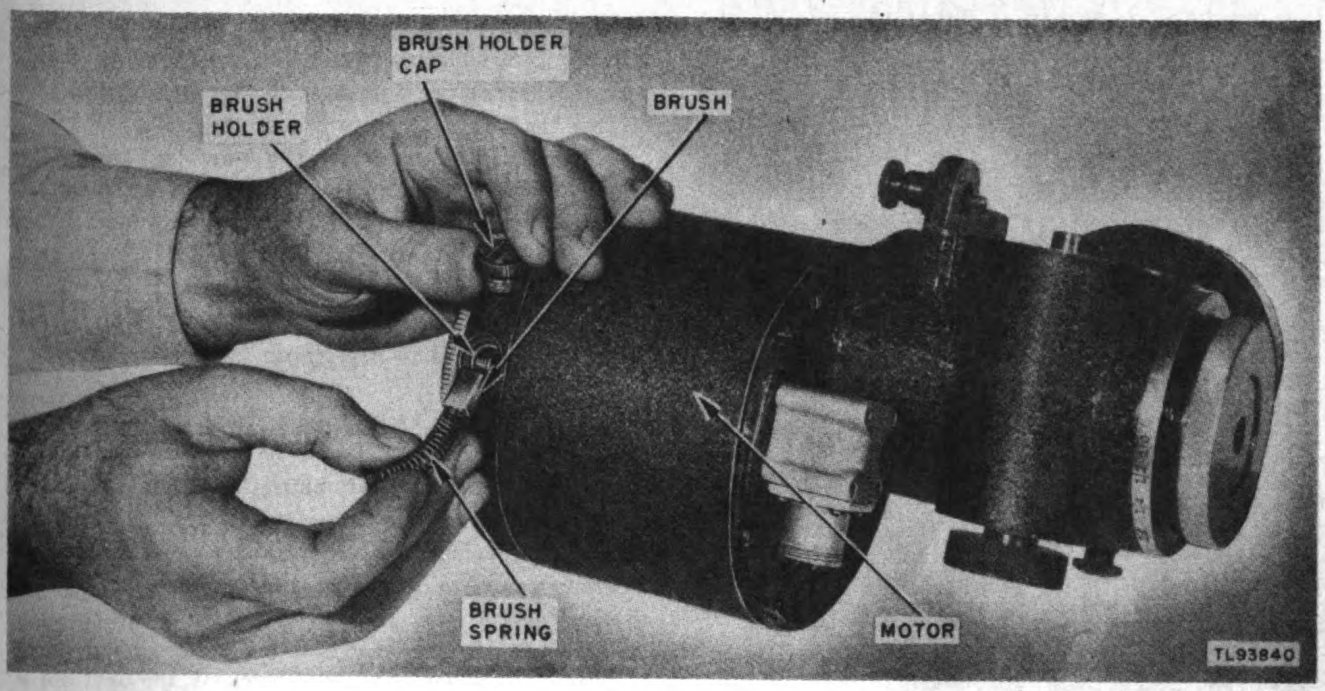


Figure 133. Installing motor brushes.

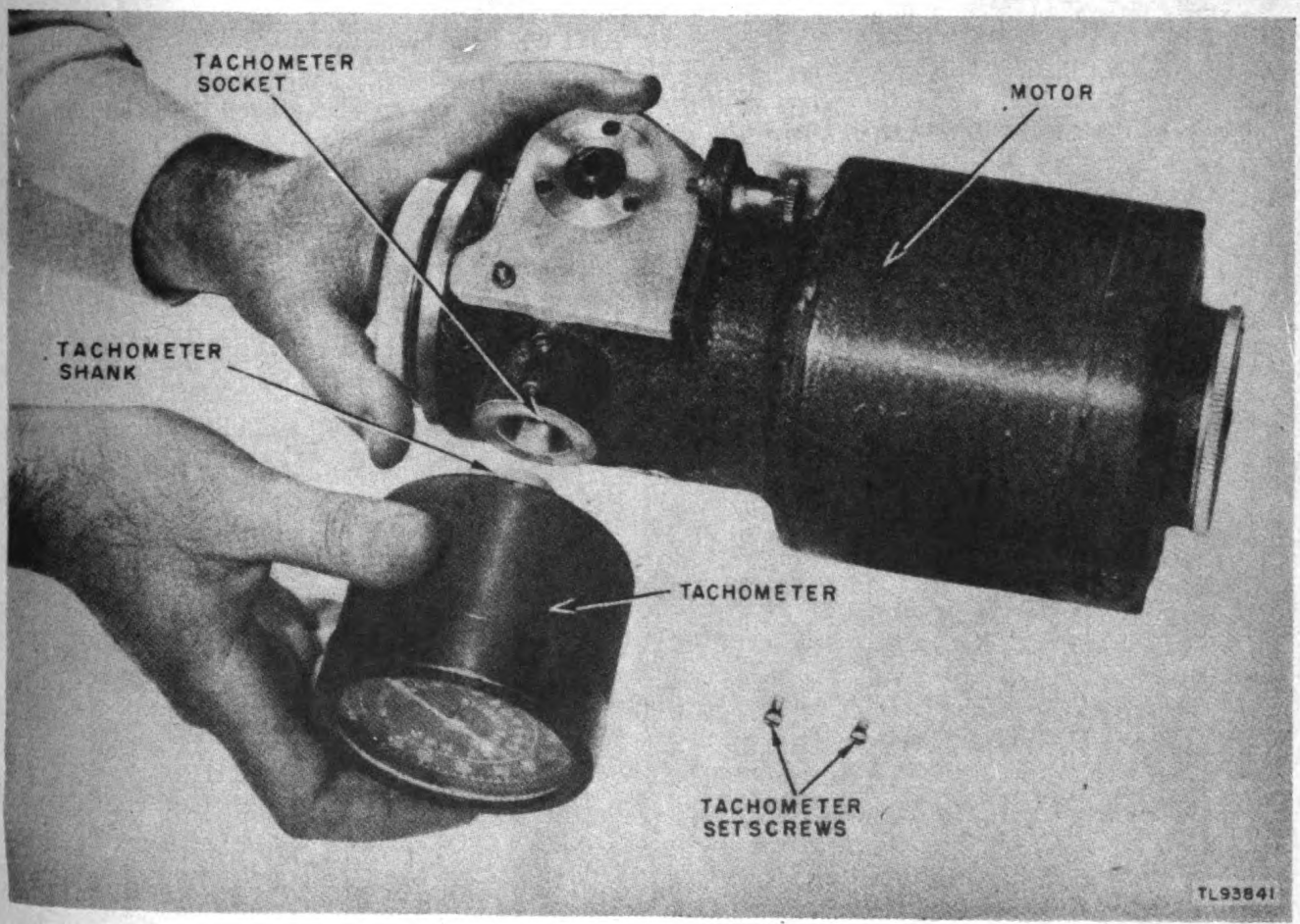


Figure 134. Installing tachometer.

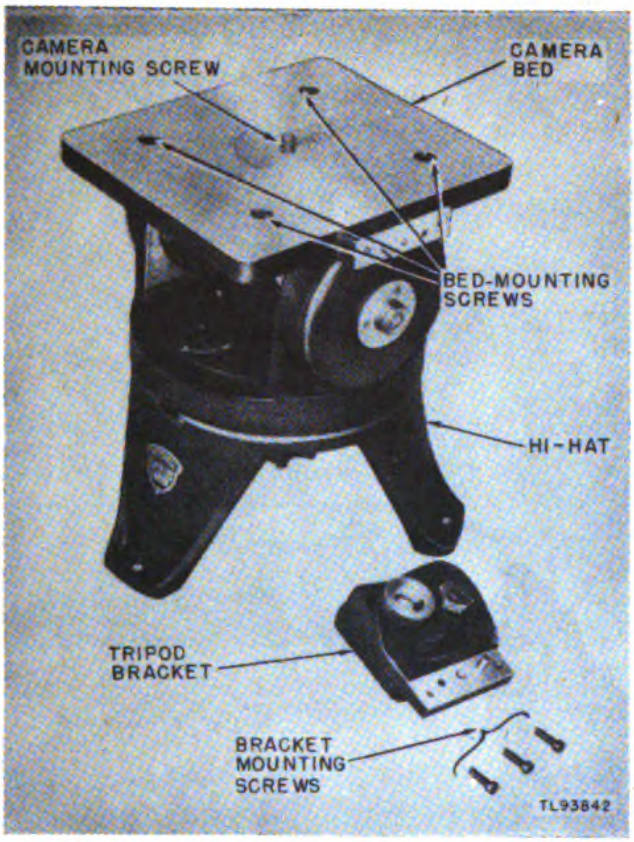


Figure 135. Tripod bracket removed from tripod head.

b. Remove the shoe from the defective leg assembly by removing the three countersunk wood screws that secure the shoe to the end of the leg. (See fig. 139.)

c. Install the shoe on the new leg assembly, being certain that the small extended platform of the shoe faces the outside surface of the leg. (The shoe should be positioned the same way as the two shoes on the other legs of the tripod.)

d. Mount the new leg assembly on the tripod head as described in paragraph 77*g* through *k*.

79. Replacing Tripod Leg Section (figs. 137 and 138)

To replace either the left or the right outer section of the leg, proceed as follows:

a. Remove the leg assembly from the tripod as described in paragraph 77*a* through *c*.

b. Remove the knurled locknuts from the leg assembly by unscrewing each nut as far as it will go.

Note. The left nut is left-hand threaded; the right nut is right-hand threaded.

c. Remove the lower leg band from the defective outside leg section by removing the three countersunk wood screws.

d. Work the lower leg band free of the defective leg section and then pull the defective section through the adjusting clamp band until the section is free of the leg assembly.

