

RESTRICTED

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**4.2-INCH RECOILLESS  
CHEMICAL MORTAR  
E34R1**



War Department, • 21 December 1944

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CONFIDENTIAL

WAR DEPARTMENT.

Washington 25, D.C., 21 December 1944.

TB CW 24, 4.2-Inch Recoilless Chemical Mortar E34R1, is published for the information and guidance of all concerned.

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For explanation of symbols see FM 21-8.



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Fig. 1. 4.2-inch recoilless chemical mortar E34R1 (left view).

### SAFETY PRECAUTIONS

1. Be sure that an area extending approximately 50 to 100 yards to rear of mortar is clear of personnel, ammunition, or other equipment before firing.
2. Stay forward of a line running 30 degrees forward of lateral from middle of barrel when firing mortar, in order to avoid blast effect (fig. 15). Do not move to or face rear of mortar when firing.
3. Do not fire mortar at elevations greater than 45 degrees.
4. Do not attempt to handle misfire when barrel is hot -- wait until it is cool.
5. Remove sight from sight clamp before firing mortar.
6. Do not use rocket driver above 200-mil elevation.
7. Use lanyard at all elevations if firing is not immediate.
8. Do not disassemble propelling charge. The ammunition is fixed.

# PART ONE

## INTRODUCTION

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### Section 1

### GENERAL

#### 1. SCOPE.

a. This bulletin is published for the information of the using arms and services. All items, components, and packing are experimental and therefore subject to change.

b. In addition to a description of the 4.2-inch recoilless chemical mortar E84R1, which is a development item, this bulletin contains technical information required for the identification, use and care, ammunition, and accessory equipment of the weapon.

c. In all cases where the nature of the repair, modification, or adjustment is beyond the scope or facilities of the unit, the responsible maintenance unit should be informed so that trained personnel with suitable tools and equipment may be provided, or proper instructions issued.

#### 2. RECORDS.

a. Mortar record book. (1) Mortar record book (Chemical Warfare Service Form No. 5) is used, with slight modification, for the purpose of keeping an accurate record of materiel. The book must always remain with the materiel regardless of where it may be sent. This book should be in possession of the organization at all times. The unit commander is responsible for its completeness of records and its location. It must contain data of issuance of materiel, by whom used, and place where issued. If a mortar book is lost, it should be replaced at once, and all entries should be brought up-to-date. Additional copies may be obtained by requisition to Supply Division, Office of the Chief, Chemical Warfare Service, Washington, D. C.

NOTE: Record of assignment must be removed and destroyed prior to entering combat, but records of use must be maintained.

(2) Complete instructions on entries in the mortar record book are contained therein. It is absolutely essential that mortar book entries be kept complete and up-to-date in order that pertinent information with reference to the suitability of this mortar can be provided. In order to facilitate proper maintenance of mortar and its related materiel, and to avoid unnecessary duplication of repairs and maintenance, a record of



Fig. 2. 4.2-inch recoilless chemical mortar E34R1 (right view).

completed modification work orders must be made in the record book. This record should show date completed and bear initials of officer or mechanic responsible for completion of the modification.

b. Field report of accidents. When an accident involving ammunition occurs during practice, the incident should be reported as prescribed in Army Regulations 750-10 by the officer under whose supervision ammunition is maintained or issued. Where practicable, reports covering malfunctions of ammunition in combat should be made to the Chief, Chemical Warfare Service, giving type of malfunction, type of ammunition, lot number of complete rounds or separate loading components, conditions under which fired, and any details judged pertinent to the malfunction.

c. Unsatisfactory equipment report. Suggestions for improvement in design, maintenance, and safety and efficiency of operation, prompted by chronic failure or malfunction of the weapon, spare parts, or equipment should be reported on WD, AGC Form No. 468 with all pertinent information necessary to initiate corrective action. The report should be forwarded to the Chief, Chemical Warfare Service, Washington, D.C., through command channels, in accordance with instruction number 7 on the form. Such suggestions are encouraged in order that other organizations may benefit.

## Section II

## DESCRIPTION AND DATA

## 3. DESCRIPTION.

a. General. The 4.2-inch recoilless chemical mortar E34R1 (figs. 1 and 2) is a lightweight, flexible, direct-fire weapon, having a heavy weight and high rate of fire as well as a comparatively long range. Using fixed ammunition, range is varied by changing elevation. The mortar utilizes a modified cal. .30 machine gun mount as a support and fires a modified standard 4.2-inch chemical mortar shell, fitted with a special propellant.

b. Components. The mortar consists of a barrel and standard (fig. 3). These can be transported by pack, cart, or any other means of transport.

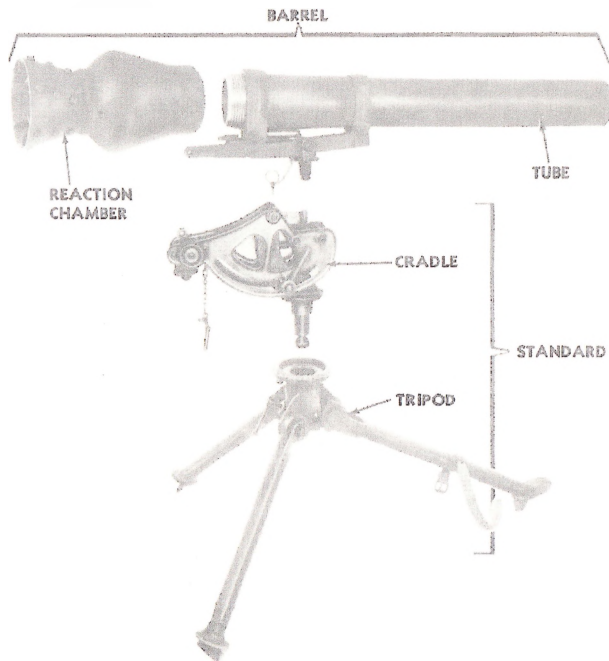


Fig. 3. Component assemblies of mortar.

c. Emplacing. Because of absence of recoil, this weapon can be fired from any footing. Without the tripod, weapon can be mounted on any cal. .30 pintle socket.

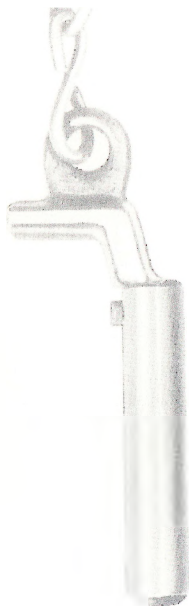
d. Sight. A sight is furnished to enable mortar squad to lay mortar for direction and elevation.

e. Functioning. See paragraph 37b.

#### 4. IDENTIFICATION INFORMATION.

a. Model number. The present system of model designation for experimental models consists of the letter "E" followed by arabic numerals. Modifications of experimental models are indicated by adding the letter "R" and appropriate arabic numerals. Thus, E2R1 indicates the first modification of an experimental model for which the original model designation was E2.

b. Serial numbers. Four serial numbers are required for records concerning the components of this material. They are the tube, reaction chamber, standard, and sight serial numbers.



(1) Tube serial number is stamped on upper rear surface of tube.

(2) Reaction chamber serial number is stamped on outer front surface of chamber.

(3) Standard serial number is stamped on cradle sideplate and on tripod socket.

(4) Sight serial numbers are located in the following places:

(a) Elevation quadrant (brass identification plate).

(b) Telescope adapter (brass identification plate).

(c) Elbow telescope (stamped on body).

#### 5. EMERGENCY REPLACEMENT.

The E22 standard used for the E34R1 mortar is the cal. .30 machine gun mount M1917A1 (TM 9-1205) with L-shaped leg of body of elevating screw joint pin cut off three-eighths inch to provide clearance for the reaction chamber (fig. 4). In an emergency, when E22 standard is not available, the standard cal. .30 machine gun mount M1917A1 can be used until pin can be modified.

Fig. 4. Modified elevating screw joint pin.

## 6. TABULATED DATA.

|                                                              |                               |
|--------------------------------------------------------------|-------------------------------|
| Weight of mortar E34R1                                       | 170 pounds                    |
| Weight of tube E37                                           | 61 pounds                     |
| Weight of reaction chamber E25                               | 56 pounds                     |
| Weight of standard E22                                       | 53 pounds                     |
| Length of mortar                                             | 51 inches                     |
| Length of bore                                               | 9.5 calibers                  |
| Length of tube                                               | 40 inches                     |
| Length of rifling                                            | 40 inches                     |
| Normal powder pressure                                       | 13,000 pounds per square inch |
| Muzzle velocity                                              | 700 feet per second           |
| Range                                                        | 0 to 3,800 yards              |
| Rate of fire (maximum)                                       | 10 rounds per minute          |
| Probable error of deflection (vertical)                      | 1 mil                         |
| Probable error of elevation (vertical)                       | 2 mils                        |
| Number of rounds which can be fired consecutively            |                               |
| at 10 rounds per minute before cooling                       | 50 rounds                     |
| Time to assemble mortar                                      | 2 minutes                     |
| Limits of elevation:                                         |                               |
| Maximum                                                      | +800 mils                     |
| Minimum                                                      | -250 mils                     |
| Traverse                                                     | unlimited                     |
| Elevation per click of handwheel                             | 1 mil                         |
| Sighting equipment:                                          |                               |
| Elevation quadrant T13                                       |                               |
| Telescope adapter M9                                         |                               |
| Elbow telescope M62                                          |                               |
| Aiming post M1                                               |                               |
| Aiming post light M14                                        |                               |
| Transportation equipment:                                    |                               |
| Browning machine gun cart M4A1                               |                               |
| 4.2-inch recoilless chemical mortar man pack E12             |                               |
| Ammunition (For complete ammunition data, see section XVII.) |                               |

## Section III

## TOOLS, PARTS, AND ACCESSORIES

## 7. ACCESSORIES AND SPARE PARTS.

Accessories and spare parts are supplied to the using arm for field replacement of those parts most likely to become broken, worn, lost, or otherwise unserviceable. Accessories and spare parts supplied with the current 4.2-inch recoilless chemical mortar consist of the following:

## SPARE PARTS KIT

- |                                                     |                                                                 |
|-----------------------------------------------------|-----------------------------------------------------------------|
| 2 - NUT, jam, hex, S., 5/8"-11NC-2                  | 3 - GUIDE (set screw)                                           |
| 1 - LEVER, releasing, chamber                       | 2 - SCREW, set, socket hd., full dog pt., S., 5/16"-18NC x 3/4" |
| 1 - SCREW, shoulder                                 | 1 - PIN, firing                                                 |
| 2 - PLUG, restricting (size determined at proofing) | 1 - SUPPORT, powder                                             |

## ACCESSORIES SET

- |                                                               |                                                                              |
|---------------------------------------------------------------|------------------------------------------------------------------------------|
| 2 - BAG, wiping cloths                                        | 1 - WRENCH, fuze, assembly                                                   |
| 1 - BRUSH, wire                                               | 1 - ROLL, tool, ammunition, assembly (less contents)                         |
| 6 - CLOTH, abrasive, aluminum oxide, grit no. 2/0-100 (sheet) | 1 - ROD, cleaning, assembly                                                  |
| 4 - CLOTH, wiping (1/2-lb. bundle)                            | 2 sets - POST, aiming, M1                                                    |
| 1 - LANYARD, assembly                                         | 2 pairs - GLOVES, heat resisting                                             |
| 1 - LIGHT, aiming post, M14 (red)                             | 1 - SCREWDRIVER, cabinet, 1/4" x 6" blade                                    |
| 1 - LIGHT, aiming post, M14 (green)                           | 1 - SCREWDRIVER, common, heavy duty, 7/16" x 8" blade                        |
| 1 - OIL, lubricating, gun, medium grade (1-qt. can)           | 1 - WRENCH, socket head, screw, 5/32" hex (for 5/16" set screw)              |
| 1 - ROLL, tool, ammunition, complete assembly includes:       | 1 - WRENCH, engineers, 15°, single end, normal duty, 1/2"                    |
| 6 - CLOTH, abrasive, aluminum oxide, grit no. 2/0-100 (sheet) | 1 - WRENCH, socket, offset pattern, hex 1" opening (Armstrong 270D or equal) |
| 1 - CLOTH, wiping (1/2-lb. bundle)                            | 1 - WRENCH, combination, M5 (for M7 mount, tripod, caliber .30, M1917A1)     |
| 2 - FILE, American Std., flat, 2d cut, 8"                     | 1 - WRENCH, elevation, 41W-905-17, code 856                                  |
| 1 - HATCHET, broad, assembly                                  | 1 - WRENCH, spanner                                                          |

**PART TWO****OPERATING INSTRUCTIONS**

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**Section IV****GENERAL****8. SCOPE.**

Part two contains information for guidance of personnel responsible for operation of the equipment. It includes information on operation of the equipment and description and location of the controls.

