

DEPARTMENT OF THE ARMY FIELD MANUAL

FM 23-80

*This manual supersedes Training Circular 10, War Department, 1946, and those portions of Training Circular 25, War Department, 1945, and Training Circular 11, War Department, 1946, which pertain to the 57-mm rifle.*

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# 57-MM RIFLE

## M18



DEPARTMENT OF THE ARMY • JUNE 1948

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OMAR N. BRADLEY  
*Chief of Staff, United States Army*

OFFICIAL:

EDWARD F. WITSELL  
*Major General*  
*The Adjutant General*

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# RESTRICTED

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## CHAPTER 1

### INTRODUCTION

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**1. PURPOSE AND SCOPE.** a. This manual provides the unit commander with the data necessary for the progressive training of recoilless weapons units in all the elements of gunnery as executed with the 57-mm rifle M18.

b. The scope of the manual includes mechanical training, training for placing the rifle in action, marksmanship, and the technique of direct fire and fire from defilade. Suggestions for the organization of material and the presentation of training are contained in chapter 7. For definition of military terms not defined herein, see TM 20-205, and for List of Training Publications, see FM 21-6.

*Note.* The primary difference between the 57-mm rifles M18 and T15E13 is the connection between the trigger and the sear. On the rifle M18 (fig. 1) this connection is made by using a wire cable enclosed in a conduit whereas on the rifle T15E13 rods enclosed in metal housings are used. Although other differences between the rifles M18 and T15E13 do exist they are of such a nature that they do not affect troop use or care.

## CHAPTER 2

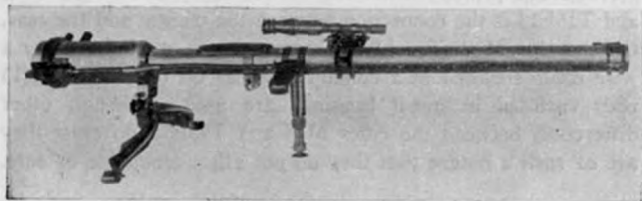
# MECHANICAL TRAINING

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### Section I. GENERAL

**2. DESCRIPTION.** a. **General.** The 57-mm rifle M18 (fig. 1) is a light-weight, recoilless, portable weapon. It is designed to be fired from the shoulder, a bipod, the machine gun tripod mount, caliber .30, M1917A1, or any other mount, stationary or vehicular, which will accommodate the standard machine gun pintle or cradle pintle. It is an air-cooled, single-loading weapon using fixed ammunition. This rifle is equipped with a manually operated breech mechanism and a percussion type firing mechanism. It is designed for direct fire only and sighting equipment for this purpose is furnished with each weapon.

b. **Serial number information.** Data required for



*Figure 1. 57-mm rifle M18 (mounted on bipod).*

records concerning these weapons consists of two serial numbers, the rifle number and the tube number, and the model designation. The rifle number and model designation are stamped on the front face of the chamber directly under the tube. The tube number is stamped on the muzzle of the tube.

**c. Tabulated data.** (1) *General.*

Weight of rifle (w/sight and integral mount) .....	lbs.	44.40
Weight of rifle (complete w/sight and pintle for mounting on tripod)....	lbs.	40.25
Weight of tripod .....	lbs.	53.20
Weight of rifle (complete with sight and over-all cover M123) .....	lbs.	55.00
Length of rifle .....	inches	61.60
Length of tube .....	inches	48.00
Length of rifling.....	inches	46.50
Twist of rifling, right hand, 1 turn in	inches	67.20
Number of lands and grooves.....		24
Type of breechblock.....		Interrupted lug
Type of firing mechanism.....		Percussion

(2) *Performance.*

Muzzle velocity .....	f/s	1200
Maximum range (approx).....	yds.	4340

**d. Mount.** See FM 23-55 for data pertaining to machine gun tripod mount, caliber .30 M1917A1.

**e. Sighting equipment:**

- Telescope, carrying, M86C
- Case, carrying, M76

Mount, sight, M74

Sight, front, M26

Light, instrument, M45

Table, firing, 57-E-1 (abridged) •

**3. PRINCIPLE OF OPERATION.** The shell casing for recoilless rifle ammunition is perforated so that the propellant gases can escape through the perforations into the enlarged chamber. The breech is so constructed that gases resulting from ignition of the propellant charge are allowed to escape to the rear through orifices in the breechblock, thereby eliminating recoil. The gas escape orifices are so designed that the momentum of gas discharge effectively counteracts the momentum of recoil and the angular momentum induced by the motion of the fired shell. This balancing of forces causes the rifle to remain motionless.

## **Section II. DISASSEMBLY, ASSEMBLY, AND OPERATING INSTRUCTIONS**

**4. GENERAL.** A knowledge of disassembly and assembly procedures is a prerequisite for understanding functioning and stoppages. Such knowledge is also a prerequisite for the ability to perform immediate action to reduce stoppages, and for the proper care and cleaning of the weapon. The following paragraphs outline a standardized, step by step method of disassembly and assembly.

**5. DISASSEMBLY. a. General.** Disassembly may be considered under two general headings:

(1) Disassembly of the rifle to the extent required for ordinary care and cleaning (field stripping).

(2) Complete disassembly, under competent supervision, of all component parts for periodic cleaning (fig. 2).

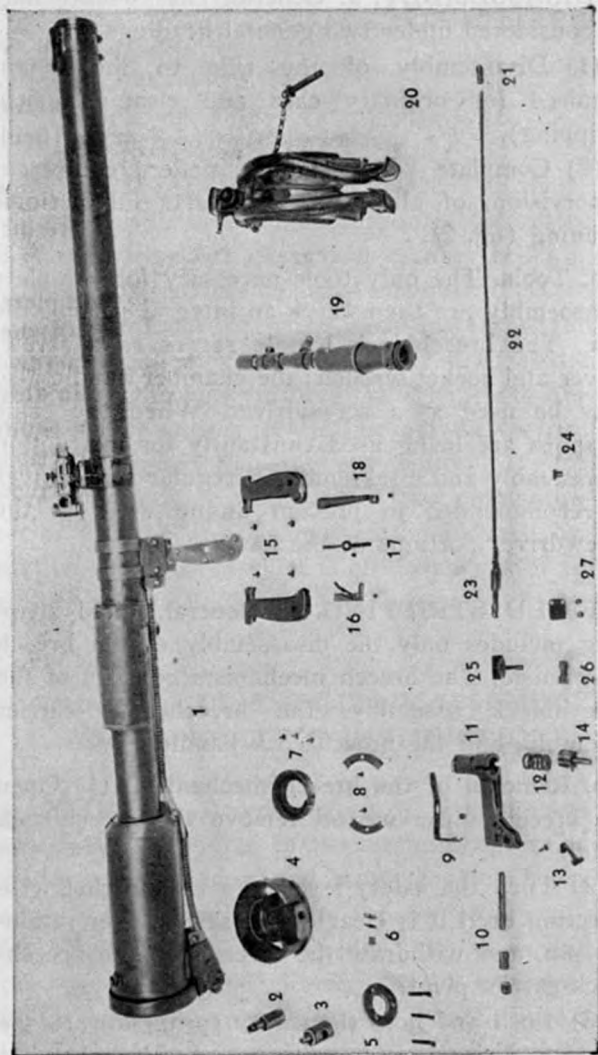
**b. Tools.** The only tools necessary for complete disassembly are themselves an integral part of the rifle. The breechblock handle serves as a screwdriver and socket wrench; the chamber handle also may be used as a screwdriver. When the same weapons are being used constantly for instruction in assembly and disassembly, a regular screwdriver is recommended to prevent undue wear on the screwdriver portions of the handles.

**6. FIELD STRIPPING. a. General.** Field stripping includes only the disassembly of the breech mechanism. The breech mechanism consists of the breechblock assembly, the breechblock carrier assembly, and the breechblock handle.

**b. Removal of the breech mechanism.** (1) Open the breech, unscrew and remove the breechblock handle.

(2) Turn the safety lever in a counterclockwise direction until it is clear of the safety lever retaining pin, and withdraw the lever from the breechblock carrier pivot.

(3) Push and hold the safety spring toward the chamber. Using the screwdriver end of the chamber



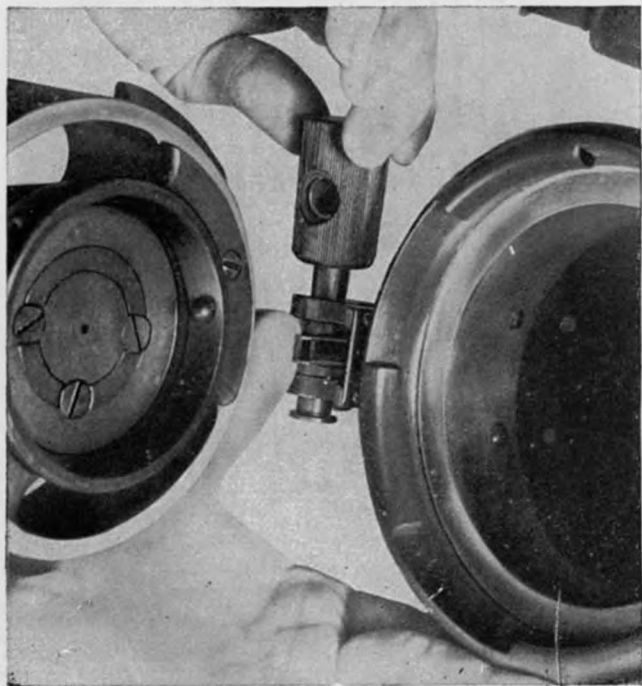
1. Barrel assembly.
2. Breechblock handle.
3. Chamber handle.
4. Breechblock assembly.
5. Breechblock cover and screws.
6. Extractor assembly.
7. Throat ring and screws.
8. Throat blocks and screws.
9. Breechblock detent and screw.
10. Sear, sear spring, and sear plug.
11. Breechblock carrier assembly.
12. Firing spring.
13. Sear lever.
14. Hammer and firing pin assembly.
15. Trigger handle grips and screws.
16. Trigger safety assembly.
17. Firing cable operating link.
18. Trigger.
19. Telescope M86C.
20. Bipod assembly.
21. Firing cable end.
22. Firing cable.
23. Safety spring.
24. Firing cable lock screw.
25. Safety lever.
26. Breechblock carrier pivot.
27. Carrier hinge bracket cover spring and screws.

Figure 2. 57-mm rifle M18, disassembled.

handle as a tool, push the breechblock carrier pivot up and out of the carrier hinge bracket. Release the safety spring (fig. 3).

(4) Withdraw the breech mechanism from the carrier hinge bracket assembly.

