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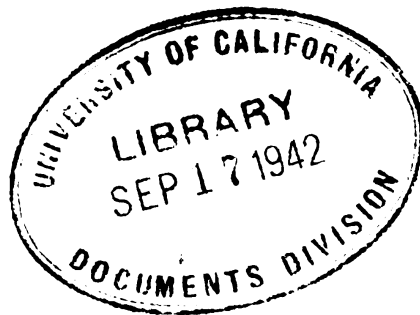
TECHNICAL MANUAL



ORDNANCE MAINTENANCE

**INSTRUMENT, FLANK SPOTTING, M1
RULE, FLANK SPOTTING, M1**

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WAR DEPARTMENT,
WASHINGTON, July 8, 1941.

ORDNANCE MAINTENANCE
INSTRUMENT, FLANK SPOTTING, M1
RULE, FLANK SPOTTING, M1

Prepared under direction of the
Chief of Ordnance

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SECTION I

GENERAL

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1. **Purpose.**—This manual is published primarily for the information and guidance of ordnance maintenance personnel.

2. **Scope.**—This manual supplements the technical manuals which are prepared for the using arm. It contains descriptive matter and illustrations sufficient to provide a general working knowledge of the equipment and detailed instructions for inspection, maintenance, and repair by ordnance maintenance personnel.

3. References.—The appendix at the end of this manual lists the Technical Manuals and Standard Nomenclature Lists for equipment described herein.

SECTION II

INSTRUMENT, FLANK SPOTTING, M1

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4. Description.—*a.* The flank spotting instrument (fig. 1) is an observing instrument used in determining spotting corrections for antiaircraft fire.

b. The instrument is furnished complete with elbow telescope, M2A1, packing chest, camel's-hair brush, type C tripod, tripod carrying strap, and electrical equipment.

c. The instrument is designed to be set up at a flank station situated on a measured base line from the battery. The telescope measures the deviation in miles between the target and each of the bursts observed, these deviations being measured in the slant plane containing the target and the spotting base line. The instrument scales show the vertical angle (ϵ_m) and slant angle (θ). These values obtained from the instrument are used in setting the flank spotting rule, M1.

d. The upper portion of the instrument, which carries the telescope and two scales, pivots on a horizontal shaft which passes through the column, C69934. The vertical scale, C69935, is secured to the outer end of the horizontal shaft. The column fits into the tripod head in which it is oriented and clamped. The slant scale, B137948 (fig. 2), swings in a plane, the inclination of which is determined by the setting of the vertical scale. The vertical scale is graduated on both faces, each provided with an index. The instrument is moved in the plane of the vertical scale and slant scale by means of the handle, B137949. An adjustable friction screw, A49082, is provided to hold the instrument in position in the plane of the slant scale. A circular level vial is secured to the top of the vertical column.

e. The elbow telescope, M2A1 (fig. 5), is attached to the telescope holder to which is secured the slant scale and the handle. The telescope is a compact, 8-power, fixed-focus telescope of the prismatic type and is provided with two removable filters, one blue and one amber. A lamp and lamp bracket are provided for illumination of