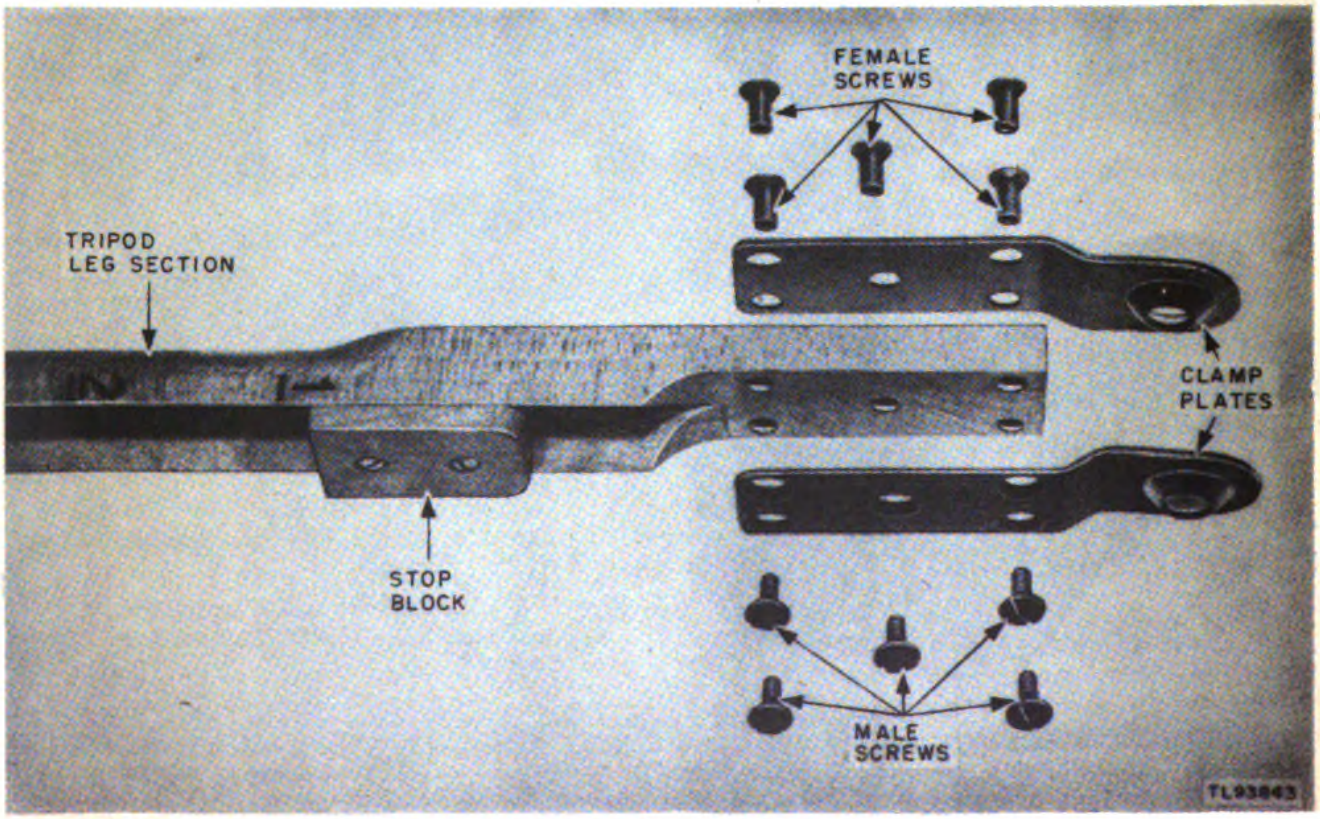


Figure 136. Tripod clamp assembly, exploded view.

e. Remove the clamp assembly (pivot plates) from the defective leg section and install it on the new section as described in paragraph 77*d* through *f*.

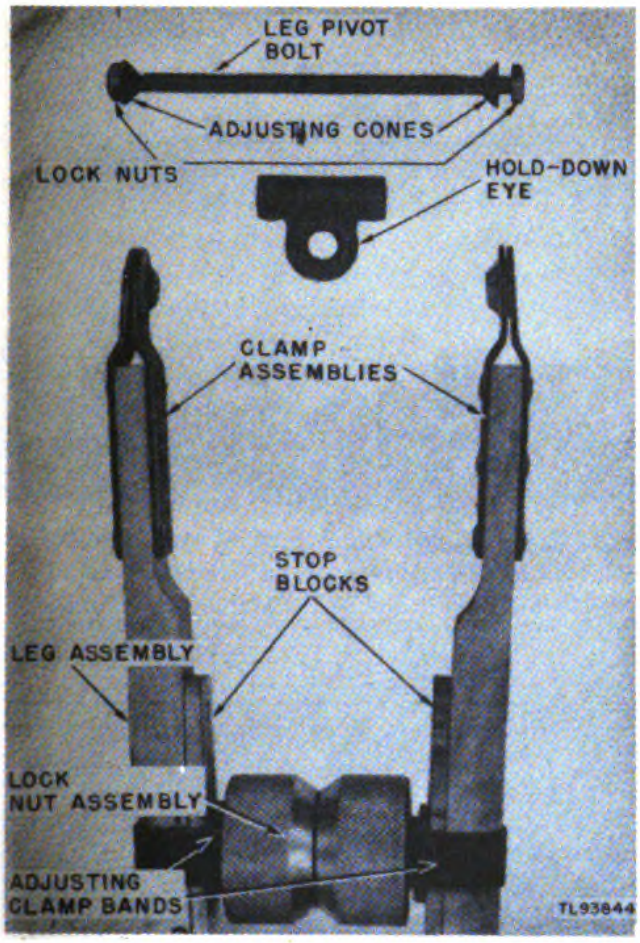


Figure 137. Leg assembly removed from tripod.

f. Remove the wooden stop block which is positioned on the inside of the defective leg section, and install it on the new leg section, being sure that it is positioned properly by aligning the new leg section with the defective one.

g. Insert the new leg section through the adjusting clamp band and reinstall the lower leg band on the new leg section.

h. Install the leg assembly on the tripod head as described in paragraph 77*g* through *k*.

80. Replacing Tripod Leg Locknut Assembly

To replace the leg locknut assembly, proceed as follows:

a. Remove the leg assembly from the tripod head as described in paragraph 77*a* through *c*.

b. Remove knurled nuts by unscrewing them completely.

Note. The right nut is right-hand threaded; the left nut is left-hand threaded.

c. Spring the two outer leg sections apart slightly and remove the defective nuts.

d. Install the new nuts on the clamp studs, being sure that the rod which is fitted to one nut is inserted into the hole of the other nut. Do not tighten the nuts.

e. Spring the leg section apart slightly and mount the leg assembly on the tripod head as described in paragraph 77*g* through *k*.

81. Replacing Tripod Leg Shoe (fig. 139)

To replace the tripod shoe, proceed as directed in paragraph 78*b* and *c*.

82. Replacing Tripod Head Brass Clutch Plate and Fiber Disks (fig. 140)

One brass clutch plate and two fiber clutch disks are used to control the lateral (panoramic) movement of the tripod head. The plate and disks are located in the circular base of the tripod and are replaced as follows:

a. Install the tripod head on the hi-hat for ease in handling.

b. Remove the pan locking lever by loosening the setscrew in the collar of the lever.

c. Remove the pan locking screw by unscrewing it all the way.

d. Turn the tripod head upside down so that it rests on the camera bed.

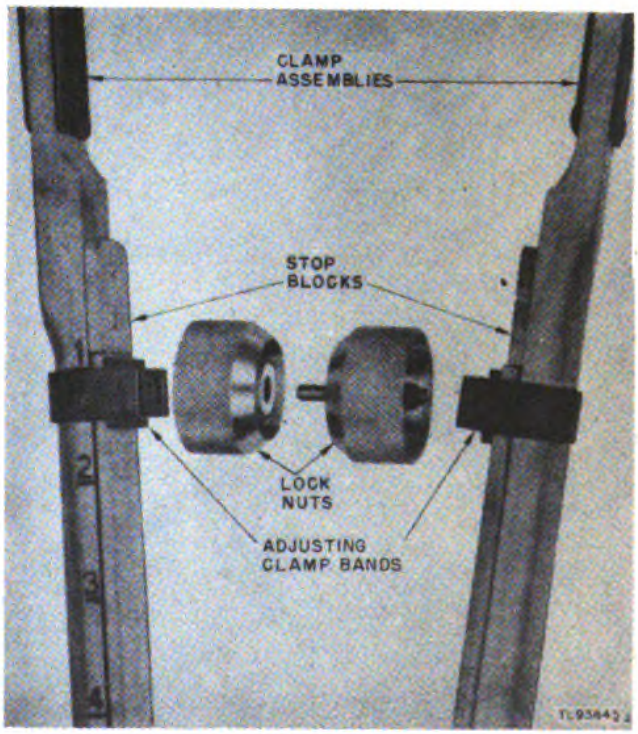


Figure 138. Locknuts removed from leg assembly.

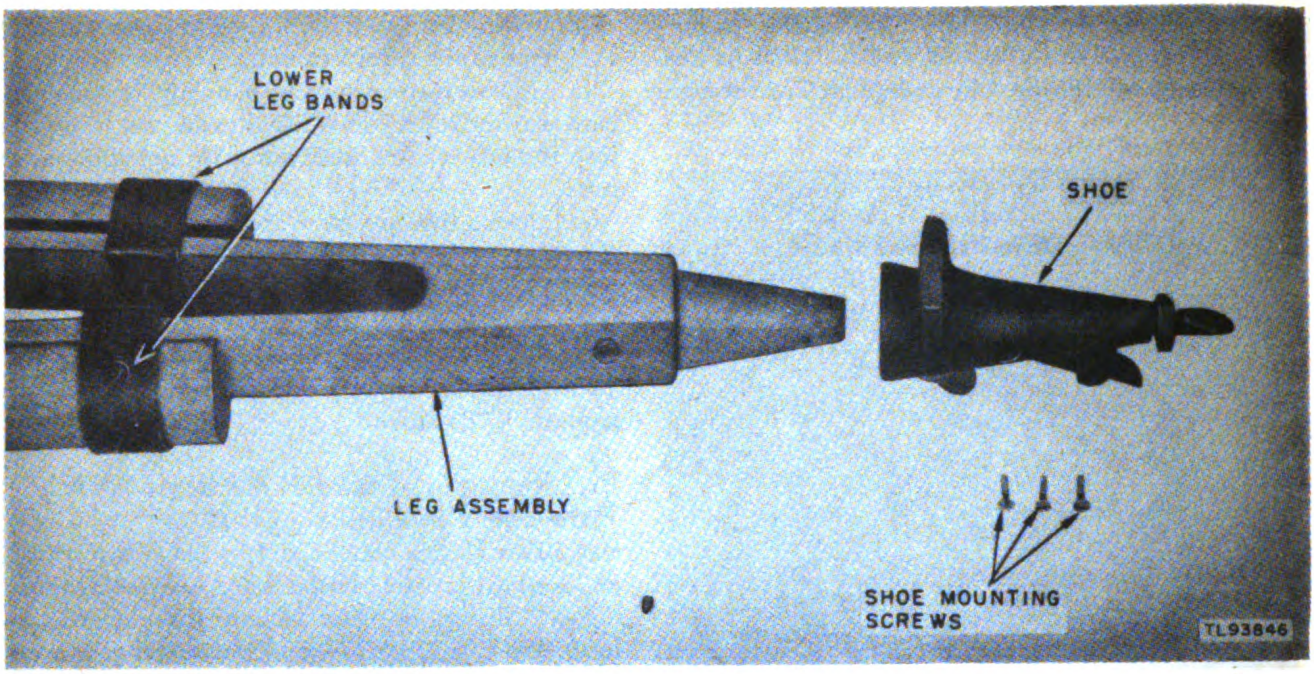


Figure 139. Shoe removed from tripod leg assembly.