**Section V****SERVICE UPON RECEIPT  
OF EQUIPMENT****9. GENERAL.**

a. Upon receipt of materiel, it is the responsibility of the officer in charge to ascertain whether it is complete and in sound operating condition. A record should be made of missing parts and malfunctions, and such conditions should be corrected as quickly as possible.

b. Attention should be given to small and minor parts as these are more likely to become lost and may seriously affect proper functioning of materiel.

c. Materiel should be cleaned and prepared for service in accordance with instructions given in paragraph 22. Materiel should be lubricated in accordance with section XI.

**10. SERVICE.**

Upon receipt of a mortar, following procedure is carried out:

a. Remove component parts of the mortar and accessories and spare parts from their respective packing boxes.

b. Check completeness of contents.

c. Remove rust-preventive materials, clean, and lubricate equipment (pars. 20 and 22).

d. Examine all parts for serviceability.

e. Assemble mortar and inspect for binding of parts or other signs of improper assembling (pars. 25 and 26).

## Section VI

### CONTROLS

#### 11. CONTROLS.

There are two control mechanisms used in firing the mortar -- elevating mechanism and traversing mechanism (TM 9-1205). Mechanisms are located together and are termed the elevating and traversing mechanism (fig. 5). This mechanism is housed in rear end of cradle frame. Elevating and traversing screws, actuated by handwheels, provide mechanical means for manipulation in single-mil increments.

a. Elevating mechanism. Large adjustments in elevation are made by means of the cradle clamp on right side of cradle (fig. 5). The gun pintle housing, equipped with a quick release latch (locking lever), is assembled in forward end of cradle. A mil scale, reading from 500 to 0 to 400, and subdivided to 25-mil units, is etched on upper side of elevation arc.

b. Traversing mechanism. Traversing clamp allows large changes in traverse (fig. 5). Traversing dial, seated on top of socket, may be rotated in its seat. The dial is graduated 3200 mils in both directions from zero (fig. 5). Traversing dial may be secured in any desired position by means of traversing dial clamp.

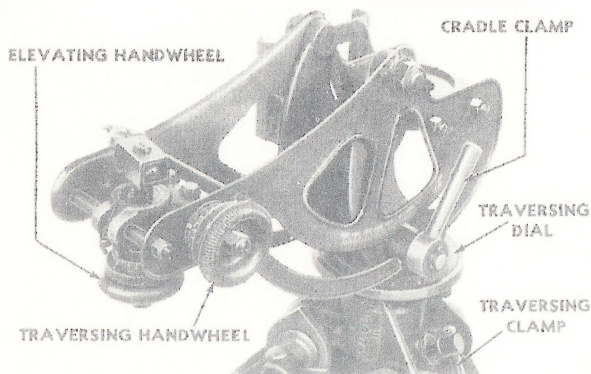


Fig. 5. Elevating and traversing mechanism.

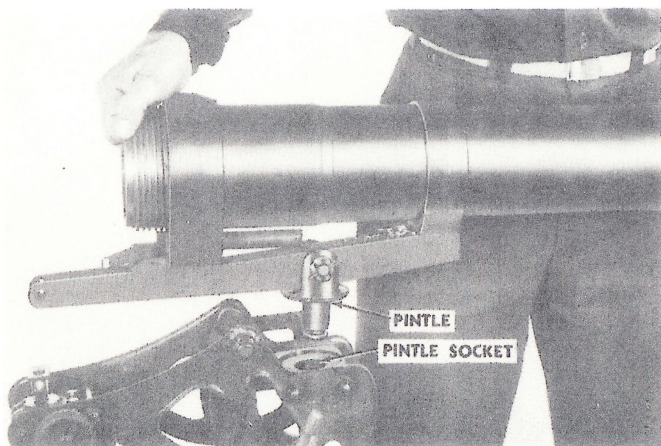


Fig. 6. Inserting pintle into pintle socket.

## Section VII

### OPERATION UNDER USUAL CONDITIONS

#### 12. ASSEMBLY.

Set up standard as described in FM 23-55, making certain that elevating and traversing mechanism is in zero position. Mount tube on cradle (fig. 6) by locking pintle in place (figs. 7 and 8) and inserting body of elevating screw joint pin through rear of mounting bracket and bushing on head of elevating mechanism (fig. 9). Thread reaction chamber onto the tube (fig. 10) until latch first engages chamber slot; release latch by pressing forward on chamber releasing lever, turning chamber one-quarter turn farther onto tube (fig. 11); release lever and turn chamber until latch again engages chamber slot (approximately three-quarters turn). Locking of reaction chamber to the tube is necessary to prevent excessive tightening of chamber onto tube during firing. When reaction chamber and tube are assembled to the standard, elevating and traversing adjustments of cradle should operate freely within their full limits without binding or mechanical interference. After chamber is assembled to the tube, insert latch retaining pin into hole of latch spring retainer (fig. 12) to prevent latch from working out during firing. Assemble sight clamp to tube (fig. 13) and mount sight (par. 47) (fig. 14).

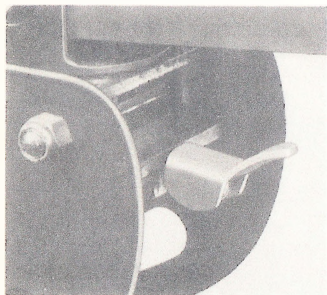


Fig. 7. Pintle locking lever in open position.

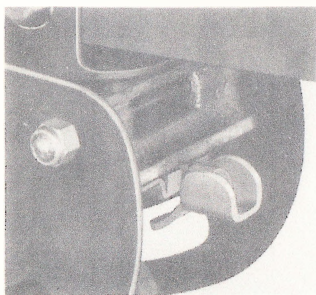


Fig. 8. Pintle locking lever in closed position.

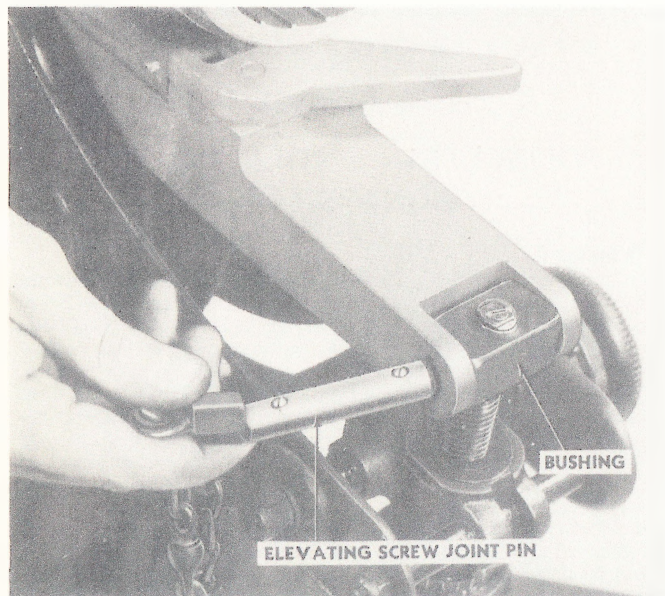


Fig. 9. Securing rear of mounting bracket to elevating and traversing mechanism.

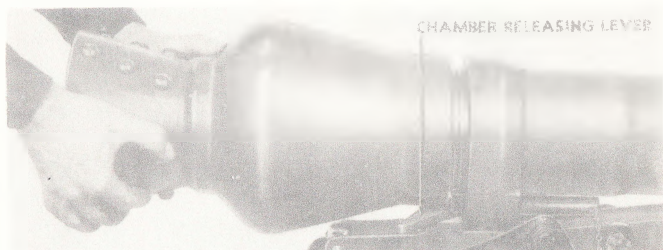


Fig. 10. Threading reaction chamber to tube.

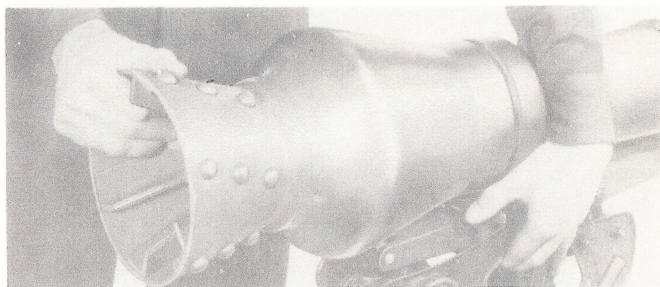


Fig. 11. Holding chamber releasing lever forward to permit one additional rotation of the chamber.

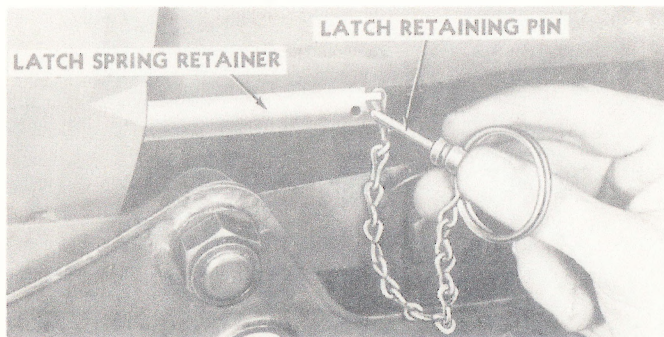


Fig. 12. Inserting latch retaining pin into latch spring retainer.

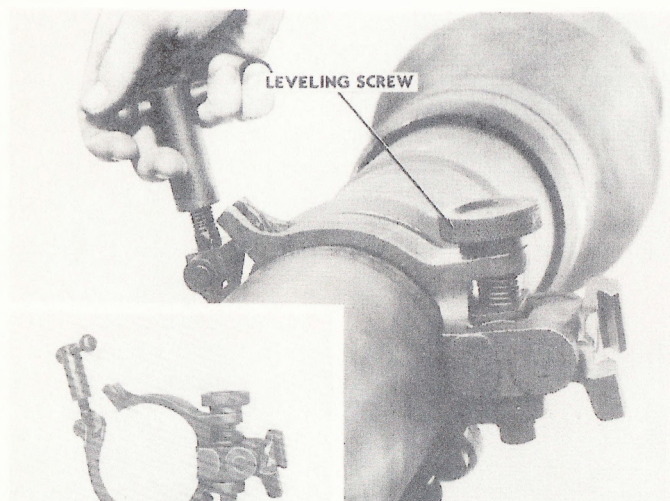


Fig. 13. Securing sight clamp to tube. (Insert) Sight clamp.

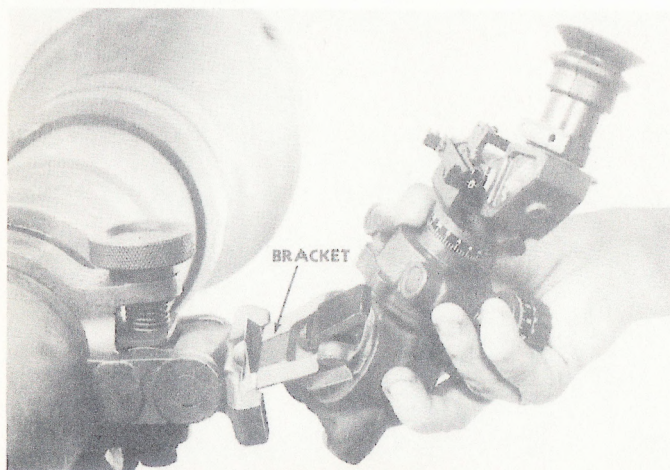


Fig. 14. Mounting sight to sight clamp.

### 13. FIRING.

a. General precautions. When mortar is fired, there is an intense chamber blast and a lesser muzzle blast. The gases issuing from the chamber are under high pressure and are very hot. The following precautions must be observed:

(1) Before any round is loaded into mortar, a suitable area to rear of mortar must be clear of personnel, ammunition, or other equipment. This area may be taken as extending approximately 100 yards to the rear for practice firing and 50 yards for combat and 30 degrees forward of lateral of center of barrel (fig. 15).

(2) If firing is not immediate or rapid, employ a lanyard to retain round in the muzzle. This precaution is especially important at angles of elevation in the range of 100 to 250 mils, at which some rounds may appear stable in the muzzle and others may slide down the tube unexpectedly with sufficient force to actuate percussion primer and fire the round.

(3) All personnel in vicinity of mortar should wear ear plugs.

(4) Personnel must stay forward of a line running 30 degrees forward of lateral from middle of barrel but out of small muzzle blast area (fig. 15). When firing mortar, gunner retires quickly along such a line to reach lowest pressure region as soon as possible. He must keep well forward of center of barrel.

b. Loading. (1) Prepare ammunition as described in paragraph 41.

(2) During loading, the loader should habitually avoid facing rear of mortar.

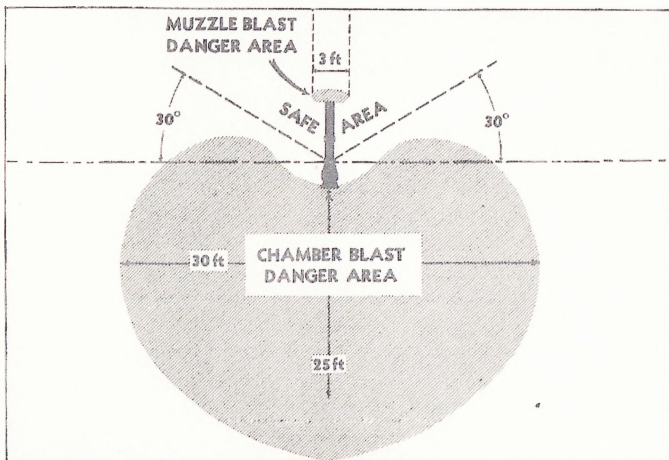


Fig. 15. Diagram showing safe and danger areas during firing.