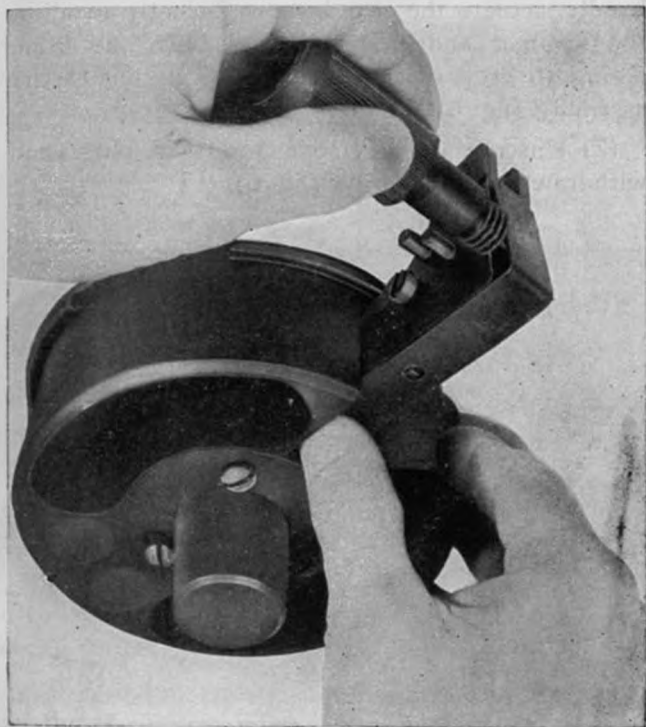
**c. Disassembly of the breech mechanism.** (1) Hold the breechblock face down in the left hand, and rotate the carrier assembly counterclockwise (fire position).



*Figure 3. Removal of breechlock carrier pivot, 57-mm rifle M18.*

(2) Remove the breechblock detent screw.

(3) Insert the screwdriver tip of the breechblock handle between the short side of the breechblock detent and the hinge end of the breechblock carrier. Press down with the thumb on the spring portion of the breechblock detent. While maintaining this pressure, rotate the screwdriver until the spring portion of the detent is clear of the breechblock cover. Unhook the detent from the pin (fig. 4).



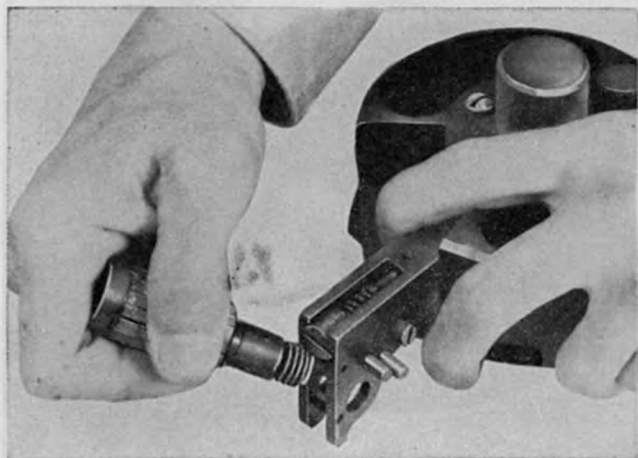
*Figure 4. Removal of breechblock detent, 57-mm rifle M18.*

(4) Use the screwdriver end of the breechblock handle to actuate the sear lever by pushing it down to disengage the sear from the hammer, thus relieving the pressure of the compressed firing spring (fig. 5).

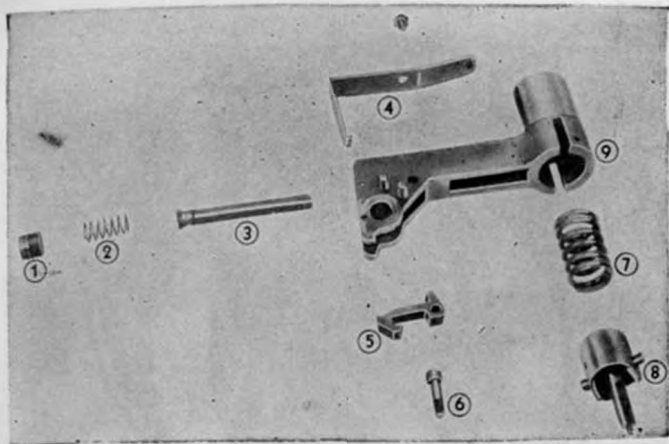
(5) Remove the breechblock cover screws and breechblock cover. Lift the carrier assembly out of the breechblock.

(6) Using the screwdriver tip of the breechblock handle, actuate the sear lever sufficiently to allow the hammer and firing pin assembly and firing spring to drop out of their recess in the carrier assembly (fig. 6).

(7) Unscrew and remove the sear plug, and withdraw the sear spring (fig. 6).



*Figure 5. Actuating sear lever, 57-mm rifle M18.*



- |                                 |                                   |
|---------------------------------|-----------------------------------|
| ① Sear plug.                    | ⑥ Sear lever axis pin.            |
| ② Sear spring.                  | ⑦ Firing spring.                  |
| ③ Sear.                         | ⑧ Hammer and firing pin assembly. |
| ④ Breechblock detent and screw. | ⑨ Breechblock carrier assembly.   |
| ⑤ Sear lever.                   |                                   |

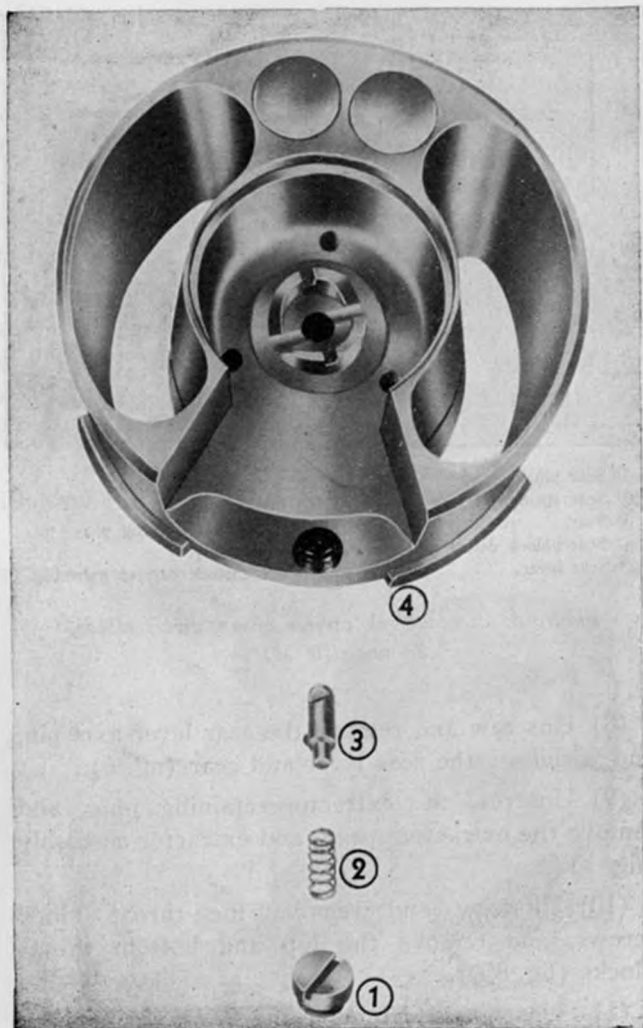
*Figure 6. Breechblock carrier group, disassembled, 57-mm rifle M18.*

(8) Unscrew and remove the sear lever axis pin, and withdraw the sear lever and sear (fig. 6).

(9) Unscrew the extractor retaining plug, and remove the extractor spring and extractor assembly (fig. 7).

(10) Unscrew and remove the throat block screws, and remove the top and bottom throat blocks (fig. 8①).

(11) Unscrew and remove the firing pin bushing and throat ring retaining screws, and withdraw the throat ring (fig. 8②) from its seat.



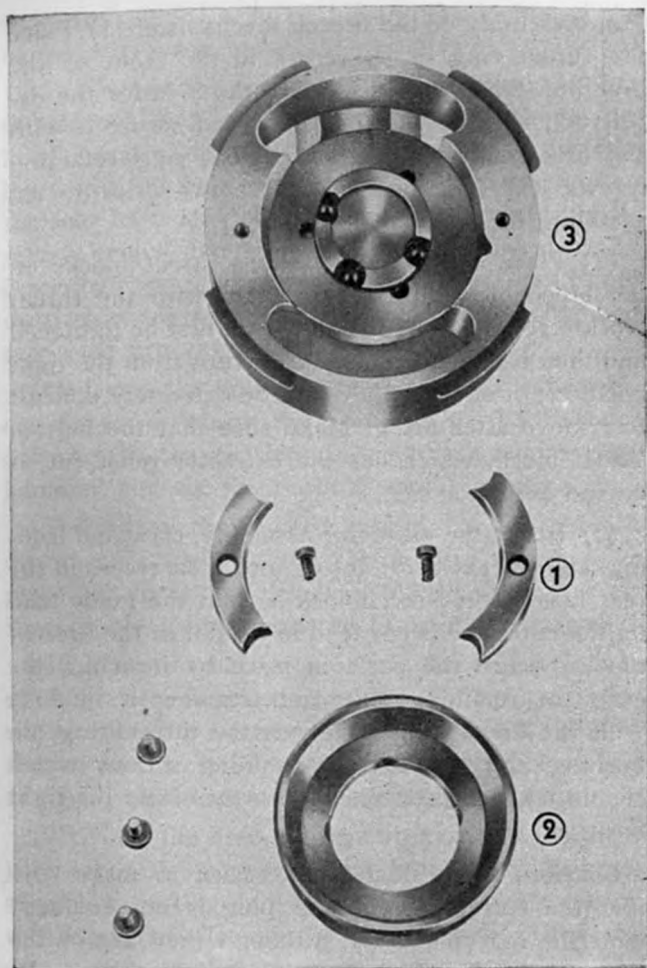
① Extractor retaining plug.

② Extractor spring.

③ Extractor assembly.

④ Breechblock assembly.

Figure 7. Extractor group removed from breechblock, 57-mm rifle M18.



- ① Throat blocks and screws.
- ② Throat ring. Firing pin bushing and throat ring retaining screws.
- ③ Breechblock assembly.

*Figure 8. Throat ring and throat blocks removed from breechblock, 57-mm rifle M18.*

d. **Assembly of the breech mechanism.** (1) Place the throat ring in its recess in the front of the breechblock. Check to see that the hole for the extractor is on the extractor side, and secure it with the firing pin bushing and throat ring retaining screws. (Do not tighten the screws prior to assembling the extractor assembly.)

(2) Place the top and bottom throat blocks on the breechblock and secure them with the throat block screws. These screws should first be tightened and then backed off one-quarter turn from the tight position; otherwise, they will be extremely difficult to remove after firing. Make sure that the bottom throat block, which has the extractor relief cut, is on the extractor side.

(3) Insert the extractor assembly, claw and leading, and the extractor spring into their recess in the rear face of the breechblock so that the guide stud on the extractor is engaged in its slot in the breechblock. Secure the parts in place by inserting the extractor retaining plug and screwing it in flush with the breechblock. Tighten the three firing pin bushing and throat ring retaining screws which should be backed off one-eighth turn from the tight position.

**Caution.** Care must be exercised to make sure that the extractor retaining plug is not confused with the sear plug; for, although they are of the same thread diameter, they are not interchangeable.

(4) Insert the sear in its recess in the carrier so that the headed end is away from the hammer. The narrow milled shoulder on the opposite end of

the sear should be faced toward the inside of the hammer housing.

(5) Engage the sear lever with the sear so that the forked end engages the milled cuts on the headed end of the sear. Aline the hole in the sear lever with the hole in the carrier. Insert and tighten the sear lever axis pin. Insert the sear spring in its recess behind the sear and retain it in place by inserting and tightening the sear plug. (Note caution in (3) above, extractor retaining plug and sear plug are not interchangeable.)

(6) Using the thumb, actuate the sear lever sufficiently to withdraw the sear out of the hammer opening in the carrier. Insert the firing spring, hammer, and the firing pin assembly in place.