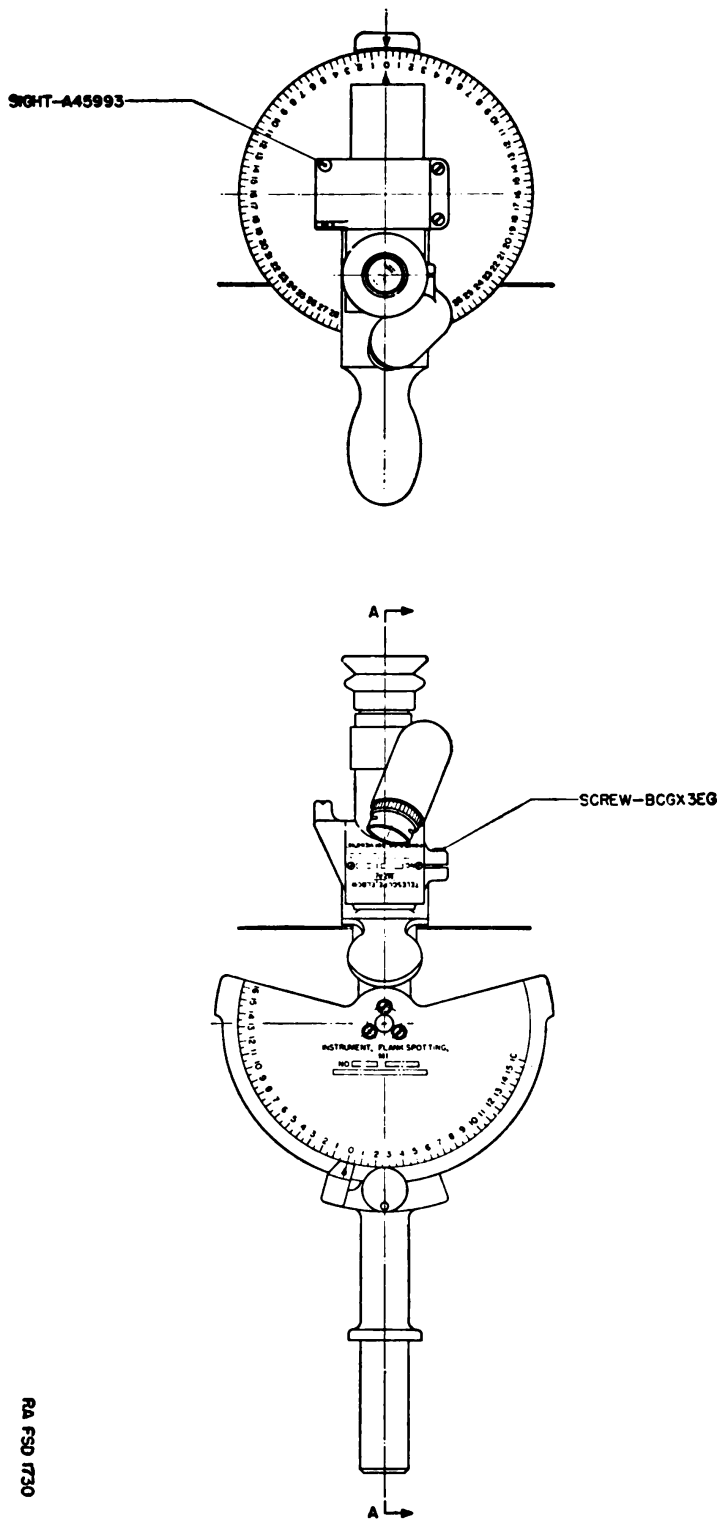


FIGURE 1.—Flank spotting instrument, M1—side and plain views.