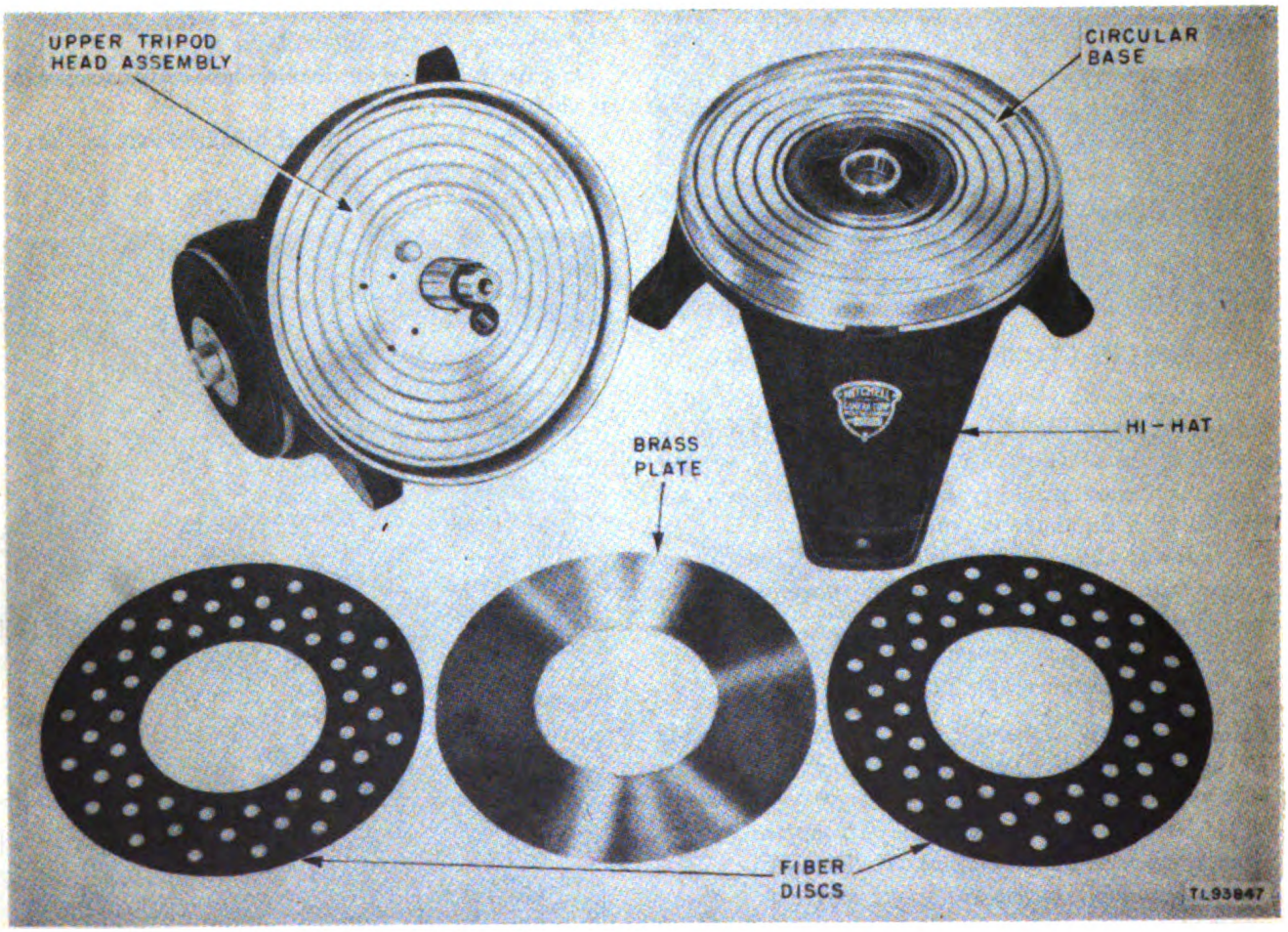


Figure 140. Fiber disks and brass plate removed from tripod head.

e. Remove the screws in the center of the pan tension knob, and then unscrew the knob completely and remove it.

f. Remove the flat keyed washer that is positioned beneath the pan tension knob.

g. Turn the tripod head right side up and remove the upper tripod head assembly from the circular base by turning the upper assembly back and forth while pulling upward steadily.

Note. The suction caused by the grease in the clutch assembly will make it difficult to lift the upper tripod head assembly off the base rapidly, but the constant lift will separate the two parts gradually.

h. When the upper tripod head assembly is lifted off the tripod base, remove the upper fiber disk, then the brass clutch, and then the lower fiber disk.

i. Install the new lower fiber disk, then the new brass clutch plate, and then the upper fiber disk, lubricating the parts as described in the lubrication order for the equipment. (See fig. 147.)

j. Fit the upper tripod head assembly over the tripod head base being sure that the positioning pin in the under side of the upper assembly fits into the hole in the expanding brake which is positioned in the center of the circular base. Work the upper assembly down into position slowly, allowing the air to escape.

k. When the parts are closely fitted together, turn the tripod upside down and slip the keyed flat washer over the shaft being sure that the tab on the washer fits into the keyway in the shaft.

l. Install the pan tension knob and then the tension knob retaining screw.

m. Turn the head upright and install the pan locking screw, tightening it enough to lock the head assembly.

n. Fit the panoram locking lever over the head of the adjusting screw and position it so that the lever can be moved far enough in a counterclockwise direction to loosen the locking screw enough to permit panning the tripod head. When the lever is properly positioned, tighten the setscrew.

83. Replacing Tripod Head Steel Clutch Plates, Fiber Disks, Friction Plate, and Steel Axle (fig. 141)

Two clutch assemblies are used to control the vertical (tilt) motion of the tripod head. These clutch as-

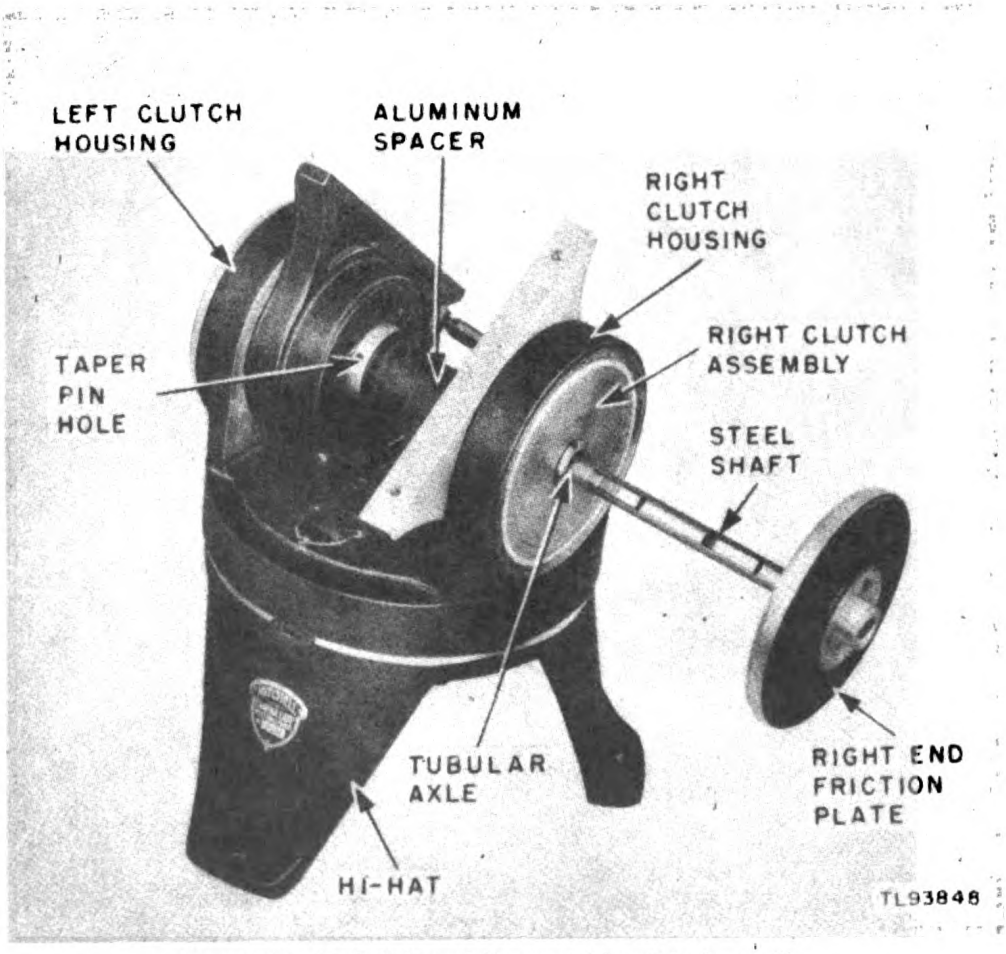


Figure 141. Steel shaft partially removed from tripod assembly.

semblies are located in the clutch housings of the upper tripod assembly. Each clutch assembly contains four fiber disks and five steel plates. The plates in each clutch assembly are of two types: three plates are equipped with four semicircular tabs on the periphery of each plate designed to fit into matching notches in the clutch housing; two plates are equipped with four internal teeth designed to fit into grooves of the tubular shaft. A fiber disk is positioned between each pair of steel plates and between the innermost plate and the clutch housing. To replace the clutch plates and the fiber disks, proceed as follows:

a. Install the tripod head on the hi-hat for ease in handling, and remove the camera bed by removing the four countersunk screws.

b. Loosen the tilt lock.

c. Remove the tilt tension knob by removing the single knob-retaining screw and unscrewing the knob completely.

d. Remove the two large taper pins which are located on the cross shaft of the tripod head.

e. Drive the steel shaft out of the clutch housing from the tension knob end of the axle, using a wooden dowel and a light hammer.

Note. The steel shaft is fastened to the right-end aluminum friction plate. If the shaft is the only part being replaced, remove the friction plate from the axle by removing the taper pin. Install the new axle in the hole in the right-end friction plate, align the holes, and seat the taper pin. Reinstall the right-end friction plate with the axle by reversing the disassembly procedure described in *a* through *e* above.

f. Drive the tubular steel axle out of the clutch housings from the right end of the shaft, using a wooden dowel and a light hammer. The axle will come off with the left friction plate. (This plate is cast aluminum and forms the left-end cover of the tilting mechanism.)

Note. When the axle is removed, the aluminum spacer will drop from between the two clutch housings. If the tilt return springs are to be replaced, move the camera bed bracket away from the clutch housings and remove the springs from the recesses on the inner face of the bed brackets. Install the new springs and reassemble by reversing the disassembly procedure.