(7) Engage the hooked end of the breechblock detent on its pin in the carrier and secure it in place by inserting the breechblock detent screw through the detent into the back of the carrier.

(8) Place the carrier group in the recess in rear of the breechblock so that the "V" shaped cam surfaces on the hammer assembly rest in the "V" shaped notches in the center of the breechblock and the firing pin is seated in the firing pin aperture.

(9) Place the breechblock cover over the circular portion of the carrier which houses the hammer assembly, making sure that the holes which engage the detent are facing the breechblock. Aline the detent hole in the cover with the detent and the three cover screw holes with their mating holes in the breechblock. Replace the breechblock cover screws.

(10) Holding the breechblock with the left hand, rotate the carrier assembly clockwise cocking the hammer. This action also places the breech mechanism in position to be assembled to the chamber.

**e. Installation of the breech mechanism.** (1) Insert the breechblock carrier assembly within the carrier hinge bracket aligning the hole in the hinge with the hole in the bracket. Insert the breechblock carrier pivot, small end leading, until it is stopped by the safety spring. Push and hold the safety spring toward the chamber, to clear the pivot, and press the pivot completely into the bracket making sure that the keyway in the pivot straddles the key in the upper portion of the breechblock carrier. Release the safety spring.

(2) With the breech open, insert the safety lever into the carrier pivot. Turn the lever clockwise as far as possible, being certain that the flange on the lever is retained by the head of the safety lever retaining pin.

(3) Replace the breechblock handle and close the breech.

**7. DISASSEMBLY FOR PERIODIC CLEANING.** **a. General.** Disassembly for periodic cleaning will include only the removal of the breech mechanism and the trigger group. Removal or disassembly of the front sight, rear sight mounting bracket and rear open sight, trigger handle bracket, extendable handle, carrier hinge bracket assembly, or any other parts not specifically mentioned herein, will be done only by ordnance personnel or under the

supervision of ordnance personnel. After each 100 rounds of ammunition has been fired, or at least once a month, the trigger group will be completely disassembled, cleaned, lightly oiled, and reassembled. Care will be exercised to insure that the inside of the firing cable conduit is thoroughly cleaned. Clean firing pin hole, using contour brush.

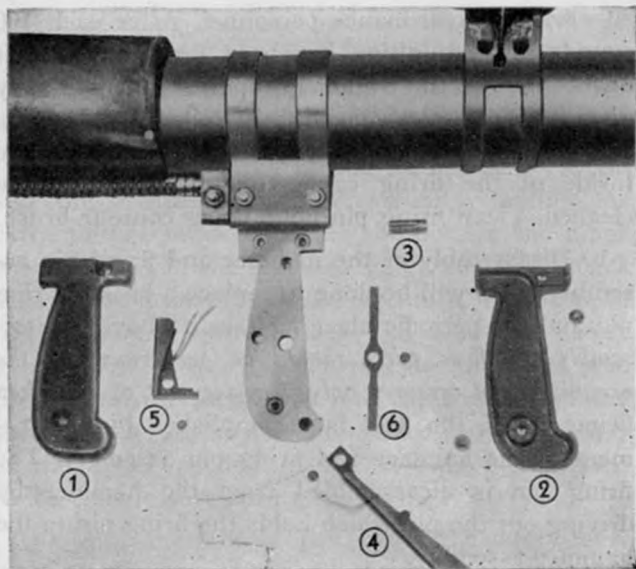
**b. Disassembly of the hammer and firing pin assembly.** This will be done to replace a broken firing pin and for periodic cleaning (see **a** above). *Disassembly of these parts should be performed by the organizational armorer only.* Replacement of a broken firing pin in the field is accomplished by replacement of the hammer and firing pin assembly. The firing pin is disassembled from the hammer by driving out the pin which holds the firing pin to the hammer assembly.

**c. Disassembly of the trigger group.** (See fig. 9.) The trigger group, which is composed of a trigger handle group and a firing cable group, is disassembled as follows:

(1) Remove the breech mechanism from the chamber as outlined in paragraph 6b.

(2) Using the screwdriver end of the breechblock handle, unscrew the trigger grip screws and remove the right and left hand trigger grips (fig. 9① and ②).

(3) Depress the trigger to push the firing cable end (fig. 9③) out to a point where it may be engaged by the screwdriver tip of the breechblock handle. Disengage the firing cable end from the firing cable by unscrewing it *clockwise*.



- ① Right trigger handle grip.
- ② Left trigger handle grip.
- ③ Firing cable end.
- ④ Trigger and pivot.
- ⑤ Trigger safety assembly and pivot.
- ⑥ Firing cable operating link and pivot.

*Figure 9. Trigger handle group, disassembled,  
57-mm rifle M18.*

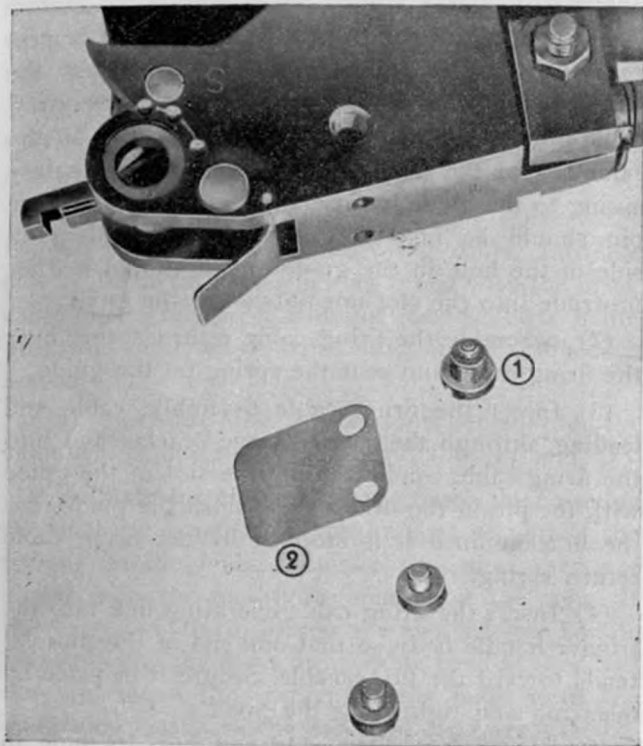
(4) Unscrew and remove the pivots which secure the trigger (fig. 9④), the trigger safety (fig. 9⑤), and the firing cable operating link (fig. 9⑥). Withdraw the trigger, trigger safety, and firing cable operating link from their seats in the trigger handle body.

(5) Slide the trigger safety spring sideways out of its seat and remove it from the trigger safety.

(6) Remove the firing cable end from the hole in the trigger handle clamp.

(7) Unscrew and remove the firing cable lock screw (fig. 10).

(8) Remove the firing cable assembly by grasping the safety spring and pulling it to the rear.



① Firing cable lock screw.

② Carrier hinge bracket, bottom cover spring and screws.

Figure 10. Carrier hinge bracket group, 57-mm rifle M18.

(9) Detach the firing cable return spring from the firing cable guide and withdraw it from the cable.

(10) *To be performed by organizational armorer only.* Remove the safety spring from the firing cable guide by driving out the firing cable guide pin. This pin should be driven from the slotted side of the guide.

**d. Assembly of the trigger group.** (1) *To be performed by organizational armorer only.* Insert the shank of the safety spring into the slot of the firing cable guide so that the slot in the spring is on the same side as the slot in the guide. Secure the safety spring to the guide by inserting the guide pin. This pin should be inserted through the countersunk side of the hole in the guide and it should neither protrude into the slot nor outside of the guide.

(2) Assemble the firing cable return spring over the firing cable and seat the spring on the guide.

(3) Insert the firing cable assembly, cable end leading, through the carrier hinge bracket and into the firing cable conduit. Aline the slot in the guide with the pin in the bracket and push the guide into the bracket until it is stopped by the firing cable return spring.

(4) Insert the firing cable operating link into the trigger handle body so that one end of the link extends toward the firing cable. Secure it in place by inserting and tightening the pivot.

(5) Insert the firing cable end into its hole in the front end of the trigger handle clamp and screw it onto the firing cable by turning *counterclockwise*. Maintain pressure on the safety spring until the

firing cable end engages with the firing cable. (For adjustment see e(2) below.)

(6) Insert the trigger in position in the trigger handle body and secure it with the pivot.

(7) Aline the circular end of the trigger safety spring with its hole in the trigger safety and assemble the spring to the trigger safety. Install the trigger safety assembly into the trigger body and secure it with the pivot.

(8) Assemble the right and left trigger grips to the trigger body and insert and tighten the four screws.

(9) Depress the trigger safety and squeeze the trigger, thereby moving the firing cable, until the slot in the firing cable guide is alined with the firing cable lock screw hole. Holding the trigger to maintain this alinement, insert and tighten the lock screw.

(10) Assemble the breech mechanism to the chamber as outlined in paragraph 6e(1) and (2).

**e. Adjustment of the trigger group.** (1) Examine the qualifying marks on the bracket section of the trigger handle body to make sure that they are alined with the qualifying marks on the tube. If they are not alined, loosen the two trigger handle bolt nuts and the front firing cable conduit lock bolt nut and move the trigger handle body until the qualifying marks on the tube and body are alined.

(2) **Caution.** *Make certain a round of ammunition is not in the chamber.* With the rifle cocked, the breech closed and locked, and the safety lever in the fire

position, depress the trigger safety and squeeze the trigger. If the hammer does not release, screw the firing cable end, either clockwise or counterclockwise, until the hammer does release when the trigger is actuated.

**8. OPERATING INSTRUCTIONS.** The assistant gunner services the piece. He grasps the chamber handle with his right hand (over the chamber) and the breechblock handle with his left hand (under the chamber). His left arm is bent at the elbow to form an angle of approximately  $90^\circ$ . All portions of his body are kept forward of the breech while loading or unloading.

**a. To load.** (See figs. 11, 12, and 13.) The assistant gunner opens the breech by grasping the breechblock handle and rotating the breechblock approximately forty-five degrees *counterclockwise*; then to the rear. He inserts a cartridge into the chamber and pushes it forward until the rotating band on the projectile contacts the lands in the tube. He then rotates the cartridge case, either clockwise or counterclockwise, to aline the engraving on the rotating band of the projectile with the rifling in the tube. When alined, he pushes the cartridge into the chamber until it is stopped by the positioning band on the cartridge case. From a position on the right side of the rifle, he grasps the breechblock handle, rotates the breechblock forward until it is seated in the breech, and turns it clockwise until it is fully locked.

**Caution.** Never stand directly behind the rifle when opening or closing the breech, and never



*Figure 11. Loading procedure, 57-mm rifle M18.*



Figure 12. Loading procedure (closing the breech), 57-mm rifle M18.

