

# TM 9-1580

WAR DEPARTMENT TECHNICAL MANUAL

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*ORDNANCE MAINTENANCE*

## BINOCULARS, FIELD GLASSES, AND B.C. TELESCOPES, ALL TYPES

MB

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WAR DEPARTMENT

MARCH 1945

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*TM 9-1580*

This TM supersedes TM 9-1580, dated 6 Apr 42; TM 9-1611, dated 7 Apr 42; and OFSTB 1611-1, dated 24 Sep 43. This TM supersedes portions of WDTB ORD 136, dated 5 Aug 44, which apply to the materiel covered in this TM; however, this TB remains in force until incorporated in all other affected TM's or specifically rescinded.

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FIELD GLASSES,  
AND B.C. TELESCOPES,  
ALL TYPES**



*WAR DEPARTMENT*

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WAR DEPARTMENT  
Washington 25, D. C., 15 March 1945

TM 9-1580, Ordnance Maintenance: Binoculars, Field Glasses, and B.C. Telescopes, All Types, is published for the information and guidance of all concerned.

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(For explanation of symbols, see FM 21-6.)

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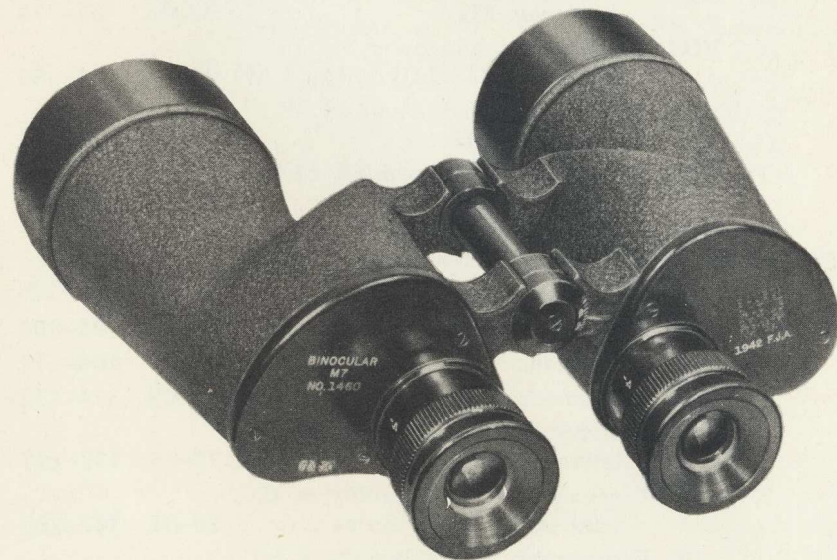


# ORDNANCE MAINTENANCE—BINOCULARS, FIELD GLASSES, AND B.C. TELESCOPES, ALL TYPES



RA PD 48196

**Figure 1—Binocular M2 With Carrying Case**



RA PD 48197

**Figure 2—Binocular M7**

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## CHAPTER ONE—GENERAL

### Section I

## INTRODUCTION

### 1. SCOPE.\*

a. This Technical Manual is published for the information and guidance of ordnance maintenance personnel. It contains detailed instructions for inspection, adjustment and repair, and disassembly and assembly of a comprehensive group of binoculars, field glasses, and battery commander's telescopes together with their respective accessories, supplementary to those in the Field and Technical Manuals prepared for the using arm. This manual does not contain information which is intended primarily for the using arm, since such information is available to ordnance maintenance personnel in TM 9-575.

### 2. CHARACTERISTICS.

a. **Binoculars and Field Glasses.** The binocular or field glass is used for observation and the approximate measurement of small angles. Each binocular and field glass comes complete with a carrying case, a neck strap, and a shoulder strap for the case. The power of the binocular or field glass is marked on the eyepiece cover of the instrument.

b. **Battery Commander's Telescopes.** These instruments are used for purposes of observation, for measuring angles in azimuth, and for measuring angles of site. The complete instrument consists of the telescope assembly, telescope mount, tripod, carrying case, and instrument light.

\*To provide maintenance instructions with the materiel, this Technical Manual has been published in advance of complete technical review. Any errors or omissions will be corrected by changes or, if extensive, by an early revision.



INCHES 1 2 3

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MAINTENANCE—BINOCULARS, FIELD GLASSES,  
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RA PD 48221

Figure 3—Binocular M3, M6, M8, or M9 With Carrying Case

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RA PD 86663

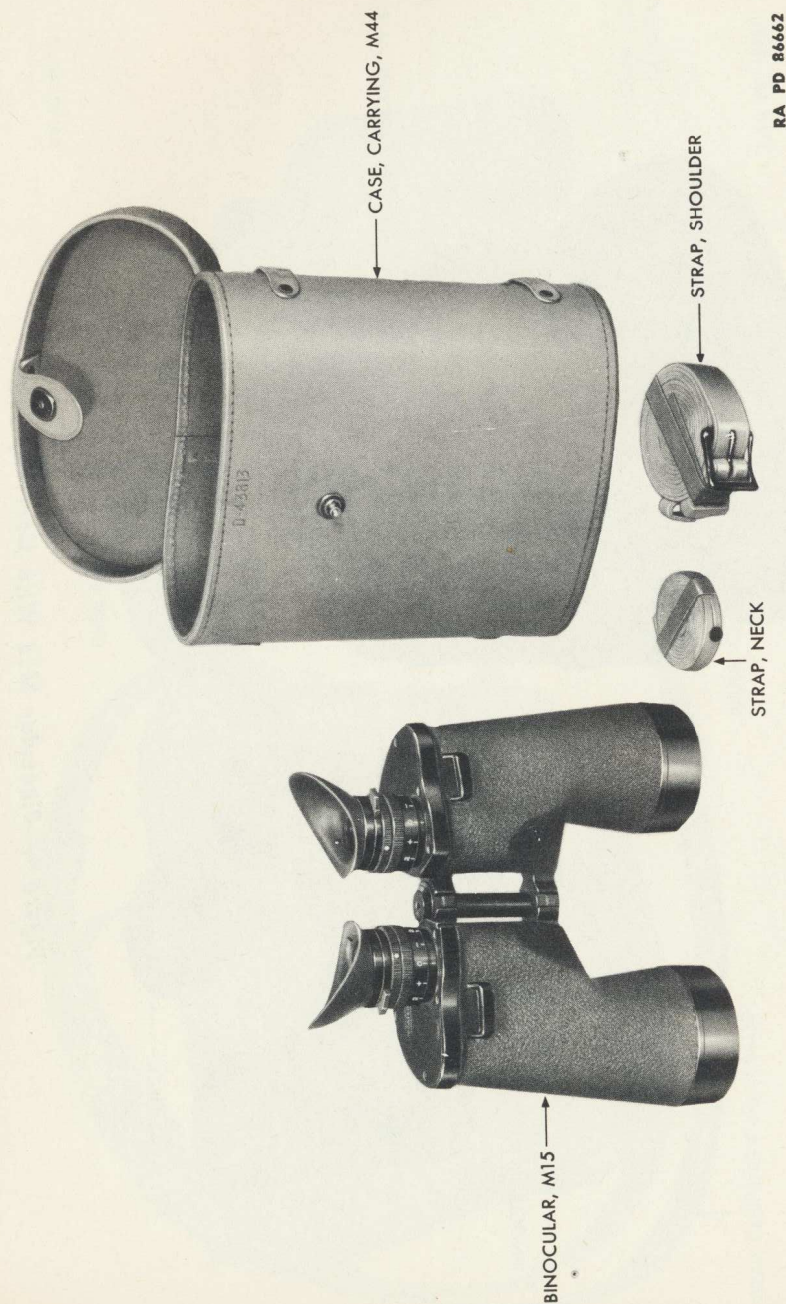
Figure 4—Binocular M13 With Carrying Case

INTRODUCTION

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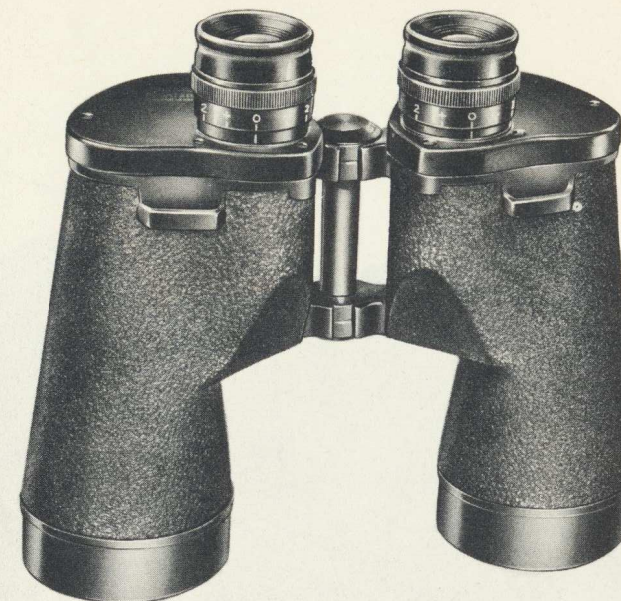


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Figure 5—Binocular M15 With Carrying Case

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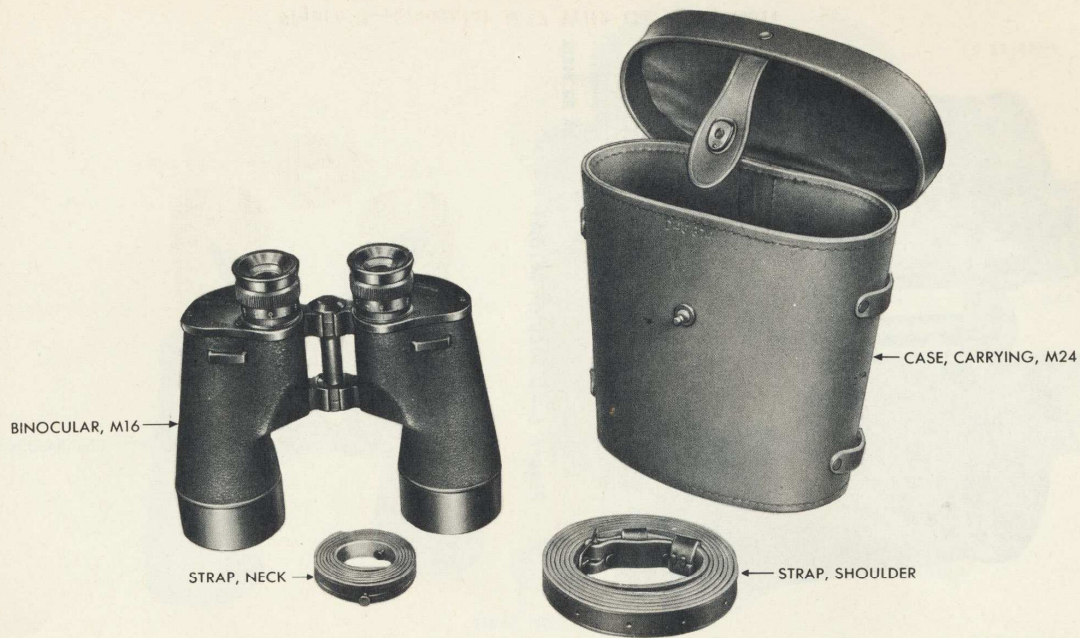
INTRODUCTION



RA PD 86822

Figure 6—Binocular M15A1

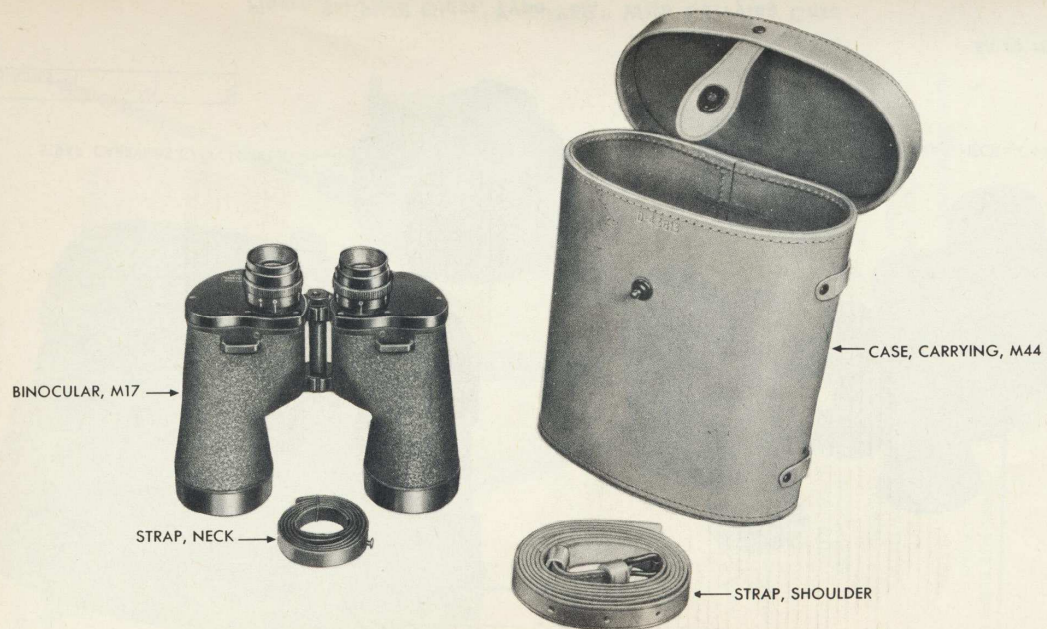




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Figure 7—Binocular M16 With Carrying Case

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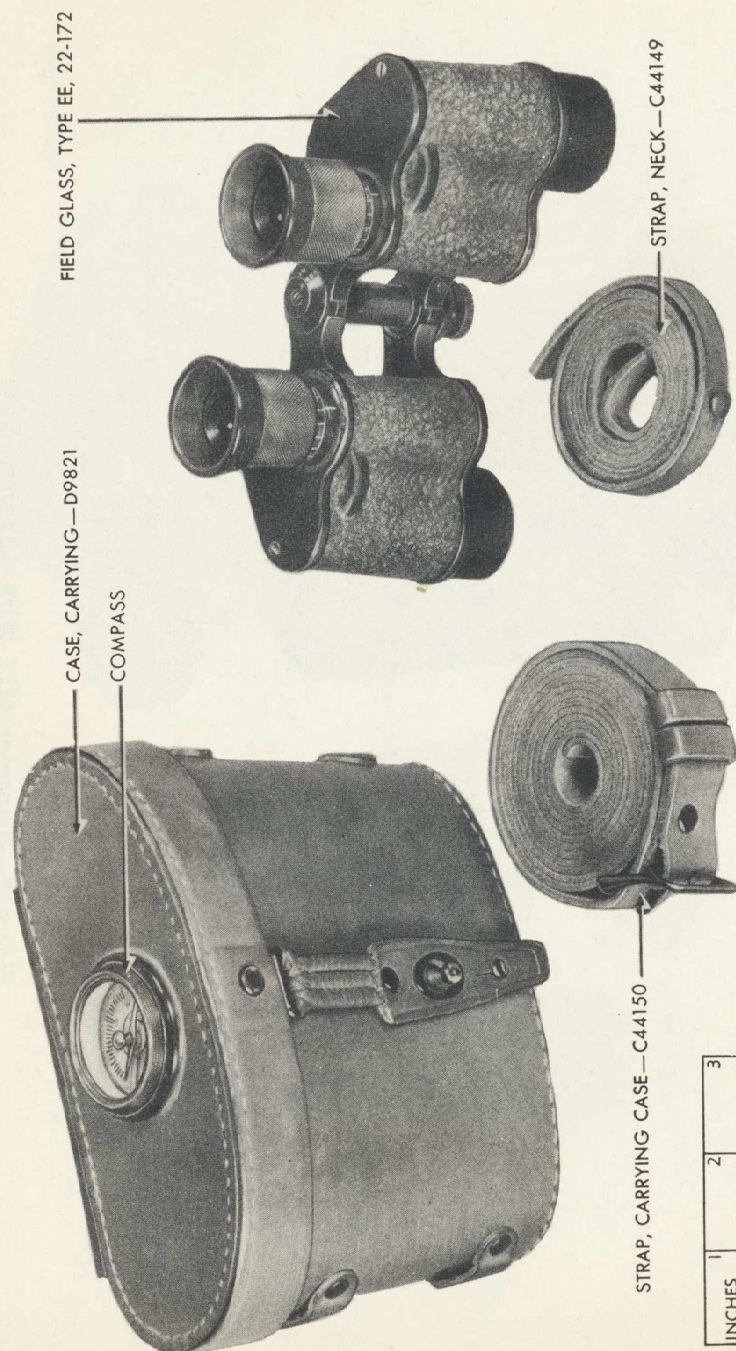


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Figure 8—Binocular M17 With Carrying Case



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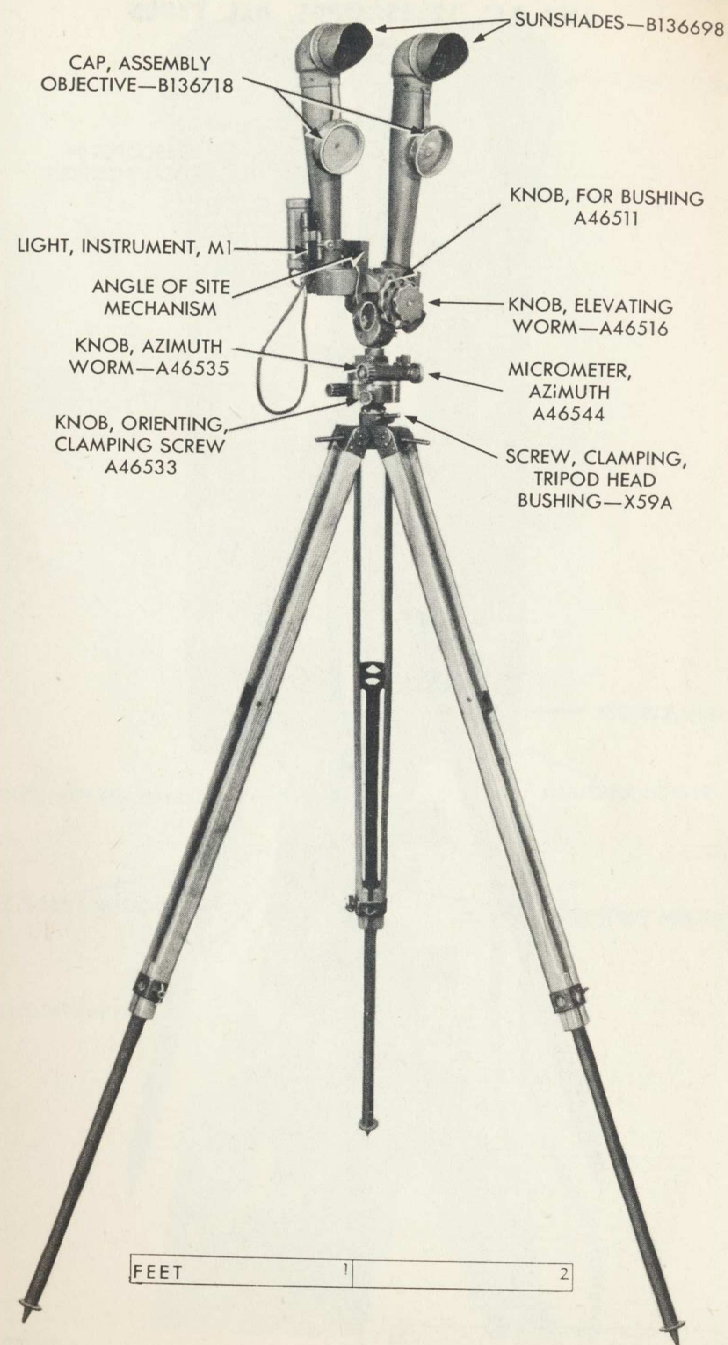


RA PD 75714

Figure 9—Field Glass, Type "EE." With Carrying Case

MB

INTRODUCTION



RA PD 75669

Figure 10—B.C. Telescope M1915A1



# ORDNANCE MAINTENANCE—BINOCULARS, FIELD GLASSES, AND B.C. TELESCOPES, ALL TYPES

## b. Lubricants.

GREASE, equilibrator. For eyepiece focusing movements.

GREASE, lubricating, special. For all lubrication where grease is required.

OIL, lubricating, for aircraft instruments and machine guns. For all lubrication where oil is required.

## c. Sealing Compounds.

COMPOUND, sealing, black Navy. For sealing optical elements in their cells, etc. (When present stock is exhausted, use COMPOUND, sealing, for optical lenses.)

COMPOUND, sealing, for optical lenses.

CEMENT, sealing or plugging. Class A, red; class B, yellow; class C, black.

CLAY, plastic modeling. Formerly known as plasteline.

COMPOUND, caulking, knife grade, HNC, or equal. For sealing windows in frames on fire control materiel.

VARNISH, shellac, orange, medium body, high iodine.

## d. Miscellaneous.

FILLER, graduation. For scales of optical instruments. Colors: black, vermilion (deep), white (translucent).

GYPSUM, calcined, grade I, fine (plaster of paris). For setting level vials.

PAPER, lens, tissue.

SYRINGE, bulb, 3½ oz.

# CHAPTER TWO—BINOCULARS AND FIELD GLASSES

## Section I

## FUNCTIONAL DESCRIPTION

### 20. GENERAL.

a. Binoculars and field glasses are optical instruments used for observation and sometimes used for measurement of small horizontal and vertical angles. Each half of the binocular or field glass is a terrestrial telescope employing porro prisms as the erecting system. Each telescope rotates about a hinge pin, or mechanical axis, parallel to the optical axis of the telescopes. The hinge permits adjustment of the distance between the eyepieces. Proper adjustment of the interpupillary distance allows the light from the exit pupils to enter the pupils of the eyes.

b. The baton and arrow (fig. 20) represent an image in the field of view which has been inverted and reversed by the objective lens. Note that the baton is again reversed by the horizontal prism, while the arrow is reinverted by the vertical prism. The porro prisms not only erect the image but also make possible a reduction in the length of the telescopes, and provide a means of adjustment. Furthermore, they are arranged to separate the objectives of the two telescopes considerably more than the eyepieces alone permit, thus increasing the stereoscopic effect.

c. All military binoculars and field glasses are constructed for separate focusing; that is, each eyepiece is focused independently of the other by turning the focusing nut in a plus or minus direction.