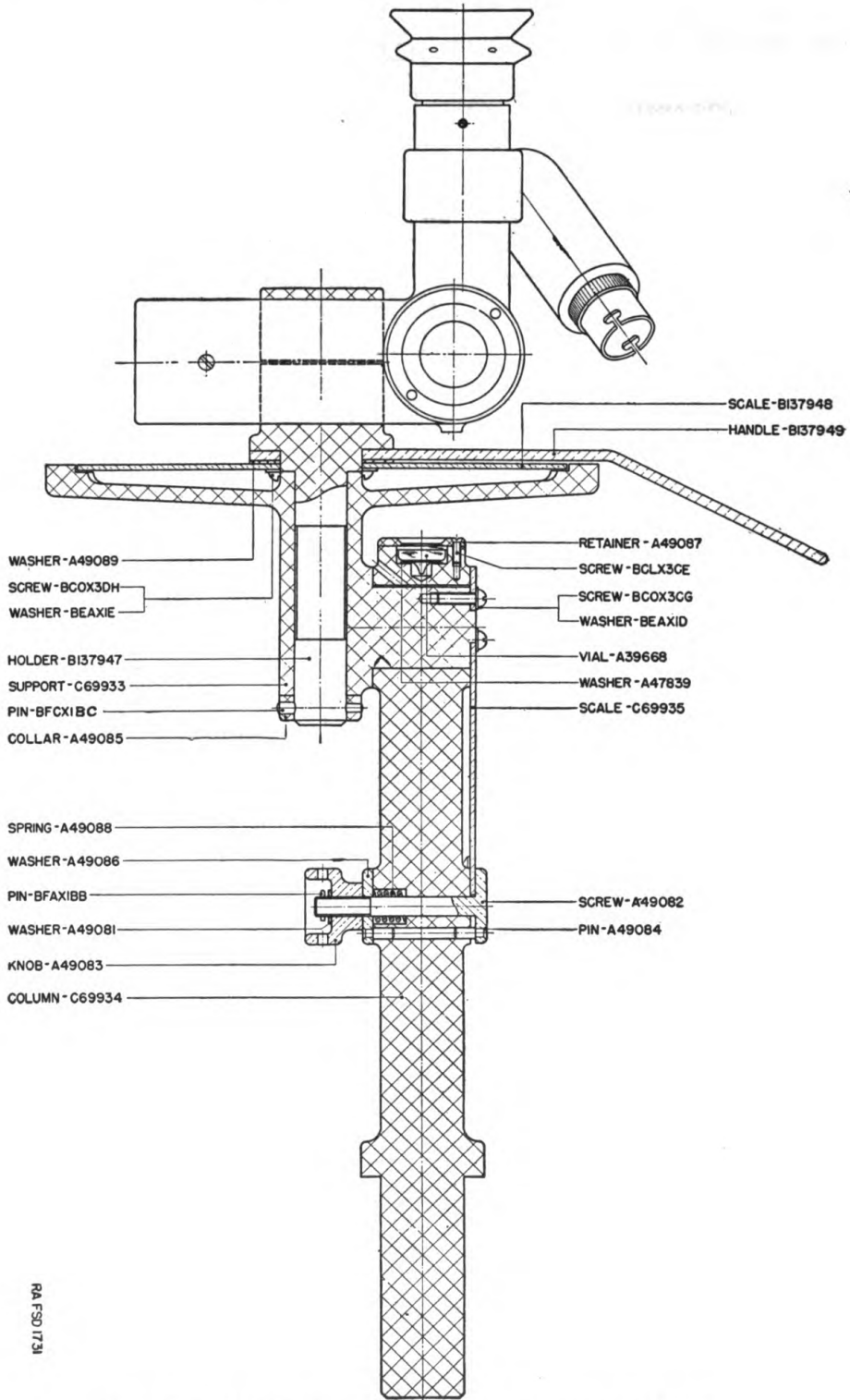


FIGURE 2.—Flank spotting instrument, M1—sectioned views.