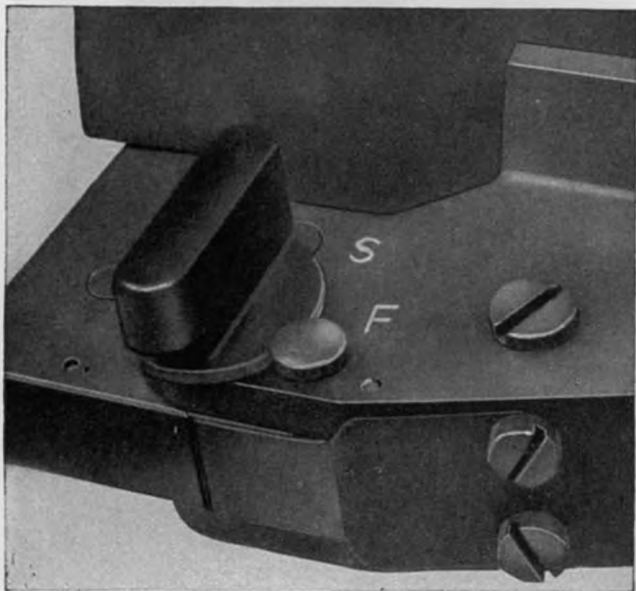


Figure 13. Loading procedure (locking the breech), 57-mm rifle M18

allow any portion of the body to be behind the breech when it is being closed.

**b. To unload.** The assistant gunner opens the breech by grasping the breechblock handle, rotating the breechblock approximately forty-five degrees *counterclockwise*, and then pulling it to the rear. The empty cartridge case will have been partly withdrawn by the extractor assembly, and he removes the cartridge case by hand.

**c. To fire the piece.** The assistant gunner makes certain the breech is closed and locked. He moves the safety lever to the fire position (F, fig. 14). The assistant gunner checks the backblast area and



*Figure 14. Safety lever in safe position, 57-mm rifle M18.*

taps the gunner on the shoulder. The gunner depresses the trigger safety and squeezes the trigger. (Persons near the rifle should place ear plugs or cotton in their ears.)

d. **To clear the rifle.** The assistant gunner opens the breech and checks the chamber to see that the rifle is unloaded. The piece is clear when the breech is open and the chamber is empty.

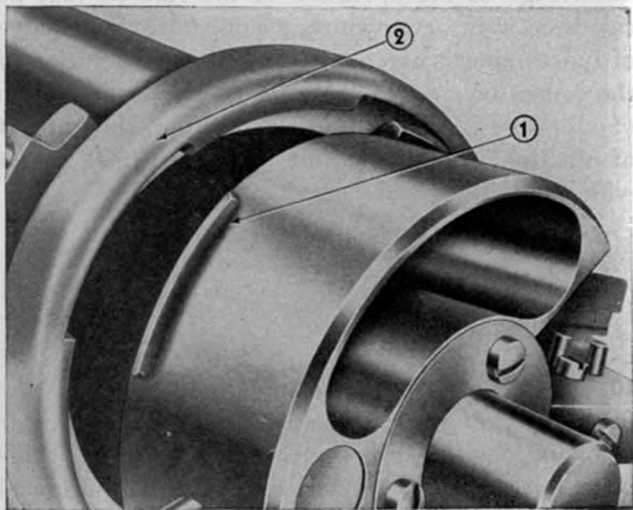
### Section III. MECHANICAL FUNCTIONING

9. **GENERAL.** The soldier must have a practical knowledge of the operation of the rifle so that he can keep it in action during combat. A knowledge of functioning is essential for prompt recognition of the causes of mechanical failures and the reduction of stoppages. To facilitate instruction, the subject of functioning is divided into three principal phases which are—

- a. Opening the breech.
- b. Closing the breech.
- c. Firing the piece.

10. **FUNCTIONING.** A complete discussion of the functioning of a weapon normally describes a cycle of operations. Since it is necessary to choose some point in the cycle from which to start, it is assumed in the following paragraphs on functioning that the piece has just been fired and that the empty shell case is still in the chamber. At this point in the cycle, successive steps in operation of the piece are:

a. **Opening the breech.** (1) *Unlocking.* (See fig. 15.) When the breechblock has rotated counter-clockwise approximately forty-five degrees, the interrupted lug on the breechblock (fig. 15①) is unlocked from the mating interrupted lug in the chamber (15②), and the breechblock is free to be rotated to the rear. The turning of the breechblock is automatically stopped after the interrupted lug is disengaged by the action of the cut-away portion of the breechblock contacting the breechblock carrier. The spring action of the breechblock detent against the breechblock cover tends to hold the breechblock in the open position.



- ① Interrupted lug on breechblock.
- ② Interrupted lug in chamber.

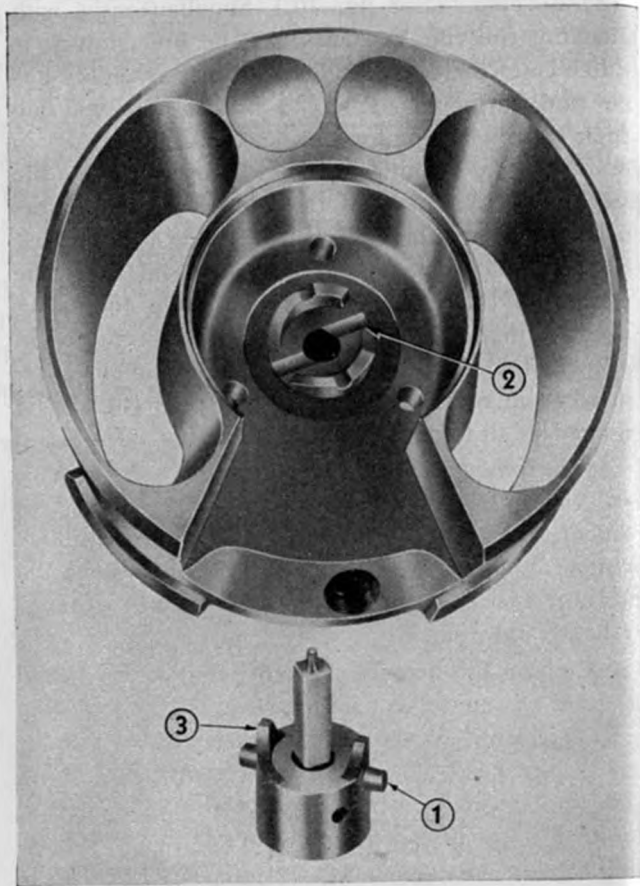
Figure 15. *Breechblock locking surfaces, 57-mm rifle M18.*

(2) *Cocking.* (See fig. 16.) Simultaneously with unlocking the rifle is cocked as the breechblock is rotated counterclockwise. The hammer assembly has two cam surfaces (fig. 16③) on its forward end which mate with similar cam surfaces (fig. 16②) in the firing pin bushing which is assembled to the breechblock. Rotation of the breechblock counterclockwise allows the cams on the firing pin bushing to engage the cams on the hammer and force the hammer to the rear; thus, compressing the firing spring until the hammer is engaged and retained in the cocked position by the sear. The hammer is prevented from rotating by two guide pins (fig. 16①) engaged in slots of the hammer housing.

(3) *Extraction.* When the breech is in a closed position, the notch on the extractor is positioned in front of the rim of the cartridge. As the breechblock swings to the rear, the extractor withdraws the cartridge case sufficiently so that it may be grasped by hand and ejected.

**b. Closing the breech.** (Assume that a new round has been positioned in the chamber.) (1) *Positioning of the extractor.* As the breechblock is rotated into the breech, the head of the extractor comes in contact with the rim of the cartridge case. The extractor is cammed back into its recess in the breechblock, compressing the extractor spring. As soon as the breechblock has been rotated completely forward into the breech, the extractor is forced out of its recess by action of the compressed extractor spring and engages the rim of the cartridge.

(2) *Locking.* The breech is closed at this point, but not locked. Rotation of the breechblock clockwise

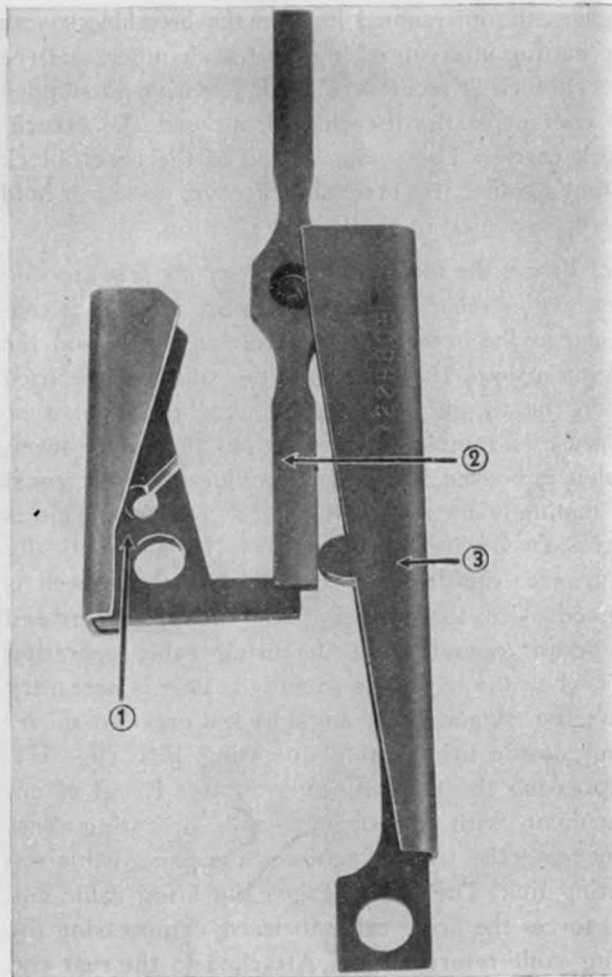


- ① Guide pins on hammer.
- ② Cam surface on breechblock.
- ③ Cam surface on hammer.

*Figure 16. Cocking surfaces on breechblock and hammer, 57-mm rifle M18.*

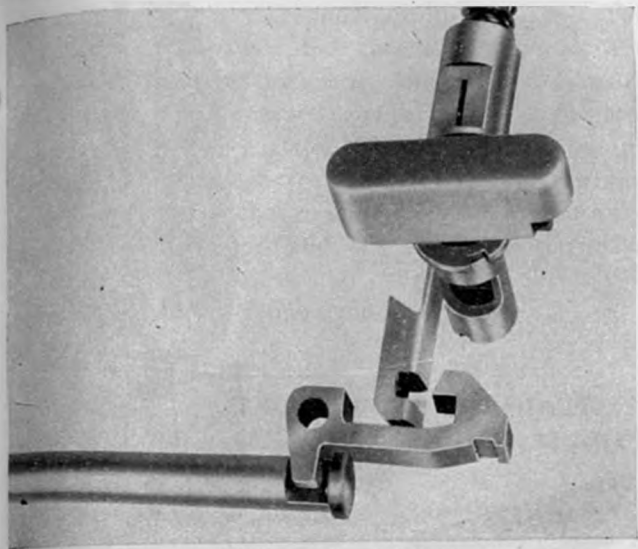
engages the interrupted lugs on the breechblock with the mating interrupted lugs in the chamber, and the breechblock is securely locked. Rotation is stopped by contact of the breechblock against the breechblock carrier. The spring action of the breechblock detent against the breechblock cover tends to hold the breechblock in the locked position.