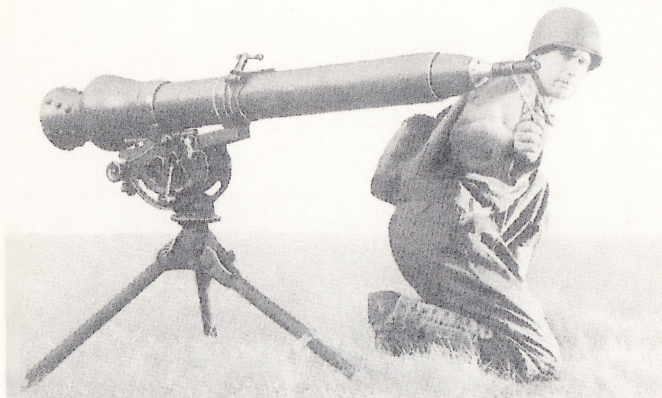


Fig. 16. Firing position for low angle fire (elevation 200 mils or less).

(3) For low angle fire with driver, place complete round in muzzle. If round is to be fired immediately, it should be inserted until the bourrelet is inside the barrel; shell should be steadied in this position by hand until immediately before round is fired. If round is not to be fired immediately, the lanyard yoke should be dropped over the relief before loading and round inserted with the bourrelet outside the barrel until ready to fire, at which time yoke should be removed, while round is steadied, and loading completed, as indicated above. The round should always be placed or rotated in barrel so that pull-ring end of cotter pin faces side of mortar from which firing is to be accomplished.

(4) For high angle fire without driver, place round in muzzle of barrel and hold round by hand or yoke until ready to fire.

c. Firing procedure. (1) Mortar can be fired from either the right or left side of the muzzle.

(2) For rounds fired with driver, fire round by removing cotter pin from driver, removing pin with a steady pull. When firing from right side of mortar, grasp pull-ring with left hand (body facing direction of fire), withdraw pin, and at the same time move to and face the right front of the mortar. Gunner must not move to rear or face rear of barrel. When firing from left side, grasp pull-ring with right hand (body facing direction of fire) (fig. 16), withdraw pin, and at the same time move to and face the left front of the mortar. After removal of the pin, driver rocket ignites immediately, and round is propelled through the

tube and strikes the firing pin, igniting in approximately one-quarter of a second. This short interval of time emphasizes need for prompt retirement in proper direction.

(3) For rounds fired without a driver, fire loaded round by releasing grasp on round and allowing it to slide down the barrel. When firing from left side (fig. 17), move to and face left front of mortar immediately upon release of round. When firing from right side, move to and face right front of mortar immediately upon release of round.

#### 14. DISASSEMBLY.

a. To disassemble the reaction chamber, remove latch retaining pin from spring retainer, push releasing lever forward, and unscrew chamber from tube. Protect hands with gloves or some other means to prevent burns, as the chamber may be very hot after firing.

b. To disassemble remaining components of mortar, return elevating and traversing mechanism to zero positions and reverse procedure of assembly (par. 12).



Fig. 17. Firing position for high angle fire (elevations to 751 mils).

## Section VIII

OPERATION UNDER UNUSUAL  
CONDITIONS**15. OPERATION IN COLD CLIMATES.**

a. General. Cold weather (-40 degrees Fahrenheit or centigrade) does not impose any limitations upon operation of the mortar. Normal lubricant used [light (PL) preservative lubricating oil] allows the mortar to function in extreme cold.

b. Tube cleaning solution. Cleaning a cold mortar after firing cannot be accomplished in the normal manner at temperatures below 32 degrees Fahrenheit, because water freezes in barrel. If cleaning can be done with barrel hot, and if hot water is available, soap, soda ash, or sal soda solutions can be used; otherwise, it is necessary to add alcohol, glycerine, or ethylene glycol to solution. To 10 parts by volume of cleaning solution, add number of parts of one of the antifreezes shown below.

| Temperature | Glycerine | Alcohol | Ethylene Glycol |
|-------------|-----------|---------|-----------------|
| 20° F.      | 2-1/2     | 2       | 2               |
| 10° F.      | 5         | 4       | 3-1/3           |
| 0° F.       | 6-1/2     | 6-1/2   | 5               |
| -15° F.     | 10        | 9       | 7-1/4           |
| -30° F.     | 13        | 16      | 10              |
| -40° F.     | 16        | 27      | 12              |

**16. OPERATION IN HOT CLIMATES.**

a. Hot weather (150 degrees Fahrenheit) does not impose any limitations upon operation of the mortar. Normal lubricant used [light (PL) preservative lubricating oil] allows the mortar to function in extreme heat.

b. Since sand and dust in combination with oil produce a cutting compound, operating mechanisms of the mortar should be carefully cleaned and operated dry, where conditions are such that sand and dust are apt to get into these parts. At frequent intervals, wipe off any accumulation of sand or dust. At conclusion of firing operations, clean materiel, apply lubricant, and cover materiel.

c. Keep sand and dust out of bore, since presence of foreign matter results in rapid erosion of bore when mortar is fired. Keep the muzzle cover and tube cap on at all times during transport and when mortar is not actually firing.

d. Where temperature and humidity are high, or where salt air is present, inspect all parts thoroughly at frequent intervals and use proper care and maintenance to guard against rusting and corrosion.

## Section IX

# DEMOLITION TO PREVENT ENEMY USE

### 17. GENERAL.

a. Destruction of the materiel, when subject to capture or abandonment in the combat zone, will be undertaken by the using arm only when, in the judgement of the military commander concerned, such action is deemed necessary, and as a final resort to keep the materiel from reaching enemy hands.

b. Adequate destruction of this materiel means damaging it in such a way that the enemy cannot restore it to usable condition in the combat zone either by repair or by cannibalization. Adequate destruction requires that:

(1) Every part essential to operation of the materiel must be damaged.

(2) Parts must be damaged beyond repair in the combat zone.

(3) The same parts must be destroyed on all materiel so that the enemy cannot make up one operating unit by assembling parts from several partly destroyed units.

c. The tube and reaction chamber are the most vital parts of this mortar. These are the first things to damage. Next in order of importance are the standard, sighting equipment, mortar book, and firing tables.

### 18. PROCEDURES.

a. Disassemble mortar and screw tube cap and chamber closing plugs on tube and chamber, respectively. Render tube useless by inserting three incendiary grenades M14. Drop two grenades into tube unarmed; drop in third grenade with safety pin removed. The latter grenade ignites the first two. Repeat same procedure for reaction chamber. Incendiary grenades M14 are not explosive and have a 2-second delay in fuze functioning; they may be safely placed at a desired point, armed by removing safety pin, and ignited by releasing lever. Damage standard by smashing elevating and traversing mechanism, tripod legs, and cradle with a heavy hammer.

b. Stack all accessories, including tools and powder, and ignite by placing an incendiary grenade M14 over a crack at top of stack.

c. For demolition of ammunition, see TM 9-1900.

d. If it is impossible to disassemble the mortar, insert five incendiary grenades M14 into chamber through the tube and drop in sixth grenade with safety pin removed.

## PART THREE

# MAINTENANCE INSTRUCTIONS

---

### Section X GENERAL

#### 19. SCOPE.

Part three contains information for the guidance of personnel of the using organizations responsible for first and second echelon maintenance of this equipment. It contains information needed for the performance of lubrication and preventive maintenance services as well as description of the major systems and units and their functions in relation to other components of the equipment.

### Section XI LUBRICATION

#### 20. GENERAL CARE.

a. Keep bore of the tube and all unpainted surfaces clean and free from rust. Always keep bore and chamber lightly oiled with a light oil when not in actual use; keep muzzle covered with the muzzle cover and the respective caps and plugs screwed on the tube and chamber.

b. If mortar is to be kept in readiness for use, apply a film of light preservative lubricating oil to all parts. If rust appears, clean parts with dry cleaning solvent, dry thoroughly, and re-oil. Otherwise, wipe clean and renew oil film every 5 days.

c. See TM 9-1205 for lubrication under unusual conditions.

d. Prior to assembly of mortar, apply a film of special preservative lubricating oil to bearing surfaces of all moving parts. Prevent oil from getting into the serrations or into seat of traversing dial, as it causes dirt and sand to collect, interfering with proper operation.

## Section XII

### PREVENTIVE MAINTENANCE SERVICES

#### 21. GENERAL.

Preventive maintenance services prescribed by army regulations are a function of using organization echelons of maintenance. This section contains preventive maintenance service allocated to the squad and scheduled preventive maintenance service allocated to organizational maintenance (second echelon).

#### 22. CLEANING.

It is important that proper attention be given to cleaning and inspection of the mortar before, during, and after firing periods.

a. Before firing. (1) Remove all oil from the barrel (bore as well as reaction chamber) and any excess oil on outside of barrel and on standard.

(2) See that reaction chamber is properly locked to the tube by the chamber latch.

(3) Be sure all nuts, bolts, and screws are in position and securely tightened.

b. During firing. (1) Swab out tube after every five rounds, except in rapid fire.

(2) Examine powder support and firing pin at every opportunity and see that reaction chamber is locked.

c. After firing. (1) Remove reaction chamber and swab out barrel, removing all residue.

(2) Clean firing pin.

(3) Clean reaction chamber.

(4) Clean and lubricate mounting bracket and standard, giving special attention to bearing surfaces.

(5) Tighten all nuts and screws.

## Section XIII

### MALFUNCTIONS AND CORRECTIONS

#### 23. MORTAR AND ROUND MISFIRES.

a. Precautions. (1) If possible, isolate all misfires of mortar and round (excluding the driver) until barrel is cool. Handle driver misfires as prescribed in paragraph 24.

(2) After barrel cools, allow a minimum of at least 1 minute to elapse before attempting removal of misfire.

(3) A minimum of personnel (preferably not more than two) should approach mortar, being careful of possible rear blast.

(4) Remove misfire by loosening cradle elevating handle, guarding against rearward tipping of barrel, and tip barrel forward to slide round out of muzzle where it must be caught to avoid impact of fuze. Carefully avoid the hot driver body.

**b. Mortar malfunctions.**

| <u>Cause</u>                        | <u>Remedy</u>                        |
|-------------------------------------|--------------------------------------|
| (1) Obstruction in tube or chamber  | Remove obstruction and refire round. |
| (2) Eccentric tube.                 | Replace tube.                        |
| (3) Dirty tube.                     | Clean tube (app., sect. I).          |
| (4) Absent or defective firing pin. | Replace firing pin (par. 32b).       |

**c. Round malfunctions.**

| <u>Cause</u>                              | <u>Remedy</u>             |
|-------------------------------------------|---------------------------|
| (1) Eccentric shell body or components.   | Remove and replace round. |
| (2) Burrs, rust, paint, or dirt on round. | Remove and clean round.   |
| (3) Defective propelling charge.          | Remove and replace round. |
| (4) Obstruction covering striker nut.     | Remove and replace round. |
| (5) Wet propelling charge                 | Remove and replace round. |

**24. DRIVER MISFIRES.**

**a. General.** When a driver misfire occurs, wait 1 minute and then remove and isolate the round. Then when convenient, remove and replace the driver.