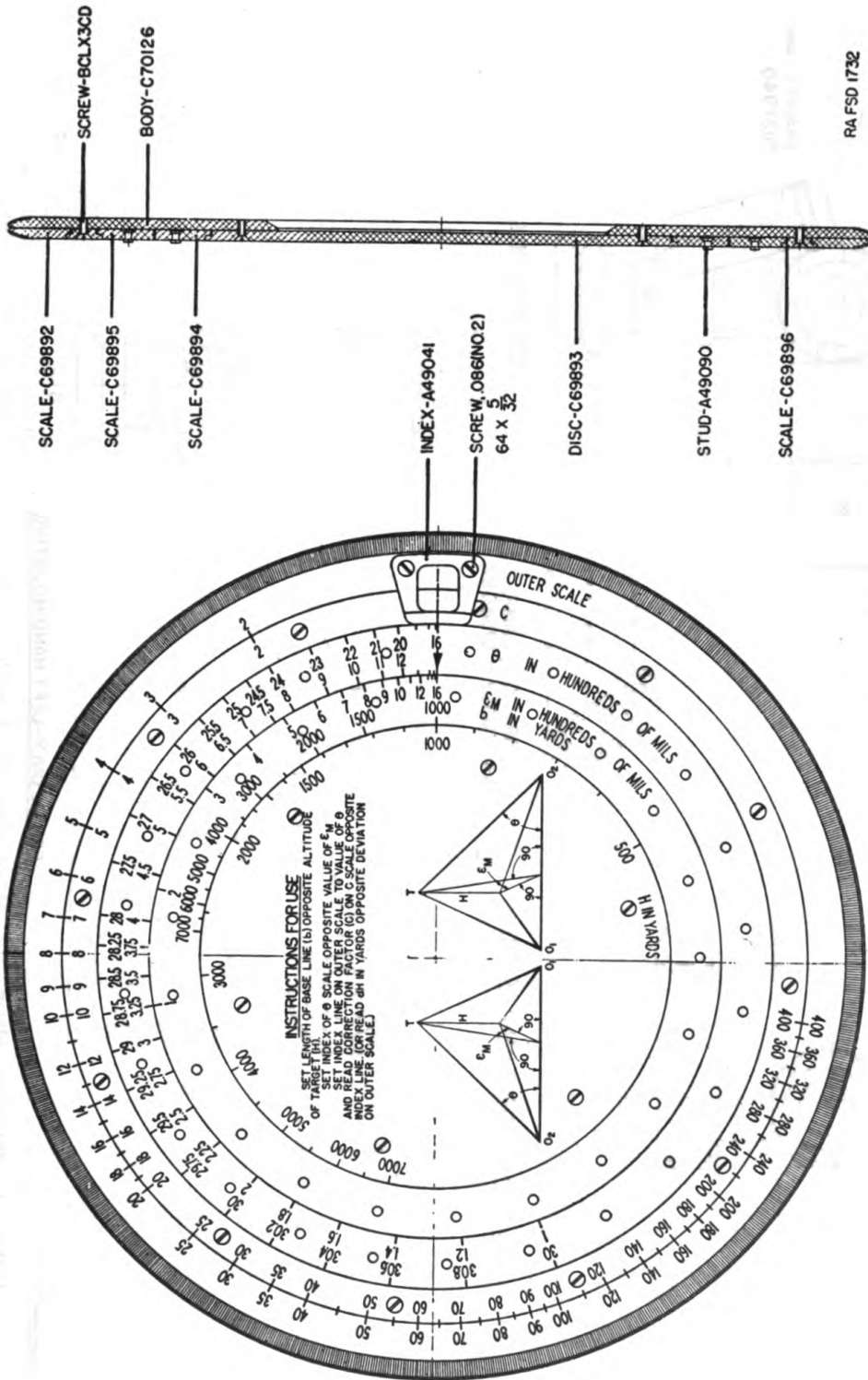