### 21. DIFFERENCES AMONG MODELS.

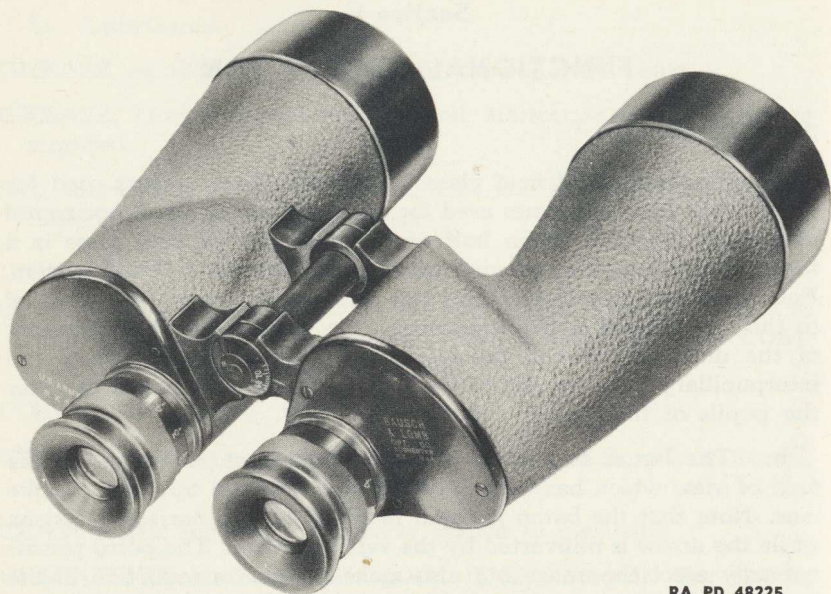
a. All binoculars and field glasses are generally the same, differing only in appearance and optical characteristics.

b. Binoculars M2, M7, M15, and M15A1 have no reticles; Binoculars M3, M8, M9, M13, M16, and M17, and field glass, type "EE," each have a reticle in the left telescope; while Binocular M6 has a reticle in the right telescope.

c. Binocular M15 has a shield assembly and filter arrangement for each eyepiece. The other binoculars do not have this feature. However, a variable density filter, the Filter M1, has been approved for use with Binoculars M3, M7, M8, M9, M13, M15A1, M16, and M17. This filter consists of two pairs of polarizing disks mounted in a frame which may be easily attached to the eyepiece. One of each pair of polarizing disks is permanently mounted in a fixed position



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RA PD 48225

Figure 18—Binocular M2

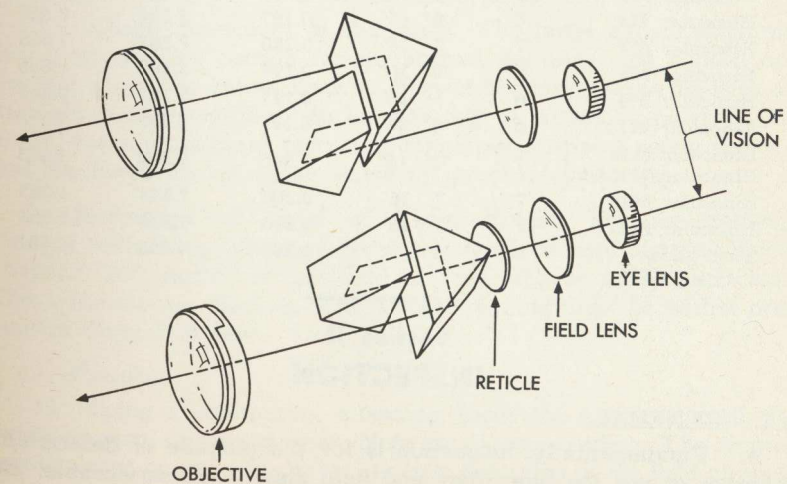
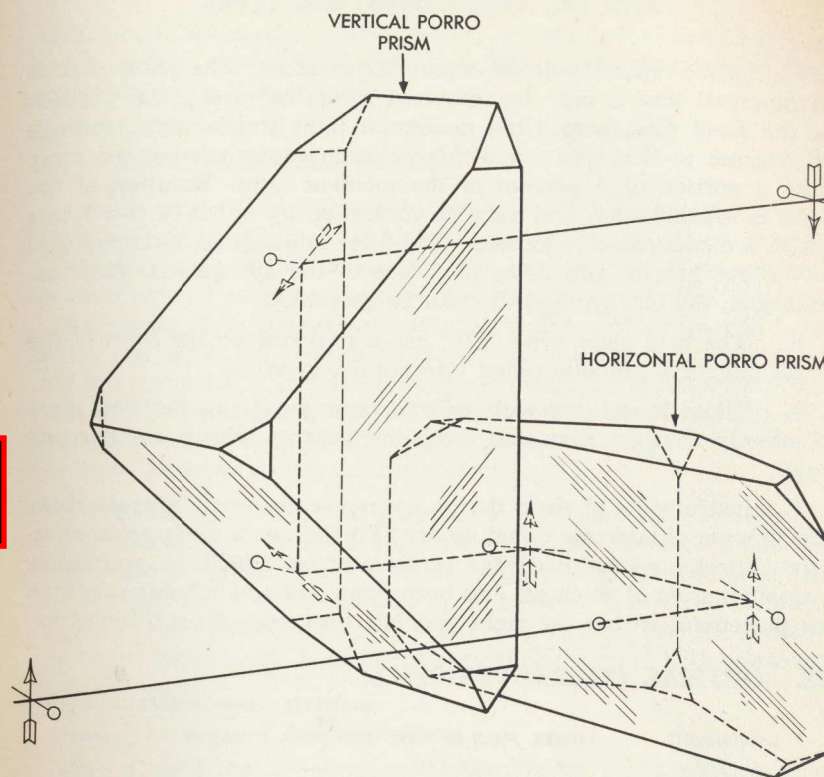


RA PD 48185

Figure 19—Binocular M8

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FUNCTIONAL DESCRIPTION



ERECTING SYSTEM

RA PD 47470

Figure 20—Porro Prism Erecting System



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to neutralize reflection from horizontal surfaces. The other disk is so mounted that it may be rerotated from the same axial position as the fixed disk, permitting maximum light transmission, through 90 degrees to that position which permits transmission of no more than a portion of 1 percent of the incident light. Rotation of the disks is synchronized and may be controlled by either of two levers which are conveniently located. The filter is attached, after removal of the eye guards, and takes the place of the eye guards. After installation, the old eye guards shall be discarded.

d. The field glass, type "EE," has a stop ring on the front of the hinge pin for a predetermined interpupillary setting.

e. Those binoculars with a larger exit pupil can be used more effectively at night than can those instruments with a smaller exit pupil.

f. Instruments of early design are not waterproof, whereas those instruments of later manufacture are. Further, as a measure of moisture control, a special cartridge (desiccator set 5800228), containing a small amount of silica gel, has been approved and is being procured for placement within the right and left telescope of each binocular.

## 22. OPTICAL CHARACTERISTICS.

INSTRUMENT	POWER	FIELD OF VIEW	DIAMETER OF EXIT PUPIL	EFFECTIVE FOCAL LENGTH	
				Objective	Eyeiece
Binocular M2	8	6° 15'	—	—	—
Binocular M3	6	8° 30'	0.197	5.191	0.865
Binocular M6	6	8° 16'	0.197	5.191	0.865
Binocular M7	7	7° 16'	0.280	7.583	1.083
Binocular M8	6	8° 30'	0.197	5.189	0.866
Binocular M9	6	8° 16'	0.197	5.191	0.865
Binocular M13	6	8° 30'	0.197	5.191	0.865
Binocular M15	7	7° 16'	0.280	7.583	1.083
Binocular M15A1					
Binocular M16	7	7° 16'	0.280	7.583	1.083
Binocular M17	7	7° 16'	0.280	7.583	1.083
Field glass, type "EE"	6	8°	0.197	4.890	0.781

## Section II INSPECTION

### 23. GENERAL.

a. Fundamentally, inspection is for the purpose of determining whether or not the binoculars and field glasses are serviceable. Important but lesser purposes are the detection of incipient failure and determination of whether or not proper care is being taken of the

## INSPECTION

materiel and accessories. Serviceability, as interpreted in this section, is the ability of the binoculars and field glasses to perform their intended functions completely.

### 24. INSPECTION PROCEDURE.

a. **General.** The instrument must first be examined for completeness and appearance. If the accessories are not all present, the personnel receiving the instrument will sign only for those received. Note all missing parts on the inspection form and get authorization for replacement. Note general appearance, condition of scales, paint, and sealing. If seals are broken or screws are missing, it may indicate that the instrument has been tampered with by unauthorized personnel. This condition should be noted on the inspection form. The general condition of the paint may indicate how long the instrument has been in service without maintenance.

b. **Condition of Optical Elements.** Sight into the objective end of the instrument and check the objective lens and porro prisms for cleanliness, or presence of moisture, grease, dirt, chipped lens, and for deterioration of the cementing agent between compound elements. Inspect the eyelens, field lens, and reticle by sighting into the eyepiece end of the instrument. Inspect the optical elements of both telescopes in this manner.

#### c. Operation of Movable Parts.

(1) Check the eyepiece cell assembly to make sure it turns smoothly in the cover under a moderate pressure.

(2) Check movement of the hinge. The hinge should maintain any interpupillary setting for all normal handling, but should not be tight enough to cause binding. Inspect the hinge stop ring stop on the field glass, type "EE," to be sure that it is free to move in the hinge. Inspect the hinge stop ring, hinge pin clamping screw washer, and the hinge pin clamping screw for proper functioning.

d. **Definition of Field of View, Proper Diopter Setting.** Using a collimating telescope, focus the eyepiece until distant objects (beyond 200 yards) in the field of view appear sharp and clear. Check the diopter reading. The diopter reading must be within one-quarter diopter of zero.

#### e. Parallax.

(1) Using a collimating telescope, focus the eyepiece until the reticle appears sharp and clear. Note the diopter reading. The diopter reading must be the same as for the best definition of the field of view.

(2) An alternate method of checking for parallax is as follows: Place the instrument on a solid surface, and observe a distant target



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(beyond 200 yards) through the binoculars. Move the head, and watch for movement of the reticle at its nearest point of center in relation to the distant target in the field of view. Any apparent movement is parallax. There must be no movement.

**f. Diopter Movement.** From the point where clear definition of the field of view is obtained with a collimating telescope there must be full diopter movement as indicated by the diopter scale. Inspect both telescopes in this manner.

**g. Tilt in Field of View.** Pronounced cases of tilt can be detected by looking through the objective end of each telescope separately, observing a straight line. Hold the instrument about a foot from the eyes and look through and around the telescope simultaneously. The part of the line visible in the field of view of the telescope should not be tipped in relation to the actual line. For a more accurate check, place the binoculars in a testing fixture such as shown in figure 15. Place a collimating telescope in a surface gage equipped with the special fixture shown in figure 15. Place the surface gage on the surface plate and align one of the cross lines of the reticle in the collimating telescope on a plumb line. Slide the surface gage in back of the telescope of the binocular and sight through the collimating telescope and binocular. The plumb line and the cross line must be parallel.

**h. Tilt of Reticle.** For a field check, set the interpupillary scale at 63 millimeters, and place the binoculars on a level surface. Sight on a line known to be vertical. The vertical line of the reticle should be approximately parallel to the vertical line.

## i. Double Vision.

(1) Hold the instrument in the hands, and focus both telescopes on a distant object. Close either eye for a minute or so. Then open the eye quickly. If any double vision exists it can be detected at once. The target will appear to blur apart and then together again quickly, as the eye corrects for the defect. To use this method, observation should be confined to a sharply outlined target such as a telephone pole or a smokestack.

(2) An alternate method of checking for double vision is as follows: Sight into the telescope and observe an object on the edge of the field of view of one telescope, and see that it is exactly in the same position in the other telescope. It is well to check on an object at the side of the field of view and also at the top. It should be noted that, as the eyepiece is focused in and out, the size of the field of view changes. It is also true that many eyepieces are not optically centered and the collimation will change slightly as the eyepiece is

# ADJUSTMENT AND REPAIR

focused. For these reasons it is best to set the instrument on a solid surface while making the check, and carefully focus both eyepieces to the same eye.

**j. Interpupillary Scale Setting.** Set the interpupillary scale at 64 millimeters. The distance between corresponding points of the eyepiece should be 2.52 inches.

## k. Stagger.

(1) **OBJECTIVE END.** Hold the instrument in either hand with the objective end on a surface plate. Note if there is any difference in the length of the objective cells. If a difference is noted, measure with a 6-inch scale. The stagger must not exceed the tolerance as listed below.

(2) **EYEPIECE END.** Set the diopter scales at zero. Hold the instrument in either hand, with the objective end on a surface plate. Place the edge of a 6-inch rule across the top of the eyepieces. **CAUTION: Do not bear down on the scale, as the eyepiece cells may become damaged.** Note if there is any difference in the length of the eyepieces. If a difference is noted, measure with a 6-inch scale. The stagger must not exceed the tolerance as listed below.

Instrument	Tolerance, Objective End	Tolerance, Eyepiece End
Binocular M2	—	0.0625 in.
Binocular M3	—	0.038 in.
Binocular M6	—	0.038 in.
Binocular M7	—	0.0625 in.
Binocular M8	—	0.038 in.
Binocular M9	—	0.038 in.
Binocular M13	—	0.038 in.
Binocular M15	—	0.0625 in.
Binocular M15A1	—	0.0625 in.
Binocular M16	—	0.0625 in.
Binocular M17	—	0.0625 in.
Field glass, type "EE"	$\frac{3}{32}$ in.	0.034 in.

**l. Carrying Case.** Check for general appearance. Make sure straps and snaps are in a serviceable condition. Check the seams to see that the stitching is not broken. Check condition of the leather. It should be clean and without cracks or checks.

## Section III

# ADJUSTMENT AND REPAIR

## 25. CONDITION OF OPTICAL ELEMENTS.

**a.** If, during inspection, the optical elements were found to be dirty, disassemble the instrument and clean the optical elements as explained in paragraph 11.



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b. Compound elements that have become separated must be cleaned and recemented as outlined in paragraph 11.

c. Lenses that are badly scratched or chipped must be replaced. If a reticle or field lens is scratched so as to affect the field of view, it must be replaced.

### 26. LOOSENESS OR BINDING IN EYEPiece CELL ASSEMBLY.

a. If the eyepiece cell assembly binds or has rough movement, remove the cell assembly and clean the threads of the eyepiece cell and the eyepiece adapter. Lubricate the threads of the cell with the proper type of lubricant and install the cell assembly in the adapter. If the eyepiece cell assembly still has rough movement or binds, it will be necessary to remove the cell assembly again, remove the eye and field lens, clean the threads of the cell and adapter thoroughly, and lap the threads of the cell and adapter together. In lapping threaded parts, caution should be exercised not to use an abrasive that is too coarse. A very loose fit can be obtained with very little effort. Clean the cell and adapter to remove all traces of lapping. Install the eye and field lens in the cell. Lubricate the threads of the eyepiece cell with the proper type lubricant, depending on the temperature (par. 9), and install in the adapter.

b. If the cell assembly is too loose in the adapter, it can be partially corrected by removing the cell assembly, cleaning the male and female threads, and relubricating with a heavier type of lubricant of the approved type. Install the cell assembly and again check the movement. If the cell assembly is still too loose for proper operation, replace both cell and adapter.

### 27. HINGE.

a. If the hinge has rough movement, it may be caused by burs on the washers or hinge pin. Disassemble hinge assembly and remove all burs from the washers with a fine oilstone. Remove burs from the hinge pin by lapping.

b. If the hinge binds, disassemble the hinge assembly and clean the hinge, hinge pin, and washers. Lubricate and reassemble. Adjust the hinge pin screws for correct tension. If the holes in the hinge pin screws cannot be lined up, drill new holes in the hinge flanges. It will be necessary to adjust the interpupillary scale as outlined in paragraph 34.

## ADJUSTMENT AND REPAIR

c. If the hinge movement is too loose, disassemble hinge assembly and clean all parts. If necessary, install additional washers between the hinge flanges to take up all end play. Assemble hinge assembly and adjust hinge pin screws for correct tension.

### 28. DEFINITION OF FIELD OF VIEW, PROPER DIOPTR SETTING.

a. If inspection shows that the diopter scale does not indicate zero within one-quarter diopter, with the field of view sharp and clear, as viewed through a collimating telescope, adjust as follows: Using a collimating telescope, sight into the instrument. Focus the eyepiece until objects beyond 200 yards within the field of view appear sharp and clear. Remove the eye guard. Remove the locking screw from the diopter scale clamping nut and loosen the clamping nut. Shift the diopter scale until it reads zero. In Binocular M8 it will be necessary to drill a new hole for the diopter scale locating screw.

### 29. PARALLAX AND DIOPTR MOVEMENT.

#### a. General.

(1) **IMPROPER DIOPTR MOVEMENT.** Improper diopter movement is caused by the image formed by the objective lens being too close or too far from the focal plane of the eyepiece. An objective lens with too short a focal length will result in insufficient minus movement of the focusing nut. An objective lens with too long a focal length will result in insufficient plus movement of the focusing nut. As a general rule, improper diopter movement in binoculars will be encountered only when the optical elements have been replaced.

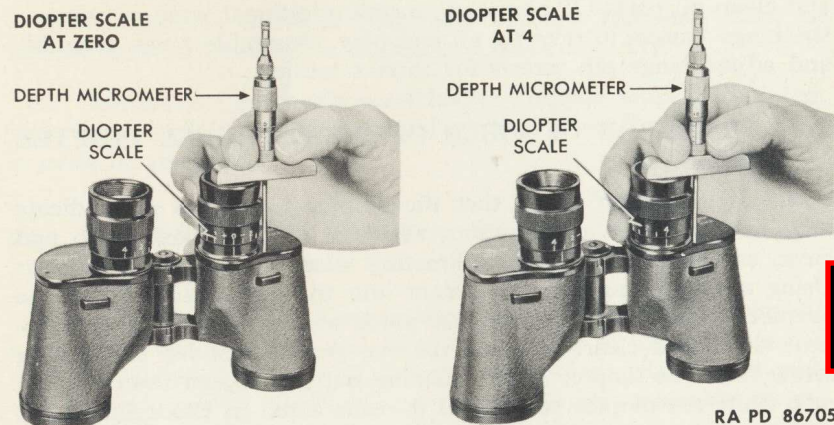
(2) **PARALLAX.** Parallax is caused by the reticle not lying in the focal plane of the objective lens.

(3) These adjustments are interrelated and, therefore, if either adjustment is required as a result of inspection, both adjustments should be made.

(4) Before attempting to make the adjustments, it will be necessary to know how far and in what direction the various optical elements need be moved to correct for parallax and improper diopter movement. This can be determined by knowing how far the eyepiece cell travels in or out for each graduation of the diopter scale. To obtain this measurement proceed as follows: Set the diopter scale at zero and measure with a depth micrometer the distance from the top of the eye guard to the top of the body cover (fig. 21). Turn the focusing nut to plus or minus 4 diopters and again measure the distance from the top of the eye guard to the top of the body cover



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RA PD 86705

**Figure 21—Measuring Travel of Focusing Nut**

(fig. 21). The difference in the two measurements is the length of travel in inches for 4 diopters. To obtain the travel in inches for 1 diopter, divide the total difference by four.

(5) The correct distance from the target at which a telescope, with a prism erecting system, should be set for the removal of parallax can be found by the following formula:

$\text{Dia. of exit pupil in inches} \times 50 \times \text{magnification}^2 = \text{Distance in yards from the telescope at which the target should be set for the removal of parallax.}$

The diameter of the exit pupil may be computed as follows:

$\frac{\text{Diameter of entrance pupil (objective)}}{\text{Magnification}} = \text{Diameter of exit pupil}$

Example:

Binocular M16—7 x 50  
7 power, 50-mm entrance pupil  
 $50 = 7.14\text{-mm dia. of exit pupil}$

7

$7.14 \times 0.039 = 0.278 \text{ in. dia. of exit pupil (1 mm = 0.039 in.)}$

Dia. of exit pupil = 0.278 in.

Magnification = 7

$0.278 \times 50 \times 7^2 = 13.9 \times 49 = 681.1$

Therefore, 681.1 = the distance in yards from the telescope at which the target should be placed for the removal of parallax. This distance is the theoretical infinity for this type and size of instrument. However, distances between this distance and one-half of this distance may be used without too much parallax being introduced. The theoretical infinity is the preferable distance at which to remove parallax.

## ADJUSTMENT AND REPAIR

### b. Left Telescope.

(1) **CHECK DIOPTER MOVEMENT.** Using a collimating telescope, sight into the instrument and focus the eyepiece until objects at least 200 yards distant in the field of view appear sharp and clear. From this position the focusing nut must have full diopter movement in both directions.

### (2) ADJUST TO OBTAIN CORRECT DIOPTER MOVEMENT.

(a) **Binoculars.** If diopter movement is insufficient in the plus direction, it can be corrected by replacing the objective lens with a lens having a shorter focal length, or by replacing the present adapter with one having less depth. If diopter movement is insufficient in the minus direction, it can be corrected by replacing the objective lens with a lens having a longer focal length, or by replacing the present adapter with one having greater depth.

(b) **Field Glass, Type "EE."** If diopter movement is insufficient in the plus direction, it can be corrected by moving the reticle away from the eye and field lens. If diopter movement is insufficient in the minus direction, it can be corrected by moving the reticle towards the eye and field lens. The reticle can be moved away from the eye and field lens by replacing the reticle cell with a cell having a wider shoulder, or by replacing the eyepiece sleeve with a longer one. The reticle can be moved toward the eye and field lens by replacing the reticle cell with a cell having a thinner shoulder, or by replacing the eyepiece sleeve with a shorter one. Zero the scale by loosening the diopter scale locking screw and turning the scale until the zero is opposite the index. Tighten the locking screw.

### (3) ELIMINATE PARALLAX.

(a) **Binoculars (Except M3).** Eliminate parallax as follows: Zero the scale and move the reticle until it appears sharp and clear when viewed through a collimating telescope with the scale at zero. Turn the focusing nut all the way out. Sight into the instrument with a collimating telescope. Focus the eyepiece until the reticle appears sharp and clear. Note the diopter scale reading. If the diopter scale reads plus, it will be necessary to move the reticle away from the eye and field lens. If the diopter scale reads minus, it will be necessary to move the reticle towards the eye and field lens. To move the reticle away from the eye and field lens, use a thinner reticle spacer between the reticle and the shoulder of the reticle cell. To move the reticle towards the eye and field lens, use a wider reticle spacer.

(b) **Binocular M3 Only.** When adjusting the Binocular M3, it will only be necessary to loosen the clamping screw in the reticle cell and slide the reticle cell either toward or away from the eye and field lens as required.



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(c) *Field Glass, Type "EE."* Eliminate parallax by moving the focal plane of the objective lens until the field of view appears sharp and clear when viewed through a collimating telescope with the scale at zero. To do this, turn the focusing nut all the way out. Sight into the instrument with a collimating telescope and focus the eyepiece until the field of view appears sharp and clear. Note the diopter scale reading. If the diopter scale reads minus, it will be necessary to shift the focal plane of the objective lens toward the eye. If the scale reads plus, it will be necessary to move the focal plane of the objective lens away from the eye. To move the focal plane away from the eye, replace the objective lens with a lens having a shorter focal length. The same results can be obtained by replacing the objective adapter with a thinner one, or by replacing the eyepiece washer with a thinner one. To move the focal plane toward the eye, replace the objective lens with a lens having a longer focal length. The same results can be obtained by replacing the objective adapter with a wider one, or by replacing the eyepiece washer with a wider one. When parallax has been completely eliminated, both the reticle and the field of view will appear sharp and clear with the diopter scale reading zero.

## c. Right Telescope.

(1) **CHECK DIOPTER MOVEMENT.** Using a collimating telescope, sight into the instrument and focus the eyepiece until objects beyond 200 yards within the field of view appear sharp and clear. From this position the focusing nut must have full diopter movement in both directions.

(2) **ADJUST TO OBTAIN CORRECT DIOPTER MOVEMENT.** If diopter movement is insufficient in the plus direction, it will be necessary to replace the objective lens with a lens having a shorter focal length, or to replace the objective adapter with one having less depth. If diopter movement is insufficient in the minus direction, it will be necessary to replace the objective lens with a lens having a longer focal length, or to replace the objective adapter with one having greater depth. Zero the scale the same as for the left telescope. Check the instrument for stagger as outlined in paragraph 24. If stagger is present, adjust as in paragraph 30.

## 30. STAGGER.

a. **Binoculars.** Stagger can be eliminated or brought into the specified tolerance by moving the focal plane of the objective lens in or out as required. After this adjustment is made, it will again be necessary to check for proper diopter movement and for parallax, if position of left objective has been disturbed.

# ADJUSTMENT AND REPAIR

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b. **Field Glass, Type "EE."** Stagger is eliminated from the field glass, type "EE," in the same manner as for binoculars, except stagger can also be present in the objective end of the instrument. To eliminate stagger in the objective end of the instrument, it will be necessary to replace the objective adapter with an adapter having a thicker or thinner shoulder, depending upon whether the eyepiece is too long or too short. It will then be necessary to shift the focal plane of the objective lens either toward or away from the eye by changing the objective lens or the eyepiece washer. After this adjustment is made, it will again be necessary to check for proper diopter movement as outlined in paragraph 24.

## 31. TILT IN FIELD OF VIEW.

a. **General.** Tilt in the field of view is caused by the porro prisms not being set at a 90-degree angle in relation to one another.