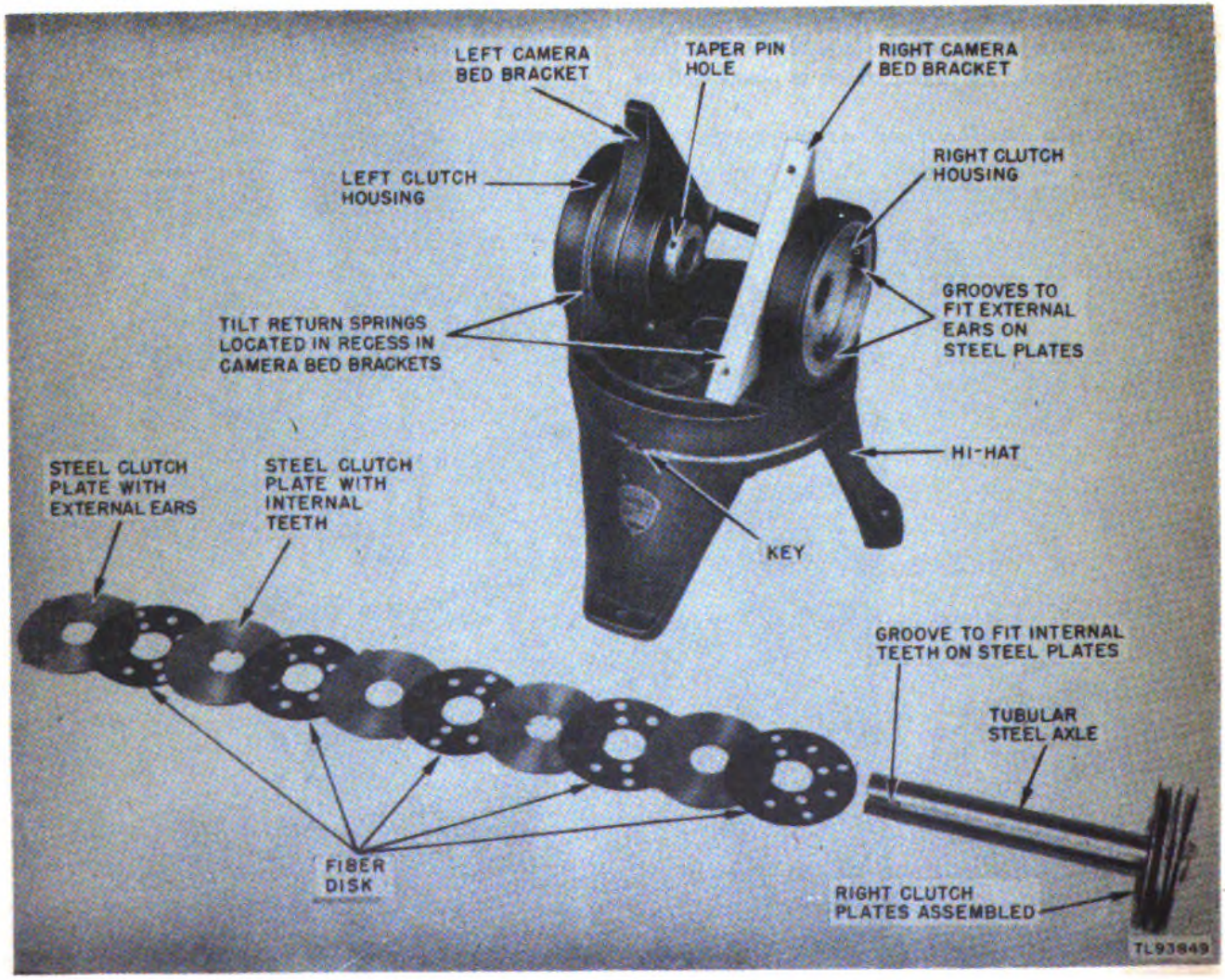


Figure 142. Tubular axle and clutch assemblies removed from tripod head assembly.

g. When the tubular steel axle is removed, remove the steel plates and fiber disks from the right clutch housing.

h. Use a light hammer to remove the left friction plate from the axle by tapping the plate lightly with a hammer. When the plate is removed, remove the left steel plates and fiber disks from the axle.

i. Reinstall the tubular steel axle through the clutch housings, being certain to fit the aluminum spacer over the axle as it passed from one clutch housing to the other.

Caution: The taper pin holes in the shaft are not spaced equidistant from the ends of the shaft. Be sure that the shaft is installed so that the taper pin holes line up with the holes in the hubs of the camera bed supporting brackets, and that the large taper pin hole is toward the rear of the head (opposite from the nameplate).

j. Assemble and install the clutch assemblies at both ends of the tubular axle being sure that the plate and disks are installed in the following order:

Fiber disk.
Steel plate with external ears.
Fiber disk.
Steel plate with internal teeth.
Fiber disk.
Steel plate with external ears.
Fiber disk.
Steel plate with internal teeth.
Fiber disk.
Steel plate with external ears.

Caution: When fitting the clutch plate and disk assemblies into the clutch housings over the tubular shaft, extreme caution must be exercised to avoid tilting the steel plates with external ears. The plate must be installed evenly with all four ears entering their slots at the same time. The slightest tilt of a plate during this assembling process will jam the plate and burr the ears which will make proper assembling impossible. If a plate tilts and jams, do ***not*** force it. Remove it by prying it out of the housing gently, and start over again.

k. When both clutch assemblies are installed in their housings, install the left friction plate over the left end of the tubular shaft being sure that the four keys in the plate fit into the four grooves of the tubular shaft. When the plate is properly fitted, tap it lightly with a hammer handle to seat it over the tubular axle.

l. Insert the right friction plate with the steel shaft through the right clutch assembly all the way through the tilt mechanism until the left end of the shaft protrudes through the left clutch assembly.

Note. Be sure that the four keys in the right friction plate fit into the four keys in the right end of the tubular axle, and that the slots in the steel shaft are in a horizontal position to match the taper pin holes in the tubular shaft.

m. Swing the right camera bed bracket into a horizontal position to align the taper pin holes in the hub of the bracket with the holes in the tubular shaft and in the steel axle. When the holes are lined up, install the taper pin from the rear of the tripod head (the side opposite the nameplate).

n. Swing the left camera bed bracket into a horizontal position and install the left taper pin described in *m* above.

o. Tilt the camera bed brackets back and forth to make sure that the clutch plates and disks are operating smoothly, then seat the taper pins with a light blow.

p. Reinstall the tilt knob and then reinstall the knob-retaining screw.

q. Install the camera bed and tighten the four countersunk screws evenly.

84. Unsatisfactory Equipment Report

a. When trouble in equipment used by Army Ground Forces or Army Service Forces occurs more often then repair personnel feel is normal, WD AGO Form 468 (Unsatisfactory Equipment Report) should be filled out and forwarded through channels to the Office of the Chief Signal Officer, Washington 25, D. C.

b. When trouble in equipment used by Army Air Forces occurs more often than repair personnel feel is normal, Army Air Forces Form 54 (Unsatisfactory Report) should be filled out and forwarded through channels.

c. If either form is not available, prepare letter containing the data elicited by the sample form shown in figure 143, without reproducing copies of the form.

WAR DEPARTMENT

UNSATISFACTORY EQUIPMENT REPORT

FOR	TECHNICAL SERVICE: Signal Corps — MATERIEL	DATE: 10 Dec 44
FROM	ORGANIZATION: 165 Signal Photographic Co. A.P.O. 420, c/o PM	STATION: New York, N.Y.
TO	NEXT SUPERIOR HEADQUARTERS: Theatre Signal Officer (Through channels) — STATION:	TECHNICAL SERVICE: Signal Corps

COMPLETE MAJOR ITEM

NOMENCLATURE	TYPE	MODEL	
Printer PH-000	Automatic	C-1	
MANUFACTURER: X. Y. Z. Co.	U. S. A. REG. No.: 38024-Phila-45-62	SERIAL No.: B-110	DATE RECEIVED: 5 July 44
EQUIPMENT WITH WHICH USED (If applicable): Not applicable			

DEFECTIVE COMPONENT—DESCRIPTION AND CAUSE OF TROUBLE

PART No.	TYPE	MANUFACTURER	DATE INSTALLED
SOSW 8P000-2	Platen switch	X. Y. Z. Co.	7 July 44

DESCRIPTION OF FAILURE AND PROBABLE CAUSE (If additional space is required, use back of form): Electrical contacts burned and pitted, causing poor contact and erratic exposures. Probably caused by faulty material.

DATE OF INITIAL TROUBLE	TOTAL TIME INSTALLED			TOTAL PERIOD OF OPERATION BEFORE FAILURE					
	YEARS	MONTHS	DAYS	YEARS	MONTHS	DAYS	HOURS	MILES	ROUNDS
7 Dec 44	--	5	--	--	--	--	720	--	--

BRIEF DESCRIPTION OF UNUSUAL SERVICE CONDITIONS AND ANY REMEDIAL ACTION TAKEN: Not unusual. Printer operated about 6 hours each day at 80 exposures per hour. Burnished the contacts at 6-hour intervals. Installed capacitor across contacts, 250,000 MMF.

TRAINING OR SKILL OF USING PERSONNEL			RECOMMENDATIONS (If additional space is required, use back of form)
POOR	FAIR	GOOD	New type of material for contacts and a capacitor across contacts.
		X	

ORIGINATING OFFICER

TYPED NAME, GRADE, AND ORGANIZATION	SIGNATURE
John J. Doe, Capt, 165th Sig. Photo Co.	John J. Doe.

FIRST ENDORSEMENT

	TECHNICAL SERVICE	OFFICE	
TO CHIEF	Signal Officer, Washington 25, D. C.		
NAME, GRADE, AND STATION		STATION	DATE

Instructions

1. It is imperative that the chief of technical service concerned be advised at the earliest practical moment of any constructional, design, or operational defect in material. This form is designed to facilitate such reports and to provide a uniform method of submitting the required data.
2. This form will be used for reporting manufacturing, design, or operational defects in material, petroleum fuels, lubricants, and preserving materials with a view to improving and correcting such defects, and for use in recommending modifications of material.
3. This form will not be used for reporting failures, isolated material defects or malfunctions of material resulting from fair wear-and-tear or accidental damage nor for the replacement, repair or the issue of parts and equipment. It does not replace currently authorized operational or performance records.
4. Reports of malfunctions and accidents involving ammunition will continue to be submitted as directed in the manner described in AR 750-10 (change No. 3).
5. It will not be practicable or desirable in all cases to fill all blank spaces of the report. However, the report should be as complete as possible in order to expedite necessary corrective action. Additional pertinent information not provided for in the blank spaces should be submitted as inclosures to the form. Photographs, sketches, or other illustrative material are highly desirable.
6. When cases arise where it is necessary to communicate with a chief of service in order to secure safety to personnel, more expeditious means of communication are authorized. This form should be used to confirm reports made by more expeditious means.
7. This form will be made out in triplicate by using or service organization. Two copies will be forwarded direct to the technical service, one copy will be forwarded through command channels.
8. Necessity for using this form will be determined by the using or service troops.

W. D., A. G. O. Form No. 468
22 August 1944

This form supersedes W. D., A. G. O. Form No. 468, 1 December 1943, which may be used until existing stocks are exhausted.

U. S. GOVERNMENT PRINTING OFFICE 16—42562-1

TL 93905

Figure 143. Unsatisfactory Equipment Report.

APPENDIX
MAINTENANCE PARTS

1. Maintenance Parts for Camera PH–274 (Exclusive of Tripod)

The following information was compiled on 21 November 1945. The appropriate pamphlets of the ASF Signal Supply Catalog for Camera PH–274 (exclusive of the tripod) are:

Organizational Spare Parts: SIG 7–PH–274.
Higher Echelon Spare Parts: SIG 8–PH–274.