**b. Inability to pull cotter pin.**

| <u>Cause</u>                      | <u>Remedy</u>                                                                 |
|-----------------------------------|-------------------------------------------------------------------------------|
| (1) Bent cotter pin.              | Remove round, straighten end of pin with pliers, and attempt to refire.       |
| (2) Removal of pin is incomplete. | Attempt to refire round and if unsuccessful, remove round and replace driver. |
| (3) Broken pull-chain.            | Remove round and replace driver.                                              |

c. Failure to fire after removing cotter pin.

| <u>Cause</u>                                                      | <u>Remedy</u>                    |
|-------------------------------------------------------------------|----------------------------------|
| (1) Defective parts or assembly.                                  | Remove round and replace driver. |
| (2) Driver not screwed or tightly.                                | Remove round and replace driver. |
| NOTE: <u>If driver is not screwed in fully, it will not fire.</u> |                                  |

d. Separation of driver from shell.

| <u>Cause</u>                                              | <u>Remedy</u>                    |
|-----------------------------------------------------------|----------------------------------|
| (1) Malhandling.                                          | Remove round and replace driver. |
| (2) Defective driver.                                     | Remove round and replace driver. |
| NOTE: <u>Do not attempt to fire driver that is loose.</u> |                                  |

## 25. MALFUNCTIONS AFFECTING ASSEMBLY.

a. Chamber tight on tube.

| <u>Cause</u>                           | <u>Remedy</u>                                                       |
|----------------------------------------|---------------------------------------------------------------------|
| (1) Latch not engaged in chamber slot. | Allow barrel to cool and remove chamber with chain or strap wrench. |
| (2) Fouled threads.                    | Same as above.                                                      |

b. Sticking latch.

| <u>Cause</u>                      | <u>Remedy</u>                          |
|-----------------------------------|----------------------------------------|
| (1) Broken or deformed latch.     | Replace latch (par. 30d).              |
| (2) Lack of lubrication.          | Lubricate (par. 20).                   |
| (3) Dirt or other obstructions.   | Disassemble and clean (app., sect. I). |
| (4) Broken latch spring.          | Replace spring (par. 30d).             |
| (5) Sticking latch retaining pin. | Replace pin (par. 30e).                |

c. Pintle yoke deformed.

| <u>Cause</u>           | <u>Remedy</u>                  |
|------------------------|--------------------------------|
| (1) Defective yoke.    | Remove and replace (par. 30g). |
| (2) Pintle bolt loose. | Remove and replace (par. 30g). |

d. Broken or deformed bracket.

| <u>Cause.</u>                 | <u>Remedy</u>                         |
|-------------------------------|---------------------------------------|
| (1) <u>Malhandling.</u>       | <u>Remove and replace (par. 30a).</u> |
| (2) <u>Defective bracket.</u> | <u>Remove and replace (par. 30a).</u> |

**26. MALFUNCTIONS AFFECTING OPERATION.**

a. Excessive motion of mortar during firing.

| <u>Cause</u>                                                                           | <u>Remedy</u>                                                                                                                        |
|----------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|
| (1) <u>Extremes of temperature. (-40 degrees Fahrenheit or 150 degrees Fahrenheit)</u> | <u>Place sandbags around legs of standard.</u>                                                                                       |
| (2) <u>Open pintle locking lever.</u>                                                  | <u>Close pintle locking lever (figs. 7 and 8).</u>                                                                                   |
| (3) <u>Loose tripod legs.</u>                                                          | <u>Tighten loose nuts.</u>                                                                                                           |
| (4) <u>Loose elevating or traversing clamps.</u>                                       | <u>Tighten clamps.</u>                                                                                                               |
| (5) <u>Missing restricting plug.</u>                                                   | <u>Replace with appropriate plug (par. 32a).</u>                                                                                     |
| (6) <u>Obstruction in chamber.</u>                                                     | <u>Remove obstruction.</u>                                                                                                           |
| (7) <u>Improper restricting plug.</u>                                                  | <u>If mortar kicks forward, replace plug with next larger size and if mortar kicks to rear, replace plug with next smaller size.</u> |
| (8) <u>Loose mounting bracket.</u>                                                     | <u>Tighten hex jam nuts if loose and replace if missing (par. 30a).</u>                                                              |

b. Malfunctions of cradle and tripod. See TM 9-1205.

**27. FUZE MALFUNCTION.**

a. Failure of round to burst upon impact.

| <u>Cause</u>                    | <u>Remedy</u>                                                                                  |
|---------------------------------|------------------------------------------------------------------------------------------------|
| (1) <u>Failure to pull pin.</u> | <u>Pull pins on future rounds.</u>                                                             |
| (2) <u>Defective fuze.</u>      | <u>If pins are pulled and duds occur, report defective fuzes on appropriate form (par. 2).</u> |

## Section XIV

### BARREL E28

#### 28. COMPONENTS.

The barrel consists of the tube and reaction chamber (fig. 3).

#### 29. TUBE.

a. The tube is made from the tube of the standard M2 improved 4.2-inch chemical mortar barrel (TM 3-320), modified by shortening to 40 inches and adding special threading. It has an inside diameter of 4.2 inches between lands. The tube includes a complete mounting assembly consisting of a front and rear support band, mounting bracket, cal. .30 machine gun mount pintle, and a locking mechanism which is assembled to the rear support band between mounting bracket and tube body. Figures 18 and 19 show the complete tube and its component parts. The tube cap serves as a thread protector and prevents water from entering tube when mortar is disassembled. The muzzle cover is the standard leather cover used on the standard 4.2-inch chemical mortar.

b. The tube is rifled with 24 lands and grooves. Depth of groove is 0.08 inch and width is 0.486 inch; width of land is 0.062 inch. Pitch increases parabolically from 0 to 1 turn in 20 calibers.

#### 30. DISASSEMBLY AND ASSEMBLY OF TUBE.

a. Mounting bracket. (Fig. 20) To disassemble mounting bracket, remove hex jam nuts on under side of bracket, using appropriate socket wrench on the combination tool. Remove washers and pull off bracket. To assemble, reverse procedure for disassembly.

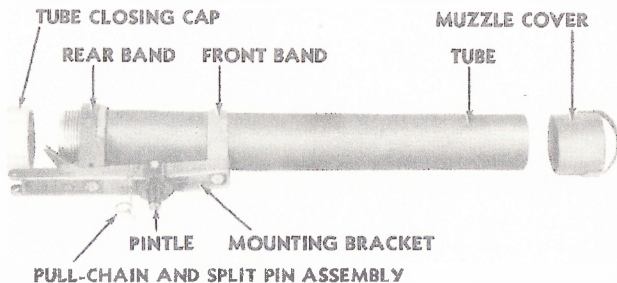


Fig. 18. Tube assembly.

b. Chamber releasing lever. To remove chamber releasing lever, unscrew shoulder screw on under side of mounting bracket (fig. 21), using screw driver of combination tool, and lift off lever. To assemble, reverse procedure for disassembly.

c. Latch spring retainer. To remove latch spring retainer, unscrew retainer by inserting screw driver of combination tool into slotted end of retainer. To replace, reverse procedure for removal.

d. Retainer spring. To remove retainer spring, remove chamber releasing lever, as described in b above, and slide out latch and spring (fig. 22). To replace spring, insert into retainer, and insert the latch and replace releasing lever.

e. Latch retaining pin. To replace pin, disconnect from chain, using a screw driver to open link, and place new pin in link. Close link with pliers.

f. Pull-chain and split pin assembly. To remove assembly, open chain link, securing assembly to tube. Replace by reversing procedure for removal.

g. Pinile yoke. To remove yoke, pull out cotter pin from castle nut, unscrew castle nut, and slide out bolt (fig. 23). To replace yoke, reverse procedure for removal.

### 31. REACTION CHAMBER.

a. The reaction chamber (fig. 24) includes six vanes, a three-legged firing pin holder, a powder support, firing pin, and restricting plug. The chamber has an open throat at the rear through which gases are permitted to escape with linear momentum equal to that of the shell.

b. Six vanes are riveted to rear of chamber as indicated in figure 24, using cold headed riveting. Vanes are set at an angle of 15 degrees to introduce angular momentum, to counterbalance the reaction to the rotation of the shell. Vanes are carefully fitted to the chamber and securely riveted to prevent gas leakage around vanes and rivets.

c. Within the reaction chamber, in front of the vanes, is the three-legged firing pin holder (fig. 24). The holder is assembled with a press fit and held in place by three guide screws in the chamber wall. The holder provides adequate throat area as well as support for the firing pin and powder support (fig. 24).

d. The powder support bears against front face of holder and is held in place by the firing pin which threads into holder. Firing pin is provided with a hexagon on the firing end for ease in assembly and disassembly (fig. 25).

e. Rear of the holder has an internal thread in the center for inserting a restricting plug. Purpose of restricting plug is to adjust throat area for proper balance of the mortar. Each mortar is equipped with the plug which gives proper balance, and, in the event that the plug is to be replaced, the correct one must be used. Mortar record book supplied with the mortar designates the type plug for the accompanying mortar.

f. Threaded end of the reaction chamber has a slot to receive the chamber latch (fig. 24).

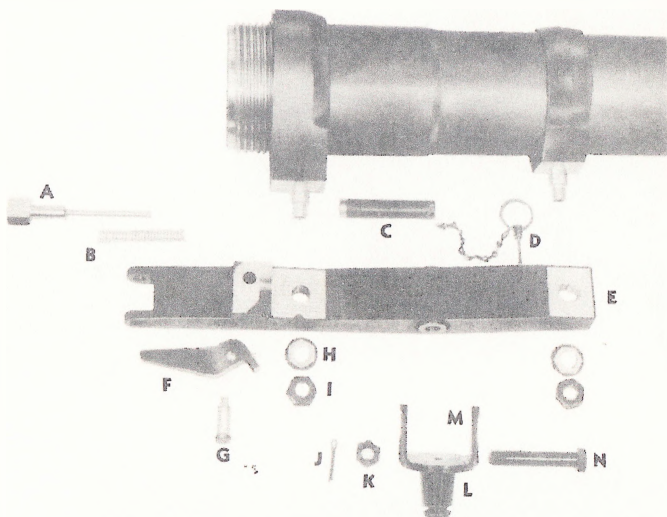


Fig. 19. Component parts of tube.

- |                                       |                      |
|---------------------------------------|----------------------|
| A - Latch                             | H - Washer           |
| B - Latch spring                      | I - Hex jam nut      |
| C - Latch spring retainer             | J - Cotter pin       |
| D - Pull-chain and split pin assembly | K - Castle nut       |
| E - Mounting bracket                  | L - Pintle           |
| F - Chamber releasing lever           | M - Pintle yoke      |
| G - Shoulder screw                    | N - Pintle yoke bolt |

g. A chamber plug (fig. 26) is supplied with the chamber and serves as a thread protector when the mortar is disassembled.

### 32. DISASSEMBLY AND ASSEMBLY OF REACTION CHAMBER.

a. Restricting plug. To remove restricting plug, insert screw driver into slotted head of plug and unscrew (fig. 27). To replace, reverse procedure for removal.

b. Firing pin. To remove firing pin, use appropriate socket wrench portion of combination tool, place over hexagonal section of firing pin, and unscrew firing pin (fig. 28). To replace, reverse procedure for removal and make certain the powder support is in place.

c. Powder support. Remove firing pin by procedure in b above and lift out powder support. To replace, reverse procedure for removing.

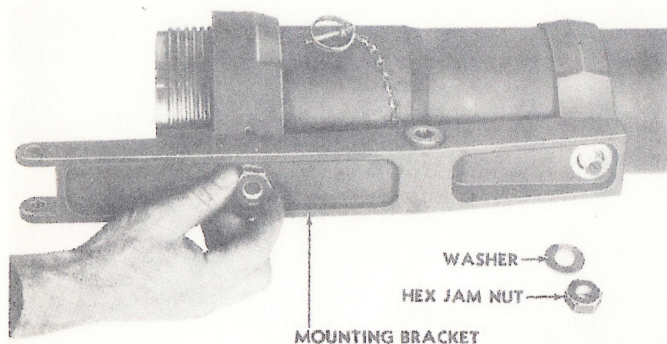


Fig. 20. Removing hex jam nut.

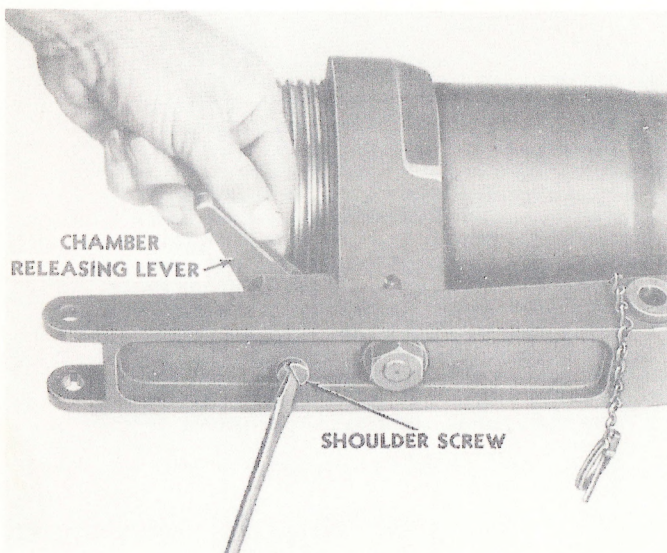


Fig. 21. Removing chamber releasing lever by unscrewing shoulder screw.

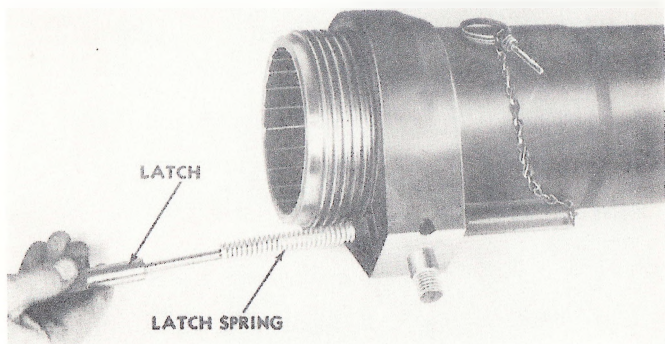


Fig. 22. Removing latch and latch spring.