### b. Procedure.

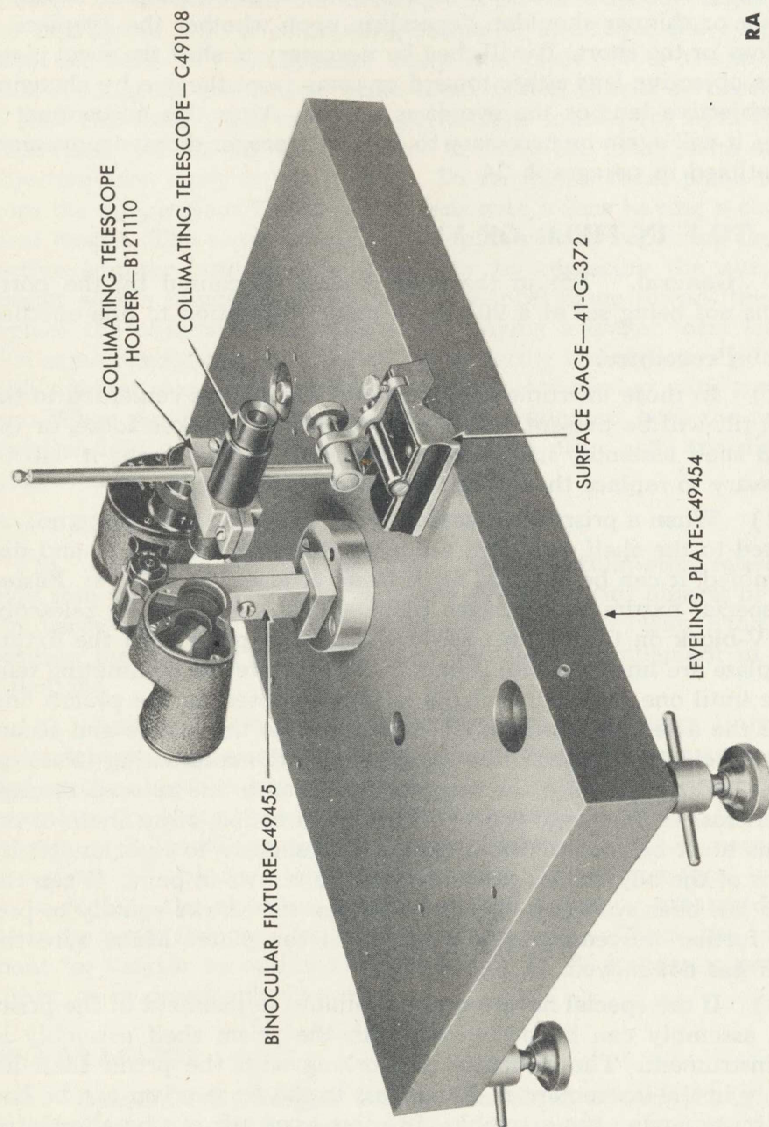
(1) In those instruments which have the prisms cemented to the shelf, tilt will be present only if the cement has broken loose, or the prism shelf assembly has become damaged. In this event it will be necessary to replace the entire prism shelf assembly.

(2) When a prism shelf assembly, in which the prisms are not cemented to the shelf, has been removed from the instrument and disassembled, it can be checked for tilt and adjusted as follows: Fasten the special fixture to a surface plate. Place a collimating telescope in a V-block on the fixture. Move the surface plate until the fixture and plate are lined up with a plumb line. Rotate the collimating telescope until one of the cross hairs is superimposed on the plumb line. Place the assembled prism shelf assembly into the fixture and secure with the clamping arms. The cross hairs of the collimating telescope should be parallel with the image of the plumb line as seen through the prisms. If the image is tilted in either direction, adjustment of the prisms must be made. Rotate the prisms slightly to right or left by means of the adjusting screws. Adjust the screws in pairs. When the prism has been rotated sufficiently, tighten the screws equally to prevent further movement of the prism on the plate. Make sure the prism has not moved.

(3) If the special fixture is not available, adjustment of the prism shelf assembly can be performed with the prism shelf assembly in the instrument. The difficulty of working with the prism shelf assembly in the instrument is that access to the front prism can be had only by removing the assembly. In most cases tilt can be eliminated by adjusting only one prism; if it cannot be eliminated, remove the assembly, rotate the front prism on the shelf by means of the adjusting screws, replace assembly in the instrument, and proceed with the



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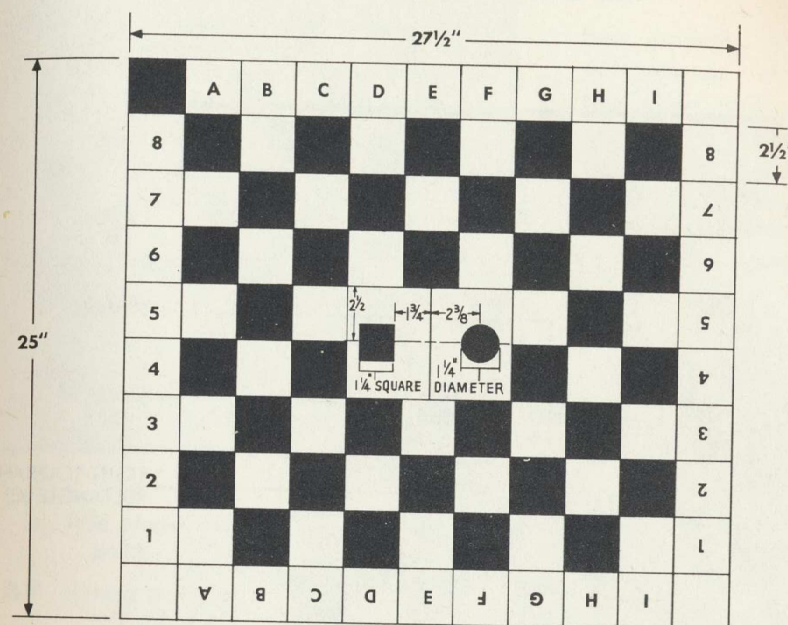


RA PD 86706

Figure 22—Adjusting for Tilt of Field

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## ADJUSTMENT AND REPAIR



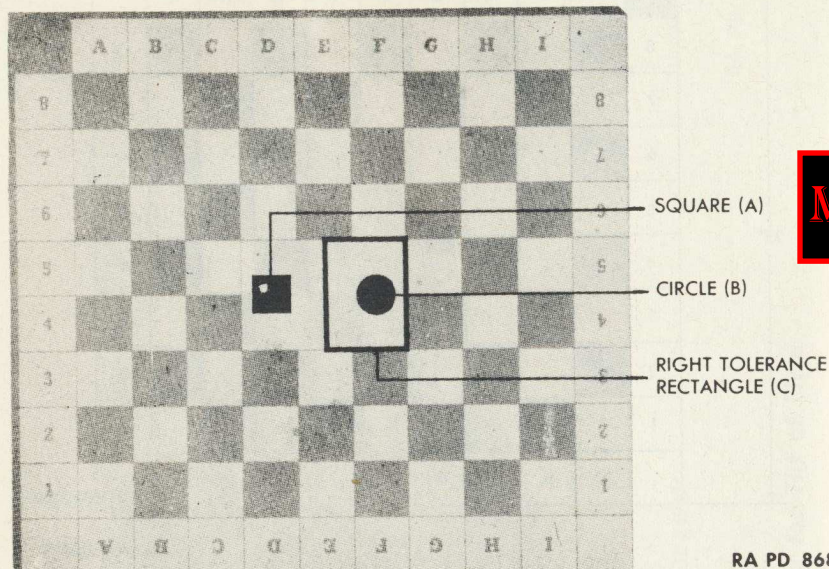
RA PD 86674

Figure 23—Target for Collimating Binoculars and Field Glasses (To Be Used at a Distance of 139 Yards)

adjustment. When using the body as a fixture, it will be easier to work if the objective lens and eyepiece are removed. To adjust the prism shelf assembly in the instrument, proceed as follows: Fasten the special fixture C49455 on a surface plate and install the binoculars in the special fixture. Place the collimating telescope holder B121110 on the vertical spindle of a universal surface gage (fig. 22). Install a collimating telescope in the holder. Push down on the two pins at the rear of the surface gage and set the gage on the surface plate with the two pins against the back edge of the plate. Adjust the collimating telescope holder so that the collimating telescope is in the line with, and at the same height as, the aperture in the prism shelf. Slide the surface gage off to one side and rotate the collimating telescope until one of the cross hairs is superimposed on the plumb line. Slide the surface gage in back of the instrument. Sight into the collimating telescope and into the prism assembly. The cross hairs of the collimating telescope should be parallel with the image of the plumb line as seen through the prisms. If the image is tilted in either direction, adjust as outlined above.



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RA PD 86823

Figure 24—Tolerance Check for Collimation

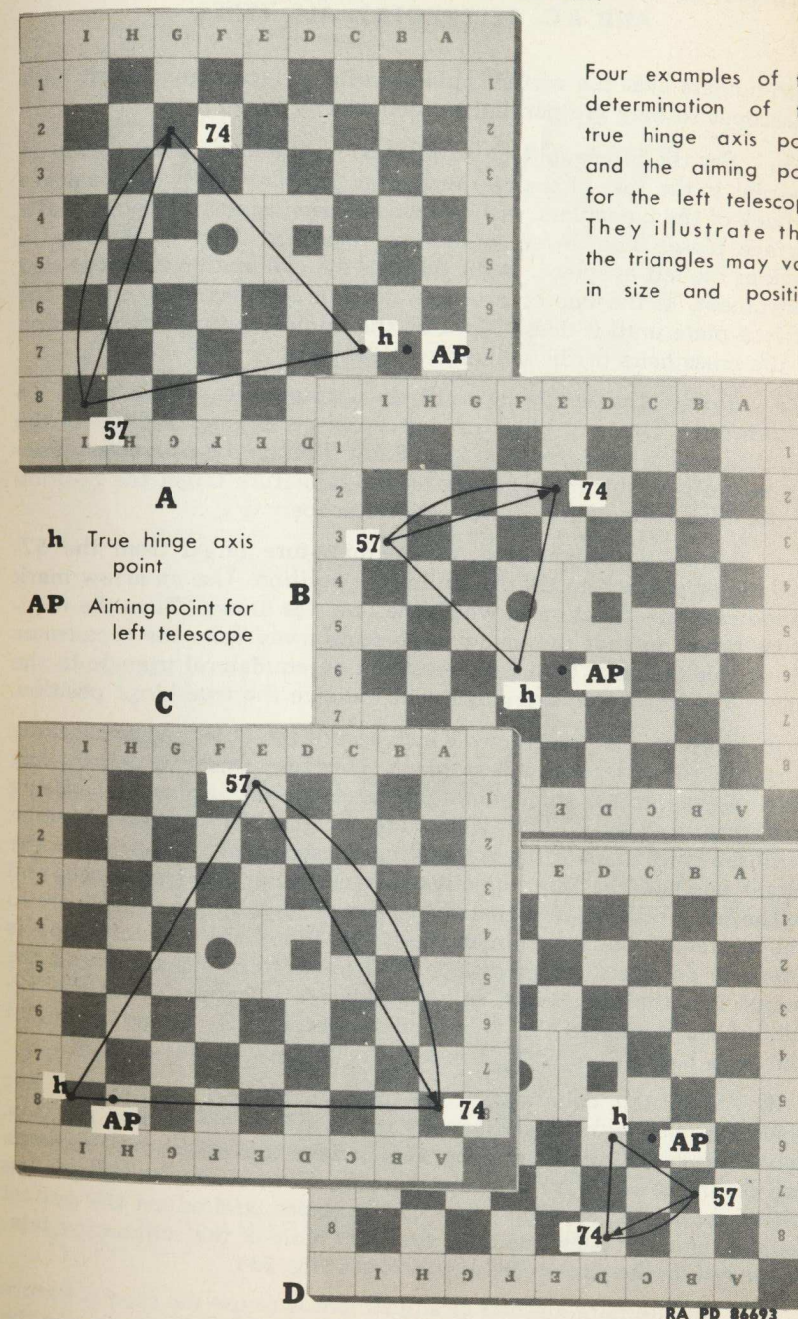
## 32. TILT OF RETICLE.

a. Set the interpupillary scale at 63 millimeters. Place the instrument in the special fixture C49455. Level the instrument by placing a bench level across the instrument so that it will touch corresponding parts of the two bodies. Sight through the instrument at a true horizontal line. Remove the eyepiece and body cover, loosen the reticle cell retaining ring, and rotate the reticle in the cell until the horizontal scale of the reticle coincides with the horizontal line. Install body cover and eyepiece.

## 33. COLLIMATION.

a. Set up a target (fig. 23) 139 yards from the instrument and perpendicular to the axis of the true hinge "H." For any other target distance, use the formula:  $\frac{1}{2} \text{ mil} = \text{range in yards} \times 0.018$ . Answer will be in inches. The instrument repairman should have an exact duplicate of the target, in miniature, placed close at hand, on which to record the position of the optical axis for the different interpupillary settings. Mount fixture C49455 on a surface plate. Install two collimating telescopes in the collimating telescope holders and slide

# ADJUSTMENT AND REPAIR



Four examples of the determination of the true hinge axis point and the aiming point for the left telescope. They illustrate that the triangles may vary in size and position.

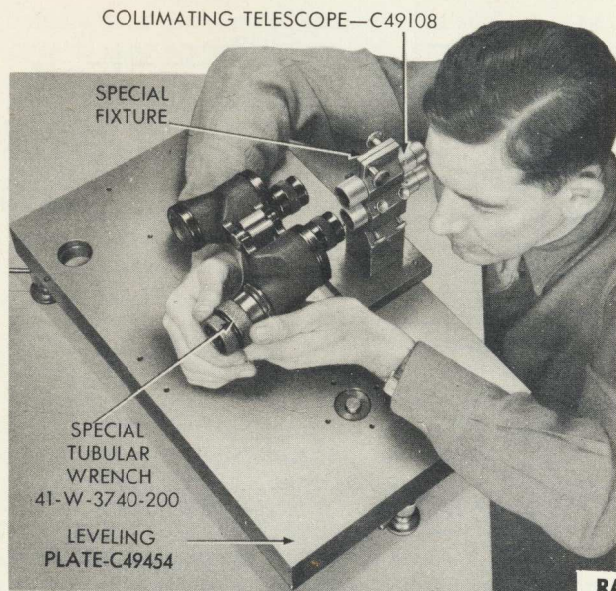
RA PD 86693

Figure 25—Determination of Hinge Position

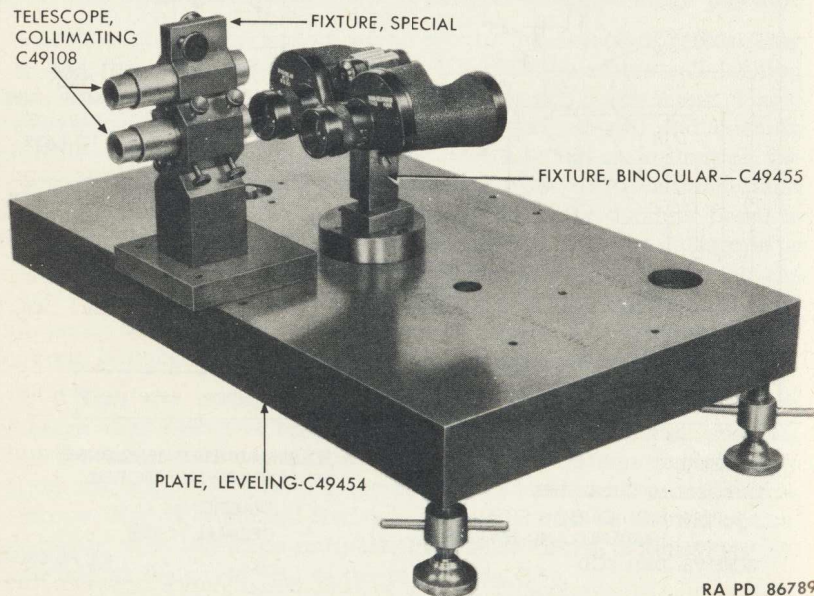






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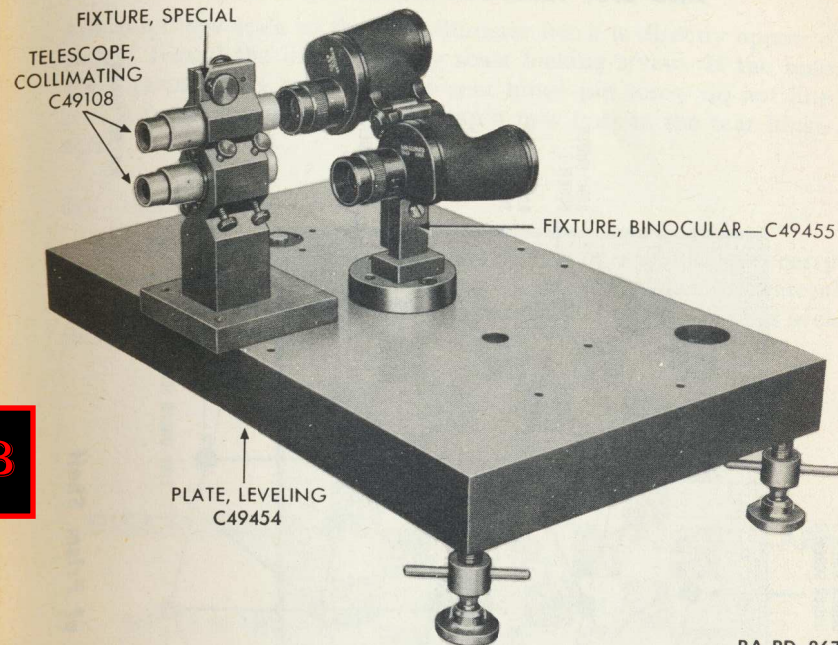
RA PD 86816

**Figure 27—Rotating Eccentric Cell and Bushing**

RA PD 86789

**Figure 28—Binocular and Fixture in Position for Collimating, Interpupillary Setting 57-mm**

## ADJUSTMENT AND REPAIR



RA PD 86793

**Figure 29—Binocular and Fixture in Position for Collimating, Interpupillary Setting 74-mm**

same as when using the two surface gages. This fixture will not be available until such time as it is listed in SNL F-272.

h. It must be remembered that a collimating telescope inverts and reverts the image so that the aiming point for the left telescope will be to the right of the true hinge position, and the aiming point for the right telescope will be to the left of the true hinge position.

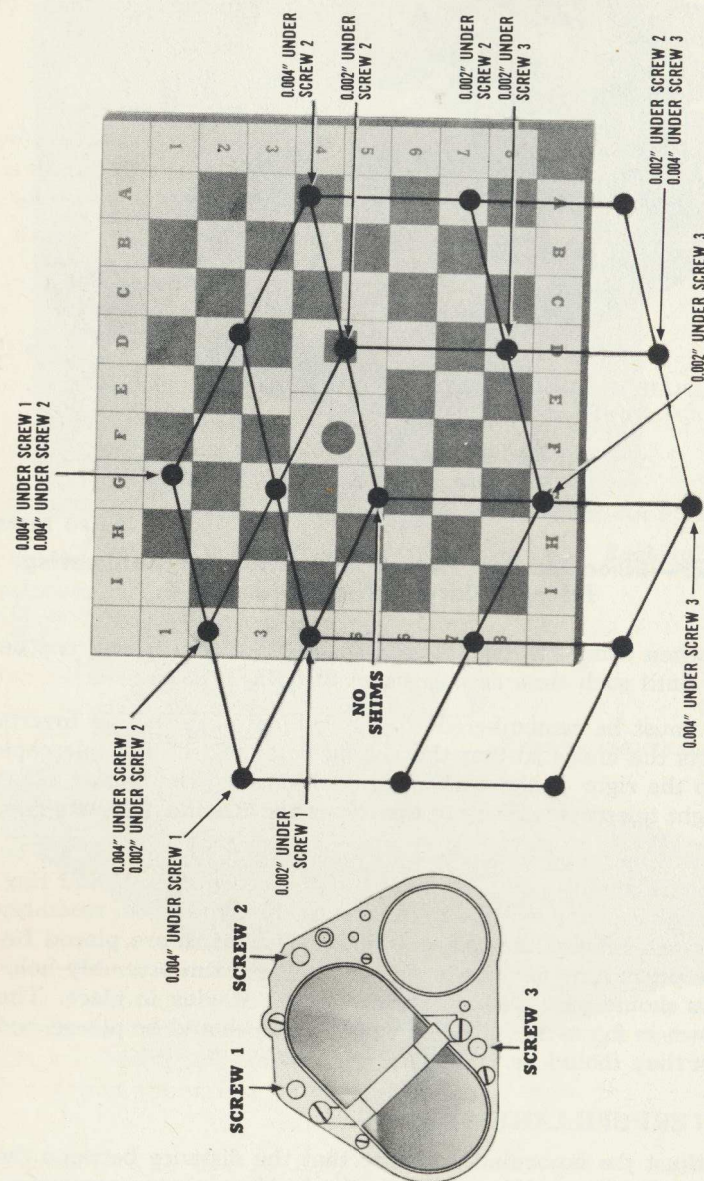
i. It will be found in some cases that the line of sight cannot be moved to the aiming point by means of the eccentric cell and ring. Should this happen, it will be necessary to shim the prism assembly so it is tipped toward the target. Shims, when used, are placed between the prism shelf and body supports. The prism assembly holding screws should pass through to insure their staying in place. The chart shown in figure 30 indicates where shims should be placed and how thick they should be.

**34. INTERPUPILLARY SETTING.**

a. Adjust the binocular bodies so that the distance between the outside of one part of the eyepiece to the inside of the corresponding part of the other eyepiece is 64 millimeters (2.52 inches). Set the



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RA PD 86694

Figure 30—Shimming of Prism Shelf

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## DISASSEMBLY AND ASSEMBLY OF BINOCULARS M2 AND M7

interpupillary scale so the 64-millimeter mark is directly opposite the index. Install the interpupillary scale locking screw. If the holes in the interpupillary scale and the rear hinge pin screw do not line up, it will be necessary to drill and tap a new hole in the rear hinge pin screw.

### 35. CARRYING CASE.

a. If, during the inspection, the straps or snaps of the carrying case were found to be damaged so as to make the case unserviceable, it will be necessary that the case be replaced. If the stitching is broken, this must be repaired.

## Section IV

## DISASSEMBLY AND ASSEMBLY OF BINOCULARS M2 AND M7

### 36. DISASSEMBLY.

a. **Remove and Disassemble Left Eyepiece Assembly** (figs. 31 and 32). Scribe a reference line showing relation of the eyepiece assembly to the body and remove eyepiece assembly. Remove eye guard. Remove screw which locks diopter scale clamping ring in place and remove ring. Remove screw which holds diopter scale in relation to eyelens and field lens cell and remove diopter scale. Remove eyelens and field lens cell retaining ring from eyepiece adapter and remove cell.