For an index of available catalog pamphlets, see the latest issue of ASF Signal Supply Catalog SIG 2.

1. Maintenance Parts for Camera PH–274 (Exclusive of Tripod) (Continued)

Ref symbol (fig. No.)	Signal Corps stock No.	Name of part and description
	8A374	CAMERA PH–274, motion picture, 35-mm, silenced; Mitchell, or equal, complete w/motor, lenses, 3 extra magazines, accessories and tripod; in accordance w/spec No. 171–189.
115	8P8–6031	BUSHING, bearing: bronze; no finish; 13/32" ID x 7/8" OD x 2½" lg; Mitchell Camera No. AOF–14–2.
133	3H3100A10–3/C1	CAP, contact brush: bakelite and brass; no finish; over-all 21/32" diam x ¾" lg; Mitchell No. M–080; (threaded 7/16"–32 thd NC—mtd into bushing; slot on hd 15/32" lg x 3/32" d; p/o Mitchell Motor No. NC–SUB–4.
16	8P8–6034	CORE, film: steel; dull black paint; winds exposed film in magazine take-up; 1⅜" lg x ⅝" diam; Mitchell Camera No. STM–SUB–1–3; (mtd on shaft 19/32" lg x ⅝" wd).
132	8P8–6036	COUNTER, mechanical: geared; white die cast metal buffed; 2" lg x 1¼" h x 1" thk; Mitchell Camera No. M–243; (4 digits; resetting; both counterclockwise and clockwise; subtract rotation; flange mtg w/2 clearance No. 8 screws).
131	8P8–6048	DRIVE, magazine: film magazine; aluminum casting; no finish; 3⅜" lg x 1½" wd x 1¼" diam over-all; Mitchell Camera No. 11A; (used to drive spindle on film magazine).
116	8P8–6057	GEAR, spur: micarta; no finish; spiral gear, used on sprocket shaft; 1⅝" OD x 1 5/16" ID x ⅝" thk; 17 teeth; Mitchell Camera No. GC–20.
117	8P8–6056	GEAR, spur: steel; no finish; to drive intermittent; ⅝" diam x 9/32" ID x 23/32" lg; Mitchell Camera No. AB–10–2A; (mtd by 9/32" shaft diam; pinion gear helical teeth).
116	8P8–6055	GEAR, helical: micarta; steel hub; no finish; 4½" diam x 5/16" w/132 teeth helical cut; Mitchell Camera No. OAF–14–5; (milled keyway 1/16" wd x 1/32" d x ⅜" lg; hub diam ⅜" x ⅜" lg.
118	8P8–6059	GUIDE ASSEMBLY, sprocket: aluminum casting, steel; flat black paint; 1 23/32" lg x 1 5/8" wd x 1 5/32" h; eccentric shaft hole 9/32" diam x 1⅜" lg; channel in roller ⅛" wd x 1/16" d, shaft hole in roller ¼" diam; Mitchell Camera No. NC–SUB–6–2.
119	8P8–6072	INTERMITTENT ASSEMBLY, camera: shuttle intermittent; steel; polished finish; positions film and moves same to photographing apert for exp; 4 3/16" over-all lg x 4 1/32" wd x 3 7/16" h; Mitchell Camera No. OGC–SUB–1; (mtd by four No. 9–32 clearance mtg/c 5" x 2⅜").
9	8P8–6089	KNOB, round: aluminum; no finish; 0.190" shaft diam; 15/32" lg x ¾" diam; Mitchell Camera No. AJ–20–6; shaft hole 15/32" d; straight knurl on large diam; (turret setting knob).
6	8P8–6090	KNOB, round: aluminum; no finish; thd for ¼"–20 NC thd; ¾" lg x ⅞" diam over-all; Mitchell Camera No. AJ–20–13; (straight knurl) (magazine holding screw).
124	8P8–6111	LEVEL, spirit: sp camera; aluminum casting; 1 31/32" lg x 1" h x ½" thk; Mitchell Camera No. AM–28–7A; (1 straight level).
119	8P8–6106	LEVER, pressure plate: no finish; to hold pressure plate in place; 1⅜" lg x ½" wd x 3/32" thk; Mitchell Camera No. AJ–20–7; (one 9/32" clearance hole).
31	3H3100A10–4	MOTOR, DC: shunt wound; 1/10 hp closed frame; 10" lg x 5" diam; 12 v at 22 amp; 2,800 rpm; Mitchell No. NC–SUB–4; (screws on by means of two No. 12–24 screws 4" center right angle).
114	8P8–6026	PIN ASSEMBLY, complete: turrent locating; steel and aluminum; steel bracket has flat black parkerized finish; aluminum is polished; positions lens turret; 2¼" lg x 9/32" thk; head diam of pin ¾"; turret locating pin assembly.
47	8P8–6139	PLATE, pressure: plate steel; hardened; ground; no finish; 1 9/32" wd x 7/32" thk x 1" h x 31/32" lg x ⅛" diam; ends of rollers machined to ⅛" lg x 1/16" diam; Mitchell Camera No. SS–SUB–6–1–1.
124	8P8–6088	POINTER ASSEMBLY, dial: aluminum and steel; no finish; pointer indicates exposed film footage; body 9/16" lg x ⅜" diam over-all w/pointer hand extending 35/64"; Mitchell No. NC–SUB–6–3.
	6L6632–3.8S	SCREW, machine: Bind H, steel hardened; 6–32 NC; 3/16" lg; ½" head diam x 1/32" thk on edges; Mitchell No. NBR 24 screw p/o lever for pressure plate.
	6L6632–4.3S–1	SCREW, machine: Fil H; hardened steel; No. 6–32 thd, ¼" lg; head ⅜" diam, ⅛" thk; Mitchell No. 13.

1. Maintenance Parts for Camera PH–274 (Exclusive of Tripod) (Continued)

Ref symbol (FIG. No.)	Signal Corps stock No.	Name of part and description
	6L6632–4.3S–2	SCREW, machine: Fil H; hardened steel; No. 6–32 thd, 1/4" lg; head 11/16" diam, 1/16" thk; Mitchell No. 69.
	6L6632–3.8S–1	SCREW, machine: Bind H; hardened steel; No. 6–32 thk, 3/16" lg; head 9/16" diam, thickness at edge 1/32"; Mitchell No. 10.
	6L6348–3.3S	SCREW, machine: Fil H; hardened steel; No. 3–48 thd, 3/16" lg; head 9/32" diam, 1/16" thk; Mitchell No. 15.
	4G5033.3/S1	SCREW: (Mitchell Camera Corp dwg 1 screw; ref 486 of Theodolite PH–BC–33 and PH–BE–33).
	6L7024–33.8KS	Screw: machine: knurled head; hardened steel; No. 10–24 thd; 2 1/16" lg w/ 5/16" thd; head 3/32" thk, 3/4" diam; Mitchell No. 5–31; (one shoulder 3/8" lg, 13/32" diam; second shoulder 1 1/32" lg, 3/32" diam.)
125	8P8–6155	SHAFT, sprocket: drive sprocket; steel hardened gnd; no finish; 4 1/8" lg x 13/32" diam milled 1 end, 1/4" flat on 3 sides, 21/32" lg hole on 1 end; No. 6–32 thd, 3/8" lg; Mitchell Camera No. OAF–14–1.
126	8P8–6192	SPRING, turret: steel; no finish; apply tension on turret; 3/8" OD x 1/4" ID x 1/16" wire diam; Mitchell Camera No. AJ–20–17; (mtd on 1/4" diam stud).
12	4G5033.3/S65	SPRING: buckle trip; (Mitchell Camera Corp dwg NC–304; ref 471 of Theodolite PH–BC–33 and PH–BE–33).
127	4G5033.3/S72	SPRING: sprocket film guide; (Mitchell Camera Corp dwg AF–14–23; ref 439 of Theodolite PH–BC–33 and PH–BE–33).
128	4G5033.3/S66	SPRING: clamp arm; (Mitchell Camera Corp dwg S–30–A; ref 482 of Theodolite PH–BC–33).
129	8P8–6200	SPROCKET, film: macadamite; to form loop above and below apert plate; 1 7/16" wd x 1 7/8" diam; Mitchell Camera No. AOF–14–10C; (mount on shaft 9/32"; 32 sprocket teeth around OD).
134	8P8–6210	TACHOMETER: 0–120 ft per min 0–32 frames per sec; mtg dial type; 2 17/32" h x 3 5/32" diam; Mitchell Camera No. 90; (mechanical ft per min in multiples of 10, frames per sec in multiples of 2; round gear coupled).
130	8P8–6123	TRIP UNIT, switch: mechanical; steel hardened; no finish; to activate an elec sw; 2 11/16" lg x 3/16" diam over-all; Mitchell Camera No. O6C–SUB–2; (consists of spring, Mitchell Camera No. SM–81, shaft, Mitchell Camera No. GC–28B, and knob, Mitchell Camera No. NC–235; mts into bushing 3/16" diam.
6	8P8–6167	VISOR, rubber: flexible; smooth black; eye guard of focusing eyepiece; 1 1/2" lg x 2 1/4" diam; Mitchell Camera part No. A-182872; snaps on Mitchell Std. & B&H Std. Professional 35-mm MP cameras.
	6L58024–26	WASHER, flat: steel hardened; 1/4" ID, 1 3/16" OD, 1/16" thk; Mitchell No. AJ–20–14.
131	8P8–6020	BELT, round: fabric; 3/16" diam of stock, 23 1/4" inside circumference; Mitchell Camera No. A1–24–21.
133	3H3100A10–3/B10	BRUSH, electrical contact: carbon; no finish; 3/4" lg x 3/8" wd x 1/4" thk; Mitchell No. MO93; (compression spring 1 7/16" lg x 3/8" diam; p/o Mitchell Motor No. N6–SUB–4.
	6L3505–32–14	NUT, sprocket: gear retaining; steel hardened; 5/16"–32 thd over-all lg 23/32"; 7/8" across flats x 5/32" thk; Mitchell No. AF–14–9; special hollowed-out type with a 1 9/16" lg hollow extension above hexagon shaped nut; all one piece.
	6L3602–56	NUT, hexagon: hardened steel; No. 2–56 thd; 1/16" thk; 3/16" across flats; Mitchell No. S–43.
	6L58023–26	WASHER, flat: steel hardened; 3/16" ID, 1/2" OD, 3/32" thk; Mitchell No. AJ–20–7.