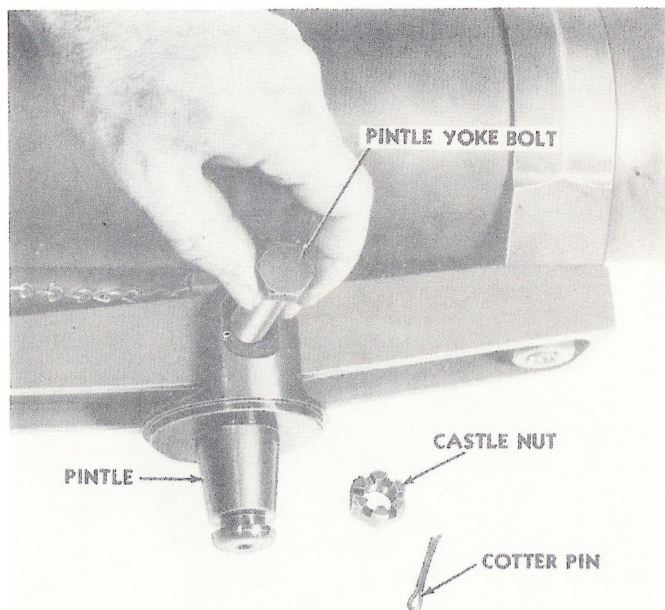


Fig. 23. Removing pintle.

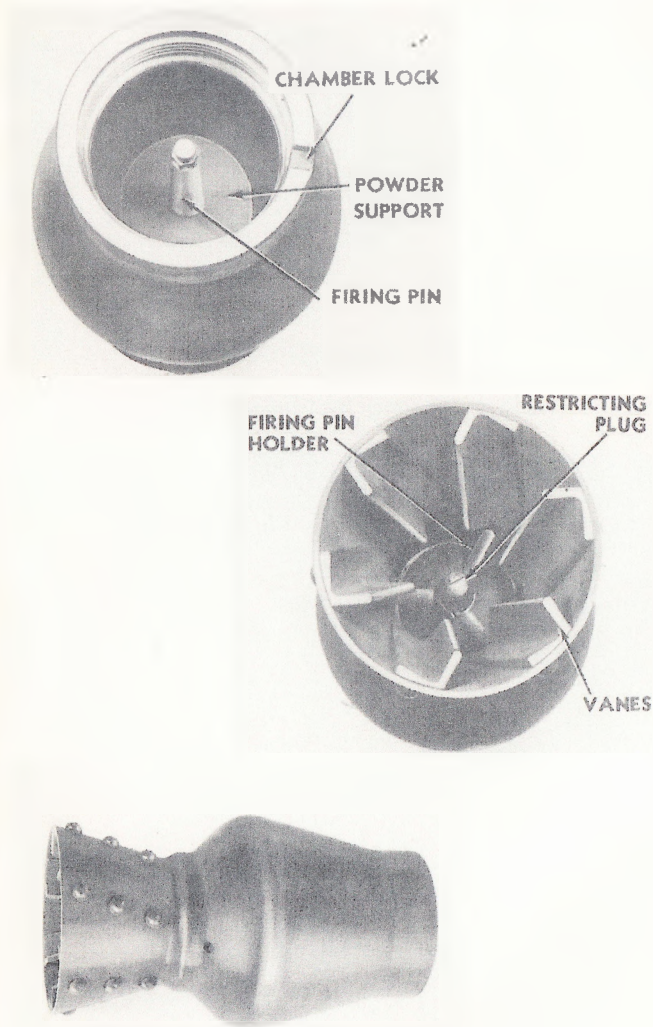


Fig. 24. Top, rear, and side views of reaction chamber.

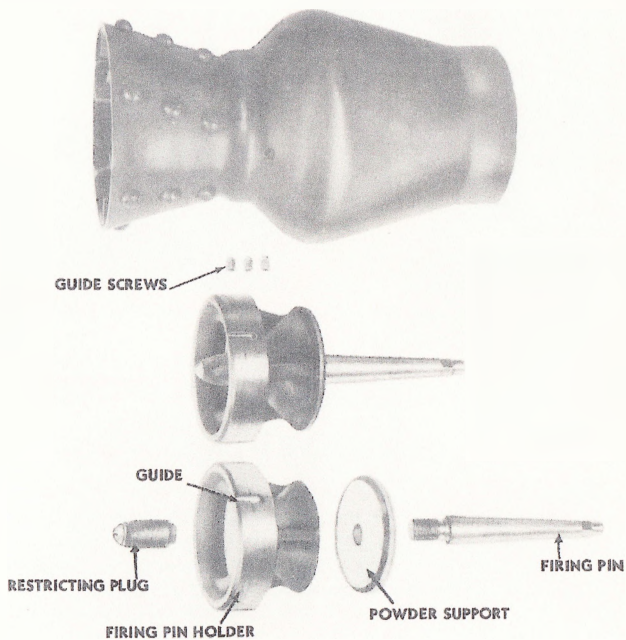


Fig. 25. Internal components of reaction chamber.

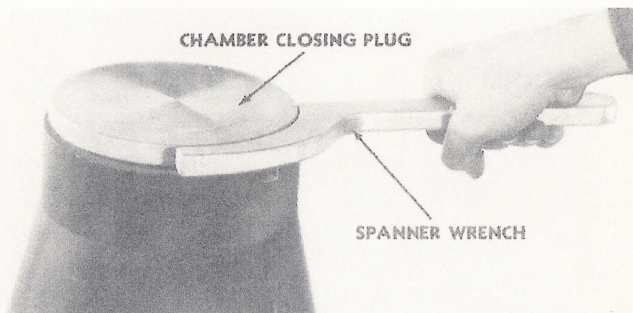


Fig. 26. Removing plug, using spanner wrench.

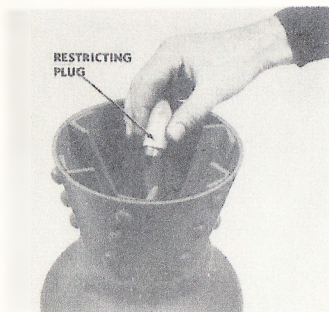


Fig. 27. Restricting plug removed from firing pin holder.

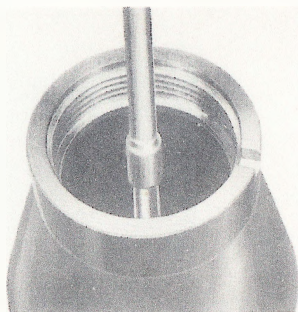


Fig. 28. Removing firing pin, using combination tool.

## Section XV

### STANDARD E22

#### 33. GENERAL.

The standard (fig. 3) used with the mortar is a modified cal. .30 machine gun mount M1917A1. The modification is that the body of the elevating screw joint pin has the L-shaped leg cut off three-eighths inch to provide clearance for the reaction chamber (fig. 4). In addition, the yoke pintle is removed from the cradle and assembled to mounting bracket of tube.

#### 34. DESCRIPTION.

a. Central member of tripod is a socket with three projecting lugs. Attached to socket are three legs which may be clamped in various positions, thus providing a level mount on uneven or sloping ground and permitting adjustment of height.

b. Cradle pintle fits into and pivots in the socket. Traversing clamp prevents pintle from being pulled out of socket and controls ease of rotation of the pintle.

c. Cradle is assembled to top of pintle by means of the cradle trunnion studs which are threaded into seatings in the pintle yoke. Vertical movement of cradle around this yoke may be adjusted or fixed at a desired point by means of cradle-clamping handle. In the forward end of the cradle is the gun pintle housing, equipped with a quick release latch (locking lever). Elevating and traversing mechanism is housed in rear end of cradle frame.

#### 35. DISASSEMBLY AND ASSEMBLY.

For disassembly and assembly of the standard, see TM 9-1205.

## PART FOUR

### AUXILIARY EQUIPMENT

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#### Section XVI

#### GENERAL

##### 36. SCOPE.

Part four contains information for the guidance of personnel responsible for the operation of this equipment. It contains only the information necessary to using personnel to identify, connect, and protect such auxiliary equipment while being used or transported with the main equipment.

#### Section XVII

#### AMMUNITION

##### 37. GENERAL.

a. Complete round. Ammunition for the 4.2-inch recoilless chemical mortar is issued in the form of fuzed, complete rounds of fixed ammunition (fig. 29). The term "fixed" used in connection with ammunition signifies that the propelling charge is fixed (not adjustable) and that the round is placed in the muzzle as a unit. The round consists of a 4.2-inch chemical mortar shell body, 4.2-inch chemical mortar shell fuze (modified), modified cartridge container, rocket driver, and propellant assembly (figs. 29 and 30). For a description of the standard 4.2-inch chemical mortar shell body and fuzes, see TM 3-320.

b. Action on firing. (1) The complete round, weighing approximately 29 pounds, is loaded in the mortar by placing it in the muzzle. For direct fire (elevations up to 200 mils), where gravity will not always fire shell, the complete round as shown in figure 29 is used. The mortar is fired by pulling hammer retaining pin in the rocket driver. This actuates the driver and propels the round through the tube and against a fixed firing pin to actuate the percussion primer at base of shell.

(2) At elevations greater than 200 mils, the force of gravity is used to drive round against firing pin. Firing at these elevations, the rocket driver is not used. The round without rocket driver is dropped into the muzzle in the manner of firing the standard mortar.

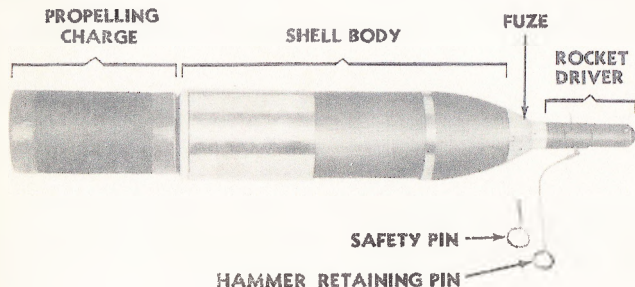


Fig. 29. Complete round for E34R1 recoilless mortar.

(3) When the percussion primer is actuated by the firing pin, it ignites a secondary igniter (black powder paste) which in turn ignites the main charge. The pressure developed when the propelling charge is ignited expands a rotating disk of soft brass, attached to base of shell, into rifling of the tube. At the same time, part of the gases are moving in the opposite direction and are forced to rear of tube into the expanding portion of reaction chamber where their linear direction is changed to an angular direction the same as that of the shell rotation. It is this utilization of the gases which gives the mortar its recoilless feature.

### 38. FIRING TABLES.

Appropriate provisional firing tables for the 4.2-inch recoilless chemical mortar E34R1 and complementary angle of site data are given in tables I, II, III, and IV.

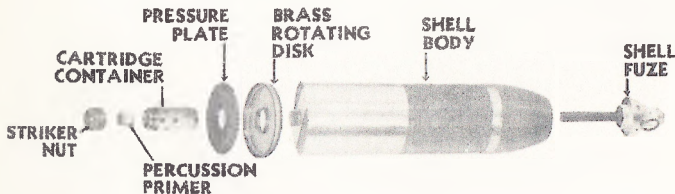


Fig. 30. Components of recoilless mortar shell disassembled.

**39. IDENTIFICATION.**

a. General. Ammunition and ammunition components are completely identified by means of painting and marking (including an ammunition lot number). Other essential information is marked on the components; for example, on the projectile, the kind of filler; and on the propelling charge, the model number. See table V.

b. Ammunition lot number. A lot number is assigned all ammunition at the time of manufacture. It is stamped or marked on every loaded complete round and on all packing containers. It is required for all purposes of record, including reports on condition, functioning, and accidents in which the ammunition may be involved.

c. Painting and marking. (1) Painting. Projectiles are painted to prevent rust and to provide, by the color, a ready means of identification as to the filling. The colors used are as follows:

|                          |                                         |
|--------------------------|-----------------------------------------|
| High explosive . . . . . | Olive-drab body with marking in yellow. |
|--------------------------|-----------------------------------------|

Chemical:

|                                 |                                 |
|---------------------------------|---------------------------------|
| Nonpersistent war gas . . . . . | Gray body with one green band.  |
| Persistent war gas . . . . .    | Gray body with two green bands. |
| Smoke . . . . .                 | Gray body with one yellow band. |
| Harassing gas . . . . .         | Gray body with one red band.    |

NOTE: All shell markings are in same color as bands.

(2) Marking. For purposes of identification, the components of the complete round are marked to give lot number, model, date and place of manufacture, and other pertinent information.