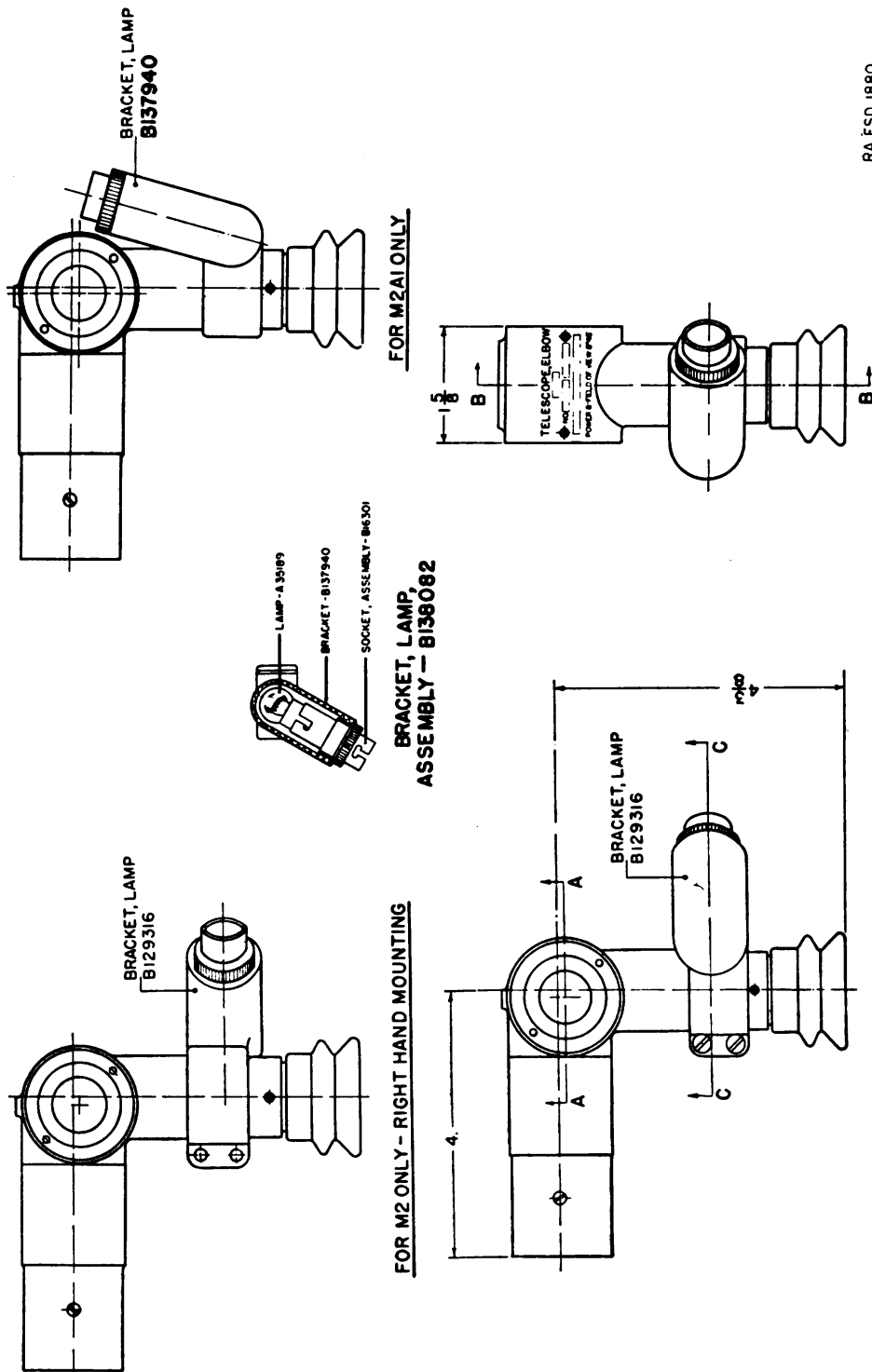