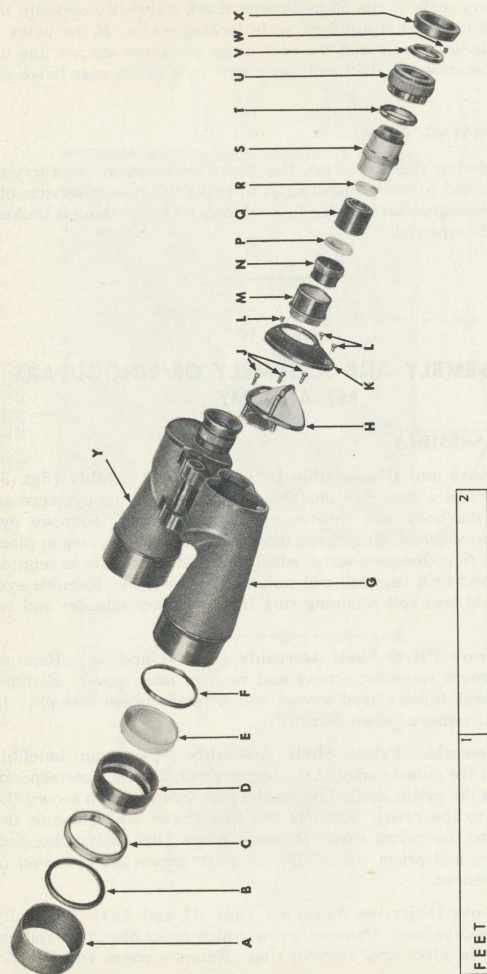
b. **Remove Prism Shelf Assembly** (figs. 31 and 32). Remove rear body cover retaining screws and remove body cover. Remove the three large fillister-head screws which retain prism assembly in position and remove prism assembly.

c. **Disassemble Prism Shelf Assembly.** Using an indelible pencil, mark the outside edge of the upper prism. Scribe a corresponding mark on the prism shelf. Loosen the four screws which secure the prism wire to the prism. Remove the two screws which secure the prism clip to the prism shelf. Remove prism clip, prism clip pad, shield, prism, and prism wire. **NOTE: Both prisms are removed in the same manner.**

d. **Remove Objective Assembly** (figs. 31 and 32). Manually unscrew objective cap. Remove screw which locks objective cell retaining ring in place and remove ring. Remove screw which locks



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Figure 31—Binocular M2—Left Telescope Disassembled

DISASSEMBLY AND ASSEMBLY OF BINOCULARS M2 AND M7

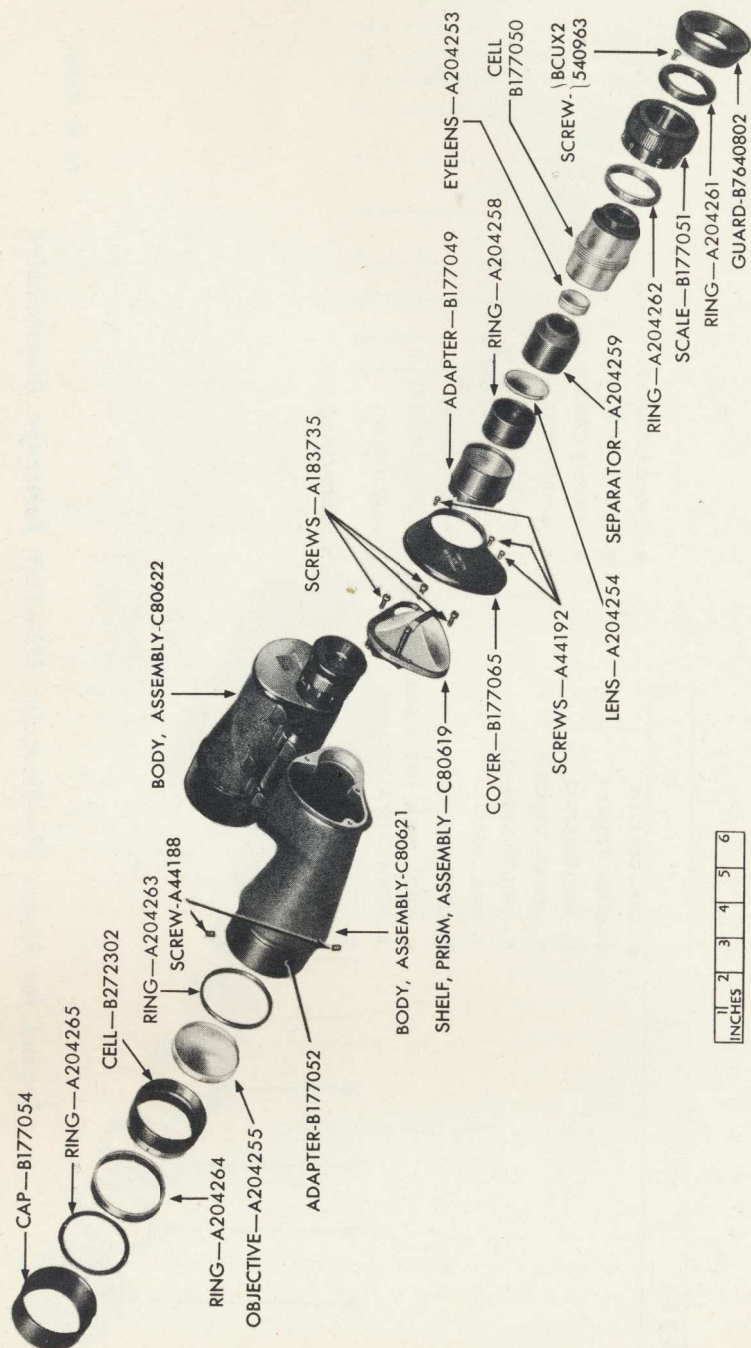
- |                                |                     |
|--------------------------------|---------------------|
| A—CAP—D28621-2                 | P—EYEPiece—D28623-3 |
| B—RING—D28621-4                | Q—SPACER—D28619-3   |
| C—RING—D28619-12               | R—EYEPiece—D28623-4 |
| D—MOUNT—D28621-3               | S—MOUNT—D28619-6    |
| E—OBJECTIVE—D28623-1           | T—RING—A204262      |
| F—RING—D28622-1                | U—RING—D28619-5     |
| G—BODY—D28562-1                | V—RING—A204261      |
| H—SHELF, PRISM, LEFT, ASSEMBLY | W—SCREW—A44191      |
| J—SCREWS—(3) A183735           | X—CAP—D28619-1      |
| K—COVER—D28620-5               | Y—BODY—D28563-1     |
| L—SCREWS—(3) A44192            |                     |
| M—ADAPTER—D28619-7             |                     |
| N—RETAINER—D28619-4            |                     |

RA PD 75656A

Legend for Figure 31—Binocular M2—Left Telescope Disassembled

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RA PD 75779

Figure 32—Binocular M7—Left Telescope Disassembled

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## DISASSEMBLY AND ASSEMBLY OF BINOCULARS M2 AND M7

eccentric bushing in place. Protect the objective lens with padding, apply pressure from the inside and rear of instrument, and force the objective assembly out of the objective adapter. Remove eccentric bushing from the eccentric cell.

e. **Remove Axle.** Remove interpupillary scale screw. Remove screw which holds interpupillary scale in place and lift off scale. Remove axle pin rear tension screws. Remove screw from axle front tension screw and remove tension screw. Remove axle tension rear screw. Using a brass drift and a small ball peen hammer, drive axle out of the hinge.

## 37. ASSEMBLY.

a. **Install Axle.** Lubricate axle and brass washers with special lubricating grease. Install as many brass washers as necessary to take up all play between the flanges. **NOTE:** The washers having holes with the larger diameter must be placed between the flanges next to the interpupillary scale. Place bottom of hinge lugs on a level surface and, using a brass drift and a small ball peen hammer, tap the axle into place. Install locating pin. Install and align axle tension front screw and adjust to the correct tension. Install screws in rear and front axle tension screws. Install interpupillary scale and locating screw.

b. **Assemble Objective** (figs. 31 and 32). If the objective assembly was disassembled, reassemble at this time. Apply a light coating of grease to the machined surface of the eccentric cell. Install eccentric ring on the eccentric cell.

c. **Install Objective Assembly** (figs. 31 and 32). Install the objective assembly in the objective adapter. Install screw which locks bushing in place. Seal objective cell and bushing with sealing compound. Install objective cell retaining ring and screw. Install objective cap.

d. **Assemble Prism Shelf Assembly.** Set the prism wire in place on the prism shelf under the four adjusting screws. Set the porro prism on the shelf, being careful to match the scribe marks made during disassembly. Place the shield, pad, and spring clip on the prism and secure all parts with the two screws. Install the other prism in the same manner. Adjust prism as explained in paragraph 31.

e. **Install Prism Shelf Assembly** (figs. 31 and 32). Place prism assembly in body of instrument. Install large fillister-head screws which secure the prism assembly in position. Apply a light coating of sealing compound around the inside of the body cover at the flange and place the cover in position on the body. Secure cover to the body with the retaining screws.



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f. Assemble and Install Left Eyepiece Assembly (figs. 31 and 32). If the eye and field lens cell assembly was disassembled, assemble at this time. Assemble eyelens and field lens cell to the eyepiece adapter. Install eyelens and field lens cell retaining ring. Place diopter scale in its proper relation to the eye and field lens cell and install screw. Install diopter scale retaining ring and screw. Replace eye guard. Apply a light coating of sealing compound on the flange of the eyepiece adapter, and screw adapter into place marked by the reference line made during disassembly.

## Section V

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## DISASSEMBLY AND ASSEMBLY OF BINOCULAR M13

### 38. DISASSEMBLY.

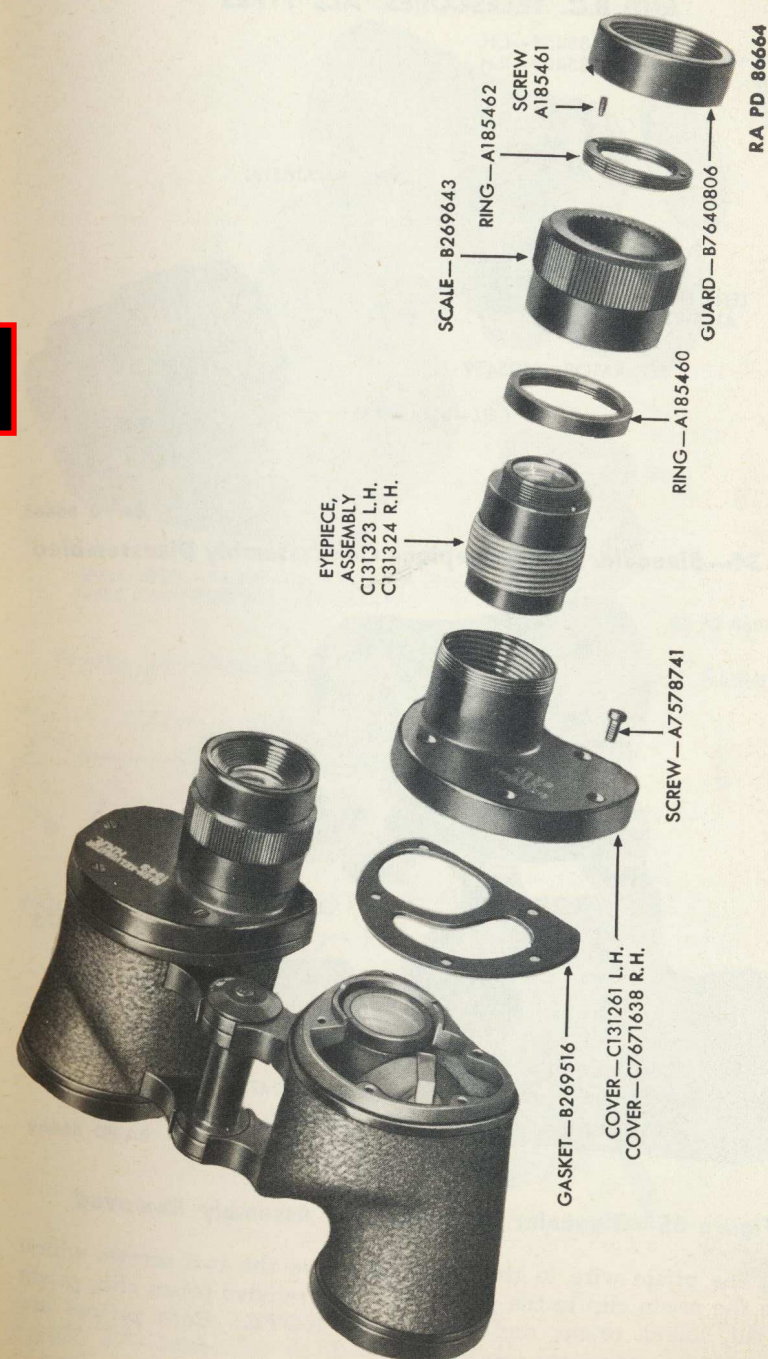
a. Remove and Disassemble Left Eyepiece Assembly (figs. 33 and 34). Remove eye guard. Remove dog-point screw which locks the diopter scale clamping ring on the eye and field lens cell. Unscrew clamping ring and remove diopter scale. Unscrew stop ring which retains eye and field lens cell in the cover. Remove eye and field lens cell. Scribe the starting point of one thread on the eyepiece cell assembly to the cover. Remove the five screws which secure the left body cover to the body of the instrument, and remove cover and gasket.

b. Remove Reticle Assembly (fig. 35). Scribe position of reticle to retaining ring, retaining ring to cell, and cell to prism shelf. Unscrew reticle retaining ring and remove reticle and reticle spacer. Unscrew reticle cell.

c. Remove Prism Shelf Assembly (fig. 36). Remove the three large fillister-head screws which secure the prism assembly in the body. Hold the binoculars with the neck strap loop toward the body; grasp the upper prism with the thumb and forefinger across the upper prism clip. Raise the prism shelf assembly until the locating pins are freed. Lift the assembly by raising the outside edge of the shelf until the shelf clears the outside body lug. Lift the prism shelf assembly the rest of the way out. Do not force the assembly during this operation, as there is danger of chipping the lower prism.

d. Disassemble Prism Shelf Assembly (fig. 37). Using an indelible pencil, mark the outside edge of the upper prism. Scribe a corresponding mark on the prism shelf. Loosen the four screws which

# DISASSEMBLY AND ASSEMBLY OF BINOCULAR M13

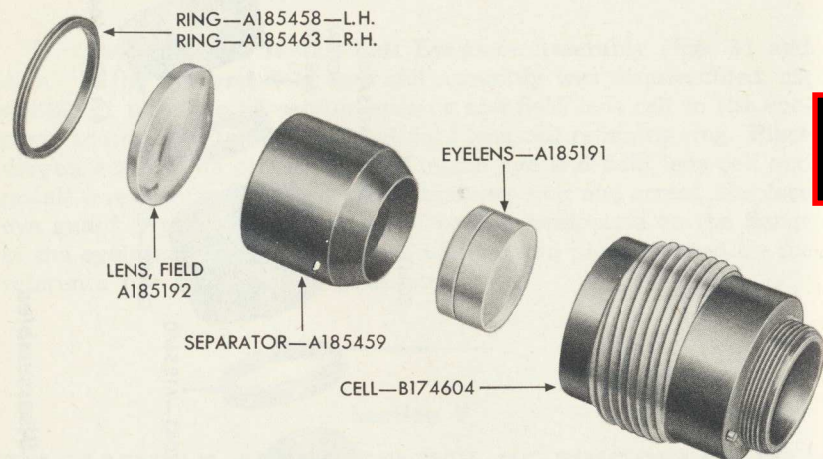


RA PD 86664

Figure 33—Binocular M13—Eyepiece Assembly Disassembled

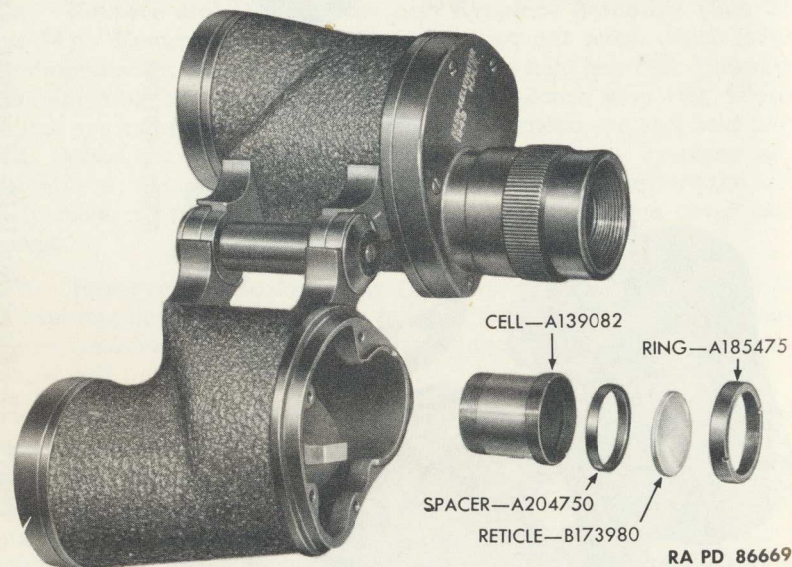


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RA PD 86665

**Figure 34—Binocular M13—Eyepiece Cell Assembly Disassembled**

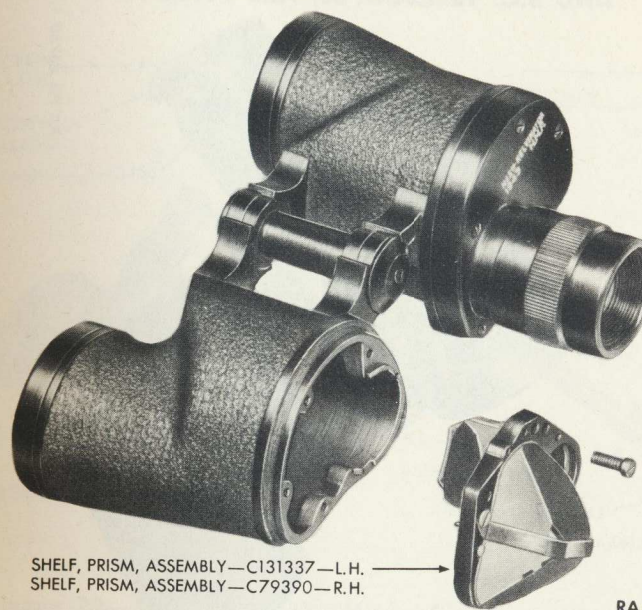


RA PD 86669

**Figure 35—Binocular M13—Reticle Assembly Removed**

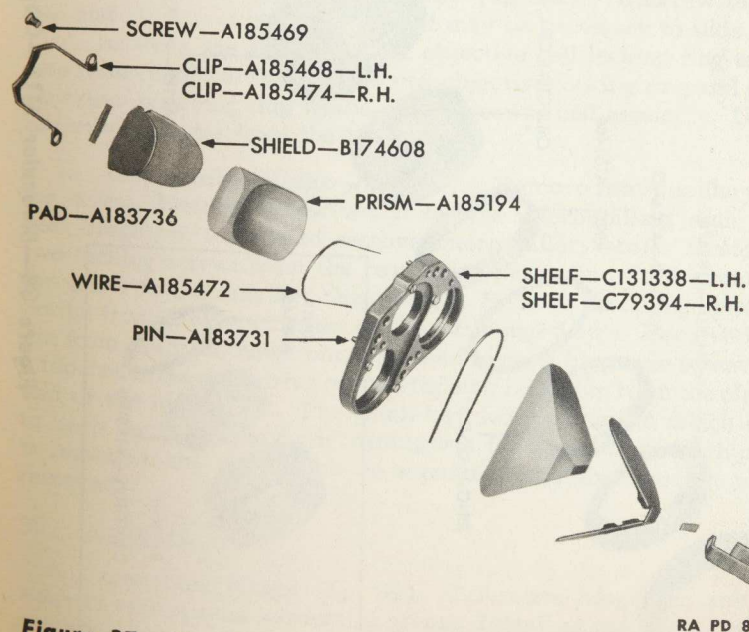
secure the prism wire to the prism. Remove the two screws which secure the prism clip to the prism shelf and remove prism clip, prism clip pad, shield, prism, and prism wire. **NOTE:** Both prisms are removed in the same manner.

# DISASSEMBLY AND ASSEMBLY OF BINOCULAR M13



RA PD 86671

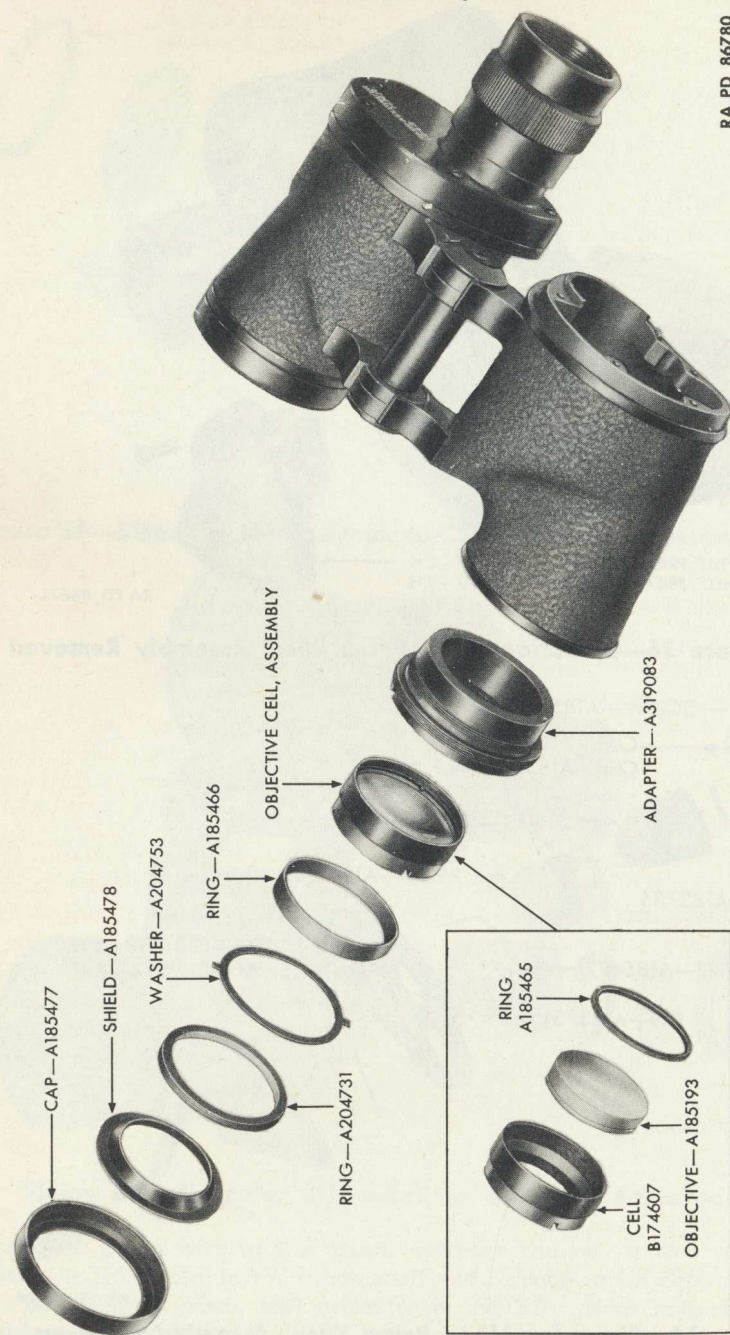
**Figure 36—Binocular M13—Prism Shelf Assembly Removed**



RA PD 86668

**Figure 37—Binocular M13—Prism Shelf Assembly Disassembled**



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Figure 38—Binocular M13—Objective Assembly Disassembled

## DISASSEMBLY AND ASSEMBLY OF BINOCULAR M13

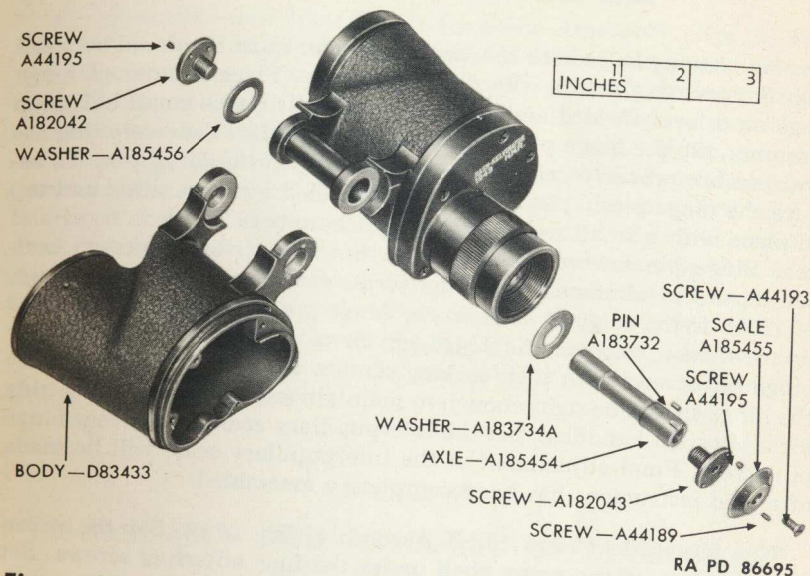


Figure 39—Binocular M13—Hinge Pin Assembly Disassembled

e. Remove Objective Assembly (fig. 38). Unscrew objective cap and remove objective shield. It may be necessary to slide a knife blade between the shield and the objective cell locking ring to facilitate removal of the shield. Unscrew objective locking ring and remove objective retaining ring washer and objective cell assembly. Unscrew objective adapter from the body.

f. Disassemble Hinge (fig. 39). Remove interpupillary locating screw. Remove screw which secures interpupillary scale to the rear hinge pin screw and remove interpupillary scale. Remove the two locking screws from the rear hinge pin screw. Scribe rear hinge pin screw to the rear left hinge flange. Remove rear hinge pin screw. Scribe front hinge pin screw to the left hinge flange. Remove locking pin from the front hinge pin screw and remove hinge pin screw. Using a tapered brass drift, drive out the tapered hinge pin from the objective end of the instrument. The small beveled locking pin which is used to keep the hinge pin from turning will fall out. When the hinge pin is removed, the bodies can be separated and the two flat washers removed.