2. Maintenance Parts for Standard Tripod, Part of Camera PH–274

Ref symbol (fig. No.)	Signal Corps stock No.	Name of part and description
	8A4137	TRIPOD; "Standard": for 35-mm MP camera; Mitchell; (w/telescoping maple legs reinforced w/steel plates on all sides; taper bearings; tightening nut; hardened steel points screwed and locked; 2 knurled; (right & left) knobs on ea leg to release and grip legs in extension ht range 46 to 76"; complete w/std size friction tilthead).
141	8P8–6000	AXLE: steel; nickel plate; axle for tilt mechanism; 6¾" lg x ⅞" OD x ½" ID; Mitchell Camera No. FH–12; (4 keyways 3/32" x ⅛" x 1" lg at 90° on ea end) p/o Mitchell Camera No. 1310.
135	8P8–6015	BED, camera: cast aluminum; crackled finish; 8" x 7" ribbed w/four ¼" csk holes and boss for serrated back plate on telescope handle; Mitchell Camera No. FH–20; (drilled and tapped to take three No. 10 screws complete w/knurled nut and bevel gear assembly to tighten screw into camera.
	6L440–.5P	BOLT, saw: OH; steel; parkerized; No. 10–32; ½" lg w/¼" thd Mitchell No. B3–7 & 8.
135	8P8–6025	BRACKER, tripod: cast aluminum; black wrinkle finish; sector approx 150°, 2⅛" radius, ⅜" thk; Mitchell Camera No. FH–8; (serrated sect 3 counterbored and 2 reamed pin holes; 7/32" boss to take axle circular slot approx 150°, 7/16" wd).
136	8P8–6035	CLAMP ASSEMBLY, leg: steel; black crackle finish; 4⅞" lg x 1⅜" wd; Mitchell Camera No. B3–2 & BD–3; (consists of 2 pieces of sheet steel, w/5 csk screw holes ea, upper sect dimpled and bored; p/o Mitchell Camera Tripod).
142	8P8–6040	DISK, clutch; fibre 2 15/16" OD x 1" ID x 0.015" thk; Mitchell Camera No. FH–48; (has 3 rows of ¼" holes 1" apart).
140	8P8–6041	DISK, clutch: fibre; 6½" OD x 3 5/32" ID x 0.014" thk; (Mitchell holes 1" apart).
6 & 7	8P8–6061	HANDLE, lock: steel alloy; no finish; ⅜" OD x 2⅛"; Mitchell Camera No. F–42A; (threaded ¼"–20 for ½"; screw driver slot on large end; p/o Mitchell Camera Tripod; (pan handle locking lever and tilt lock).
23	8P8–6062	HANDLE, tripod head: aluminum; closed lg 19", opened lg 29" large tube 1" OD, small tube ⅞" OD; steel; (complete w/locking clamp; rubber grip and serrated lock other end); Mitchell Camera Nos. FH–46, FH–8, FH–56.
142	8P8–6077	KEY, machine: ⅛" x ⅜" x 11/16" drilled and csk for No. 6 screw; Mitchell Camera No. FH–55; (two 3/32" dowel pins projecting 3/16", ⅜" between centers).
8	8P8–6087	KNOB, round: cast aluminum; tapped 7/16"–24; 2½" OD x 17/32" thk; ¼" boss, 1⅜" diam; Mitchell Camera No. FH–16; (tilt tension knob).
139	8P8–6097	LEG ASSEMBLY, tripod: wood; smooth unsurfaced finish; 39" lg x 1⅜" wd; Mitchell Camera No. B10–2, B9–7, B9–7A and B9–5; (crotch shaped; pointed to take tripod shoe; complete w/RH and LH threaded clamp and clamp plates).
137	8P8–6103	LEG SECTION: wood; smooth unfinished; 39" lg x 1⅜" wd; Mitchell Camera No. SCPC–1203; numbered from 1 to 15; 5 holes drilled for upper plate screw; grooved to fit inner sect left side.
137	8P8–6102	LEG SECTION: wood; smooth unfinished surface; 39" lg x 1⅜" wd; Mitchell Camera No. B10–1; (5 holes drilled for upper plate screws; grooved to fit inner section, outer section plain, right side).
138	8P8–6123	NUT ASSEMBLY, lock: tripod leg; Mitchell Camera No. B9–11, 9, and 10; (consists of 2 knurled aluminum nuts 2 5/16" OD x 1 5/16" thk; recessed both ends, male sect has ¼" steel rod insert 7/16" lg, other side ½"–13 RH thd ½" lg; female steel insert drilled to take rod, ½"–13 LH thd ½" lg).
136	8P8–6113	NUT, conical: steel; parkerized; 5/16"–18; ⅜" min diam, ¾" max diam, 7/32" thk; Mitchell Camera No. B3–6; (screw driver slot, wide end).
136	6L3506–24–12P	NUT, hexagon: steel; parkerized; ⅜"–24 thd, 7/32" thk; ¾" across flats; (hardened, complete w/No. 4–40 setscrew and plug).
22	8P8–6114	NUT, round: cast bronze; 2¾"–12 thd; 3¾" OD x 15/32" thk; Mitchell Camera No. FH–32; (w/4 right angle ears).
	6L3944–23	PIN, straight: steel alloy; ¼" diam, 1 7/16" lg; Mitchell Camera No. FH–42A; (small end threaded No. 10–32 for ⅜"; screw driver slot on large end).

2. Maintenance Parts for Standard Tripod, Part of Camera PH–274 (Continued)

Ref symbol (fig. No.)	Signal Corps stock No.	Name of part and description
	6L3942–14N	PIN, straight: steel; no finish; used for locking pan; 3/8" OD x 7/8" over-all; Mitchell Camera No. FH–21; tapered 5/16" to form blunt wedge, 1 side milled flat for lg of wedge section.
	6L3905–28	PIN, taper: steel; Morse No. 5/0; 0.190" min diam, 0.219" max diam, 1 3/4" lg.
140	8P8–6137	PLATE, clutch: brass; 6 1/2" OD x 3 3/32" ID x 0.033" thk; Mitchell Camera No. FH–68.
142	8P8–6135	PLATE, clutch: steel; no finish; 2 15/16" OD x 7/8" ID x 0.053" thk; Mitchell Camera No. RH–11A; (4 int teeth 3/32" x 1/8" wd at 90° angle).
142	8P8–6136	PLATE, clutch: steel; no finish; 3" OD x 15/16" ID x 0.053" thk; Mitchell Camera No. FH–11; (4 ext semicircular ears 1/8" rad at 90° angle).
141	8P8–6138	PLATE, friction: cast aluminum; 4 1/8" OD x 7/16" thk; circular groove 3" ID x 3 3/4" OD x 1/4" d; circular steel insert 1 9/16" OD x 7/8" ID x 1/4" thk; Mitchell Camera No. FH–14A; (has 4 int integral keys 3/32" x 1/8" wd; used as friction plate and cover for tilt mechanism).
	6L7932–4–11.71P	SCREW, machine: flat Bind H; steel; parkerized; 1/4"–32 thd; 11/16" lg with 1/2" thd; head 3/4" diam; Mitchell Camera No. FH–44; (undercut to 7/32" x 3/32").
	6L7920–4–12P	SCREW, machine: FH; steel; parkerized; 1/4"–20 thd; 3/4" lg over-all; 1/2" lg thd; Mitchell No. FH–9.
	6L7032–8.86P	SCREW, machine: cheese head; steel; parkerized; No. 10–32; 1/2" lg w/3/8" lg thd; head 1/2" diam x 1/8" thk.
141	8P8–6160	SHAFT ASSEMBLY, tripod: cast aluminum; 4 1/8" OD x 7/16" thk cir groove 3" ID x 3 3/4" OD x 1/4" d; cir steel insert 1 9/16" OD x 7/8" ID x 1/4" thk; Mitchell Camera No. SCPC–M1–1202; (has 4 int integral keys 3/32" x 1/8" wd; used as friction plate and cover for tilt mechanism, w/boss 3/4" OD x 7/16" ID x 5/16" d; assembly w/shaft steel 0.436" OD x 8 5/16" lg; 2 slots through 1/4" x 1 1/2" end of shaft pressed and riveted into boss; 2 slots through shaft 1/4" x 3/4" centers 2 5/16" apart, other end threaded 7/16"–24 for 3/4" tapped No. 10–32 x 1" d; (friction plate and shaft assembly).
139	8P8–6175	SHOE, tripod: cast bronze cone; 1 3/8" max OD x 7/16" min OD; 3" lg; Mitchell Camera No. B9–1; (3 csk screw holes pedal extension; spur on side tapped 5/16"–18; point of cone tapped 5/16"–18).
142	8P8–6190	SPRING, retainer: steel; 3/64" spring wire; 17/32" OD x 5/8" lg; has 5 turns; Mitchell Camera No. FH–60.
142	8P8–6191	SPRING, retainer: steel; no finish; 6 3/4" lg x 3/8" OD; Mitchell Camera No. FH–30A; (spring wire 1/16", 7 turns per inch; tilt return).
	8P8–6220	WASHER, flat; steel; 7/8" ID x 1 3/8" OD x 1/8" thk; Mitchell Camera No. FH–25; (int integral key 1/8" wd x 3/32").
	6L3505–18–9P	NUT, hexagon: steel; parkerized; 5/16"–18 thd; 9/32" thk; 19/32" across flats.
	6L6632–5S	SCREW, machine: steel No. 6–32 FH, 5/16" lg.
	6L7024–10.4S	SCREW, machine: steel; No. 10–24; Fil H, 5/8" long; holds tilt lock bracket on bed.
	6L832–8.3S	SCREW, machine: steel; No. 8–32 x 1/2" lg, Fil H used for tightening pan locking lever in place.
	6L9204–4	SCREW, wood: OH; steel; No. 4; 1/2" lg; (p/o Mitchell Tripod; u/w Sig C Camera PH–274).
	6L58024–1P	WASHER, flat: steel; parkerized; 1/4" ID x 1/2" OD x 1/32" thk.
	6L58026–1P	WASHER, flat: steel; parkerized; 3/8" ID x 5/8" OD x 1/16" thk.

This equipment is covered by 2 Lubrication Orders, No. 3822 and No. 3822A

WAR DEPARTMENT LUBRICATION ORDER No. 3822

War Department, Washington 25, 9 NOVEMBER 1944

INSTRUCTION—CAUTION NOTES

CLEANING

The Camera should be inspected and all units cleaned AT THE END OF EACH DAY'S WORK, to prevent hardening or caking of emulsion or dirt.

CAUTION—Clean the Aperture Plate after each 1000 feet of film, inspecting the film for scratches. Clean the Aperture and film channel by brushing with a Camel's Hair Brush. Remove accumulated emulsion with a soft pointed stick (orange stick). Be sure that no particle of dust, dirt, grit or film emulsion remains on the Aperture parts or film channel.

Remove the Turret Head Assembly to clean and lubricate its parts. To reach these parts remove Lens and Lens Mounts. Remove Turret Screw (which may be Right or Left hand thread) also Cap Nut, Spring, Washer and Turret Head. Clean the Camera parts with a soft clean brush or cloth, lightly dampened with SOLVENT, Dry Cleaning. Thoroughly dry all parts. Do not allow cleaning fluid to get on View Finder or Lens. After cleaning and lubricating, replace the assembly and adjust.

After lubricating, wipe away any excess lubricants, especially from film channel parts, lenses and other optics.