**c. Firing the piece.** (1) *Action of the firing mechanism.* The mechanism required to fire the rifle is contained in the breechblock carrier assembly and the trigger group. In order that the rifle will be fired when the trigger is squeezed, the breech must be closed and completely locked, and the safety lever, which is housed in the carrier hinge bracket, must be manually moved to the "fire" position. This is necessary because the safety lever automatically returns to the "safe" position when the breech is opened. Also, the trigger safety must be depressed to permit operation of the firing cable operating link when the trigger is squeezed. This is necessary, since the trigger safety engages and prevents movement of the firing cable operating link (fig. 17). Depressing the trigger safety rotates it out of engagement with the firing cable operating link. Squeezing the trigger actuates the firing cable operating link. The link engages the firing cable end and forces the firing cable forward, compressing the firing cable return spring. Attached to the rear end of the firing cable is a safety spring, which is held away from the sear lever when the safety lever is in the "safe" position (fig. 18). When the safety lever



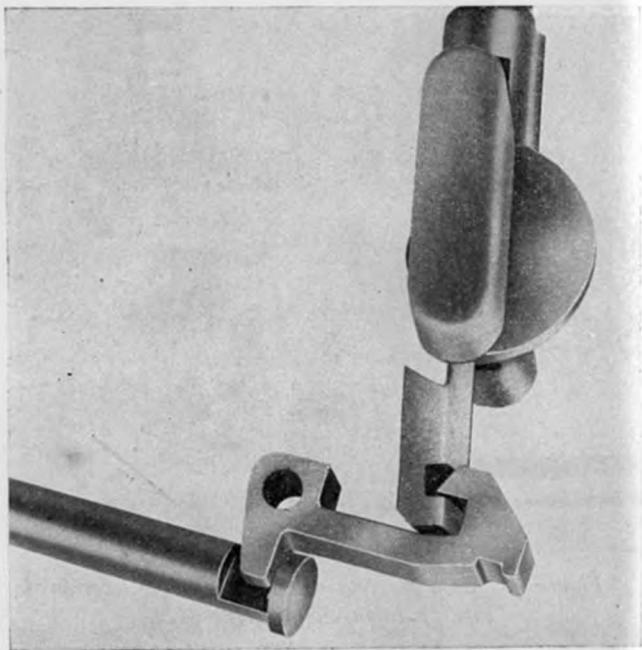
- ① Trigger safety.
- ② Firing cable operating link.
- ③ Trigger.

Figure 17. Trigger safety in normal position,  
57-mm rifle M18.



*Figure 18. Safety spring disengaged, safety lever in "safe" position, 57-mm rifle M18.*

is turned to the "fire" position, the safety spring engages the sear lever (fig. 19) and the firing cable is forced forward rotating the sear lever about the sear lever axis pin. The forked end of the sear lever, which is engaged with the sear, forces the sear out of engagement with the hammer. This allows the compressed firing spring to expand, forcing the hammer and firing pin assembly forward to strike the primer of the cartridge, thereby firing a round of ammunition. When the trigger is released, the compressed firing cable return spring expands and returns the component parts of the trigger group to their original positions.



*Figure 19. Safety spring engaged, safety lever in "fire" position, 57-mm rifle M18.*

(2) *Action of the gases.* When the propellant charge is detonated, a chemical reaction transforms the solid powder into a mass of hot expanding gas which ruptures and burns its way through the kraft paper container within the shell case and escapes through the perforations. The force exerted against the end of the projectile pushes it out of the cartridge case and through the tube. The gases have a tendency to expand in all directions with equal force, creating a momentum of forward thrust on

the rifle equal to the momentum of recoil. The force exerted against the closed portions of the breechblock creates sufficient recoil force to balance the forward thrust caused by the friction of the projectile against the walls of the tube. The gas escape orifices in the breech are so designed that the momentum of gas discharge effectively counteracts the momentum of recoil and the angular momentum induced by the motion of the fired shell; this causes the rifle to remain motionless.

#### **Section IV. STOPPAGES, IMMEDIATE ACTION, AND RESTORATION OF BALANCE**

**11. GENERAL.** a. This section deals with the common causes of stoppages, the action necessary to reduce them, immediate action, and the restoration of balance lost through erosion of the breechblock group.

b. A stoppage is any unintentional cessation of fire caused by the failure of the weapon or ammunition to function in a normal manner.

c. Immediate action is the unhesitating procedure used for the prompt reduction of common stoppages.

d. Balance of the rifle is restored by replacing the throat ring with a ring of the proper size and substituting new throat blocks.

**12. STOPPAGES.** a. **Prevention of stoppages.** Stoppages will be reduced to a minimum if the

gunner has a practical working knowledge of his rifle, makes the proper inspections, and takes appropriate preventive action before, during, and after firing.

**b. Causes of stoppages.** Common stoppages and their usual causes are listed in the following subparagraphs:

(1) *Failure to fire.*

(a) Defective ammunition.

(b) Broken firing pin.

(c) Unlocked breech.

(d) Weak or broken firing spring.

(e) Improper assembly of the breechblock or trigger group.

(f) Failure of the loader to move the safety lever from "S" to "F."

(2) *Failure of the breech to open.* Failure to remove oil from the breechblock and chamber before firing causes carbon accumulation and freezing of the breechblock to the extent that it will not open.

(3) *Failure to extract.*

(a) Burred or broken extractor, or broken extractor spring.

(b) Improper assembly of extractor or throat ring.

(c) Carbon accumulation (freezing the extractor in place).

(d) Loose positioning band allowing the round to go too far forward when loaded.

(4) *Failure to load.*

(a) Improper mating of the preengraved band on

the projectile with the lands and grooves of the rifle tube.

- (b) A burred rotating band.
- (c) Positioning band forward of proper position.
- (d) Excessive diameter of the fuze body.
- (e) Excessive varnish or paint on the rotating band.
- (f) Loose projectile.

**13. IMMEDIATE ACTION.** Immediate action, as defined in paragraph 11c, is performed by the assistant gunner (No. 2) and the gunner (No. 1). All other members of the squad will be alert to assist them. The procedure for immediate action is—

**a. Rifle fails to fire.** No. 1 calls "MISFIRE." No. 2 waits 30 seconds, recocks, sets the safety lever on "F," and taps No. 1. No. 1 relays and attempts to fire.

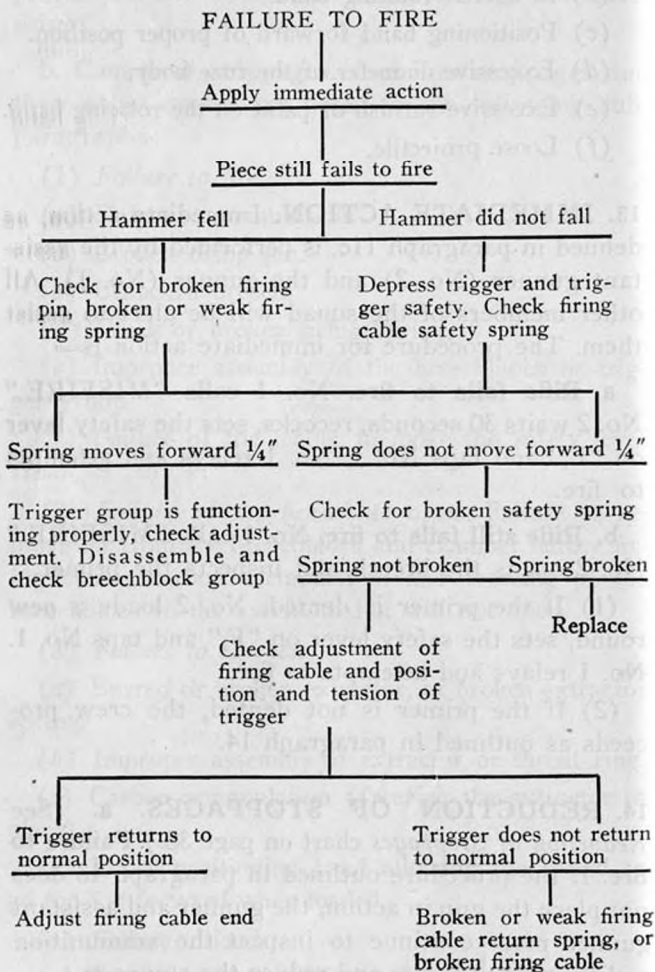
**b. Rifle still fails to fire.** No. 1 calls "MISFIRE." No. 2 opens the breech and inspects the primer.

(1) If the primer is dented, No. 2 loads a new round, sets the safety lever on "F," and taps No. 1. No. 1 relays and attempts to fire.

(2) If the primer is not dented, the crew proceeds as outlined in paragraph 14.

**14. REDUCTION OF STOPPAGES.** a. (See *Reduction of Stoppages* chart on page 38.) **Failure to fire.** If the procedure outlined in paragraph 13 does not place the gun in action, the gunner and assistant gunner must continue to inspect the ammunition and the rifle to locate and reduce the stoppage.

*Reduction of Stoppages*



b. **Failure of breech to open.** Tap the breechblock handle lightly with the heel of the hand or the butt end of a screw driver until the breech is open. Remove any corrosion with crocus cloth. Examine the interrupted lug on the breechblock for burrs and if any are present return the rifle to ordnance for repair.

c. **Failure to extract.** Inspect the extractor and depress the extractor spring. If the extractor does not return to the normal position, check it for a broken extractor spring. Clean the extractor assembly and replace any defective parts.

d. **Failure to load.** In the event the rifle cannot be loaded because of defective ammunition, replace the defective round with a new one and continue to fire. If time is available, slight burrs on the rotating band or excessive varnish may be removed at the gun position. A loose projectile may be corrected by crimping the cartridge case to the base of the projectile.

e. **Adjustment of the trigger group.** (See par. 7e).

**15. RESTORATION OF BALANCE.** a. **Forward movement.** If the forward thrust of the rifle when firing from the shoulder is strong enough to pull it off the target, the rifle should be rebalanced by replacing the throat ring with one having the next higher number. There are 5 different sizes of throat rings, numbers -4, +4, +6, +8, +10, and each is identified by a piece mark and a number which designates the size of the rings. New rifles are issued with either the -4 or +4 ring assembled and

with a spare ring of each larger size. To restore balance—

(1) Remove the two throat blocks and the throat ring by withdrawing the screws. Examine the size number on the rear base of the throat ring and select a ring having the next higher number. (Any new set of throat blocks may be used with any size ring.)

(2) Assemble a new throat ring, as well as new *top and bottom throat blocks* to the breechblock and tighten the screws. Loosen the throat block screws one-quarter turn.

(3) If this action does not eliminate all forward movement of the rifle, assemble a ring with the next higher number. When a new throat ring and a set of new throat blocks are installed, disregard any slight movement of the rifle to the rear since erosion will soon balance the piece.

**Caution.** Keep the eye away from the sight for the first round fired after a new throat ring has been installed.

**b. Recoil.** If the rifle recoils, it indicates there is an obstruction in the orifices or that a throat ring of too large a size is being used. If an obstruction is present, remove it. If the throat ring is too large, substitute a smaller numbered ring with new throat blocks. These measures should restore balance to the rifle during firing.

## Section V. AMMUNITION AND FUZES

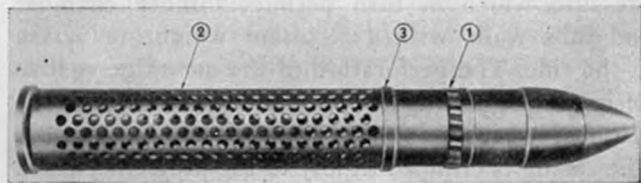
16. **GENERAL.** Ammunition for the 57-mm rifle M18 is issued in the form of complete fixed rounds

(fig. 21). The rounds consist of a primer and propelling charge in a perforated cartridge case which is crimped rigidly to the projectile. The term "fixed," used in this connection, signifies that the propelling charge is not adjustable and that the round is loaded into the weapon as a unit.