## 39. ASSEMBLY.

a. Assemble Hinge (fig. 39). Lubricate hinge pin and brass washers with special lubricating grease. Install as many brass washers as necessary to take up all play between the flanges. NOTE: The



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washers having holes with the larger diameter must be placed between the flanges next to the interpupillary scale. Place bottom of hinge lugs on a level surface and, using a brass drift and a small ball peen hammer, tap the hinge pin into place. CAUTION: Take care that the washers are properly centered before driving in the hinge pin. To secure the hinge pin in place, install the beveled pin in position and tap in place with a small punch and a light hammer. Screw in front and rear hinge pin screws, making sure that the scribe marks on both screws are in alignment with the scribe marks on the hinge flange. NOTE: If the original holes in the hinge pin screws cannot be lined up, drill new holes in the hinge pin flanges. Secure front and rear hinge pin screws with their locking screws. At this point of assembly the hinge should be tight enough to maintain any interpupillary setting for all normal handling. Set the interpupillary scale on the rear hinge pin screw. Final adjustment of the interpupillary scale will be made after the instrument has been completely assembled.

b. Assemble Prism Shelf Assembly (fig. 37). Set the prism wire in place on the prism shelf under the four adjusting screws. Set the porro prism on the shelf, being careful to match the marks made during disassembly. Place the shield, pad, and spring clip on the prism and secure all parts in place with the two screws. Install the other prism in the same manner. Adjust prism shelf assembly as explained in paragraph 31.

c. Install Prism Shelf Assembly (fig. 36). Install prism shelf assembly in the body of the instrument and secure in place with the three fillister-head screws.

d. Assemble and Install Objective Cell Assembly (fig. 38). If the objective cell has been disassembled, place a small amount of optical lens sealing compound around the shoulder on the inside of the objective cell. Install the objective lens with the greater curvature facing the field. Screw in the objective lens retaining ring. Place the eccentric ring on the objective cell assembly. Place a small amount of optical lens sealing compound around the inside of the adapter and screw the adapter into the body of the instrument. Place the objective cell with the eccentric ring into the objective adapter. Install objective retaining ring washer and objective retaining ring.

e. Assemble and Install Reticle Assembly (fig. 35). Place the reticle spacer into the reticle cell. Install the reticle so that the etchings will be facing the eye and field lens. Install reticle retaining ring, making sure that the reticle is aligned to the scribe marks made during disassembly. Screw reticle assembly into the prism shelf assembly, making sure that the scribe marks are aligned.

## DISASSEMBLY AND ASSEMBLY OF BINOCULARS M15 AND M15A1

f. Assemble and Install Left Eyepiece Assembly (figs. 33 and 34). Place a thin coating of optical lens sealing compound around the lower shoulder of the telescope body. Place the body cover gasket in position and install the body cover. Install the five screws which secure the body cover to the body of the instrument. If the eyepiece cell assembly has been disassembled, assemble at this time. Lubricate the threads of the eye and field lens cell with the proper focusing nut lubricant. Install the eye and field lens cell in the body cover, making sure that the scribe marks made during disassembly are in alignment. Screw stop ring on the cover. Place diopter scale over the eye and field lens cell, making sure that the pins in the eye and field lens cell are engaged in the serrations of the diopter scale. Screw diopter scale clamping ring into place and secure with the locking screw. Screw the eye guard into place.

### Section VI

## DISASSEMBLY AND ASSEMBLY OF BINOCULARS M15 AND M15A1

### 40. DISASSEMBLY.

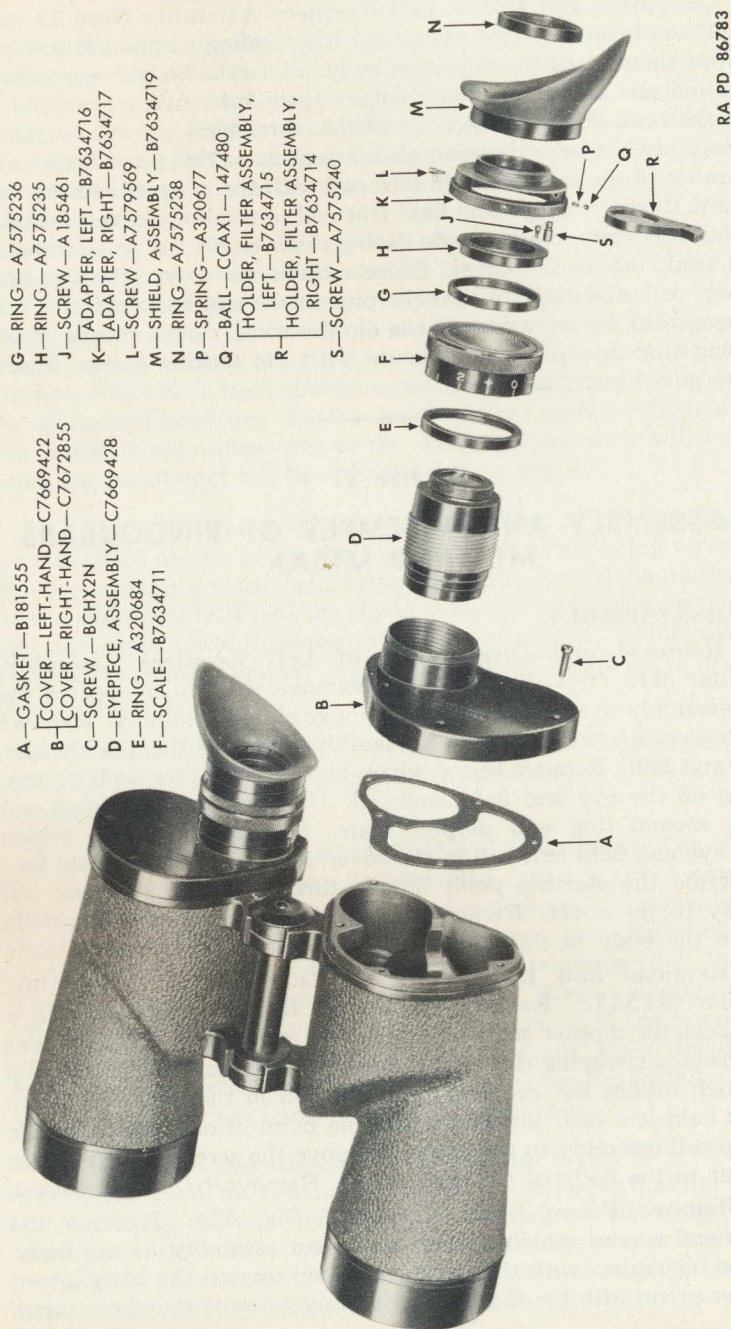
a. Removal and Disassembly of Left Eyepiece Assembly, Binocular M15 (figs. 40 and 41). Remove ring which secures the shield assembly to the adapter and remove shield assembly. Remove the two screws from the adapter assembly. Remove the filter holder, spring, and ball. Remove screw which locks the diopter scale clamping ring on the eye and field lens cell. Unscrew clamping ring and remove second ring and diopter scale. Unscrew stop ring which retains eye and field lens cell in the cover. Remove eye and field lens cell. Scribe the starting point of one thread on the eyepiece cell assembly to the cover. Remove screws which secure the left body cover to the body of the instrument and remove cover and gasket.

b. Removal and Disassembly of Left Eyepiece Assembly, Binocular M15A1. Remove eye guard. Remove dog-point screw which locks the diopter scale clamping ring on the eye and field lens cell. Unscrew clamping ring and remove diopter scale. Unscrew stop ring which retains the eye and field lens cell in the cover. Remove eye and field lens cell. Scribe the starting point of one thread on the eyepiece cell assembly to the cover. Remove the screws which secure the cover to the body of the instrument. Remove cover and gasket.

c. Remove Prism Shelf Assembly (fig. 42). Remove the fillister-head screws which secure the prism assembly in the body. Hold the binoculars with the neck strap loop toward the body; grasp the upper prism with the thumb and forefinger across the upper prism



ORDNANCE MAINTENANCE—BINOCULARS, FIELD GLASSES,  
AND B.C. TELESCOPES, ALL TYPES

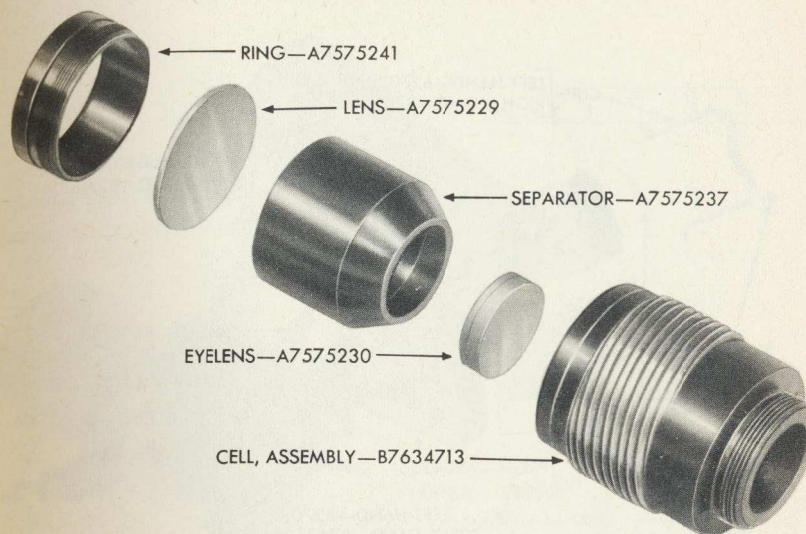


RA PD 86783

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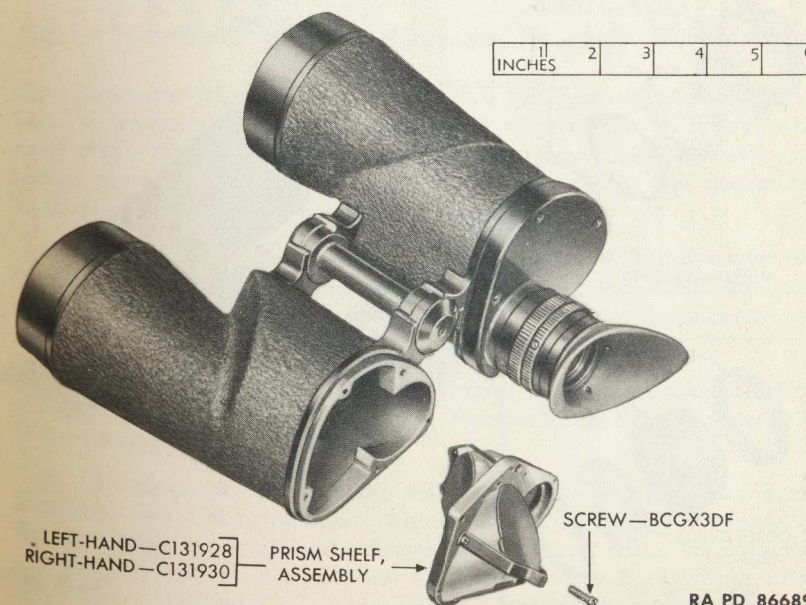
Figure 40—Binocular M15—Eyepiece Assembly Disassembled

DISASSEMBLY AND ASSEMBLY OF BINOCULARS M15 AND M15A1



RA PD 86688

Figure 41—Binocular M15—Eyepiece Cell Assembly Disassembled



RA PD 86689

Figure 42—Binocular M15—Prism Shelf Assembly Removed



# ORDNANCE MAINTENANCE—BINOCULARS, FIELD GLASSES, AND B.C. TELESCOPES, ALL TYPES

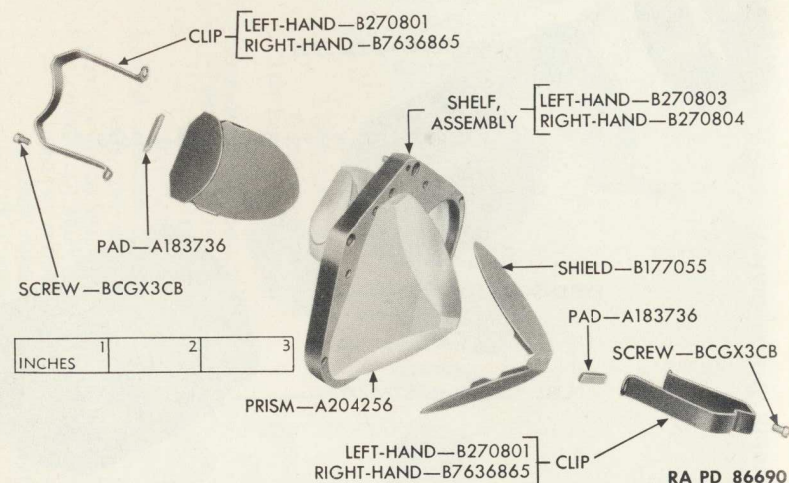


Figure 43—Binocular M15—Prism Shelf Assembly Disassembled

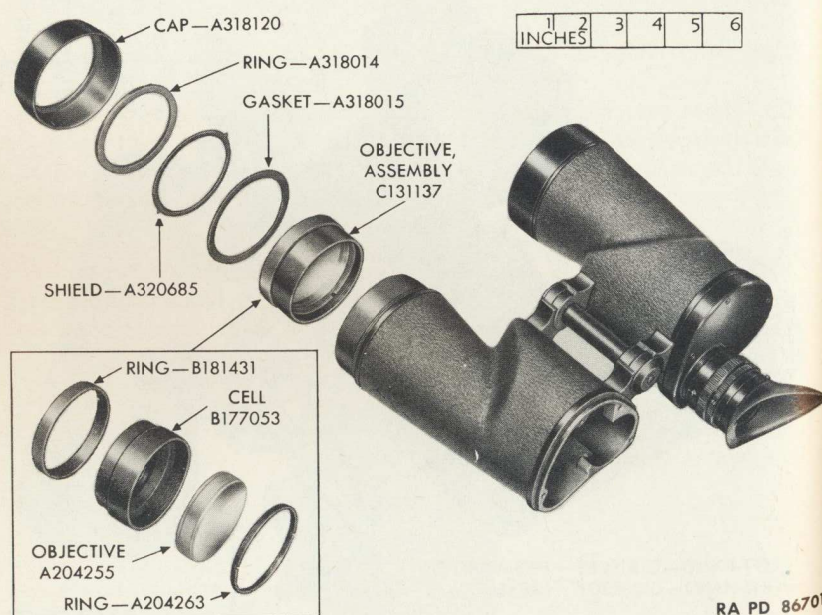


Figure 44—Binocular M15—Objective Assembly Removed

# DISASSEMBLY AND ASSEMBLY OF BINOCULARS M15 AND M15A1

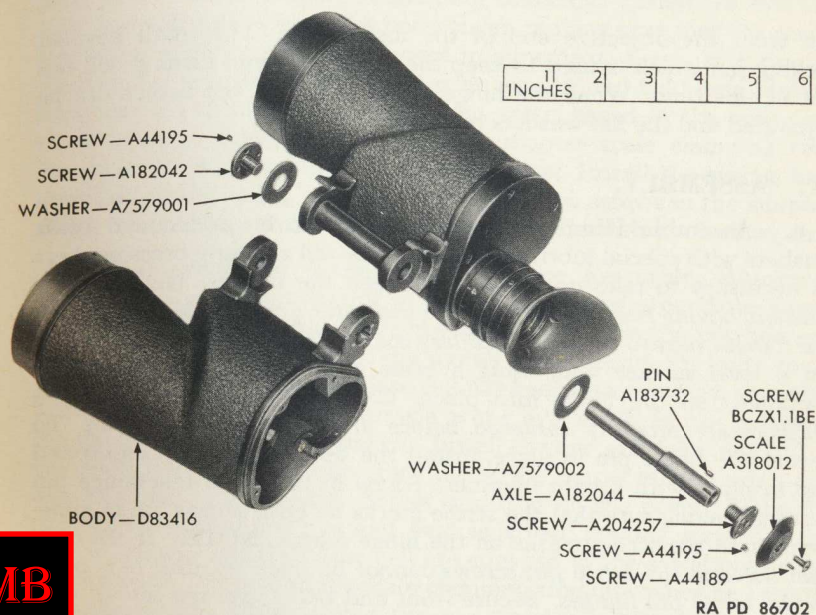


Figure 45—Binocular M15—Hinge Pin Assembly Disassembled

clip. Raise the prism shelf assembly until the locating pins are freed. Lift the assembly by raising the outside edge of the shelf until the shelf clears the outside body lug. Lift the prism shelf assembly the rest of the way out. Do not force the assembly during this operation, as there is danger of chipping the lower prism.

d. **Disassemble Prism Shelf Assembly** (fig. 43). Remove the two screws which secure the prism clip to the prism shelf. Remove prism clip, prism clip pad, and prism shield. The prisms are cemented to the shelf and need not be removed.

e. **Remove Objective Assembly** (fig. 44). Unscrew objective cap. Remove ring, shield, and gasket. Remove objective cell assembly. Remove ring from cell assembly.

f. **Disassemble Hinge** (fig. 45). Remove interpupillary scale locating screw. Remove screw which secures interpupillary scale to the rear hinge pin screw and remove interpupillary scale. Remove the two locking screws from the rear hinge pin screw. Scribe rear hinge pin screw to the rear left hinge flange. Remove locking screw from the front hinge pin screw and remove hinge pin screw. Using a tapered brass drift and a small ball peen hammer, drive out the tapered hinge



# ORDNANCE MAINTENANCE—BINOCULARS, FIELD GLASSES, AND B.C. TELESCOPES, ALL TYPES

pin from the objective end of the instrument. The small beveled locking pin which is used to keep the hinge pin from turning will fall out at this time. When the hinge pin is removed, the bodies can be separated and the flat washers removed.

## 41. ASSEMBLY.

a. **Assemble Hinge** (fig. 45). Lubricate hinge pin and brass washers with special lubricating grease. Install as many brass washers as necessary to take up all play between the flanges. **NOTE:** *The washers having holes with the larger diameter must be placed between the flanges next to the interpupillary scale.* Place bottom of hinge lugs on a level surface and, using a brass drift and a small ball peen hammer, tap the hinge into place. **CAUTION:** *Be sure that the washers are properly centered before driving in the hinge pin.* To secure the hinge pin in place, install the beveled pin in position and tap in place with a light hammer. Screw in front and rear hinge pin screws, making sure that the scribe marks on both screws are in alignment with the scribe marks on the hinge flange. **NOTE:** *If the original holes in the hinge pin screws cannot be lined up, drill new holes in the hinge pin flanges.* Secure front and rear hinge pin screws with their locking screws. At this point of assembly, the hinge should be tight enough to maintain any interpupillary setting for all normal handling. Set the interpupillary scale on the rear hinge pin screw. Final adjustment of the interpupillary scale will be made after the instrument has been completely assembled.

b. **Assemble Prism Shelf Assembly** (fig. 43). Place the shield, pad, and spring clip on the prism and secure all parts with the two screws.

c. **Install Prism Shelf Assembly** (fig. 42). Install prism shelf assembly in the body of the instrument and secure in place with the fillister-head screws.

d. **Assemble and Install Objective Cell Assembly** (fig. 44). If the objective cell has been disassembled, assemble at this time. Install objective cell assembly in the instrument. Slide the ring over the objective cell. Install gasket, shield, and ring. Screw on the objective cap.

e. **Assemble and Install Left Eyepiece Assembly, Binocular M15** (figs. 42 and 43). Place a thin coating of sealing compound around the shoulder of the telescope body. Place the body cover gasket in position and install body cover. Install screws which secure body cover to the instrument. If the eyepiece cell has been disassembled, assemble at this time. Lubricate the threads of the eye-

# DISASSEMBLY AND ASSEMBLY OF BINOCULAR M17

piece cell with the proper focusing nut lubricant. Install the eye and field lens cell assembly in the body cover, making sure that the scribe marks made during disassembly are in alignment. Screw stop ring on the cover. Place the diopter scale over the eye and field lens, making sure that the pins in the eyepiece cell are engaged in the serrations of the diopter scale. Install ring and diopter scale clamping ring. Secure clamping ring with the locking screw. Install the spring, ball, and filter holder in the adapter. Install the two screws in the adapter. Place the shield assembly in position and secure with the locking ring.

f. **Assemble and Install Left Eyepiece Assembly, Binocular M15A1.** Place a thin coating of sealing compound around the shoulder of the telescope body. Place the body cover gasket in position and install the body cover. Install the screws which secure the body cover to the instrument. If the eyepiece cell has been disassembled, assemble at this time. Lubricate the threads of the eye and field lens cell with the proper focusing nut lubricant. Install the eye and field lens cell in the body cover, making sure that the scribe marks made during disassembly are in alignment. Screw stop ring on the cover. Place the diopter scale over the eye and field lens cell, making sure that the pins in the eye and field lens cell are engaged in the serrations of the diopter scale. Screw diopter scale clamping ring into place and secure with the locking screw. Screw the eye guard into place.