TABLE I

SHELL, HE, E74  
FUZE, POINT DETONATING, E45, WITH DRIVER  
MUZZLE VELOCITY, 715 FEET PER SECOND

| 1     | 2         | 3                                                      | 4     | 5                       | 6                     | 7                         | 8                           | 9                         |
|-------|-----------|--------------------------------------------------------|-------|-------------------------|-----------------------|---------------------------|-----------------------------|---------------------------|
| Range | Elevation | Change in eleva-<br>tion for 100-yd<br>change in range | Drift | Cross wind<br>1 MPH (+) | Rear wind of<br>1 MPH | One pct in<br>air density | One in wt of<br>proj is std | One foot per<br>sec in MV |
| R     | E1        | C                                                      | Dft   | W-D                     | W-R                   | Den                       | Wt                          | t/s                       |
| yd    | mil       | mil                                                    | mil   | mil                     | yd                    | yd                        | yd                          | yd                        |
| 0     | 0.0       | 8.4                                                    |       |                         |                       |                           |                             |                           |
| 100   | 9.6       | 9.6                                                    |       |                         |                       |                           |                             |                           |
| 200   | 19.3      | 9.9                                                    |       |                         |                       |                           |                             |                           |
| 300   | 28.2      | 10.1                                                   |       |                         |                       |                           |                             |                           |
| 400   | 39.4      | 10.3                                                   |       |                         |                       |                           |                             |                           |
| 500   | 49.8      | 10.5                                                   |       |                         |                       |                           |                             |                           |
| 600   | 60.4      | 10.7                                                   |       |                         |                       |                           |                             |                           |
| 700   | 71.2      | 10.9                                                   |       |                         |                       |                           |                             |                           |
| 800   | 82.3      | 11.2                                                   |       |                         |                       |                           |                             |                           |
| 900   | 98.6      | 11.4                                                   |       |                         |                       |                           |                             |                           |
| 1000  | 105.1     | 11.7                                                   |       |                         |                       |                           |                             |                           |
| 1100  | 116.9     | 11.9                                                   |       |                         |                       |                           |                             |                           |
| 1200  | 128.9     | 12.2                                                   |       |                         |                       |                           |                             |                           |
| 1300  | 141.2     | 12.5                                                   |       |                         |                       |                           |                             |                           |
| 1400  | 153.8     | 12.8                                                   |       |                         |                       |                           |                             |                           |
| 1500  | 166.7     | 13.1                                                   |       |                         |                       |                           |                             |                           |
| 1600  | 179.9     | 13.4                                                   |       |                         |                       |                           |                             |                           |
| 1700  | 193.5     | 13.8                                                   |       |                         |                       |                           |                             |                           |
| 1800  | 207.4     | 14.2                                                   |       |                         |                       |                           |                             |                           |
| 1900  | 221.8     | 14.6                                                   |       |                         |                       |                           |                             |                           |
| 2000  | 236.6     | 15.0                                                   |       |                         |                       |                           |                             |                           |
| 2100  | 251.9     | 15.5                                                   |       |                         |                       |                           |                             |                           |
| 2200  | 267.7     | 16.1                                                   |       |                         |                       |                           |                             |                           |
| 2300  | 284.0     | 16.7                                                   |       |                         |                       |                           |                             |                           |
| 2400  | 301.0     | 17.4                                                   |       |                         |                       |                           |                             |                           |
| 2500  | 318.7     | 18.1                                                   |       |                         |                       |                           |                             |                           |
| 2600  | 337.2     | 19.0                                                   |       |                         |                       |                           |                             |                           |
| 2700  | 356.7     | 20.0                                                   |       |                         |                       |                           |                             |                           |
| 2800  | 377.3     | 21.1                                                   |       |                         |                       |                           |                             |                           |
| 2900  | 398.1     | 22.5                                                   |       |                         |                       |                           |                             |                           |
| 3000  | 422.4     | 24.2                                                   |       |                         |                       |                           |                             |                           |

TABLE I  
(contd)

| 10             | 11         | 12               | 13                                      | 14            | 15                | 16                        | 17             | 1     |
|----------------|------------|------------------|-----------------------------------------|---------------|-------------------|---------------------------|----------------|-------|
| Probable error | Deflection | Maximum ordinate | Horizontal distance of maximum ordinate | Angle of fall | Striking velocity | Line No. of metro message | Time of flight | Range |
| epr            | epd        | Ord              | D                                       | $\mu$         | SV                | L                         | Time           | R     |
| yd             | yd         | yd               | yd                                      | mil           | t/s               | No.                       | sec            | yd    |
|                |            | 0                | 0                                       | 0             |                   |                           | 0.0            | 0     |
|                |            | 0                | 50                                      | 10            |                   |                           | 0.4            | 100   |
|                |            | 1                | 100                                     | 20            |                   |                           | 0.8            | 200   |
|                |            | 2                | 150                                     | 31            |                   |                           | 1.3            | 300   |
|                |            | 4                | 201                                     | 42            |                   |                           | 1.7            | 400   |
|                |            | 8                | 252                                     | 53            |                   |                           | 2.2            | 500   |
|                |            | 9                | 303                                     | 64            |                   |                           | 2.6            | 600   |
|                |            | 13               | 365                                     | 76            |                   |                           | 3.1            | 700   |
|                |            | 17               | 407                                     | 88            |                   |                           | 3.5            | 800   |
|                |            | 22               | 460                                     | 101           |                   |                           | 4.0            | 900   |
|                |            | 27               | 512                                     | 114           |                   |                           | 4.5            | 1000  |
|                |            | 34               | 565                                     | 127           |                   |                           | 5.0            | 1100  |
|                |            | 41               | 617                                     | 141           |                   |                           | 5.5            | 1200  |
|                |            | 49               | 670                                     | 156           |                   |                           | 6.0            | 1300  |
|                |            | 57               | 723                                     | 171           |                   |                           | 6.5            | 1400  |
|                |            | 66               | 776                                     | 187           |                   |                           | 7.0            | 1500  |
|                |            | 77               | 829                                     | 203           |                   |                           | 7.5            | 1600  |
|                |            | 88               | 882                                     | 220           |                   |                           | 8.1            | 1700  |
|                |            | 100              | 935                                     | 238           |                   |                           | 8.6            | 1800  |
|                |            | 114              | 989                                     | 257           |                   |                           | 9.2            | 1900  |
|                |            | 129              | 1043                                    | 276           |                   |                           | 9.8            | 2000  |
|                |            | 145              | 1097                                    | 296           |                   |                           | 10.4           | 2100  |
|                |            | 162              | 1151                                    | 317           |                   |                           | 11.0           | 2200  |
|                |            | 181              | 1205                                    | 339           |                   |                           | 11.7           | 2300  |
|                |            | 202              | 1259                                    | 361           |                   |                           | 12.3           | 2400  |
|                |            | 224              | 1314                                    | 385           |                   |                           | 13.0           | 2500  |
|                |            | 248              | 1369                                    | 410           |                   |                           | 13.7           | 2600  |
|                |            | 275              | 1424                                    | 436           |                   |                           | 14.4           | 2700  |
|                |            | 304              | 1479                                    | 463           |                   |                           | 15.2           | 2800  |
|                |            | 336              | 1535                                    | 491           |                   |                           | 15.9           | 2900  |
|                |            | 373              | 1590                                    | 521           |                   |                           | 16.7           | 3000  |

TABLE II  
(contd)

| 10             | 11         | 12               | 13                                      | 14            | 15                | 16                        | 17   | 1     |
|----------------|------------|------------------|-----------------------------------------|---------------|-------------------|---------------------------|------|-------|
| Probable error |            |                  |                                         |               |                   |                           |      |       |
| epr            | epd        | Ord              | D                                       | $\mu$         | SV                | Line No. of metro message | Time | R     |
| Range          | Deflection | Maximum ordinate | Horizontal distance of maximum ordinate | Angle of fall | Striking velocity | No.                       | sec  | Range |
| yd             | yd         | yd               | yd                                      | mil           | ft/s              | No.                       | sec  | yd    |
|                |            | 85               | 879                                     | 215           |                   |                           | 8.0  | 1700  |
|                |            | 97               | 932                                     | 232           |                   |                           | 8.5  | 1800  |
|                |            | 110              | 988                                     | 250           |                   |                           | 9.1  | 1900  |
|                |            | 124              | 1040                                    | 268           |                   |                           | 9.6  | 2000  |
|                |            | 139              | 1094                                    | 287           |                   |                           | 10.2 | 2100  |
|                |            | 153              | 1148                                    | 307           |                   |                           | 10.8 | 2200  |
|                |            | 174              | 1203                                    | 328           |                   |                           | 11.4 | 2300  |
|                |            | 194              | 1258                                    | 350           |                   |                           | 12.1 | 2400  |
|                |            | 213              | 1313                                    | 373           |                   |                           | 12.7 | 2500  |
|                |            | 240              | 1368                                    | 397           |                   |                           | 13.4 | 2600  |
|                |            | 263              | 1423                                    | 422           |                   |                           | 14.1 | 2700  |
|                |            | 294              | 1479                                    | 448           |                   |                           | 14.8 | 2800  |
|                |            | 325              | 1535                                    | 476           |                   |                           | 15.8 | 2900  |
|                |            | 359              | 1591                                    | 505           |                   |                           | 16.4 | 3000  |
|                |            | 397              | 1647                                    | 536           |                   |                           | 17.2 | 3100  |
|                |            | 440              | 1704                                    | 570           |                   |                           | 18.1 | 3200  |
|                |            | 489              | 1761                                    | 607           |                   |                           | 19.1 | 3300  |
|                |            | 546              | 1817                                    | 648           |                   |                           | 20.1 | 3400  |
|                |            | 614              | 1874                                    | 694           |                   |                           | 21.3 | 3500  |
|                |            | 702              | 1931                                    | 751           |                   |                           | 22.8 | 3600  |
|                |            | 843              | 1989                                    | 834           |                   |                           | 25.0 | 3700  |
|                |            | 994              | 2010                                    | 915           |                   |                           | 27.2 | 3735  |

# AUXILIARY EQUIPMENT

TABLE III

| ABRIDGED FIRING TABLE                                                               |                     |                  |                     |
|-------------------------------------------------------------------------------------|---------------------|------------------|---------------------|
| Mortar, Recoilless Chemical, 4.2-Inch, E34R1<br>Shell, HE, E74 and Fuze, Delay, E46 |                     |                  |                     |
| With Driver                                                                         |                     | Without Driver   |                     |
| Range<br>(yards)                                                                    | Elevation<br>(mils) | Range<br>(yards) | Elevation<br>(mils) |
| 0                                                                                   | 0.0                 | 1700             | 188.0               |
| 100                                                                                 | 9.6                 | 1800             | 201.8               |
| 200                                                                                 | 19.3                | 1900             | 215.5               |
| 300                                                                                 | 29.2                | 2000             | 229.8               |
| 400                                                                                 | 39.4                | 2100             | 244.8               |
| 500                                                                                 | 49.8                | 2200             | 259.9               |
| 600                                                                                 | 60.4                | 2300             | 275.8               |
| 700                                                                                 | 71.2                | 2400             | 292.3               |
| 800                                                                                 | 82.3                | 2500             | 309.4               |
| 900                                                                                 | 93.6                | 2600             | 327.3               |
| 1000                                                                                | 105.1               | 2700             | 346.0               |
| 1100                                                                                | 118.9               | 2800             | 365.7               |
| 1200                                                                                | 128.9               | 2900             | 386.6               |
| 1300                                                                                | 141.2               | 3000             | 408.8               |
| 1400                                                                                | 153.8               | 3100             | 432.5               |
| 1500                                                                                | 166.7               | 3200             | 458.2               |
| 1600                                                                                | 179.9               | 3300             | 486.8               |
| 1700                                                                                | 193.5               | 3400             | 518.7               |
| 1800                                                                                | 207.4               | 3500             | 556.1               |
| 1900                                                                                | 221.8               | 3600             | 603.1               |
| 2000                                                                                | 236.6               | 3700             | 675.8               |
| 2100                                                                                | 251.9               | 3735             | 751.2               |
| 2200                                                                                | 267.7               |                  |                     |
| 2300                                                                                | 284.0               |                  |                     |
| 2400                                                                                | 301.0               |                  |                     |
| 2500                                                                                | 318.7               |                  |                     |
| 2600                                                                                | 337.2               |                  |                     |
| 2700                                                                                | 356.7               |                  |                     |
| 2800                                                                                | 377.3               |                  |                     |
| 2900                                                                                | 399.1               |                  |                     |
| 3000                                                                                | 422.4               |                  |                     |