FIGURE 3.—Flank spotting rule, M1—assembled views.



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FOR M2 ONLY - LEFT HAND MOUNTING

FIGURE 4.—Telescope, elbow, M2, M2A1, and M2A1 with bracket, lamp, assembly, B138082—assembled views.

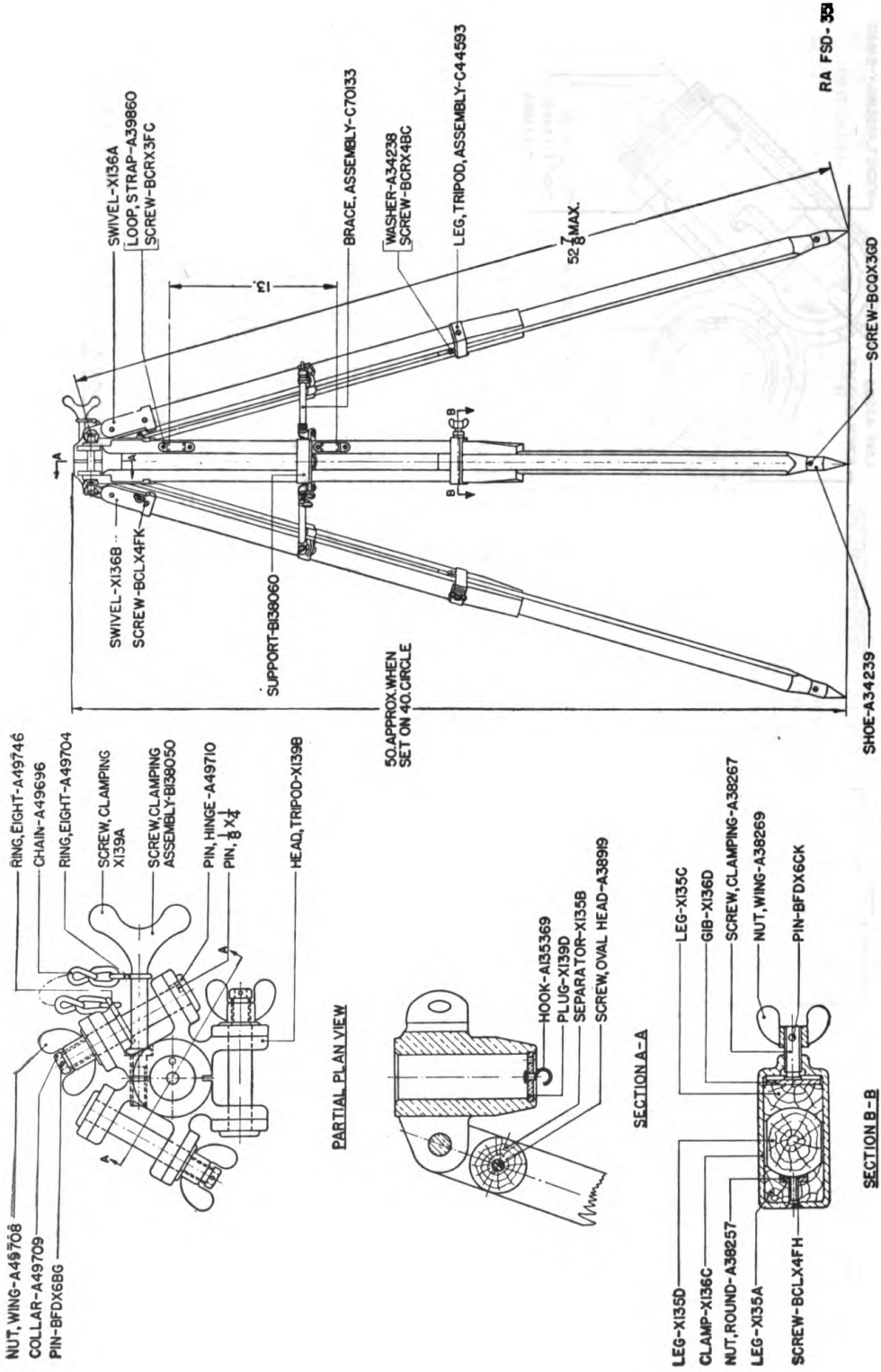


Figure 6.—Tripod, type C— assembled and sectioned views.

the telescope reticle. The lamp bracket assembly B138082 is supplied with this telescope for the flank spotting instrument.

f. The type C tripod (fig. 6) is used to support the instrument. This tripod has extensible legs, each of which is attached to the tripod head by means of a hinge pin. The legs are provided with a brace to maintain correct leg spacing. The tripod head is provided with a socket to receive the column of the flank spotting instrument.

g. The electrical equipment includes a 6-volt alkaline storage battery, battery box, connecting wires, and the necessary equipment, tools, and instruction book for use with the battery.

5. Operation.—*a. To set up the instrument.*—(1) Clamp the tripod legs at a convenient length and embed them firmly in the ground. If possible, the instrument should be set up at the same level as the gun battery.

(2) Place the instrument in the tripod head.

(3) Level the instrument by adjusting the length of the tripod legs until the bubble in the circular level vial is centered. Tighten the tripod leg clamping screws and secure the braces.

(4) Make the necessary electrical connections if illumination is required. When connecting the lead wires, to avoid shorting the battery, connect first to the lamp sockets and then complete the connection to the battery socket.

b. To orient.—The instrument is properly oriented when the vertical scale is perpendicular to the base line.

(1) *When the flank station and the director controlling the fire of the battery are intervisible.*—(a) Set the slant scale to read zero.

(b) Turn the entire instrument in the tripod head socket until the director appears at the center of the telescope reticle.

(c) Clamp the instrument by means of the tripod head clamping screw.

(2) *When the flank station and the director controlling the fire of the battery are not intervisible.*—(a) Set the instrument according to the directions obtained from a map or from a datum point of known azimuth. It should be noted that the instrument may be properly oriented in either one of two positions, 180° apart, as long as the condition of perpendicularity of the vertical scale to the base line is fulfilled. (Inspection of the θ scale of the flank spotting rule will show that the same setting is used for any two diametrically opposite angles.)

(b) Clamp the instrument by means of the tripod head clamping screw.

c. To operate.—An observer and a reader are required. The observer tracks the target (the open sight may be used for locating the target) so that it appears continuously at the center of the reticle and announces deviations of bursts as they occur. These deviations are read from the telescope reticle. The reader calls off the readings of the vertical scale (ϵ_m) and the slant scale (θ) at convenient intervals. These elements of data are transmitted to the operator of the flank spotting rule.