#### 17. DESCRIPTION AND IDENTIFICATION.

(See fig. 20.) Ammunition for the 57-mm rifle cannot be used in any other 57-mm weapon and may be identified easily from other fixed ammunition by a preengraved rotating band (fig. 20①), a perforated cartridge case (fig. 20②), and a positioning band (fig. 20③). The preengraving of the rotating band makes possible the use of a lower chamber pressure which in turn permits thinner chamber and tube walls with a resultant weight reduction in the rifle. The perforation of the cartridge case is designed to permit the escape of gases into the chamber where they are utilized to eliminate recoil. The casing is crimped rigidly to the projectile which prevents independent turning when the round is loaded into the chamber and insures that the preengraved rotating band is fitted into the lands and grooves of the tube. The positioning band is provided to properly position the round in the chamber and, when properly placed, it is just above the perforations of the cartridge case. This permits all of the projectile to be seated in the tube with the base of the cartridge supported in the throat ring, and it permits proper headspace between the firing pin and primer of the cartridge. When the positioning band is too far forward, the projectile is not prop-

erly seated in the tube and the breech cannot be closed. When the positioning band is not sufficiently forward, the projectile is too far into the tube, the base of the projectile is not supported by the throat ring, and the firing pin cannot strike the primer of the cartridge. The ammunition propellant is retained within the perforated casing by a thin tube of paper 0.004 inches thick. Therefore, caution must be exercised in handling the ammunition, since puncturing of the paper will cause a loss of propellant with a resultant loss of range and accuracy. Moisture also will damage the round, and precautions must be exercised to keep the ammunition dry.



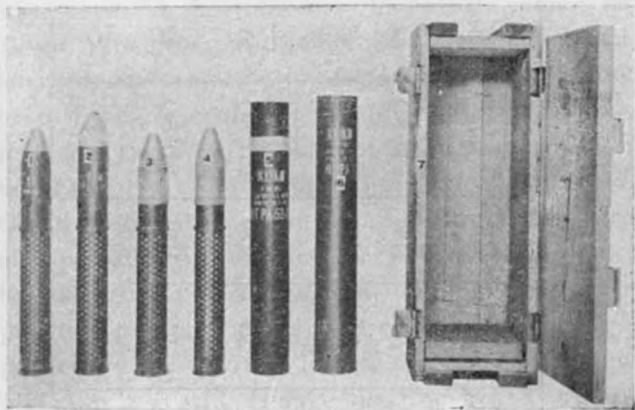
- ① Preengraved rotating band.
- ② Perforated cartridge case.
- ③ Positioning band.

*Figure 20. Identifying characteristics, ammunition for 57-mm rifle M18.*

**18. CLASSIFICATION.** Depending upon the type of projectile, ammunition for the 57-mm rifle is classified as high explosive, high explosive antitank, chemical, and target practice.

a. General characteristics of 57-mm rifle ammunition. (See fig. 21.)

Type Rd.	Wt. Rd. (lb.)	Length Rd. (in.)	Wt. (lb.) Projectile as fired	Type Filler	Wt. (lb.) Filler	Wt. (lb.) Propellant	Type Fuze	Action of Fuze	Wt. of 4 Rd. in Box (lb.)
HE (M306) . . . . .	5.30	17.54	2.75	TNT	.60	.93	M89	PD, SQ	44
HE, AT (M307) . . . . .	5.30	18.78	2.75	.....	.39	.93	M90	PI, BD non-delay	45
SMOKE WP (M308).	5.30	16.83	2.75	WP	.27	.93	M89	PD, SQ	43
TP (M306) . . . . .	5.30	17.54	2.75	Inert and Black Powder	.45	.93	M89	PD, SQ	42
					.07				



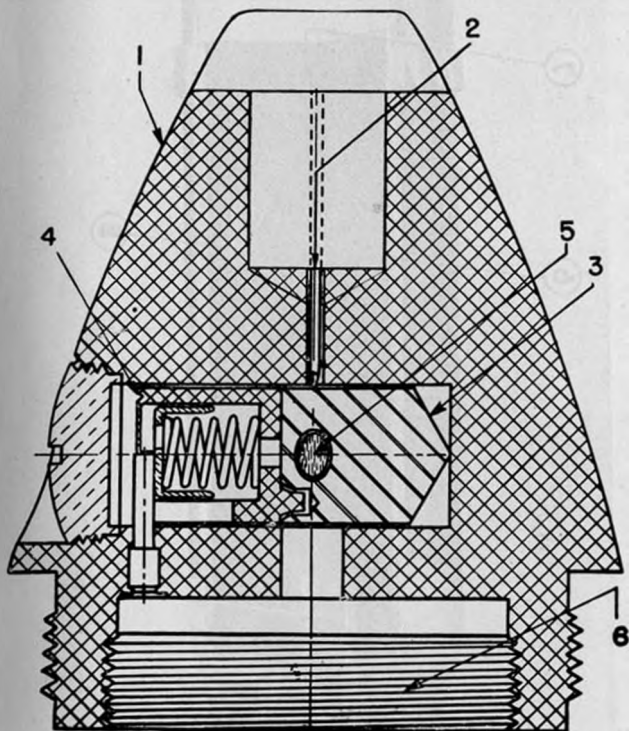
1. Cartridge, HE M306 (T22).
2. Cartridge, HE, AT M307 (T20E2).
3. Cartridge, smoke, WP M308 (T23).
4. Cartridge, target practice (TP) (T22).
5. Container, fiber, moisture resistant.
6. Container, metal, sealed.
7. Packing crate, wood.

Figure 21. Ammunition and containers, 57-mm rifle M18.

**b. The high explosive projectile (HE).** (1) *General.* The HE projectile has a total weight of 2.75 pounds and is comparatively thin walled containing 0.60 pounds of granulated TNT as the explosive bursting charge. The projectile has a muzzle velocity of 1,200 feet per second, a maximum range of 4,340 yards, and a bursting radius of 17 yards. It is used principally for fragmentation effect against personnel and against open type emplacements.

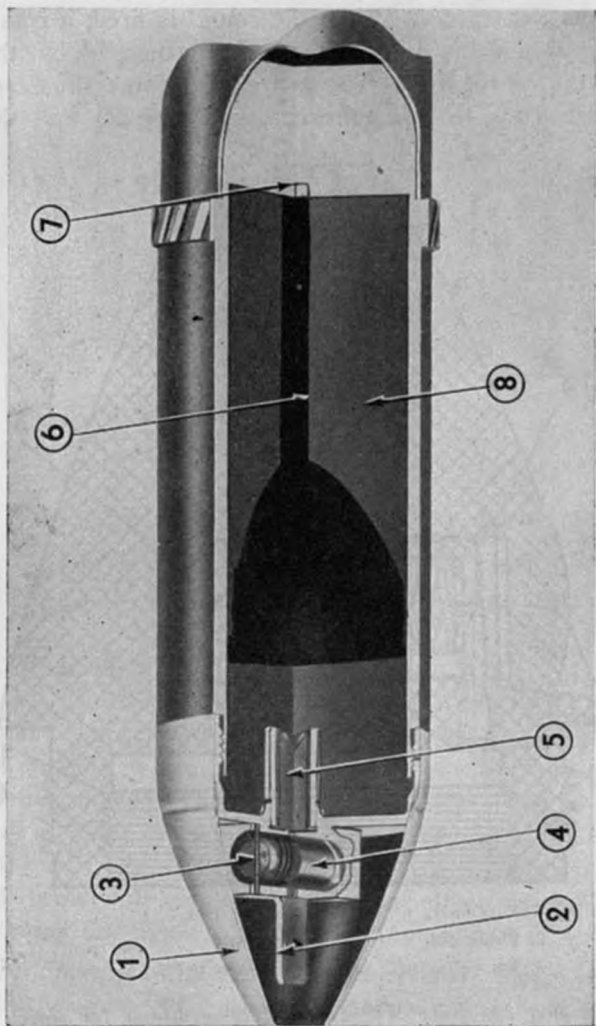
(2) *Fuze* (see fig. 22). The projectile is equipped with the fuze M89 which is super quick (point detonating) and is armed when the projectile

reaches a speed of between 1,500 and 2,000 revolutions per minute. When the round is fired, a rotating motion is imparted to the projectile by the rifling of the tube. The centrifugal force thus created tends to force the rotor (3, fig. 22) and the



- |                |                    |
|----------------|--------------------|
| 1. Fuze body.  | 4. Rotor lock.     |
| 2. Firing pin. | 5. Primer.         |
| 3. Rotor.      | 6. Booster pellet. |

Figure 22. Fuze M89 (P.D. T119 modified) for shell HE M306, 57-mm rifle M18.



- ① Ogive.
- ② Firing pin assembly.
- ③ Rotor lock assembly.
- ④ Rotor assembly.
- ⑤ Auxiliary detonator.
- ⑥ Flash channel.
- ⑦ Base primer.
- ⑧ Main charge.

*Figure 23. Fuze M90 (PI-TI23E1) for HE, AT projectile M307, 57-mm rifle M18.*

rotor lock (4, fig. 22) apart. Initially the rotor cannot move; however, centrifugal force causes the rotor lock to move away from the rotor compressing the rotor lock spring and freeing the rotor. As a safety precaution, the force of inertia (caused by acceleration of the projectile) plus friction prevents the rotation of the rotor until the projectile leaves the tube. When the projectile, after leaving the tube, has traveled about 13 feet, the rotor is rotated in its cavity by centrifugal force, alining the primer (5, fig. 22) with the firing pin (2, fig. 22). Upon impact, the fuze body (1, fig. 22) is crushed against the firing pin (2, fig. 22) which in turn strikes the primer (5, fig. 22) detonating the booster pellet (6, fig. 22) which detonates the TNT in the projectile.

**c. High explosive antitank projectile (HE, AT).** The high explosive antitank (HE, AT) projectile weighs 2.75 pounds and is designed for use against vehicles, armored targets, and concrete or log emplacements. This projectile has a velocity of 1,200 feet per second and a maximum range of 4,340 yards. The HE, AT projectile employs a point initiating fuze M90 (fig. 23). The explosive in the projectile weighs 0.39 pounds and is a shaped charge detonated at its base. By employing the principle of a shaped charge, the penetration remains the same even though the velocity may be greatly reduced. (The armor penetrating ability of a *solid projectile* depends upon its weight, velocity at time of impact, and angle of strike.) The M90 fuze (fig. 23) is armed between 1,500 and 2,000 revolutions per minute in the same manner as the M89

fuze. Upon impact the ogive (fig. 23①) is crushed against the firing pin (fig. 23②) detonating the primer which sets off the auxiliary detonator (fig. 23⑤). This detonator is a small shaped charge which passes along a flash channel (fig. 23⑥) detonating the base primer (fig. 23⑦) which in turn detonates the main charge (fig. 23⑧).

**d. Smoke projectile (WP).** The chemical round provided is smoke (WP) which is used to mark or screen point targets, as a limited casualty producing or incendiary agent, or as a combination of the two. The projectile weighs 2.75 pounds, of which the filler comprises 0.27 pounds, and has a bursting radius of 17 yards. The fuze is superquick (M89).

**e. Target practice projectile (TP).** The target practice projectile weighs 2.75 pounds, is equipped with Fuze M89 and contains a black powder charge to permit prompt and accurate observation of the strike. Other characteristics are the same as the HE round.