## Section VII

# DISASSEMBLY AND ASSEMBLY OF BINOCULAR M17

## 42. DISASSEMBLY.

a. **Remove and Disassemble Left Eyepiece Assembly** (figs. 46 and 47). Remove eye guard. Remove dog-point screw which locks the diopter scale clamping ring on the eye and field lens cell. Unscrew clamping ring and remove diopter scale. Unscrew stop ring which retains eye and field lens cell in the cover. Remove eye and field lens cell. Scribe the starting point of one thread on the eyepiece cell assembly to the cover. Remove the screws which secure the body cover to the body of the instrument and remove cover and gasket.

b. **Remove and Disassemble Reticle Assembly** (fig. 48). Unscrew reticle assembly from the instrument. Scribe position of reticle to retaining ring, and retaining ring to cell. Unscrew reticle retaining ring and remove reticle and reticle spacer.

c. **Remove Prism Shelf Assembly** (fig. 49). Remove the fillister-head screws which secure the prism assembly in the body of the instrument. Hold the binoculars with the neck strap loop toward the



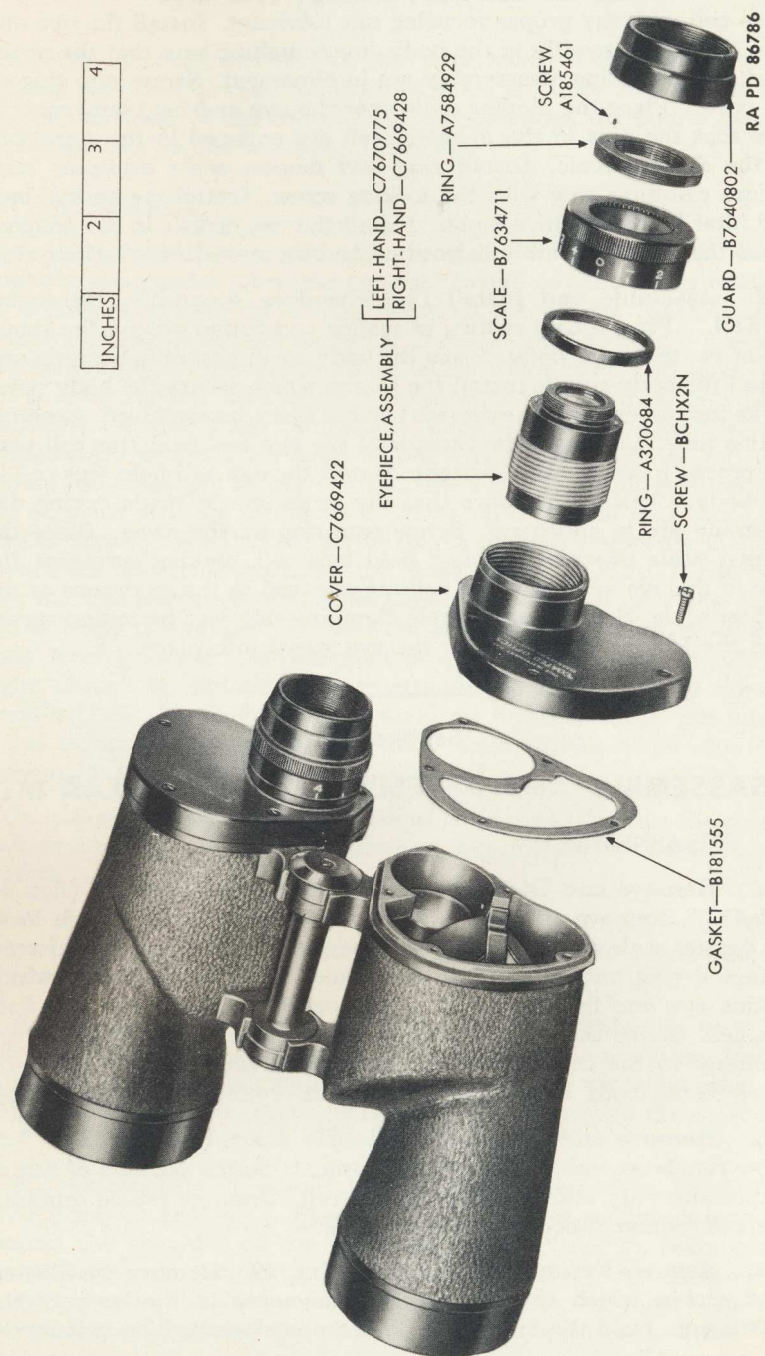
ORDNANCE MAINTENANCE—BINOCULARS, FIELD GLASSES,  
AND B.C. TELESCOPES, ALL TYPES

Figure 46—Binocular M17—Eyepiece Assembly and Cover Removed

## DISASSEMBLY AND ASSEMBLY OF BINOCULAR M17

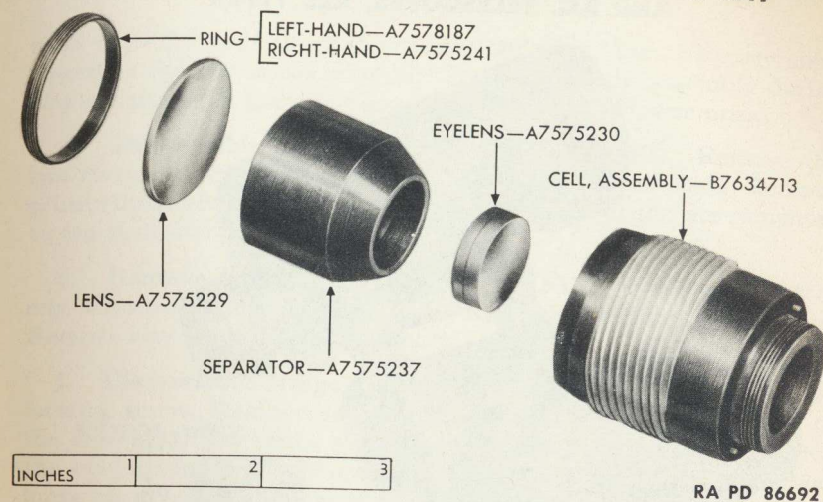


Figure 47—Binocular M17—Eyepiece Assembly Disassembled

RA PD 86692

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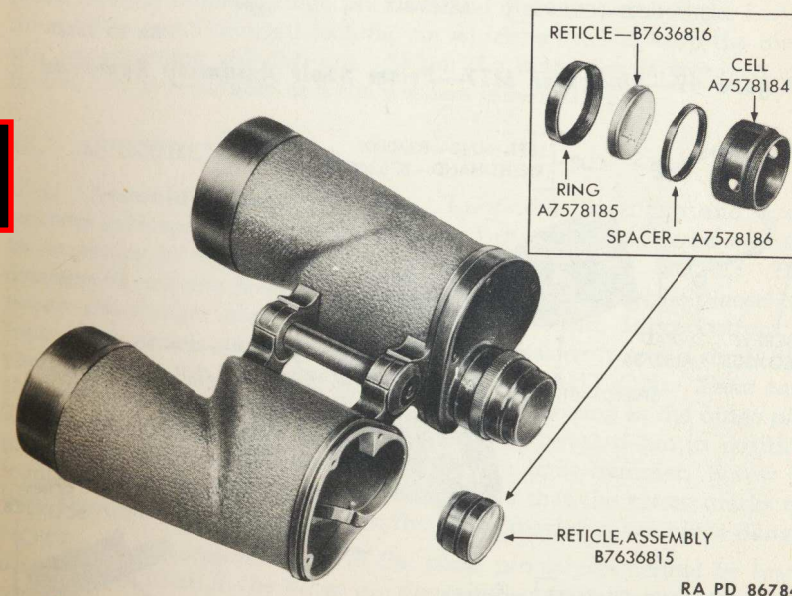
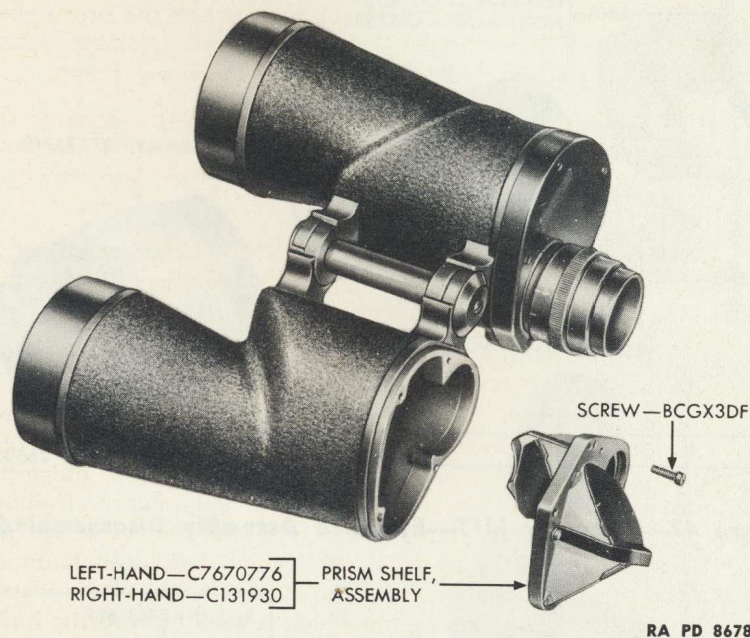


Figure 48—Binocular M17—Reticle Assembly Removed

RA PD 86784

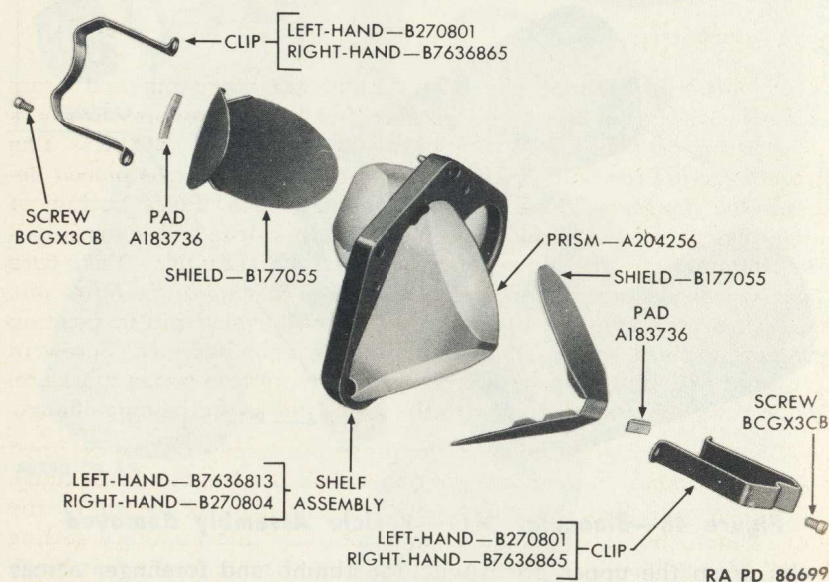
body; grasp the upper prism with the thumb and forefinger across the upper prism clip. Raise the prism shelf assembly until the locating pins are freed. Lift the assembly by raising the outside edge of the



ORDNANCE MAINTENANCE—BINOCULARS, FIELD GLASSES,  
AND B.C. TELESCOPES, ALL TYPES

RA PD 86781

Figure 49—Binocular M17—Prism Shelf Assembly Removed



RA PD 86699

Figure 50—Binocular M17—Prism Shelf Assembly Disassembled

## DISASSEMBLY AND ASSEMBLY OF BINOCULAR M17

shelf until the shelf clears the outside body lug. Lift the prism shelf assembly the rest of the way out. Do not force the assembly during this operation, as there is danger of chipping the lower prism.

d. **Disassemble Prism Shelf Assembly** (fig. 50). Remove the two screws which secure the prism clip to the prism shelf. Remove prism clip, prism clip pad, and prism shield. The prisms are cemented to the shelf and need not be removed.

e. **Remove Objective Assembly** (fig. 51). Unscrew objective cap. Remove ring, shield, and gasket. Remove objective cell assembly. Remove ring from the cell assembly.

f. **Disassemble Hinge** (fig. 52). Remove interpupillary scale locating screw. Remove screw which secures interpupillary scale to the rear hinge pin screw and remove interpupillary scale. Remove the two locking screws from the rear hinge pin screw. Scribe rear hinge pin screw to the rear left hinge flange. Remove rear hinge pin screw. Scribe front hinge pin screw to the left hinge flange. Remove locking pin from the front hinge pin screw and remove hinge pin screw. Using a tapered brass drift and a small ball peen hammer, drive out the tapered hinge pin from the objective end of the instrument. The small beveled locking pin which is used to keep the hinge pin from turning will fall out. When the hinge pin is removed, the bodies can be separated and the washers removed.

## 43. ASSEMBLY.

a. **Assemble Hinge** (fig. 52). Lubricate hinge pin and brass washers with special lubricating grease. Install as many brass washers as necessary to take up all play between the flanges. **NOTE: The washers having the holes with the larger diameter must be placed between the flanges next to the interpupillary scale.** Place bottom of hinge lugs on a level surface and, using a brass drift and a small ball peen hammer, tap the hinge pin into place. **CAUTION: Take care that the washers are properly centered before driving in the hinge pin.** To secure the hinge pin in place, install the beveled pin in position and tap in place with a small punch and a light hammer. Screw in front and rear hinge pin screws, making sure that the scribe marks on both screws are in alignment with the scribe marks on the hinge flange.

**NOTE: If the original holes in the hinge pin screws cannot be lined up, drill new holes in the hinge pin flanges.** Secure front and rear hinge pin screws with their locking screws. At this point of assembly, the hinge should be tight enough to maintain any interpupillary setting for all normal handling. Set the interpupillary scale on the rear hinge pin screw. Final adjustment of the interpupillary scale will be made after the instrument has been completely assembled.

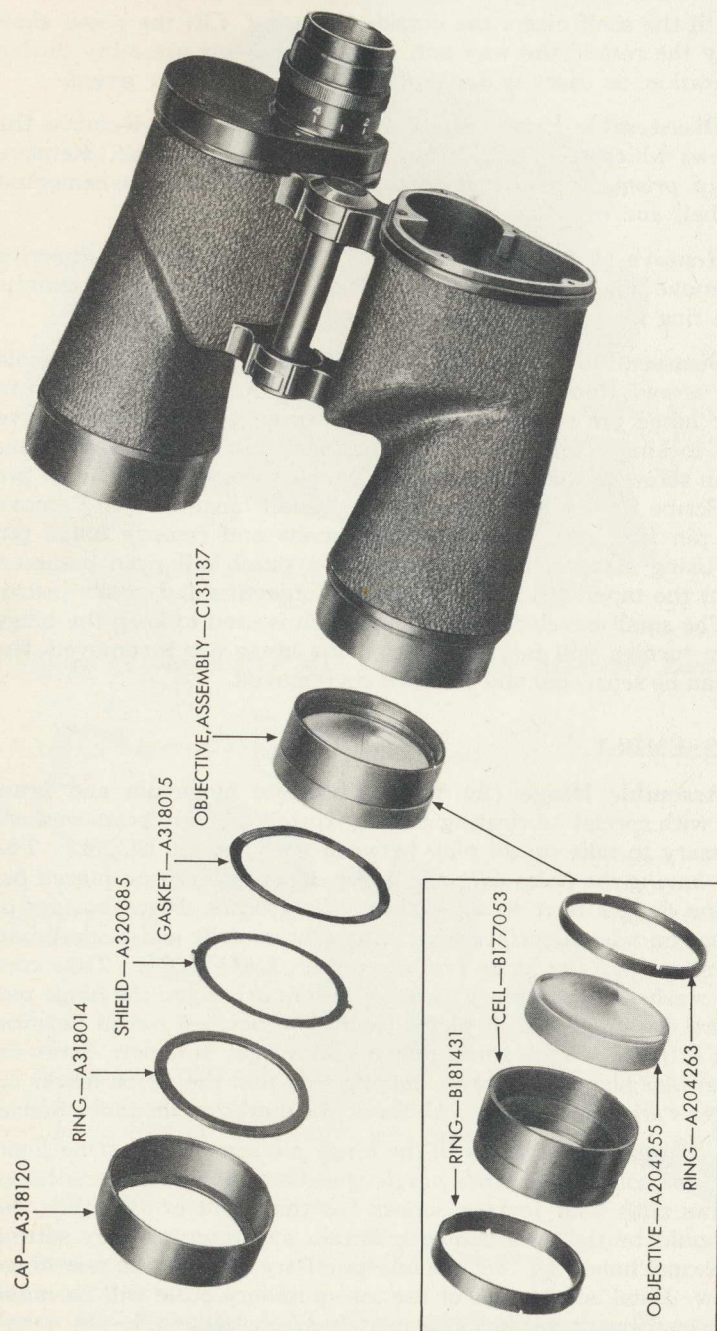


ORDNANCE MAINTENANCE—BINOCULARS, FIELD GLASSES,  
AND B.C. TELESCOPES, ALL TYPES

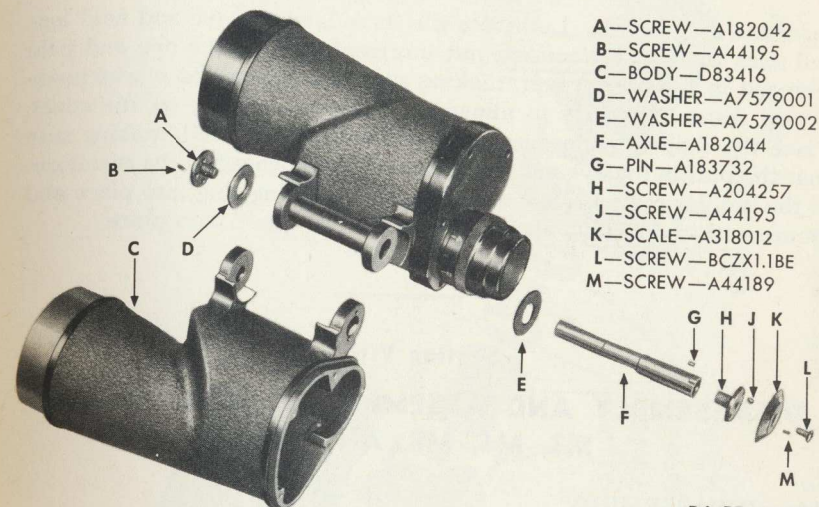
RA PD 86785

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Figure 51—Binocular M17—Objective Cell Removed



## DISASSEMBLY AND ASSEMBLY OF BINOCULAR M17



RA PD 86788

Figure 52—Binocular M17—Hinge Pin Assembly Disassembled

b. Assemble Prism Shelf Assembly (fig. 50). Place the shield, pad, and spring clip on the prism and secure all parts with the two screws.

c. Install Prism Shelf Assembly (fig. 49). Install prism shelf assembly in the body of the instrument and secure in place with the fillister-head screws.

d. Assemble and Install Objective Cell Assembly (fig. 51). If the objective cell has been disassembled, assemble at this time. Install objective cell assembly in the instrument. Slide the ring over the objective cell. Install gasket, shield, and ring. Screw on the objective cap.

e. Assemble and Install Reticle Assembly (fig. 48). Place the reticle spacer in the reticle cell. Install the reticle so that the etchings will be facing the eye and field lens. Install reticle retaining ring, making sure that the reticle is aligned to the scribe marks made during disassembly. Screw reticle assembly into the prism shelf assembly, making sure that the scribe marks are aligned.

f. Assemble and Install Left Eyepiece Assembly (figs. 46 and 47). Place a thin coating of sealing compound around the shoulder of the telescope body. Place the body cover gasket in position and install the body cover. Install the screws which secure the body cover to the body of the instrument. If the eyepiece cell has been disassembled,



# ORDNANCE MAINTENANCE—BINOCULARS, FIELD GLASSES, AND B.C. TELESCOPES, ALL TYPES

assemble at this time. Lubricate the threads of the eye and field lens cell with the proper focusing nut lubricant. Install the eye and field lens cell in the body cover, making sure that the scribe marks made during disassembly are in alignment. Screw stop ring on the cover. Place the diopter scale over the eye and field lens cell, making sure that the pins in the eye and field lens cell are engaged in the serrations of the diopter scale. Screw diopter scale clamping ring into place and secure with the locking screw. Screw the eye guard into place.

## Section VIII

### DISASSEMBLY AND ASSEMBLY OF BINOCULARS M3, M6, M8, AND M9

#### 44. DISASSEMBLY.

a. **Remove and Disassemble Left Eyepiece Assembly (fig. 54).** Remove eye guard. Remove screw which locks the diopter scale clamping ring to the eyepiece cell and remove clamping ring. Lift off diopter scale. Unscrew the eyepiece adapter from the body of the instrument. Unscrew the stop ring from the eyepiece adapter. Remove the eye and field lens cell from the eyepiece adapter. Remove the two screws which secure cover to the body and remove cover.

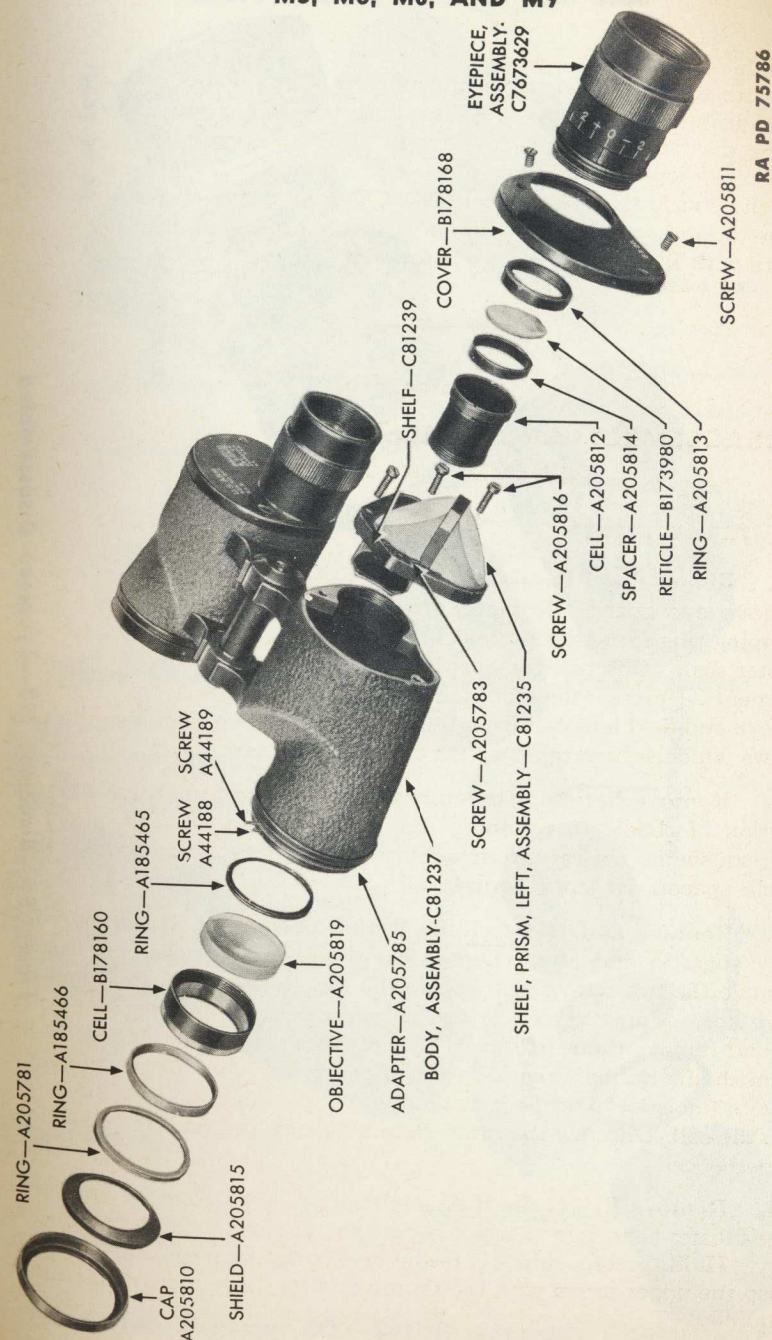
b. **Remove Reticle, Binoculars M6, M8, and M9 Only.** Scribe position of reticle to retaining ring, retaining ring to cell, and cell to prism shelf. Unscrew reticle retaining ring and remove reticle and reticle spacer. Unscrew reticle cell.

c. **Remove and Disassemble Reticle Assembly, Binocular M3 Only (figs. 55 and 56).** Loosen clamping screw in the reticle cell. Remove the two screws that secure the key to the prism shelf and remove key. Turn the reticle cell counterclockwise to clear the body lug and remove the reticle cell. Unscrew the reticle adapter from the prism shelf. Scribe a mark on top of the reticle retaining ring to line up with the left end of the horizontal mil scale; continue this line down onto the cell. Unscrew the reticle retaining ring and remove the reticle from the cell.

d. **Remove Prism Shelf Assembly (fig. 55).** Remove the three large fillister-head screws which secure the prism shelf assembly in the body. Hold the binoculars with the neck strap loop toward the body. Grasp the upper prism with the thumb and forefinger across the upper prism clip. Raise the prism shelf assembly until the locating pins are

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### DISASSEMBLY AND ASSEMBLY OF BINOCULARS M3, M6, M8, AND M9



RA PD 75786

Figure 53—Binocular M8—Left Objective and Reticle Disassembled



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AND B.C. TELESCOPES, ALL TYPES