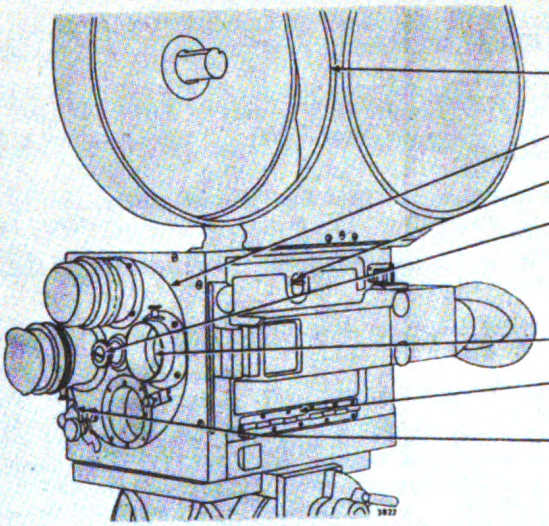
Clean Magazine parts with soft clean brush or compressed air.

Clean and brush the inside and outside of the Camera, Magazine and Accessory Cases every day.

NOTES CONTINUED ON REVERSE SIDE

Requisition LUBRICATION ORDER from Holabird Signal Depot, Baltimore, Md., by Signal Corps Stock No. 6D10121-22.

NOTE—See Reverse Side and WDLO 3822A for lubrication of other parts.



CAMERA LEFT SIDE

Interval • Lubricant

- 256 GL — Magazine Cover Threads — Coat lightly
- 768 GL — Turret Head — Coat lightly
- 768 PS — Left Door Latch — 1 drop sparingly
- 768 GL — Turret Head Hub & Bearing — Remove Turret screw, cap, nut, spring, washer and head. Clean and Coat Hub and Bearing lightly with GL. Replace Head and parts.
- 768 GL — Lens Mount Threads — Clean and coat very lightly
- 256 PS — Door Hinge — Wipe lightly with cloth slightly dampened with oil
- 768 PS — Turret Locating Pin — 2 or 3 drops, operate mechanism a few times to distribute lubricant.
- 256 PS — Film Idler Rollers — Remove retainer screw and roller from shaft. Apply 1 drop sparingly, slide roller to distribute oil; wipe away excess and replace retaining screw.
- 256 PS — Magazine Hold Down Screw — One drop
- 8 PS — Buckle Trip Reset — Daily or each 5000 film feet, apply 1 drop to rear of shaft, slide shaft in and out a few times to distribute the oil.
- 8 PS — Buckle Trip Pivot — 1 drop, sparingly
- 256 PS — Sprocket Film Guide Eccentric Control Knobs (2) — Remove Guide Arm and Retainer Screws, apply 1 drop each, sparingly to inner and outer end of Eccentric Arm; wipe away excess, reassemble.
- 256 PS — Sprocket Film Guide, Roller Shafts (4) — Remove Guide and Retainer Screws, apply 1 drop each, sparingly to inner and outer end of each roller, wipe away excess and reassemble.
- 8 PS — Finder Bracket Lock — Clean daily, apply 1 drop of oil

Lubricant • Interval

- Aperture Plate Release Studs (2) — PS 8 — 1 drop each, wipe away excess
- Pressure Plate Retaining Arm Pivot — PS 8 — 1 drop sparingly, wipe away excess
- Registration Cam Bearing — PS 8 — 1 drop, wipe away excess
- Registration Cam — PS 8 — 1 drop, wipe away excess
- Turret Head and Bearing — GL 768 — Coat lightly
- Registration Pin Felts (2) — PS 8 — 1 drop each, sparingly
- Registration Arm Bearing — PS 8 — 1 drop each side
- Pull Down Fork Retainer Washer — PS 8 — 1 drop each side
- Pull Down Fork Pivot Guides (2) — PS 8 — 1 drop each
- Release Plate Screw — PS 8 — 1 drop sparingly on tapered shoulder thread

—KEY—

LUBRICANTS	LOWEST EXPECTED AIR TEMPERATURE		INTERVALS
	above +60°F.	+60°F. to +20°F.	Operating Hours
PS—OIL, lubricating, preservative, special	MO	MO or PS	8 (approx. 1 day)
MO—OIL, lubricating, for aircraft instruments and machine guns.	MO	MO or PS	256 (approx. 1 mo.)
GL—GREASE, lubricating, special	GL	GL	768 (approx. 3 mos.) Overhaul

No. 3822

TL 93851

Figure 144. Facsimile of War Department Lubrication Order No. 3822, front side.

This equipment is covered by 2 Lubrication Orders, No. 3822 and No. 3822A

WAR DEPARTMENT LUBRICATION ORDER No. 3822

War Department, Washington 25, 9 NOVEMBER 1944

Requisition LUBRICATION ORDER from Holabird Signal Depot, Baltimore, Maryland, by Signal Corps Stock No. 6D10121-22.

INSTRUCTION—CAUTION NOTES, CONTINUED

LUBRICANT QUANTITIES

Each "1 drop" shall be a standard oil can drop of approximately 1/16 inch diameter. Each "1 drop, sparingly" shall be the quantity which can be deposited from a toothpick point or fin wire, and less than a standard oil can drop. A "light coating" is a surface deposit of minimum thinness.

INTERVALS

Each working day or each 5000 film feet (whichever occurs first), lubricate all points listed as "8 operating hour points," on this order. Complete such lubrication BEFORE STARTING each day's camera operation.

Each month lubricate the less active mechanism points (listed as, "256 operating hour points" on this order). If the camera equipment has NOT been used in this period or longer, or if it has been transferred from another geographic or climatic zone, it should be thoroughly inspected, cleaned and have all necessary points relubricated before being operated.

Each 3 months or sooner, if the performance of the camera or the severity of operating conditions indicates the need, perform overhaul and lubrication of the entire equipment.

After each lubrication, for any interval, be sure any excess lubricants are wiped away and that the camera equipment is clean.

WEATHER CONDITION CAUTIONS

MARITIME

Wipe all exposed metal parts of Camera, Magazine and Tripod daily with a soft clean cloth dampened with PS, to prevent corrosion. Also check internal parts, wiping them if required. Be sure equipment is kept clean, free from salt deposits and corrosion.

TROPICS AND SUMMER HEAT

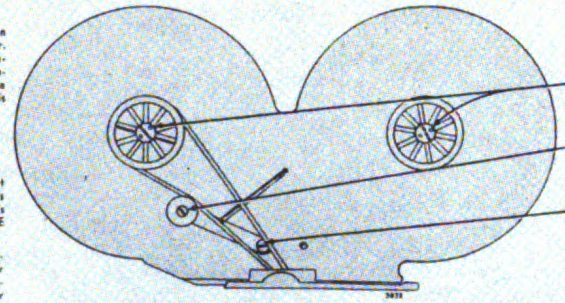
During periods when temperatures over 100°F are frequent, check lubrication daily. Replenish lubricants if they are thinned out or reduced, doing so at more frequent intervals, but in NO GREATER QUANTITIES. Avoid leaving the camera, unshaded, in the direct sun. Under very humid conditions (over 65% humidity), inspect daily for traces of fungus, moisture and metallic corrosion. Remove fouling by cleaning affected parts with SOLVENT, Dry Cleaning, then relubricate. Check power units before placing them in service, and daily thereafter.

In very dry climates, lubricate more frequently.

Under desert conditions, keep equipment covered inside cases, except when actually in use. Inspect daily for sand infiltration; if found, remove old lubricants, clean with SOLVENT, Dry Cleaning and relubricate. Under severe conditions, replenish or replace lubricants at more frequent intervals, as required.

CAUTION:—Avoid OVER lubrication.

INSTRUCTION—CAUTION NOTES CONTINUED ON LUBRICATION ORDER 3822A



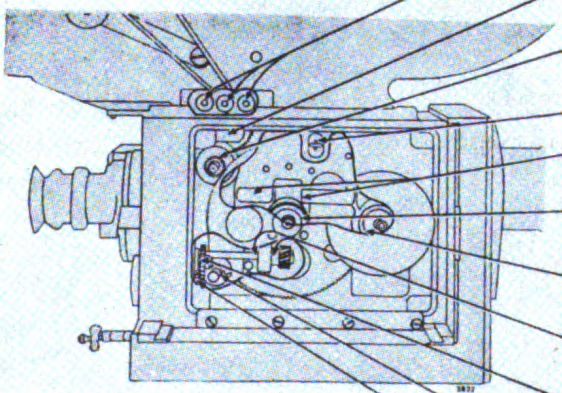
Interval • Lubricant

256 PS — Magazine Reel Spindle Shafts (2) — 1 drop, sparingly

256 PS — Take Up Belt Tension Roller — 1 drop, sparingly

256 PS — Take Up Belt Tension Roller Arm Pivot Screen — 1 drop, sparingly

CAMERA, RIGHT SIDE



256 PS — Take Up Belt Rollers (3) — 1 drop each, sparingly

768 GL — Take Up Drive Gear Shaft Ball Bearing — Coat lightly

768 GL — Main Drive Shaft Ball Bearings — Coat lightly

768 GL — Right Door Latch — 1 drop, sparingly

256 PS — Shutter Drive Shaft — Wipe with cloth slightly dampened with PS

256 PS — Sprocket Drive Shaft Bearings — 1 drop, each end

256 PS — Intermittent Main Drive Shaft Bearing — 1 drop, each end

8 PS — Footage Indicator Gear Drive Shaft — 1 drop

8 PS — Footage Indicator Gear — 1 drop

8 PS — Buckle Trip Reset — 1 drop

768 PS — Footage Indicator Gear Stud — 1 drop

Copy of this lubrication order will remain with the equipment at all times. Instructions contained therein are mandatory and supersede all conflicting lubrication instructions dated prior to 9 November 1944

By Order of the Secretary of War.
G. C. Marshall, *Chief of Staff.*

Official:
J. A. Ulio
Major General
The Adjutant General

TL 93852

No. 3822

Figure 145. Facsimile of War Department Lubrication Order No. 3822, rear side.

This equipment is covered by 2 Lubrication Orders, No. 3822 and No. 3822A

WAR DEPARTMENT LUBRICATION ORDER No. 3822A

War Department, Washington 25, 9 NOVEMBER 1944

Requisition LUBRICATION ORDER from Holabird Signal Depot, Baltimore, Md., by Signal Corps Stock No. 6D10121-22A

INSTRUCTION—CAUTION NOTES CONTINUED

COLD WEATHER AND HIGH ALTITUDE CAUTIONS

WINTERIZATION

Equipments employed out-of-doors under low temperature should be "winterized". If temperatures encountered by this Camera Equipment during operation, transportation to and from location, and in storage falls below freezing, take precautions as follows:

Remove higher temperature lubricants, cleaning the parts with SOLVENT, Dry Cleaning. Relubricate sparingly with lubricants prescribed for these temperatures.

Keep the equipment in storage at temperature similar to that where equipment is operated, using a protected outdoor shelter.