**19. PAINTING.** Ammunition is painted primarily to prevent rusting. Painting also assists in camouflage and provides, by means of color, a ready identification as to type. Projectiles for the 57-mm rifle are painted and marked in accordance with the basic color scheme published in TM 9-1900.

<i>Type</i>	<i>Body</i>	<i>Markings</i>
High Explosive (HE)	....olive drab	.....yellow
High Explosive		
Antitank (HE, AT)	....olive drab	.....yellow
Smoke (WP)	.....gray	.....1 yellow band
Target Practice (TP)	.....blue	.....white

**20. CARE, HANDLING, AND PRESERVATION.** Complete rounds are packed to withstand conditions usually found in the field and are shipped in individual moisture-resistant fiber containers. These in turn are inclosed within a sealed container which is encased by a wooden packing box. Due consideration should be given to the following:

a. Do not break the moisture-resistant seal until the ammunition is to be used.

b. Protect the ammunition, particularly the fuzes, from high temperatures, including direct rays of the sun.

c. Do *not* attempt to disassemble any fuze.

d. Prior to loading, inspect the ammunition for punctured paper and burrs or excessive paint or varnish on the rotating band. The complete round should be clean and free of dirt or mud.

e. Return all unfired rounds to their original containers.

**Caution.** *Do not handle duds: destroy them in place* with TNT or nitrostarch blocks. The dud should be approached only by experienced personnel and, without disturbing the dud, the explosive blocks carefully laid in intimate contact with it. If possible, the blocks should be placed on top of the dud because the wave of detonation tends to be propagated downward. The blocks then should be carefully mud-packed, or earth-covered to direct the explosion toward the dud as much as possible. One ½-pound TNT block is sufficient to detonate a 57-mm rifle shell. After the charge is placed the dud should be covered with sandbags to limit the range

of fragments. The demolition block is detonated by means of an electric blasting cap or miner's safety fuse and cap.

21. **FIRING TABLES.** Range data for direct fire is contained on the telescope reticle (fig. 32). Firing data is provided in FT 57-E-1 (abridged) (fig. 64).

## Section VI. CARE AND CLEANING

22. **GENERAL.** Preventive maintenance service, as prescribed by Army Regulations, is a function of the unit organization echelon maintenance. This section describes those preventive maintenance service functions allocated to the crew and the organization. Corrosion, grit, gummed oil, and water all cause rapid deterioration of both internal mechanisms and exterior unpainted surfaces. All traces of corrosion and carbon accumulation must be removed from unpainted surfaces with crocus cloth which is the coarsest abrasive to be used for this purpose. Particular care must be taken to keep bearing surfaces clean and properly lubricated.

23. **PREVENTIVE MAINTENANCE.** a. **Before firing.** Proper maintenance before firing will eliminate most stoppages and causes for accidents. The following steps should be taken prior to firing:

- (1) Thoroughly wipe dry the bore and chamber (with clean, dry, jute-burlap) removing all dirt or oil.

- (2) Disassemble the breech mechanism and wipe

dry all components, including the recesses. Reassemble the breech mechanism.

(3) Wipe the outer surfaces of the rifle with a clean, dry cloth.

(4) Check the throat ring for proper size, as shown in the gun book for that particular rifle, and for proper tightness. The throat ring retaining screws should be tightened all the way, then unscrewed  $\frac{1}{8}$  turn to prevent *freezing* during firing.

(5) Inspect the extractor for proper functioning.

(6) Inspect the firing mechanism.

(7) Check the sight for proper mounting and tightness in the sight mount.

**b. During firing.** (1) Precautions should be taken to prevent the throat ring and throat blocks from becoming frozen. To prevent freezing, during lulls in the firing loosen the throat ring retaining screws, retighten and then unscrew them  $\frac{1}{8}$  turn. The same precautions should be exercised in regard to the throat blocks; unscrew them  $\frac{1}{8}$  turn after tightening.

(2) Frequently inspect the firing pin aperture to insure that it is clean and clear.

(3) Wipe the interrupted lug of the breechblock and the chamber with a piece of waste or similar dry cloth.

**c. After firing.** (1) *Breechblock.* Disassemble the breechblock and clean it with rifle bore cleaner. Then wipe it dry and oil with preservative lubricating oil (medium) above  $0^{\circ}$  F., and preservative lubricating oil (special) below  $0^{\circ}$  F.

**Caution.** Do not attempt to clean the bore or

chamber until they have cooled sufficiently to permit handling them with the bare hands.

If rifle bore cleaner is used, it is not necessary to dry and oil the bore or chamber between cleanings. If a hot water solution is used, dry and apply a light film of oil after each cleaning as prescribed in paragraph 24. Reassemble the breech mechanism and clean it for three consecutive days thereafter or until there is no longer any evidence of sweating (a chemical reaction of the burnt powder which cannot be removed by one cleaning). After the fourth cleaning, if rifle bore cleaner is used and no firing is anticipated within the next 24 to 48 hours, thoroughly dry the breechblock and apply a light film of preservative lubricating oil (medium) above 0° F., and preservative lubricating oil (special) below 0° F. If firing is anticipated, do not apply oil.

(2) *Bore.* After firing and on 3 consecutive days thereafter clean the bore with rifle bore cleaner, making sure that all surfaces, including the rifling, are well coated. After the fourth cleaning, dry the bore and oil with preservative lubricating oil (medium) above 0° F., and preservative lubricating oil (special) below 0° F. The same rule as in (1) above applies if rifle bore cleaner is used and no firing is anticipated within 24 to 48 hours.

(3) *Trigger group.* Using a dry cloth, wipe the trigger group and the extendable handle assembly dry and apply a light film of preservative lubricating oil (medium) above 0° F., and preservative lubricating oil (special) below 0° F.

**d. Cleaning under unusual conditions.** The procedures for the mechanical operation of the rifle

are the same for operation under either usual or unusual climatic conditions. In addition to the normal preventive maintenance service specified throughout this manual, special care in cleaning and lubrication should be observed where extremes of temperature, humidity, and atmospheric conditions are present. Proper cleaning and lubrication not only insure proper operation and functioning but also guard against excessive wear of the working parts and deterioration of the matériel.

(1) *Cold climates.* (a) In temperatures below freezing, it is necessary that the working parts of the rifle be kept absolutely free from moisture. Take special care to remove excessive oil on the working parts because it will congeal to such an extent as to cause sluggish operation and functioning, or complete failure. This applies, in particular, to the small spring-operated parts in the breech mechanism and trigger group.

(b) Protect rifles not in use with the proper covers to prevent frosting.

(c) Allow rifles taken into heated buildings to come to the temperature of the building before cleaning. Immediately after they reach room temperature, disassemble to the extent outlined in paragraph 6. Thoroughly wipe all moisture from all parts as well as the bore and chamber to prevent rusting; then thoroughly clean by one of the methods outlined above and lubricate as outlined.

(2) *Hot climates.* (a) In hot climates, the thin film of oil necessary for operation and preservation will be dissipated quickly. Inspect rifles frequently, pay-

ing particular attention to unexposed surfaces such as the bore and chamber, springs and spring seats, firing pin, and like places where corrosion might occur and not be quickly noticed. When necessary, renew a film of the oil prescribed above. Keep screws and pins lightly oiled to prevent rust from attacking them and "freezing" them in place.

(b) Protect rifles not in use with the proper covers.

(c) Perspiration from the hands is a contributing factor to rusting because it contains acid. After handling, wipe dry and restore the oil film.

(3) *Excessively sandy or dusty conditions.* (a) In localities where dust and sand storms are prevalent, carefully protect the rifles with proper covers. Dust and sand will enter the mechanism and bore and stick on lubricated surfaces, forming a gummy paste which may clog the rifle and cause malfunction. This paste also will act as an abrasive and will cause undue wear of the moving parts of the rifle.

(b) Under such conditions thoroughly clean and lubricate the rifles as often as necessary.

(c) Disassemble to the extent outlined in paragraph 6. Clean by one of the methods outlined above. Lubricate with the oil specified. Apply the oil to moving parts and contacting surfaces only. The film of oil will be as light as possible for proper functioning of the rifle.

(4) *Excessively moist or salty atmosphere.* (a) Salt air is conducive to quick rusting, as the salt has a tendency to destroy the rust-preventive qualities of the oil. When operating the rifle under these conditions, treat it in a manner similar to that prescribed for operation in hot climates.

24. LUBRICATING MATERIALS. a. LO 9-304 (fig. 24) contains organizational lubrication instructions for the 57-mm rifle M18.

WAR DEPARTMENT LUBRICATION ORDER LO 9-304

1 June 1946 Supersedes 15 January 1946

RIFLE, 57-MM M18

Reference TM 9-304, ORD 7 SNL C-73.

**BREECH MECHANISM:** Before firing disassemble and wipe dry all components including all recesses. After firing disassemble and clean with CR, wipe dry and oil with FM above 0° F or PS below 0° F. Repeat on 3 consecutive days. When gun is not fired disassemble clean and CR wipe dry and recoil every 7 days.

**BORE:** After firing and on 3 consecutive days thereafter clean with CR. After 4th cleaning dry, recoil with FM above 0° F or PS below 0° F. When gun is not being fired, clean tube with CR wipe dry and recoil every 7 days. Wipe clean before firing.

**TRIGGER GROUP:** After firing or every 7 days, wipe dry and recoil by wiping components with cloth wrung out in FM above 0° F or PS below 0° F.

**EXTENDABLE HANDLE ASSEMBLY:** Daily and after firing wipe dry and cover telescoping section with light film of FM above 0° F or PS below 0° F.

**FIRING CABLE:** Disassemble wash in CR and recoil with FM above 0° F or PS below 0° F monthly.

FM - OIL lubricating preservative medium.

PS - OIL lubricating preservative special.

CR - CLEANER, rifle bore.

This WDLO supersedes all conflicting lubrication instruction prior to 1 June 1946.

A G 300.8 15 Sep 1945.

By ORDER OF THE SECRETARY OF WAR

DWIGHT D EISENHOWER, CHIEF OF STAFF

OFFICIAL:

EDWARD F WITSELL MAJOR GENERAL  
THE ADJUTANT GENERAL

Figure 24. Lubrication Order 9-304.

b. In the event the lubricants prescribed in LO 9-304 are not available, the following oils may be used as emergency substitutes:

(1) Lubricating oil (light).

(2) Engine oil, SAE 10 (above plus 32° F.).

**25. CLEANING AND PRESERVING MATERIALS.** The following cleaners and preservatives are desirable for use with the 57-mm rifle. Powdered borax; rifle bore cleaner; bore cleaning cloth; crocus cloth; cotton wiping cloth; alkaline cleaning compound; synthetic, lusterless, OD enamel; flannel cotton patches; castile or issue soap; (see TM 9-850, Supply Catalogs ORD 3 SNL K-1 and ORD 3 SNL K-2 for additional specifications).

a. Rifle bore cleaner is the preferred cleaner; however, if bore cleaner is not available, soap or hot water should be used.

b. Components of each rifle should be cleaned separately for, while like parts are interchangeable, the parts originally assembled in the rifle work best together.

c. Never use a solution of water and lye or any other caustic to clean the gun parts; also, gasoline and benzine are prohibited since they present a fire hazard. Dry cleaning solvent must not be used to clean the bore or chamber after firing because it will not readily dissolve the corrosive salts from the powder compositions.

d. If rust should accumulate, its removal from bearing surfaces requires special care in order that clearances not be unduly increased. *Crocus cloth should be used for this purpose and the use of coarse abrasives*

*is strictly forbidden.* Carbon accumulation may be removed by first applying a light coat of oil, then using crocus cloth to remove the carbon.

e. See TM 9-314 for further information on the qualities of bore cleaner and the preparation of hot water solutions to be used in cleaning.