# AMMUNITION

TABLE IV

| COMPLEMENTARY ANGLE OF SITE IN MILS                                                                                                |                         |       |       |
|------------------------------------------------------------------------------------------------------------------------------------|-------------------------|-------|-------|
| Mortar, Recoilless Chemical, 4.2-Inch, E34R1<br>Shell, HE, E74 Fuze, Point Detonating, E46<br>Muzzle Velocity, 715 feet per second |                         |       |       |
| Range<br>(yards)                                                                                                                   | Angle of Site<br>(mils) |       |       |
|                                                                                                                                    | -100                    | -200  | -300  |
| 0                                                                                                                                  | 0.0                     | 0.0   | 0.0   |
| 100                                                                                                                                | 0.0                     | 0.0   | 0.0   |
| 200                                                                                                                                | 0.0                     | 0.0   | 0.0   |
| 300                                                                                                                                | 0.0                     | 0.0   | -0.1  |
| 400                                                                                                                                | 0.0                     | -0.1  | -0.2  |
| 500                                                                                                                                | 0.0                     | -0.2  | -0.4  |
| 600                                                                                                                                | -0.1                    | -0.4  | -0.7  |
| 700                                                                                                                                | -0.3                    | -0.6  | -1.0  |
| 800                                                                                                                                | -0.4                    | -0.9  | -1.4  |
| 900                                                                                                                                | -0.6                    | -1.3  | -1.9  |
| 1000                                                                                                                               | -0.9                    | -1.7  | -2.5  |
| 1100                                                                                                                               | -1.2                    | -2.2  | -3.2  |
| 1200                                                                                                                               | -1.5                    | -2.8  | -4.0  |
| 1300                                                                                                                               | -1.9                    | -3.5  | -4.8  |
| 1400                                                                                                                               | -2.3                    | -4.2  | -5.8  |
| 1500                                                                                                                               | -2.7                    | -5.0  | -6.9  |
| 1600                                                                                                                               | -3.2                    | -5.9  | -8.1  |
| 1700                                                                                                                               | -3.7                    | -7.0  | -9.5  |
| 1800                                                                                                                               | -4.3                    | -8.1  | -11.0 |
| 1900                                                                                                                               | -5.0                    | -9.3  | -12.7 |
| 2000                                                                                                                               | -5.7                    | -10.6 | -14.6 |
| 2100                                                                                                                               | -6.5                    | -12.1 | -16.8 |
| 2200                                                                                                                               | -7.5                    | -13.8 | -19.2 |
| 2300                                                                                                                               | -8.6                    | -15.8 | -21.9 |
| 2400                                                                                                                               | -9.9                    | -18.0 | -24.9 |
| 2500                                                                                                                               | -11.4                   | -20.5 | -28.3 |
| 2600                                                                                                                               | -13.1                   | -23.4 | -32.2 |
| 2700                                                                                                                               | -15.1                   | -26.8 | -36.7 |
| 2800                                                                                                                               | -17.4                   | -30.8 | -41.9 |
| 2900                                                                                                                               | -20.1                   | -35.4 | -47.9 |
| 3000                                                                                                                               | -23.2                   | -40.7 | -54.7 |

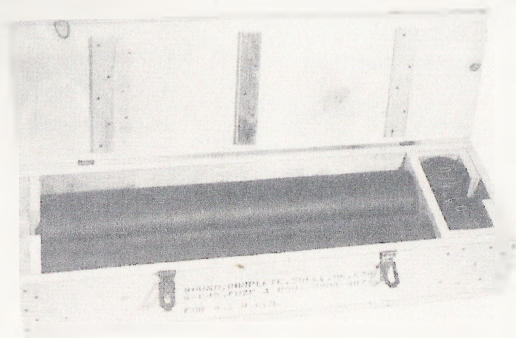


Fig. 31. Two complete rounds in packing box.

#### 40. CARE, HANDLING, AND PRESERVATION.

a. Complete rounds are packed to withstand conditions usually found in the field. Complete rounds, less rocket drivers, are shipped in individual moisture-resistant fiber containers enclosed in a wooden packing box (fig. 31). Rocket drivers are packed in metal containers which are enclosed in the box containing the shell. Since explosives are adversely affected by moisture and high temperature, observe following precautions:

(1) Do not break moisture-resistant seal of outer container until ammunition is to be used.

(2) Protect ammunition, particularly fuzes and drivers, from high temperature, including direct rays of sun.

b. Do not attempt to disassemble fuze or driver.

c. Do not remove protection or safety devices from fuzes until just before use.

d. Before loading, complete round should be free of foreign matter such as sand, mud, moisture, or grease.

e. Avoid jet end of the drivers when handling.

f. Attach drivers to round only immediately before use because driver is armed by the act of attachment. Attach this assembly last when preparing ammunition. Avoid rough treatment of round with driver in place and protect attached driver from blows and jars.

g. Since propellant is fixed, there is never a need to open propellant container or to expose charge or igniters. Handle and load round with propellant container intact.

h. Return rounds prepared for firing but not fired to their original condition and packings and mark appropriately. Such rounds should be used first in subsequent firings, in order that stocks of opened packages may be kept at a minimum.

i. Do not permit a large accumulation of ammunition and take particular care to protect ammunition from weather and fire.

#### 41. PREPARATION FOR FIRING.

a. Low angle fire. For elevations below 200 mils, prepare rounds for firing as follows:

- Remove round from fiber container.
- Immediately before firing, remove safety pin from fuze.
- Remove rocket driver from metal container and screw onto head of shell fuze (fig. 32).
- Place round in muzzle of barrel.
- To fire, see paragraph 13.

b. High angle fire. For elevations above 200 mils, prepare rounds for firing as follows:

- Remove round from individual fiber container.
- Remove safety pin in fuze and place shell in muzzle of barrel.
- To fire, see paragraph 13.

#### 42. PROPELLING CHARGE E8R2.

The fixed propelling charge consists of a small percussion primer, a tubular secondary igniter (black powder), and the charge of disks of standard trench mortar sheet powder. The charge is assembled in a foil-covered cardboard container painted olive drab. This container gives water-resistance and flame-resistance to the assembly. In one lid a hole is provided which allows the package to fit over the cartridge container. The propelling charge is securely attached to the shell by a washer that closes this hole and seats under a shoulder on the cartridge container. Under no circumstances will the propelling charge be disassembled.

#### 43. ROCKET DRIVER E21R1.

The rocket shell driver (fig. 32) is used to propel the round through the tube and against the fixed firing pin. It is used at elevations (below 200

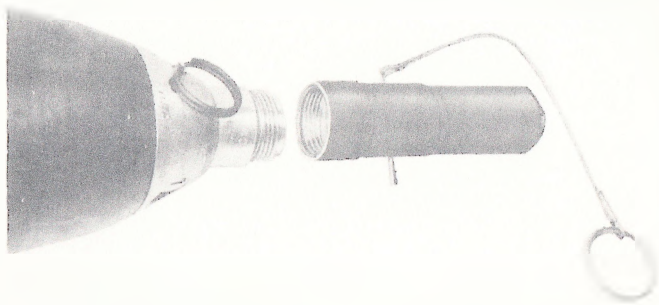


Fig. 32. Relationship of the driver to the fuze.

mils) too low for fire by gravity. Before assembly to the fuze, the rocket driver is unarmed. After it is assembled to the fuze, it is armed but does not fire until the hammer retaining pin is withdrawn. Removing hammer retaining pin releases the hammer which strikes a firing pin, firing a primary and secondary igniter which in turn ignites a powder charge. The entire rocket driver weighs approximately 0.8 pounds.

#### 44. FUZES.

a. Delay fuze E45. This fuze is the standard M4 delay fuze used with standard 4.2-inch chemical mortar shell, excepting the head assembly which has been modified to receive the rocket driver (fig. 32). Details of construction of the standard M4 fuze are given in TM 3-320. Total weight of fuze, loaded and completely assembled, is approximately 1 pound.

b. Quick fuze E48. This fuze has the same appearance as the delay fuze E45 (a, above), but it gives quick action.

c. Other fuzes. In addition to the E45 and E48 fuzes described above, the standard M2, M3, M4, and M5 fuzes (TM 3-320) may be used when firing above a 200-mil elevation with no rocket driver.

#### 45. AUTHORIZED ROUNDS.

The authorized rounds for the 4.2-inch recoilless chemical mortar are given in table V.

#### 46. PACKING.

a. Complete round. All the components of two complete rounds are packed in a wooden box approximately 36 inches long, 10-1/2 inches wide, and 7-3/4 inches high, including top and bottom cleats (fig. 31). The box contains two filled shell with propelling charge and fuze assembled and two rocket drivers. Each round is enclosed in a cylindrical, waterproof container; each driver is contained in a cylindrical metal container (approximate diameter, 3-1/2 inches; approximate length, 5 inches). The box with the two complete rounds weighs approximately 80 pounds and has a displacement of approximately 1.7 cubic feet.

b. Marking for shipment. Packings for shipment and shipping plates are marked as follows:

- (1) Name and address of consignee (or code marking).
- (2) List and description of contents.
- (3) Gross weight in pounds and displacement in cubic feet.
- (4) Number of the package.
- (5) The letters U.S. in several conspicuous places.
- (6) Order number, contract number, or shipping number.
- (7) Chemical Warfare Service insignia.
- (8) Service color painted as three triangles on adjacent faces on diagonally opposite corners.
- (9) Name or designation of consignor preceded by the word "From."
- (10) Lot number.
- (11) Month and year packed.
- (12) Inspector's stamp.

# AMMUNITION

Table V

| CHARACTERISTICS OF AMMUNITION FOR 4.2-INCH RECOILLESS CHEMICAL MORTAR E34R1 |              |                    |       |                    |                   |                   |                    |               |     |                        |                |
|-----------------------------------------------------------------------------|--------------|--------------------|-------|--------------------|-------------------|-------------------|--------------------|---------------|-----|------------------------|----------------|
| Kind                                                                        | Filling      |                    | Model | Weight<br>As Fired | Fuze              | Propelling Charge |                    | Rocket Driver |     | Cartridge<br>Container | Firing Angle   |
|                                                                             | Kind         | Weight<br>(pounds) |       |                    |                   | Kind              | Weight<br>(pounds) |               |     |                        |                |
| Shell                                                                       | HE           | 8.5                | E74   | 28.5               | Delay E45         | E3R2              | 3.5                | E21R1         | 0.8 | E22                    | Up to 200 mils |
| Shell                                                                       | PWP          | 6.3                | E77   | 28.5               | Quick E48         | E3R2              | 3.5                | E21R1         | 0.8 | E22                    | Up to 200 mils |
| Shell                                                                       | HE           | 8.5                | E74   | 28.5               | Delay E45         | E3R2              | 3.5                | None          |     | E22                    | Above 200 mils |
| Shell                                                                       | HE           | 8.5                | E74   | 28.5               | M3, M4,<br>and M5 | E3R2              | 3.5                | None          |     | E22                    | Above 200 mils |
| Shell                                                                       | PWP          | 6.3                | E77   | 28.5               | Quick E48         | E3R2              | 3.5                | None          |     | E22                    | Above 200 mils |
| Shell                                                                       | PWP          | 6.3                | E77   | 28.5               | M2                | E3R2              | 3.5                | None          |     | E22                    | Above 200 mils |
| Shell                                                                       | WP,<br>FS, L | 7.5                | E77   | 29.7               | M2                | E3R2              | 3.5                | None          |     | E22                    | Above 200 mils |
|                                                                             | CNS          | 7.0                |       | 29.2               |                   |                   |                    |               |     |                        |                |
|                                                                             | H, CG        | 6.3                |       | 28.5               |                   |                   |                    |               |     |                        |                |

## Section XVIII

### SIGHT E19

#### 47. GENERAL.

The E19 sight consists of the elevation quadrant T13, telescope adapter M9, and the elbow telescope M62. The sight has elevation limits from -200 to 1600 mils and provides 6400 mils traverse, cant adjustment, and adjustable night lighting both on the telescope and on the scales. A sight mounting clamp E10, which is quick opening, fastens to the mortar tube (fig. 13). Sight is readily attached to the dove-tailed groove of the clamp (fig. 14) and is removed during firing.

#### 48. DESCRIPTION.

a. Elbow telescope M62. (1) Elbow telescope M62 (fig. 33) is a 3-power elbow telescope with a field of view of  $12^{\circ}12'$ . It has fixed focus and is designed for normal eyesight and ordinary ranges. The reticle marking is a vertical line and a horizontal line which form a cross at the reticle center.

(2) Elbow telescope M62 fits into telescope adapter M9 which fits onto elevation quadrant T13.

b. Telescope adapter M9. Telescope adapter M9 provides the means for turning the telescope's line of sight to any deflection and clamping it in place. The deflection scale has 100-mil increments and the azimuth micrometer has 1-mil increments. The scale reads from 0 to 3200 mils in two successive half-circles. For rapid adjustment in azimuth, internal worm and gear can be disengaged by drawing azimuth micrometer knob outward. An open sight is provided, as well as clamps for holding telescope in place and for clamping deflection motion.

c. Elevation quadrant T13. (1) Elevation quadrant T13 is the foundation of this mortar sight. It provides the means for vertical adjustment of the telescope line of sight.

(2) The quadrant (fig. 34) is mainly composed of a drum-like bracket which extends laterally from a latch that attaches it to the left side of the mortar, a ring-like housing encircling the bracket, and a knob-headed worm set in the housing bottom which engages a threaded groove around the drum. Turning the knob rotates housing on drum, and scales (fig. 34) indicate how many mils telescope line of sight has been raised or lowered.

(3) Housing encircles the bracket vertically. It is formed at the top to receive the telescope adapter mounted on it, and the bottom is tubular crosswise to house the elevation worm so it can drive the bracket drum.

(4) Elevation worm shaft has the elevation micrometer knob on

its head end. This micrometer has its circular scale graduated in two successive half-circles with 50 2-mil increments, 0 to 100, in each. Micrometer index is on the housing.

(5) A retainer screwed onto rim of the bracket drum carries the elevation scale on its face. One turn of micrometer knob moves scale two divisions, since scale is graduated in hundreds of mils.

(6) A level assembly is mounted on left side of quadrant for longitudinal leveling, and another level is mounted on the quadrant rear for cross-leveling.

d. Carrying case T14. (1) Elevation quadrant, telescope adapter, and elbow telescope are held as a unit in the T14 carrying case (fig. 35). Instrument light T16 (e, below) is also held inside this carrying case, as are four dry cell batteries and sufficient electrical cord to reach from the carrying case to telescope when equipment is attached on mortar.