Frequently check the lubricant for dilution by water condensation, if necessary cleaning out such diluted lubricant and relubricating. If necessary to move the equipment back and forth between cold out-of-doors and warm in-doors, leave it in an intermediate temperature for long enough to prevent condensation of moisture on parts.

Employ heat bags or heat-insulating jackets, if required, to keep mechanism from freezing.

Below 20°

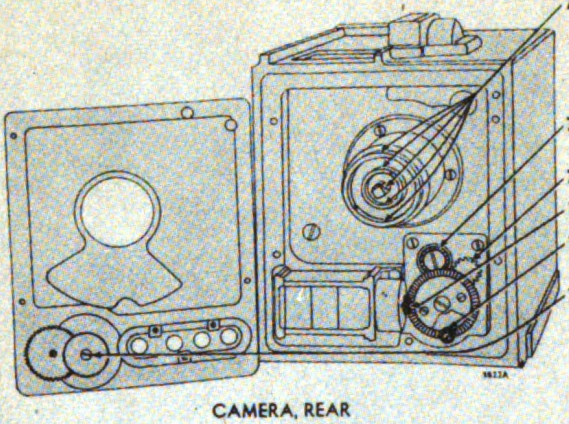
Provide slip covers of heat-insulating materials such as rock wool, celotex, felt, fur or skins (hide-side out, fitted with eyelets, not with snap or slide fasteners). For maximum benefit, color the exterior DARK. Where practicable, electrical internal heating may be used instead of slip covers.

CAUTION: Only equipments with new or replacement parts "worn in" (naturally or mechanically for 100 or more hours) on which all burrs or rough spots have been properly removed, should be used under low temperature conditions. Cameras with too-close tolerance, shafts and bearings, will bind unless heat-insulated.

SAFETY CAUTION:—At sub-zero temperatures handle metal parts only with cotton, silk, woolen or other gloves, NEVER with bare hands.

DO NOT LUBRICATE:—
- Aperture Plate
- Sprocket Film Guide Rollers
- Idler Rollers

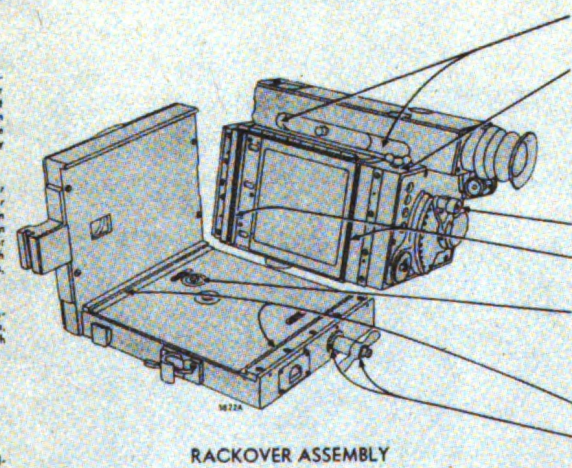
LUBRICATED BY MAINTENANCE PERSONNEL ONLY:—
- Shutter and Fade Mechanism
- Footage and Frame Counter, with gear assemblies



CAMERA, REAR

Interval • Lubricant

- 768 PS — Shutter and Fade Assembly. Clean; apply 1 drop, sparingly of PS to shaft and to each concentric outer layer. Work the mechanism to distribute the oil, then wipe away excess.
- 768 GL — Counter Shaft Ball Bearing. Coat lightly
- 768 PS — Counter Drive Gear. 1 drop, sparingly
- 768 PS — Counter Drive Pinion. 1 drop, sparingly
- 768 PS — External Indicator Drive. 1 drop, sparingly
- 768 PS — External Indicator Transmission Gears. 1 drop, sparingly Remove Screw, Idler Gear, Spacer Gear with 3 Screws, and External Footage Indicator Drive Gear. Apply 1 drop, sparingly each, to: Indicator Drive Hub, Idler Gear, 2 ends of axle. Replace in original position: Spacer Gear, Idler Gear and Screw



RACKOVER ASSEMBLY

- 256 GL — Variable Magnification Adjustment. Coat lightly
- 256 PS — Counter Reset Knob. 1 drop, sparingly
- 256 PS — Hand Dissolve Lock. 1 drop, sparingly
- 256 GL — Rack-Over Gear Track. Coat lightly—Remove excess
- — — Rack-Over Camera Stop. DO NOT lubricate. Keep Stop clean, check to see that Stop operates freely at all times.
- 256 GL — Dovetail Gibs. Coat lightly
- 256 PS — Rack-Over Handle—Release Button. Tilt Camera forward, apply 1 drop, sparingly of PS on Button and Rack-Over Handle. Operate Button to distribute oil along Release Rod. Remove all excess oil.

—KEY—

LUBRICANTS	LOWEST EXPECTED AIR TEMPERATURE: above +60°F.	LOWEST EXPECTED AIR TEMPERATURE: +60°F. to +20°F.	INTERVALS
PS—OIL, lubricating, preservative, special MO—OIL, lubricating, for aircraft instruments and machine guns.	MO	MO or PS	Operating Hours 256 (approx. 1 mo.) 768 (approx. 3 mos., Overhaul)
GL—GREASE, lubricating, special	GL	GL	
OG—GREASE, Graphited, Light	OG	OG	
PF—PARAFFIN WAX, type I, grade A	PF	PF	

No. 3822A

TL 93853

Figure 146. Facsimile of War Department Lubrication Order No. 3822A, front side.

This equipment is covered by 2 Lubrication Orders, No. 3822 and No. 3822A

WAR DEPARTMENT LUBRICATION ORDER No. 3822A

War Department, Washington 25, 9 NOVEMBER 1944

Requisition LUBRICATION ORDER from Holabird Signal Depot, Baltimore, Md., by Signal Corps Stock No. 6D10121-22A

Lubricant • Interval

Finder Dovetail Mount — GL 256
NOTE—Dovetail Eccentric Lock Shaft
Lay the Finder on its side with Dovetail up. Work the Eccentric Shaft back and forth and pull out. Apply GL Grease sparingly to the entire Dovetail mechanism, reassemble, wipe away all excess lubricants.

Finder Mount Hinge — PS 256
1 drop, sparingly, each point

Prism Head Guides — PS 256
1 drop, sparingly, each end

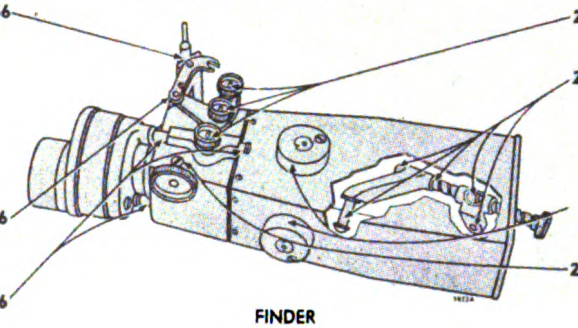
Interval • Lubricant

256 PS **Finder Adjustment Locks**
1 drop, sparingly, each point

256 PS **Parallax Adjustment**
1 drop, sparingly, each point

Matte Adjusting Knobs
Do not lubricate

256 GL **Focus Adjustment**
Remove screw, releasing Shaft, remove Shaft from bearing, clean with SOLVENT, Dry Cleaning, dry thoroughly, coat lightly with GL and reassemble.



FINDER

Tripod Friction Tilthead Table
CLEAN table and legs with a clean brush or cloth dampened lightly with Solvent, Dry Cleaning; Do NOT allow cleaning fluid to get on lenses or other glass parts. Thoroughly dry all parts.

Camera Mounting Stud — PS 256
1 drop, sparingly

Camera Mounting Stud Gears — PS 256
1 drop, sparingly—each point

Pan and Tilt Friction Plates — OG 768
Clean and coat lightly during overhaul

Leg Lock Grips — PS 256
1 drop each end (3 legs)

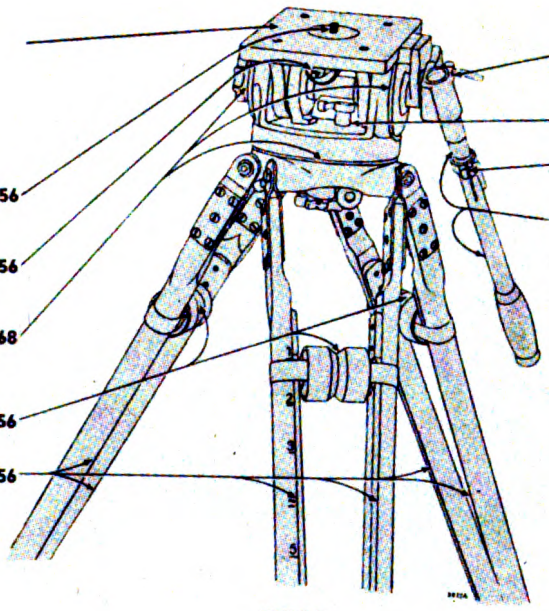
Legs — PF 256
Coat thoroughly, rub in well

256 PS **Pan Handle Lock**
1 drop

256 PS **Pan Lock Lever**
2 drops

256 PS **Pan Handle Lower Section Lock**
1 drop

256 PS **Pan Handle, Inner and Outer Tubes**
Wipe with a cloth slightly dampened with PS



TRIPOD

LUBRICATED BY MAINTENANCE PERSONNEL ONLY:
Tripod Friction Tilt Head
Camera Drive Motor, all lubrication points
Focussing Telescope
Finder Matte
Matte Adjusting Knobs
Tripod Tilt Head Lock

CAMERA DRIVE MOTOR INSTRUCTIONS

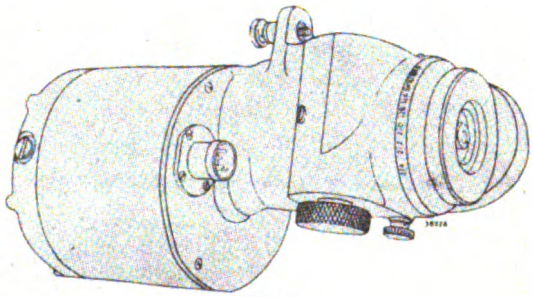
The Camera Drive motor will be turned over to a 5th Echelon shop (Electrical Mechanic) each six (6) months, at which time all bearings, gearing and wiring will be thoroughly cleaned with Solvent, Dry Cleaning and inspected for replacement of worn or damaged parts.

The lubrication to bearings and gearing will be done at this time.

All ball bearings will be coated lightly with GL grease and oil bearings lubricated with PS Oil. Wipe away all excess lubricants.

Reassemble the motor, check and adjust it for calibration and operation before replacing it in service.

This lubrication will be performed by 5th Echelon only.



MOTOR

Copy of this lubrication order will remain with the equipment at all times. Instructions contained therein are mandatory and supersede all conflicting lubrication instructions dated prior to 9 November 1944

By Order of the Secretary of War.
G. C. Marshall, *Chief of Staff.*

Official:
J. A. Ulio,
Major General
The Adjutant General

No. 3822A

TL93854

Figure 147. Facsimile of War Department Lubrication Order No. 3822A, rear side.