6. Inspection.—Inspection is for the purpose of determining the condition of the instrument, whether repairs or adjustments are required and remedies necessary to insure proper functioning and serviceability. The following list will serve as a guide:

<i>Parts to be inspected</i>	<i>Points to be observed</i>
<p><i>a.</i> Circular level vial, A39668.</p>	<p><i>a.</i> Set the instrument on the tripod and center the level bubble by means of the tripod legs. If the bubble in the level vial does not remain central as the instrument is rotated 360° in the tripod head, the vial should be adjusted by means of the vial retainer screws, BCLX3CE.</p>
<p><i>b.</i> Vertical scale, C69935.</p>	<p><i>b.</i> When the instrument is level and the line of sight of the telescope level, the zero indication of the scale should be opposite the index. If this is not the case, the scale can be adjusted to a small extent by loosening the supporting screws, BCOX3CG. The degree of friction supplied by the friction screw, A49082, is controlled by the knob, A49083, on the threaded end of the screw. This knob should be adjusted so that the vertical scale operates smoothly but with sufficient friction to hold the instrument in position at any elevation.</p>
<p><i>c.</i> Reticle cross lines of the telescope.</p>	<p><i>c.</i> Set instrument level and set the scales to zero. Sight on a truly vertical line and then on a horizontal line. If the respective horizontal and vertical lines do not agree with the reticle cross lines, the telescope may be turned in the</p>

Parts to be inspected

Points to be observed

d. Slant scale, B137948, and handle, B137949.

holder until agreement has been reached. The two telescope clamping screws should be loosened for this purpose.

d. Turn the telescope 360° by means of the handle, B137949. If scale is bent, or rubs during the operation, replacement is necessary. Examine the handle to see if it is loose. If loose, the handle screws, BCOX3DH, must be tightened.

e. Electric lighting equipment.

e. The reticle lines should be well illuminated when instrument is placed in a dark room. If illumination is poor, examine the connections and replace lamp and battery if necessary.

7. Maintenance and repair.—*a. Flank spotting instrument, M1.*—(1) To disassemble the vertical scale, C69935 (fig. 2), loosen the knob, A49083, and remove the three screws, BCOX3CG, and washers, BEAX1D.

(2) To disassemble the level vial, A39668 (fig. 2), remove the three screws, BCLX3CE, and retainer, A49087. When reassembling, care should be exercised to have the spring washer, A47839, exert just enough pressure on the vial to hold it in position when the screws are tightened.

(3) To disassemble the slant scale, B137948—

(*a*) Remove the telescope holder, B137947, by removing the pin, BFCX1BC, and collar, A49085 (fig. 2).

(*b*) Remove the slant scale, B137948, and telescope holder handle, B137949, by removing the four screws, BCOX3DH, and washers, BEAX1E.

(4) The procedure to be followed for assembling the various parts of the flank spotting instrument is the same as the disassembling procedure except in the reverse order.

(5) The replacement of the lamp, A35189 (fig. 4), is accomplished by unscrewing the socket, assembly, B16301, from its bracket, B137940. Use only 3-cp. 6-8 volt miniature lamps with G-6 bulb and double contact bayonet base for replacement.

(6) When replacing the eyeshield, A39125 (fig. 5), care should be exercised to see that it fits properly on the telescope.

b. Type C tripod.—(1) To disassemble the tripod head, X139B

(fig. 6), remove each of the three leg assemblies from the tripod head by removing the pin, BFDX6BG, collar, A49709, wing nut, A49708, and hinge pin, A49710.

(2) To disassemble the tripod leg assembly, C44593—

(a) Remove the lower part of the leg assembly from the upper part by removing the screw, BCRX4BC, and associated washer, A34238.

(b) Remove the leg clamp, X136C, by removing the screw, BCLX4FH, and loosening the clamping wing nut, A38269.

(c) Remove the support, B138060, by removing the screw and nut from each side of the support and then removing the two screws from the loop strap.

(3) The procedure to be followed for assembling the various parts of the tripod is the same as the disassembling procedure except in the reverse order.

8. Care and preservation.—*a.* The flank spotting instrument, M1, is a rugged instrument and with ordinary care it will be serviceable for a long time but it will not stand abuse.

b. At frequent intervals the flank spotting instrument should be lubricated with oil, lubricating, for aircraft instruments and machine guns (U. S. A. Spec. 2-27). Two oil holes are provided, one in the top of the column behind the circular level, and one in the side of the telescope holder support.

c. For care and preservation of the battery, follow the instructions given in the book accompanying it.

d. The electrical connections of the lighting system should be kept tight at all times.

e. Optical parts.—(1) To obtain satisfactory vision it is necessary that the exposed surfaces of the lenses and other optical parts be kept clean and dry. Corrosion and etching of the surface of the glass, which greatly interfere with the good optical qualities of the instrument may be prevented or greatly retarded by keeping the glass clean and dry.