(2) When instrument light is being used, two dry cells are inserted in the battery case which is kept in the carrying case. Carrying case is placed on the ground by the mortar, and electrical leads carry power for illumination of the telescope reticle from carrying case to telescope. Lights are turned on by turning knob on head of battery case; the intensity of the lights is adjusted by further rotation of this knob.

e. Instrument light T16. Instrument light furnishes power for reticle and scale illumination. Its use is described in d, above.

#### 49. OPERATION.

- a. Remove instrument from carrying case.
- b. Attach instrument to left side of mortar by the latch.
- c. If reticle illumination is required, attach lamp bracket on cord of instrument light to elbow telescope and turn on the light.
- d. Turn elevation micrometer knob until desired elevation is set on elevation scale and micrometer of elevation quadrant. Indication of scale and micrometer is in mils.
- e. Turn micrometer knob on telescope adapter until correct deflection is set on deflection scale and micrometer. Indication of scale and micrometer is in mils.
- f. Elevate mortar until bubble in longitudinal level vial is centered.
- g. Traverse mortar until telescope is trained on the aiming point.
- h. Instrument is removed from mortar during firing.
- i. When equipment is to be removed from mortar, depress latch on elevation quadrant and remove the sight. Place equipment as a unit in the carrying case. When packing, disconnect lamp bracket of instrument light if it is attached. Do not separate any other components.

#### 50. MAINTENANCE.

- a. Handling. Handle instrument carefully. It cannot stand abuse or rough handling, and damage to it may cause defective sighting. Take particular care to avoid denting or burring surfaces for attachment to sight clamp.

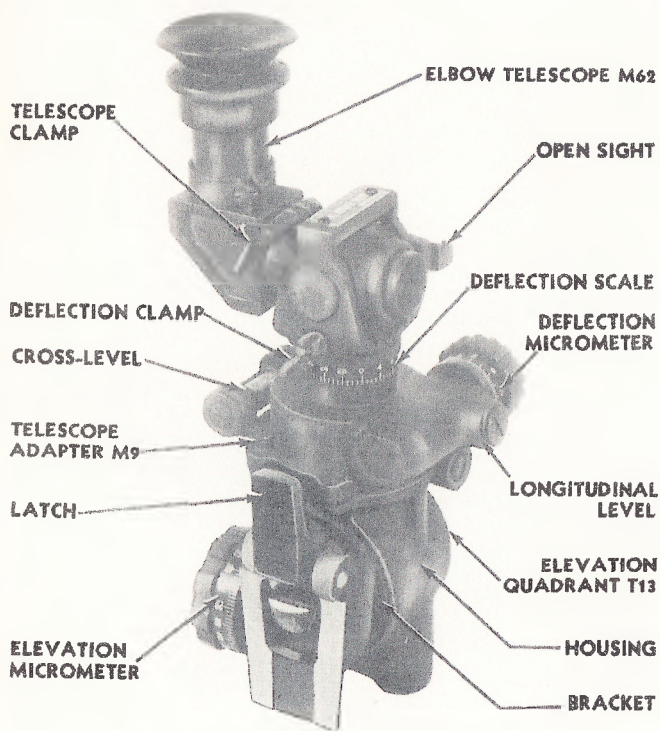


Fig. 33. E19 sight (left view).

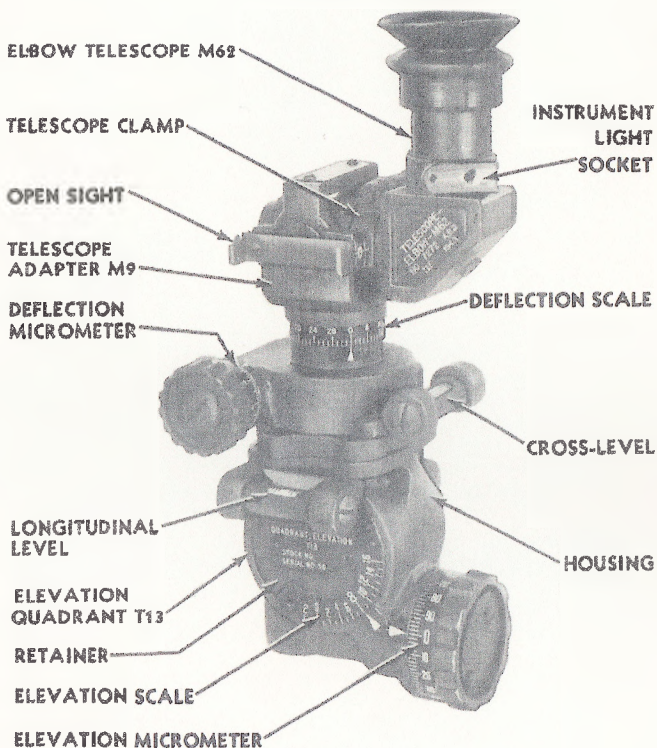


Fig. 34. E19 sight (right view).

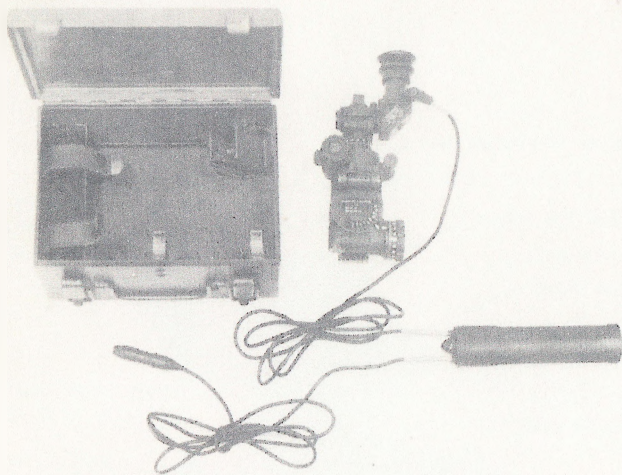


Fig. 35. Sight, instrument light, and carrying case displayed.

b. Care and preservation. (1) When not in use, keep the instrument in the carrying case provided for it. Keep it as dry as possible and never put into carrying case when wet.

(2) Elevation mechanism has stops to limit its movement. Do not try to force movement beyond the stop.

(3) Keep optical parts clean and dry. For wiping these parts, use lens tissue paper. Clean them with liquid lens-cleaning soap.

(4) Occasionally oil exposed moving parts of sight assemblage with a small quantity of light preservative lubricating oil. Keep dove-tailed surface of bracket and mating surface of tube sight clamp thinly coated with this oil. To prevent accumulation of dust and grit, wipe off excess lubricant that seeps from moving parts.

## Section XIX

# TRANSPORTATION EQUIPMENT

### 51. MAN PACK.

a. The manpack consists of the standard quartermaster packboard (Quartermaster stock number 74-T-27-20), complete with two quick release straps and two pressed steel adapters. Weight of the complete packboard is approximately 4 pounds.

b. Carrying of the 4.2-inch recoilless chemical mortar is accomplished in a similar way to the standard 4.2-inch chemical mortar by carrying the tube, reaction chamber, and standard on separate packboards. Two complete rounds of ammunition are carried on one packboard.

### 52. HANDCART M4A1.

a. The M4A1 cart (fig. 36) is the small-wheeled type and has 4-inch by 12-inch aluminum wheels mounted on an offset axle.

b. The cart can be drawn by hand and, in addition, is equipped with a lunette for connecting to a prime mover. When drawn by manpower, a drawbar is secured to the lunette with the handcart drawbar retaining pin. When not in use, drawbar is carried on drawbar bracket which is riveted to front of body. Provision is made for attaching ropes on the cart body when additional manpower is required to pull the load. Pneumatic tires enable the cart to be towed at high speeds behind trucks or other motor vehicles. A canvas cover is provided for the cart.

c. The cart has special brackets by which the recoilless mortar can be secured to the cart (fig. 36). Ammunition is carried in the cart body and is secured by straps.

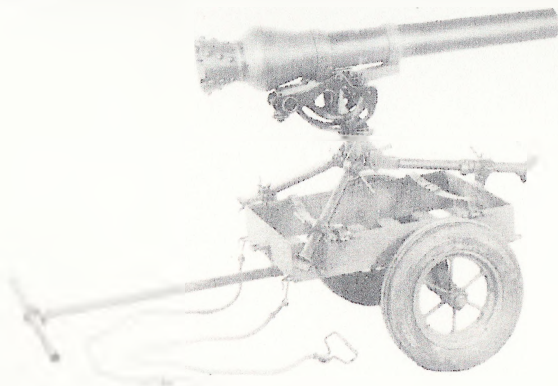


Fig. 36. Recoilless chemical mortar mounted on M4A1 handcart.

# APPENDIX

## Section I SHIPMENT AND STORAGE

### 1. GENERAL.

Preparation of the 4.2-inch recoilless chemical mortar is the same for both domestic shipment and limited storage.

### 2. CLEANING.

Thoroughly clean materiel and make free of all foreign matter, using dry cleaning solvent or a soda ash or soap solution. Cleaning should include springs, screw threads, bushings, and similar surfaces, as well as interior of reaction chamber and bore of tube.

a. Apply dry cleaning solvent by scrubbing with a brush or wiping with a clean cloth. Dry thoroughly.

b. Apply a warm soda ash or soap solution by vigorously brushing or scrubbing surfaces thoroughly until all traces of dirt have been removed. Rinse surfaces with clean, warm water and dry thoroughly.

(1) Soda ash solution consists of one-half pound of soda ash dissolved in 2 gallons of warm water.

(2) Soap solution consists of 1 pound of castile soap or issue soap in chip form dissolved in 4 gallons of hot water.

### 3. PAINTING.

Remove rust from painted surfaces that have become checked or rusted and repaint.

a. Removing rust spots. (1) Use aluminum oxide abrasive cloth for cleaning external surfaces where wear of parts cleaned do not affect functioning of mechanism. Do not use on interior surface of reaction chamber.

(2) Use crocus cloth for removing rust or stain and for polishing parts of the firing mechanism and other finished metal surfaces.

b. Application of rust-inhibitive synthetic primer. Apply a liberal coating of rust-inhibitive synthetic primer over entire area of cleaned surfaces to be repainted. The primer is used on bare metal as a base coat for synthetic enamel. It may be applied either by brushing or spraying. The primer usually brushes satisfactorily as received or after the addition of not more than 5 percent by volume of volatile mineral spirits paint thinner. For spraying, the primer may be thinned with not more than 15 percent by volume of volatile mineral spirits paint thinner. Allow to dry thoroughly.

c. Sandpapering surfaces. Sandpaper primed surfaces with grade No. 2/0, class B flint paper, and wipe all particles of dust from surfaces.

d. Application of enamel. Apply a coat of lusterless, olive-drab synthetic enamel and allow to dry thoroughly before materiel is used.

**4. LUBRICATION.**

Lubrication is performed in accordance with lubrication instructions prescribed in section XI.

**5. SEALING.**

Seal bore and chamber by using the appropriate plugs and caps and wrap in waterproof, greaseproof wrapping paper. Tape securely with nonhygroscopic adhesive tape. If greaseproof paper is not available, use canvas or burlap treated with thin rust-preventive compound and tie or strap in place.

**6. RECORD BOOK.**

a. During transfer or shipment, the mortar record book is kept in a waterproof envelope securely fastened to the tube with waterproof tape.

b. Under one of the wrappings of tape, one end of a small tab is inserted, reading: "Mortar record book here."

**7. PACKING.**

a. Tube. Tube and sight clamp are packed in a plywood box. Dimensions of box are approximately 47 inches long, 10 inches wide, and 11-1/2 inches deep.

b. Reaction chamber. Chamber is packed separately in a cleated plywood box. Dimensions of box are approximately 18-1/4 inches long, 11 inches wide, and 11 inches deep.

## Section II

## REFERENCES

- |                                                                                                   |                                                                                                              |
|---------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|
| FM 23-55                                                                                          | Browning Machine Gun, Caliber .30, M1917                                                                     |
| TM 3-320                                                                                          | 4.2-inch Chemical Mortar                                                                                     |
| TM 9-850                                                                                          | Cleaning, Preserving, Lubricating, and Welding Materials and Similar Items Issued by the Ordnance Department |
| TM 9-1205                                                                                         | Browning Machine Gun, Caliber .30, All Types, and Ground Mounts                                              |
| TM 9-1900                                                                                         | Ammunition, General                                                                                          |
| TM 31-200                                                                                         | Maintenance and Care of Pneumatic Tires and Rubber Treads                                                    |
| Army Regulations 750-10, Range Regulations for Firing Ammunition for Training and Target Practice |                                                                                                              |
| Chemical Warfare Service Form No. 5, Mortar Record Book                                           |                                                                                                              |
| WD, AGO Form No. 468, Unsatisfactory Equipment Report                                             |                                                                                                              |
| Army Service Forces Catalog. ORD 9 SNL A-42                                                       |                                                                                                              |

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