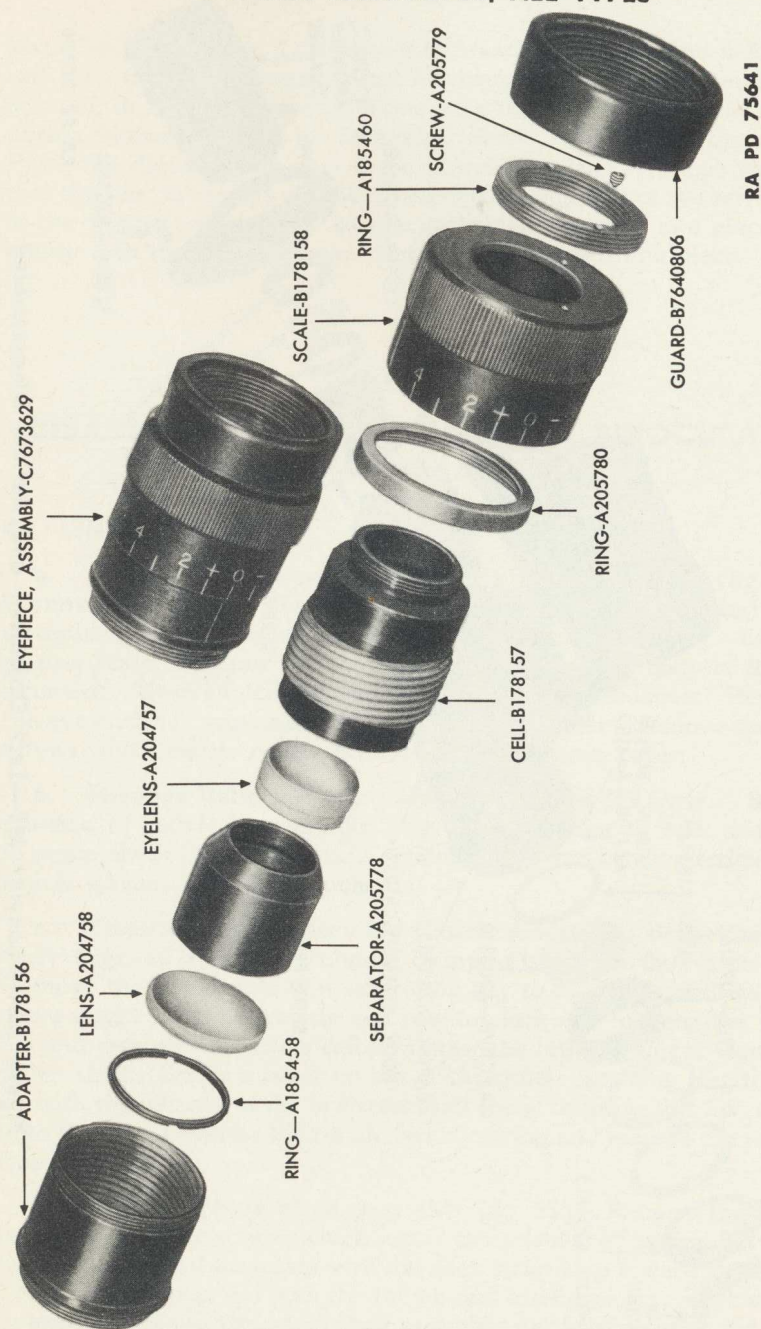


Figure 54—Binocular M8—Eyepiece Disassembled

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DISASSEMBLY AND ASSEMBLY OF BINOCULARS  
M3, M6, M8, AND M9

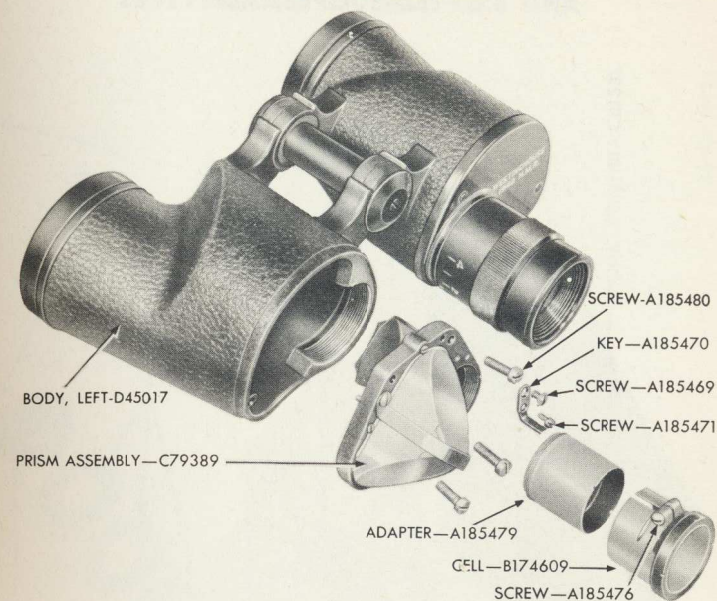


Figure 55—Binocular M3—Reticle and Prism Removal

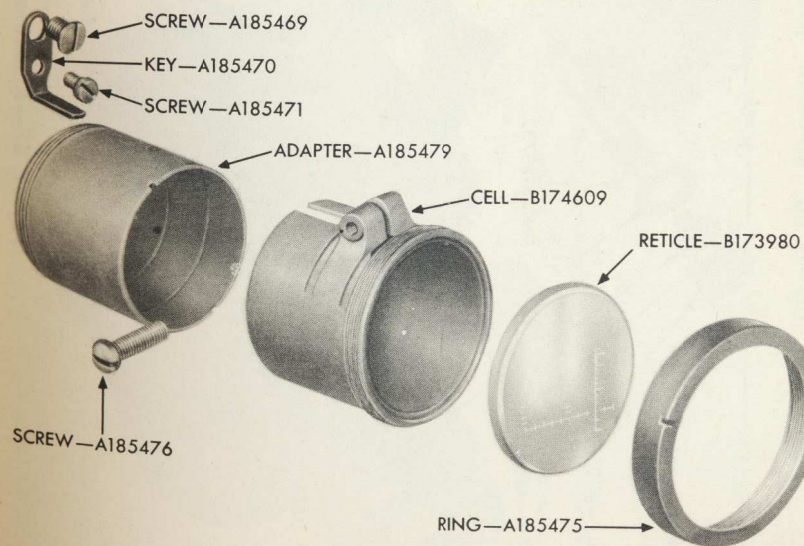
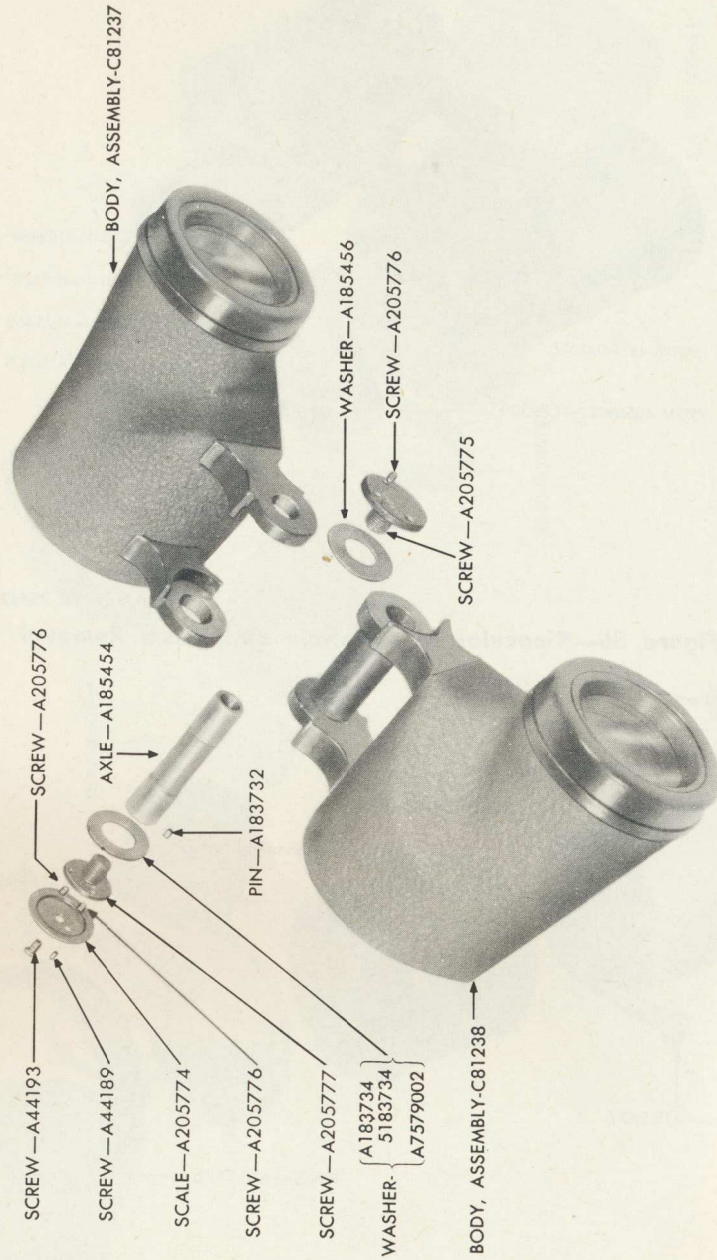


Figure 56—Binocular M3—Reticle Assembly Disassembled



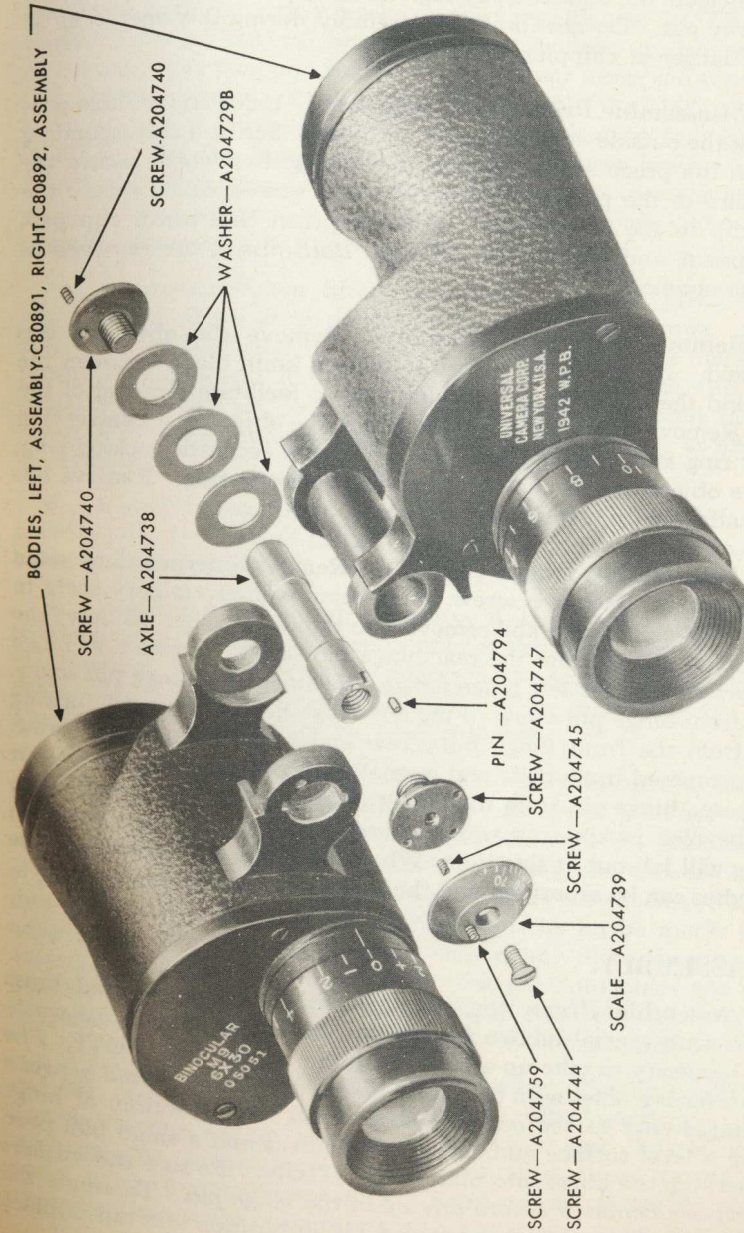
ORDNANCE MAINTENANCE—BINOCULARS, FIELD GLASSES,  
AND B.C. TELESCOPES, ALL TYPES



RA PD 75708

Figure 57—Binocular M8—Axle Removed

DISASSEMBLY AND ASSEMBLY OF BINOCULARS  
M3, M6, M8, AND M9



RA PD 75634

Figure 58—Binocular M9—Axle Assembly Removed



# ORDNANCE MAINTENANCE—BINOCULARS, FIELD GLASSES, AND B.C. TELESCOPES, ALL TYPES

freed. Lift the assembly by raising the outside edge of the shelf until the shelf clears the outside body lug. Lift the prism assembly the rest of the way out. Do not force the assembly during this operation, as there is danger of chipping the prism.

**e. Disassemble Prism Shelf Assembly.** Using an indelible pencil, mark the outside edge of the upper prism. Scribe a corresponding mark on the prism shelf. Loosen the four screws which secure the prism wire to the prism. Remove the two screws which secure the prism clip to the prism shelf. Remove prism clip, prism clip pad, shield, prism, and prism wire. *NOTE: Both prisms are removed in the same manner.*

**f. Remove Objective Assembly.** Remove the objective cap and shield. It may be necessary to slide a knife blade between the shield and the objective cell locking ring to facilitate removal of the shield. Remove the two screws which lock the objective eccentric ring locking ring and the objective cell. Remove eccentric locking ring. Remove objective cell and the objective eccentric ring. Remove objective adapter from the body.

**g. Disassemble Hinge (fig. 57).** Remove interpupillary scale locating screw. Remove screw which secures interpupillary scale to the rear hinge pin screw and remove interpupillary scale. Remove the two locking screws from the rear hinge pin screw. Scribe rear hinge pin screw to the rear left hinge flange. Remove rear hinge pin screw. Scribe front hinge pin screw to the left hinge flange. Remove locking screw from the front hinge pin screw and remove hinge pin screw. Using a tapered brass drift and a small ball peen hammer, drive out the tapered hinge pin from the objective end of the instrument. The small beveled locking pin which is used to keep the hinge pin from turning will fall out at this time. When the hinge pin is removed, the two bodies can be separated and the brass washers removed.

## 45. ASSEMBLY.

**a. Assemble Hinge (fig. 57).** Lubricate hinge pin and brass washers with special lubricating grease. Install as many brass washers as necessary to take up all play between the flanges. *NOTE: The washers having holes with the larger diameter must be placed between the flanges next to the interpupillary scale.* Place bottom of hinge lugs on a level surface and, using a brass drift and a small ball peen hammer, tap the hinge into place. *CAUTION: Be sure the washers are properly centered before driving in the hinge pin.* To secure the hinge pin in place, place the beveled pin in position and tap in place

# DISASSEMBLY AND ASSEMBLY OF BINOCULARS M3, M6, M8, AND M9

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with a small punch and a light hammer. Screw in front and rear hinge pin screws, making sure that the scribe marks on both screws are in alignment with the scribe marks on the hinge flange. *NOTE: If the original holes in the hinge pin screws cannot be lined up, drill new holes in the hinge pin flanges.* Secure front and rear hinge pin screws with their locking screws. At this point of assembly the hinge should be tight enough to maintain any interpupillary setting for all normal handling. Set the interpupillary scale on the rear hinge pin screw. Install the large screw which secures the scale to the rear hinge pin screw. Final adjustment of the interpupillary scale will be made when the instrument has been completely assembled.

**b. Assemble Prism Shelf Assembly.** Set the prism wire in place on the prism shelf under the four adjusting screws. Set the porro prism on the shelf, being careful to match the scribe marks made during disassembly. Place the shield, pad, and spring clip on the prism and secure all parts with the two screws. Install the other prism in the same manner. Adjust prism shelf assembly as explained in paragraph 31.

**c. Install Prism Shelf Assembly (fig. 55).** Install prism shelf assembly in the body of the instrument and secure in place with the three fillister-head screws.

**d. Assemble and Install Objective Assembly.** If the objective assembly was disassembled, reassemble at this time. Install objective cell assembly into the objective adapter and secure with the retaining ring. Tighten the two screws. *NOTE: This assembly must not be sealed until the instrument has been collimated.*

**e. Assemble and Install Reticle Assembly, Binocular M3 Only (figs. 55 and 56).** Place reticle on the reticle cell with the etchings facing the eye and field lens. Secure reticle with the retaining ring. Align the scribe marks on the cell and retaining ring with the left end of the horizontal mil scale of the reticle. Install the reticle cell adapter into place in the prism shelf, making sure the scribe marks on the adapter and the prism shelf are in alignment. Slide the reticle cell assembly into place on the adapter. Set key into place and secure with the two screws. Tighten the reticle cell clamping screw. *NOTE: Adjustment for tilt of reticle will be made as in paragraph 32.*

**f. Assemble and Install Reticle Assembly, Binoculars M6, M8, and M9.** Place reticle spacer in the reticle cell. Install the reticle so that the etchings will be facing the eye and field lens. Screw in reticle retaining ring, making sure that the reticle is aligned to the scribe marks made during disassembly. Screw reticle assembly into the prism shelf assembly, making sure that the scribe marks are aligned.



# ORDNANCE MAINTENANCE—BINOCULARS, FIELD GLASSES, AND B.C. TELESCOPES, ALL TYPES

g. **Install Body Cover** (fig. 54). Place a light coating of sealing compound around the inside of the body cover. Place the cover in position on the telescope and press down firmly. Secure with the two screws.

h. **Assemble and Install Left Eyepiece Assembly** (fig. 54). If the eyepiece cell assembly was disassembled, assemble at this time. Lubricate the threads of the eye and field lens cell with the proper focusing nut lubricant. Install the eye and field lens cell in the adapter. Install the adapter in the body. Screw the stop ring onto the adapter. Install diopter scale and secure with the diopter scale clamping ring. Install screw which locks the diopter scale clamping ring in place. Install eye guard.

## Section IX

# DISASSEMBLY AND ASSEMBLY OF BINOCULAR M16

## 46. DISASSEMBLY.

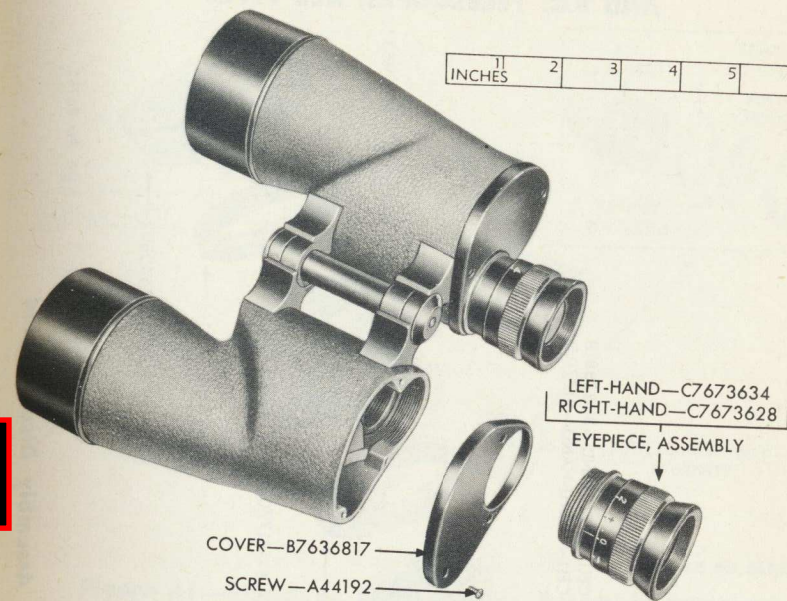
a. **Removal of Left Eyepiece and Body Cover** (fig. 59). Unscrew the eyepiece assembly. Remove the screws which secure the left body cover to the body of the instrument and remove cover.

b. **Disassemble Eyepiece Assembly** (fig. 60). Remove eye guard. Remove dog-point screw which locks the diopter scale clamping ring on the eye and field lens cell. Unscrew clamping ring and remove diopter scale. Unscrew stop ring which retains eye and field lens cell in the adapter. Remove eye and field lens cell. Scribe the starting point of one thread on the eyepiece cell assembly to the adapter.

c. **Remove and Disassemble Reticle Assembly** (fig. 61). Unscrew the reticle assembly from the instrument. Scribe position of reticle to retaining ring and retaining ring to cell. Unscrew reticle retaining ring and remove reticle and reticle spacer.

d. **Remove Prism Shelf Assembly** (fig. 62). Remove the fillister-head screws which secure the prism assembly in the body of the instrument. Hold the binoculars with the neck strap loop toward the body; grasp the upper prism with the thumb and forefinger across the upper prism clip. Raise the prism shelf assembly until the locating pins are freed. Lift the assembly by raising the outside edge of the shelf until the shelf clears the outside body lug. Lift the prism shelf assembly the rest of the way out. Do not force the assembly during this operation, as there is danger of chipping the lower prism.

# DISASSEMBLY AND ASSEMBLY OF BINOCULAR M16



RA PD 86696

Figure 59—Binocular M16—Eyepiece Assembly and Body Cover Removed

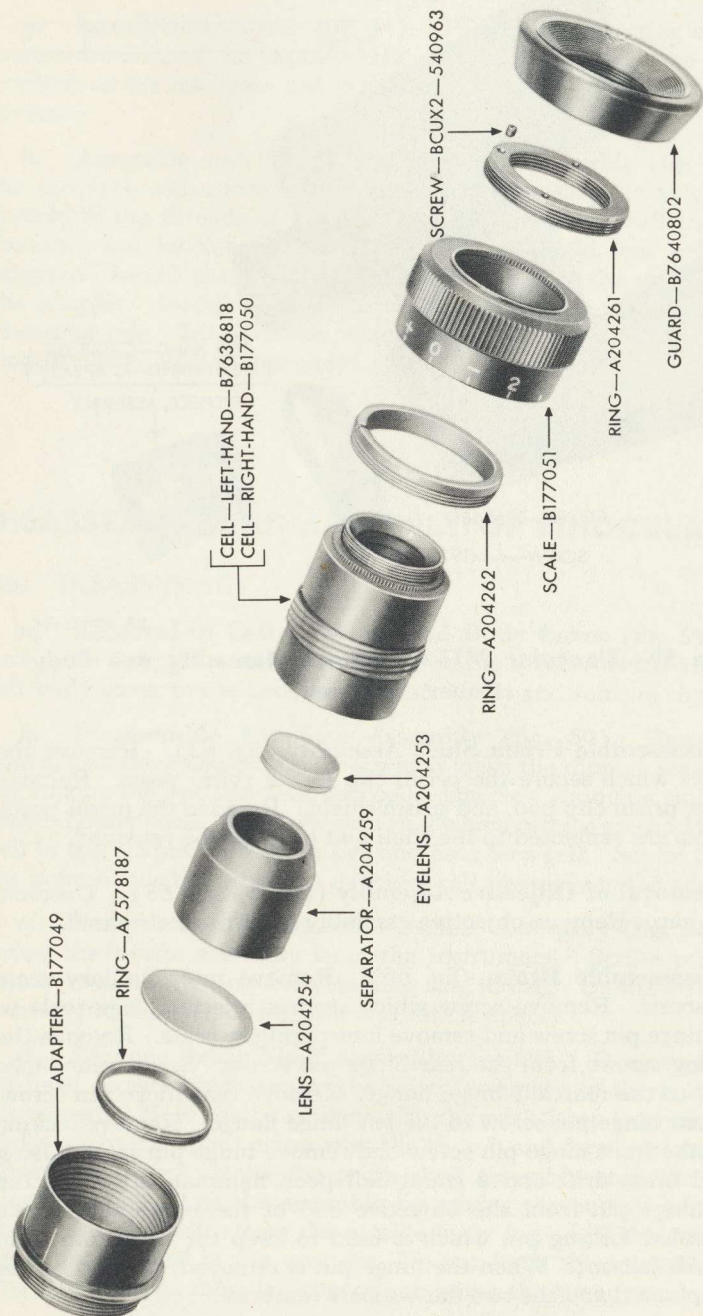
e. **Disassemble Prism Shelf Assembly** (fig. 63). Remove the two screws which secure the prism clip to the prism posts. Remove prism clip, prism clip pad, and prism shield. Remove the prism posts. The prisms are cemented to the shelf and need not be removed.

f. **Removal of Objective Assembly** (figs. 64 and 65). Unscrew objective cap. Remove objective assembly from the instrument.

g. **Disassemble Hinge** (fig. 66). Remove interpupillary scale locating screw. Remove screw which secures interpupillary scale to the rear hinge pin screw and remove interpupillary scale. Remove the two locking screws from the rear hinge pin screw. Scribe rear hinge pin screw to the rear left hinge flange. Remove rear hinge pin screw. Scribe front hinge pin screw to the left hinge flange. Remove locking pin from the front hinge pin screw and remove hinge pin screw. Using a tapered brass drift and a small ball peen hammer, drive out the tapered hinge pin from the objective end of the instrument. The small beveled locking pin which is used to keep the hinge pin from turning will fall out. When the hinge pin is removed, the two bodies can be separated and the two flat washers removed.