(2) Under no conditions will polishing liquids, pastes, or abrasives be used for polishing lenses and windows.

(3) For cleaning optical glass use only paper specially intended for cleaning optical glass. To remove dust, brush the glass lightly with a clean camel's-hair brush and tap the brush against a hard surface in order to knock out the small particles of dust that cling to the hairs. Repeat this operation until all dust is removed.

(4) Exercise particular care to keep optical parts free from oil or grease. Do not wipe the lenses or windows with the fingers. To

remove oil or grease from optical surfaces, apply ethyl alcohol lightly with a clean camel's-hair brush and rub gently with clean lens paper. If alcohol is not available, breathe heavily on the glass and wipe off with clean lens paper; repeat this operation several times until clean.

(5) Moisture due to condensation may collect on the optical parts of the instrument when the temperature of the parts is lower than that of the surrounding air. This moisture may be removed by the application of gentle warmth. Heat from strongly concentrated sources should never be applied directly as it may cause unequal expansion of parts, resulting in breakage of optical elements, or in inaccuracies in observation.

(6) The rubber eyeshield should be washed periodically in lukewarm water.

f. Wipe off all oil that seeps from the bearings in order to prevent the accumulation of dust and grit.

g. When the instrument is not being used it should be stored in the packing chest.

SECTION III

RULE, FLANK SPOTTING, M1

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9. Description.—The flank spotting rule, M1, is a circular logarithmic slide rule. It consists essentially of two fixed and three movable scales. This rule is used for reducing observed deviations as obtained from the flank spotting instrument, M1, to corrections in terms of altitude suitable for application to the antiaircraft director. This rule indicates both the actual values of the altitude correction (dH) from specific values of observed deviation (d) and the correction factor (C) by which the deviations are multiplied to obtain the corrections. In addition to the observed deviation (d) the data required to set the rule are the measured length (b) of the spotting base line, the altitude (H) of the target and the two angles (θ and ϵ_m) supplied by the flank spotting instrument.

a. The central disk, C69893 (fig. 3), contains instruction for use, operating diagrams, and a scale of altitude (H) in yards. In the operating diagrams, the base line (b) is the distance from O_1 to O_2 , where O_1 is the location of the director controlling the fire of the battery and O_2 is the location of the flank station. The central disk

and the *C* scale are attached to the body of the rule. The other scales are free to be rotated.

b. The rule is provided with a pouch for protection when not in use.

10. Inspection.—Inspection is for the purpose of determining the condition of the rule, whether repairs or adjustments are required and the remedies necessary to insure serviceability and proper functioning. The following list will serve as a guide:

Parts to be inspected

Points to be observed

a. Movable scales.

a. Rotate the scales one complete revolution. Observe whether there is any sticking due to warping of the scales. Warped scales should be replaced.

b. Fixed scales and index. A49041.

b. Examine the fixed scales and index, A49041, for looseness. If loose, the screws should be tightened.

11. General care.—*a.* Handle the rule carefully to avoid the possibility of damaging any of the parts.

b. The screws by which the index and fixed scales are attached should be kept tight at all times.

c. Keep the rule clean. A soft cloth should be used to clean the scales.

d. The rule should be placed in the pouch when not in use.

INSTRUMENT, FLANK SPOTTING, M1 RULE

APPENDIX I

LIST OF REFERENCES

1. Standard Nonmenclature Lists.

- Instrument, flank spotting, M1----- SNL F-188.
 Rule, flank spotting, M1----- SNL F-188.
 Tripods (all active types)----- SNL F-101.
 Current Standard Nomenclature Lists are as tab-
 ulated here. An up-to-date list of SNL's is main-
 tained as the "Ordnance Publications for Supply
 Index"----- (OPSI).

2. Technical Manuals.

- Cleaning and preserving materials----- TM 9-850
 (now published
 as TR 1395-A).
 3-inch antiaircraft gun matériel (mobile)----- TM 9-360

3. Field Manual.

- Antiaircraft artillery----- FM 4-110

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