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AND B.C. TELESCOPES, ALL TYPES

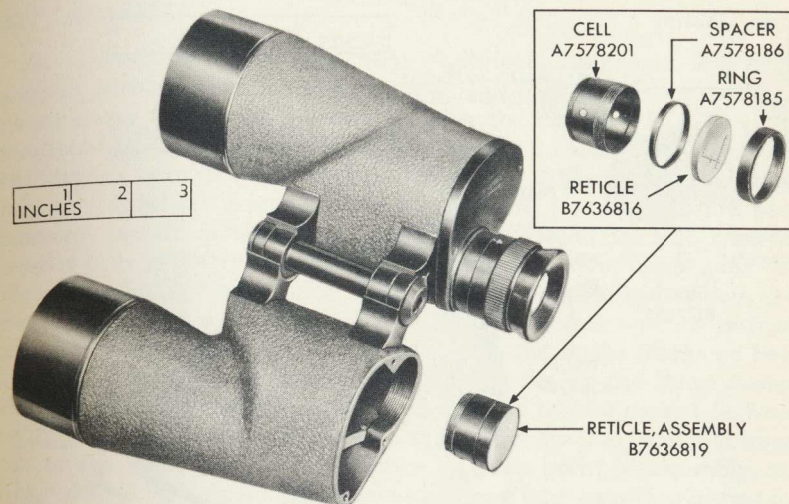


RA PD 86782

Figure 60—Binocular M16—Eyepiece Assembly Disassembled

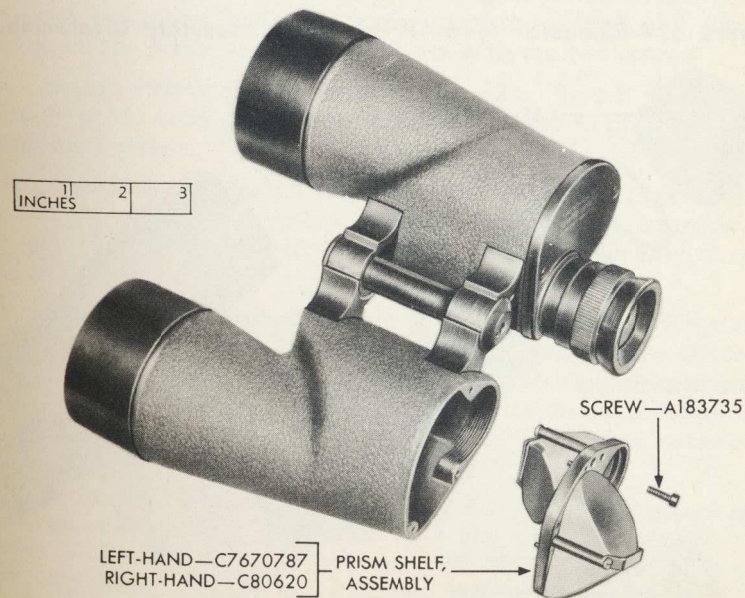


DISASSEMBLY AND ASSEMBLY OF BINOCULAR M16



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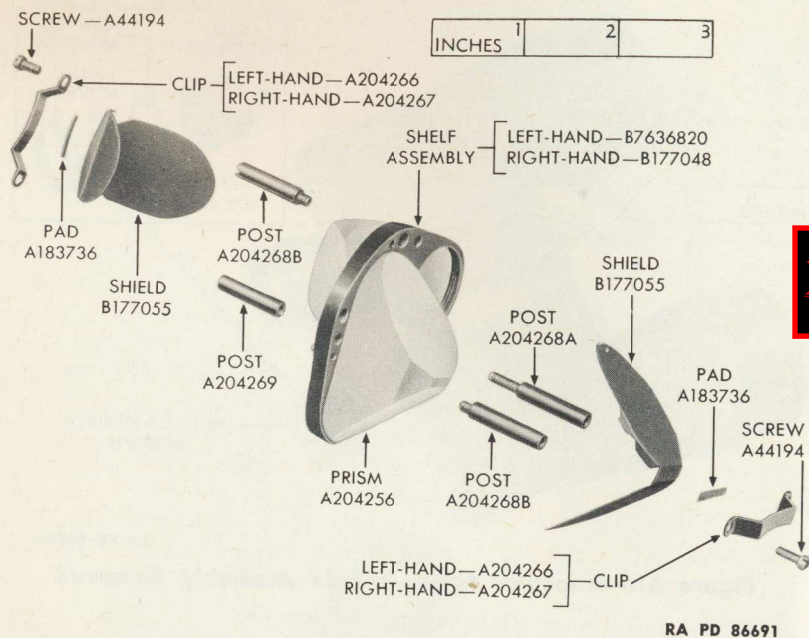
Figure 61—Binocular M16—Reticle Assembly Removed



RA PD 86697

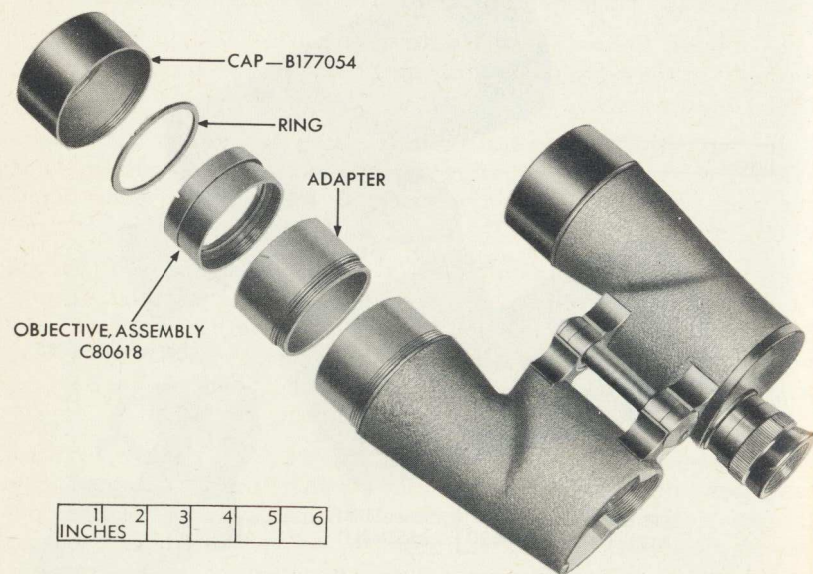
Figure 62—Binocular M16—Prism Shelf Assembly Removed



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RA PD 86691

Figure 63—Binocular M16—Prism Shelf Assembly Disassembled



RA PD 86704

Figure 64—Binocular M16—Objective Assembly Removed

## DISASSEMBLY AND ASSEMBLY OF BINOCULAR M16

## 47. ASSEMBLY.

a. **Assemble Hinge** (fig. 66). Lubricate hinge pin and brass washers with special lubricating grease. Install as many brass washers as necessary to take up all play between the flanges. **NOTE:** The washers having holes with the larger diameter must be placed between the flanges next to the interpupillary scale. Place bottom of hinge lugs on a level surface and, using a brass drift and a small ball peen hammer, tap the hinge pin into place. **CAUTION:** Be sure that the washers are properly centered before driving in the hinge pin. To secure the hinge pin in place, install the beveled pin in position, and tap in place with a small punch and a light hammer. Screw in front and rear hinge pin screws, making sure that the scribe marks on both screws are in alignment with the scribe marks on the hinge flange. **NOTE:** If the original holes in the hinge pin screws cannot be lined up, drill new holes in the hinge pin flanges. Secure front and rear hinge pin screws with their locking screws. At this point of assembly, the hinge should be tight enough to maintain any interpupillary setting for all normal handling. Set the interpupillary scale on the rear hinge pin screw. Final adjustment of the interpupillary scale will be made when the instrument has been completely assembled.

b. **Assemble Prism Shelf Assembly** (fig. 63). Screw the prism posts into the prism shelf. Place the prism shield, pad, and clip in position on the prism and secure all parts with the two screws.

c. **Install Prism Shelf Assembly** (fig. 62). Install prism shelf assembly in the body of the instrument and secure in place with the fillister-head screws.

d. **Assemble and Install Objective Cell Assembly** (figs. 64 and 65). If the objective assembly has been disassembled, assemble at this time. Install the objective assembly in the instrument. Screw on objective cap.

e. **Assemble and Install Reticle Assembly** (fig. 61). Place the reticle spacer in the reticle cell. Install the reticle so that the etchings will be facing the eye and field lens. Install reticle retaining ring, making sure that the reticle is aligned to the scribe marks made during disassembly. Screw reticle assembly into the prism shelf assembly, making sure that the scribe marks are aligned.

f. **Assemble Eyepiece Assembly** (fig. 60). If the eyepiece cell has been disassembled, assemble at this time. Lubricate the threads of the eye and field lens cell with the proper focusing nut lubricant. Install the eye and field lens cell in the adapter, making sure that the scribe marks made during disassembly are in alignment. Screw stop ring on the adapter. Place the diopter scale over the eye and field lens cell, making sure that the pins in the eye and field lens



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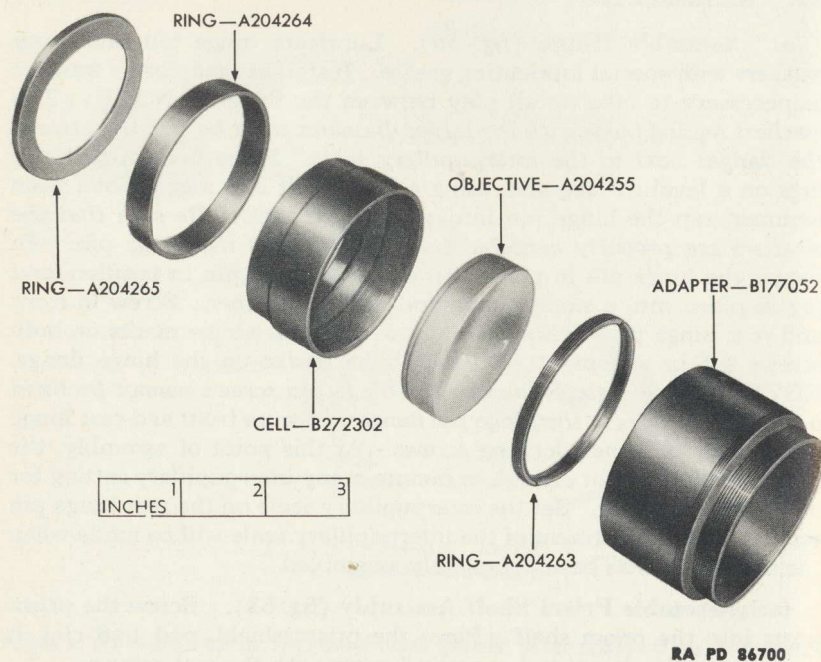


Figure 65—Binocular M16—Objective Assembly Disassembled

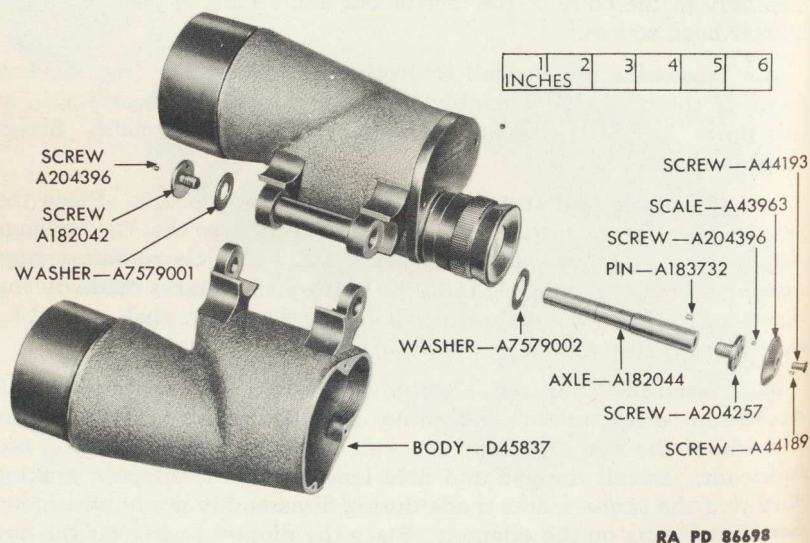


Figure 66—Binocular M16—Hinge Pin Assembly Disassembled

## DISASSEMBLY AND ASSEMBLY OF FIELD GLASS, TYPE "EE"

cell are engaged in the serrations of the diopter scale. Screw diopter scale clamping ring into place and secure with the locking screw. Screw the eye guard into place.

### Section X

## DISASSEMBLY AND ASSEMBLY OF FIELD GLASS, TYPE "EE"

### 8. DISASSEMBLY.

a. **Disassemble and Remove Left Eyepiece Assembly** (fig. 67). Using a strap wrench, unscrew eyepiece assembly from the body of the instrument. A fine reference mark must be scribed, marking the proper relation of the eyepiece sleeve to the body of the instrument. Remove eyepiece washer from the body cover. Unscrew the eye guard from the eye and field lens cell. Unscrew the eye and field lens cell from the focusing nut. Remove the focusing nut from the eyepiece sleeve. Remove the headless screw that locks the diopter scale and remove the diopter scale from the focusing nut.

b. **Remove and Disassemble Reticle Assembly** (fig. 68). Unscrew the reticle cell from the eyepiece sleeve. Scribe a reference line, marking the position of the cell to the sleeve. Scribe a reference line, marking the relation of the reticle to the retaining ring and the retaining ring to the cell. Remove retaining ring, spacer, and reticle.

c. **Remove Rear Prism** (fig. 67). Remove the left rear body cover. Loosen the tilting and adjusting screws. Remove the screw which holds the prism clip in place and remove the clip. Remove prism from the body of the instrument. Mark, with an indelible pencil on the unpolished surface of the prism, its proper relation to the body of the instrument.

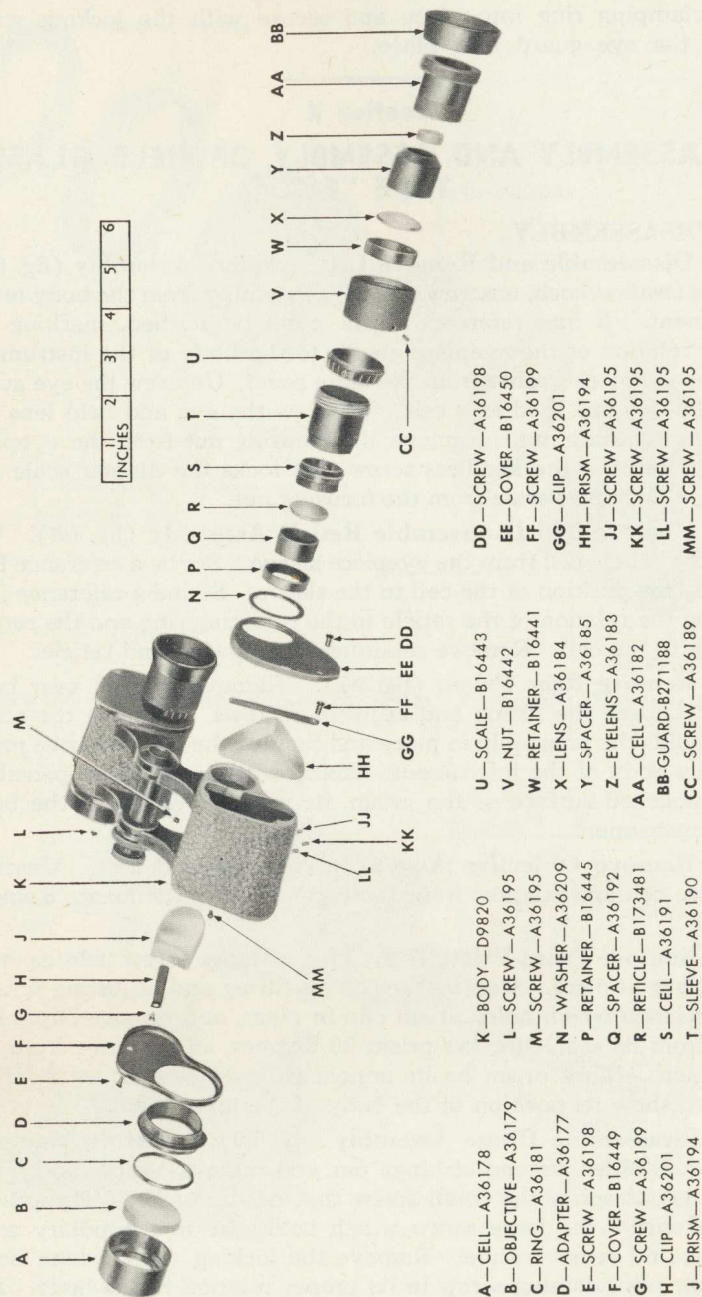
d. **Remove Objective Assembly** (figs. 67 and 69). Unscrew objective cell and adapter from the body of the instrument. Remove adapter.

e. **Remove Front Prism** (fig. 67). Remove screw holding front body cover in place. Relieve tension on tilting and adjusting screws, remove screw which holds prism clip in place, and remove clip. Lift prism from its seat, turn the prism 90 degrees, and remove from the instrument. Mark prism on its unpolished surface with an indelible pencil to show its position in the body of the instrument.

f. **Disassemble Hinge Assembly** (fig. 70). Unscrew clamping screw from objective end of hinge pin, and remove washer and hinge stop ring. Unscrew the small screw that positions the interpupillary scale. Remove the large screw which holds the interpupillary scale in place, and remove scale. Remove the locking screw which holds the hinge pin retaining screw in its proper relation to the body. Remove hinge pin screw. Unscrew the locking screw that locks the



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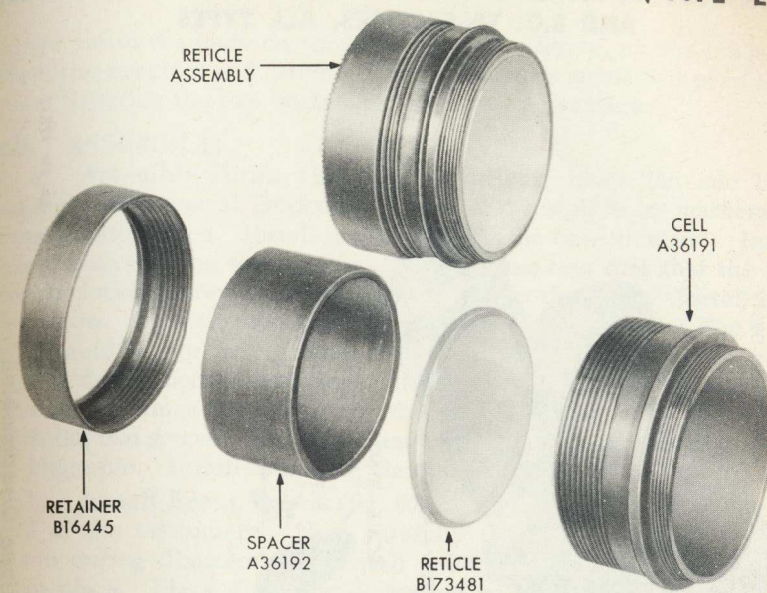


RA PD 75640

Figure 67—Field Glass, Type "EE"—Left Telescope Disassembled

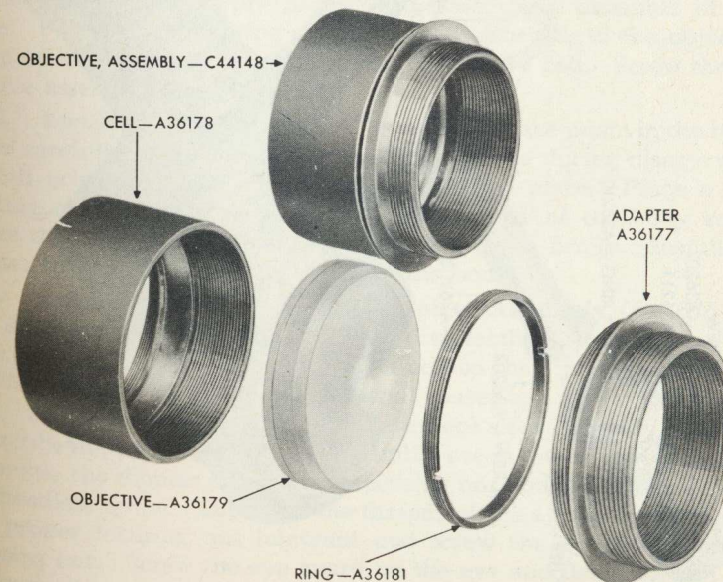
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DISASSEMBLY AND ASSEMBLY OF FIELD GLASS, TYPE "EE"



RA PD 48188

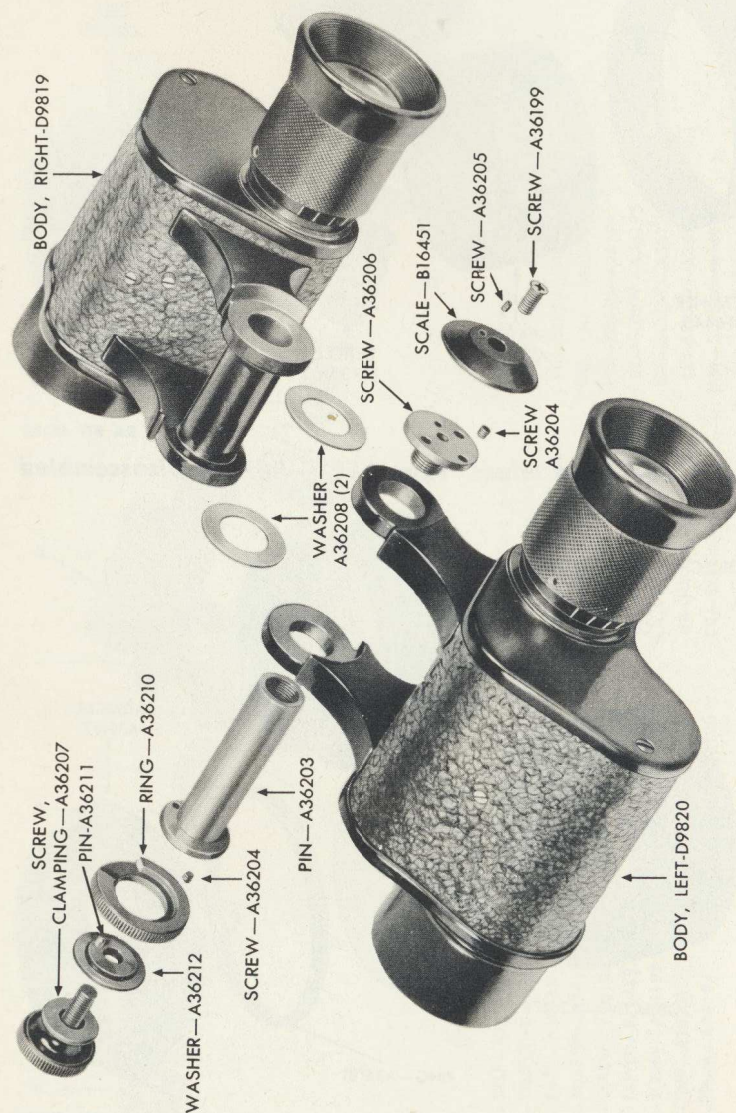
Figure 68—Field Glass, Type "EE"—Reticle Disassembled



RA PD 75632

Figure 69—Field Glass, Type "EE"—Objective Disassembled



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AND B.C. TELESCOPES, ALL TYPES

RA PD 77812

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Figure 70—Field Glass, Type "EE"—Hinge Disassembled

## DISASSEMBLY AND ASSEMBLY OF FIELD GLASS, TYPE "EE"

hinge pin to the body on the objective end. Drive out the hinge pin from the eyepiece end, using a brass drift and a small ball peen hammer. Separate the two bodies and remove the washers.

## 49. ASSEMBLY.

a. **Assemble Hinge** (fig. 70). Lubricate hinge pin and brass washers with special lubricating grease and install brass washers between body hinges. Install hinge pin from the objective end. Install hinge pin retaining screw in the hinge pin, making sure that the hole for the locking screw is in line with the hole in the hinge. Install locking screw. Tighten the hinge pin from the objective end. The hinge pin should be tight enough to hold the instrument at any interpupillary setting during normal handling. Install locking screw at the objective end of the hinge pin. Replace the interpupillary scale and secure with the two screws. Install locking ring and washer on objective end of hinge pin. Install hinge pin clamping screw.

b. **Install Front Prism** (fig. 67). Place prism in the objective end of the instrument. Note carefully the indicating scribe marks made during disassembly. Install prism clip and screw that holds it in place. Place a coating of sealing compound around the edge of the inside of the body cover. Place the body cover in position and press down firmly. Install the body cover screws.

c. **Assemble and Install Objective Assembly** (figs. 67 and 69). If the objective assembly has been disassembled, assemble at this time. Place a light coating of grease on the threads of the objective adapter and screw the adapter into the objective cell. Screw the objective assembly into the body.

d. **Install Rear Prism** (figs. 67 and 69). Place prism in the body. Note carefully the indicating scribe marks made during disassembly. Install prism clip and screw that secure it in place. Place a thin coating of sealing compound around the inside of the body cover. Place the body cover in position and press down firmly. Install the screws that secure the body cover to the body.

e. **Assemble and Install Left Eyepiece Assembly** (fig. 67). If the eyepiece cell assembly has been disassembled, assemble at this time. Install the reticle in the reticle cell so that the etched surface will face the eye and field lens. Install spacer and screw in retaining ring. Screw the reticle cell into the eyepiece sleeve, making sure that the scribe marks made during disassembly are in line with one another. Assemble the diopter scale to the focusing nut and lock in place with the headless screw. Lubricate the threads of the eyepiece sleeve with the proper focusing nut lubricant and screw the eyepiece into the focusing nut. Screw the eye guard on the eye and field lens cell and screw the eye and field lens into the focusing nut. Place a light coating of sealing compound underneath the eyepiece washer and assemble the eyepiece assembly to the body.