## **26. PREVENTIVE MAINTENANCE SCHEDULES.**

**a. Daily service.** Using a clean cloth, wipe the extendable handle assembly dry and cover the telescopic section with a light film of the oil prescribed in paragraph 24.

**b. Weekly service.** If the rifle is temporarily not in use, disassemble the breech mechanism, clean, wipe dry, and apply a light film of the oil prescribed in paragraph 24. Disassemble the trigger group, wipe the parts dry, apply a light film of oil to all parts, and reassemble.

**c. Monthly service (or after each 100 rounds).** In addition to the disassembly and cleaning of the breechblock and the trigger group, disassemble and thoroughly clean the firing cable. Wipe it dry, apply a light film of the proper oil, and assemble as outlined in paragraph 7e.

**d. Service for periods up to 90 days.** If it is anticipated that the rifle will not be used for a period up to 90 days, and neither lubrication weekly nor placing the matériel in limited storage is desirable, the rifle may, regardless of temperature, be coated with preservative lubricating oil (medium). Frequent inspections will be made to determine that the oil film is adequate to prevent corrosion.

**e. Painting.** Painting is done for the purpose of

preserving the outside surfaces of the rifle where the protective finish has been removed by corrosion, wear, or cleaning. The olive drab synthetic lusterless enamel provided for this purpose should be used; however, in an emergency, preservative lubricating oil (medium) may be substituted as a temporary expedient to prevent corrosion. Care should be observed that no paint penetrates to other parts of the gun or is so applied that it may be rubbed off and cause clogging of the mechanism.

## Section VII. DEMOLITION TO PREVENT ENEMY USE

### 27. DEMOLITION TO PREVENT ENEMY USE.

a. **General.** The destruction of matériel, when subject to capture or abandonment in the combat zone, will be undertaken by the using arm only on authority delegated by the division or higher commander, when such action is deemed necessary as a final resort to keep the matériel from reaching enemy hands.

b. **Requirements for destruction.** Adequate destruction of matériel means damaging it in such a way that the enemy cannot restore it to a usable condition in the combat zone by repair or cannibalization. Adequate destruction requires that—

(1) Sufficient parts essential to operation of the rifle must be destroyed.

(2) Parts must be damaged beyond the enemy's ability to repair them in the combat zone.

(3) The same parts must be destroyed on all

guns, so that the enemy cannot build one operating unit by assembling parts from several partially destroyed units.

## 28. PROCEDURE FOR DEMOLITION.

a. **Sights.** Detach all optical sights. If evacuation is possible, carry the sights; if evacuation is not possible, thoroughly smash them.

b. **Rifle.** The barrel assembly and breech mechanism are the most vital parts of this rifle. To destroy them, first depress the muzzle and open the breech. Using an incendiary grenade M14, pull the safety pin but continue to hold the grenade safety handle in the safe position. Aline the grenade with the open breech, release the safety handle and insert the grenade into the chamber. Stand clear to the side at least 15 yards. The intense heat of the burning incendiary grenade will damage the chamber and molten iron will pour through the bore and render it unserviceable.

**Caution.** Be sure to use an incendiary grenade and not a fragmentation or offensive grenade.

c. **Mount and gun book.** The mount should be destroyed by smashing the dial and cradle. The gun book either should be evacuated or burned.

d. **Ammunition.** Ammunition can be destroyed most quickly by detonation or burning.

(1) *Detonation.* Unpacked high-explosive rounds may be destroyed by placing them in contact in piles and detonating them with a charge of TNT, using with blasting cap and sufficient safety fuze to permit reaching cover at 200 yards. About 1 pound

of TNT per 100 pounds of ammunition should be sufficient.

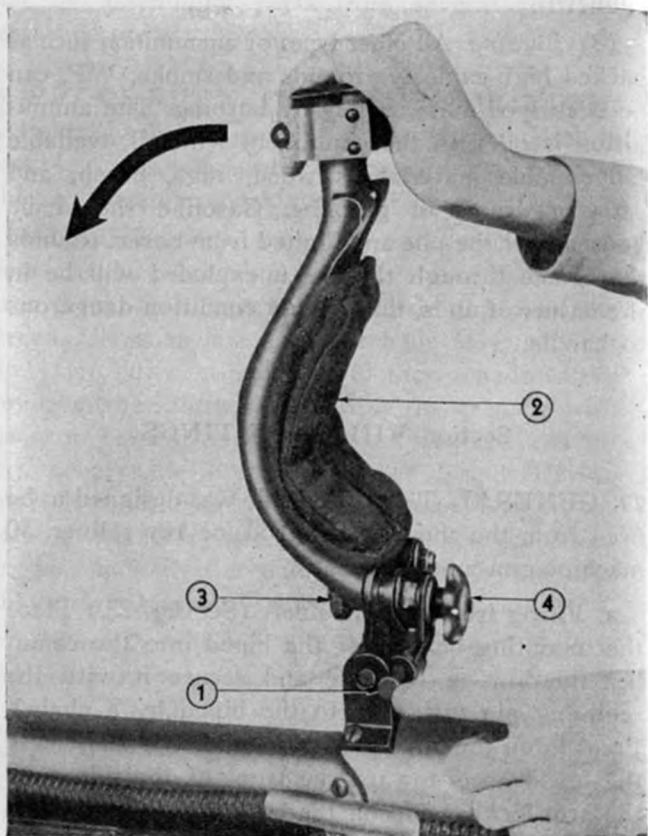
(2) *Burning.* All other types of ammunition such as packed high-explosive rounds and smoke, WP, can be destroyed most rapidly by burning. The ammunition is piled in the containers with all available inflammable material as wood, rags, brush, and cans or drums of gasoline. Gasoline should be poured over the pile and ignited from cover. Rounds that come through the fire unexploded will be in the nature of duds, that is, in a condition dangerous to handle.

## Section VIII. MOUNTINGS

29. **GENERAL.** The 57-mm rifle was designed to be fired from the shoulder, a bipod, or any caliber .30 machine gun mount.

a. **Firing from the shoulder.** (See fig. 25.) Place the mounting bracket of the bipod into the chamber fulcrum on the rifle and secure it with the retaining pin (attached to the bipod by a chain). Press in on the yoke lock pin (fig. 25①) and rotate the bipod arms toward the front of the rifle until the arm locking clip on the end of each bipod arm rests between the lugs of the tube fulcrum yoke. In this position, the pads (fig. 25②) on the bipod form a rest for the shoulder.

b. **Firing from the bipod.** (1) Place the mounting bracket of the bipod into the chamber fulcrum of the rifle and secure it with the retaining pin.



- ① Yoke lock pin.
- ② Bipod pads.
- ③ Adjustment knob (bipod spread).
- ④ Arm locking knob (leveling knob).

Figure 25. Bipod adjustments, 57-mm rifle M18.

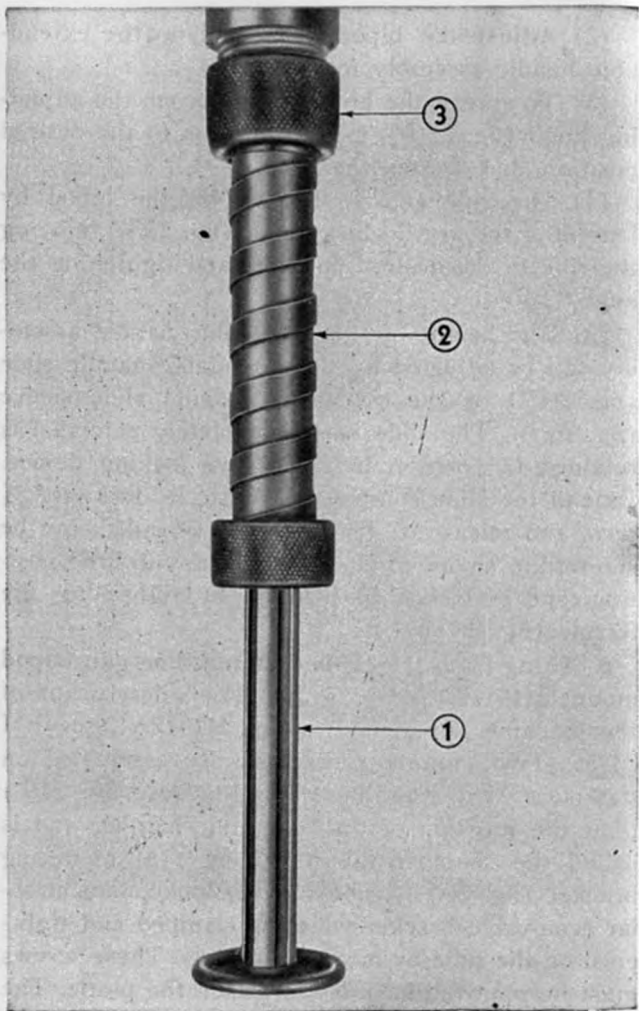
(2) Adjust the bipod arms and/or the extendable handle assembly for elevation.

(3) To spread the bipod arms, loosen the adjusting knob (fig. 25③), move the arms to the desired position, and tighten the knob.

(4) The rifle can be leveled on the bipod by loosening the arm locking knob (fig. 25④), moving the rifle to the desired position, and tightening the knob.

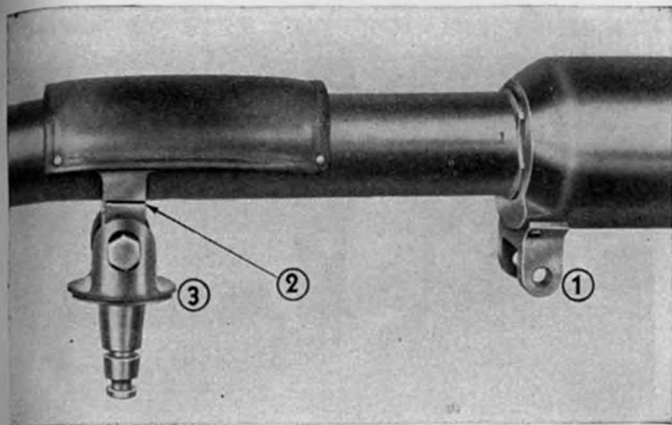
(5) The height of the extendable handle assembly can be adjusted by the extendable handle slide (fig. 26①) or the extendable handle slide sleeve (fig. 26②). The slide when completely extended is retained in position by a positive locking device. Extend the slide completely, rotate it clockwise  $\frac{1}{4}$  turn, and release it. The sleeve is threaded, can be screwed in or out of the handle to any desired position, and is locked in position by tightening the ferrule (fig. 26③).

c. **Firing from the caliber .30 machine gun tripod mount M1917A1.** (See fig. 27.) For a description of the machine gun tripod mount M1917A1, see FM 23-55. Two mounting brackets are assembled on the piece. The rear mounting bracket (fig. 27①) is at the junction of the tube and chamber and is called the chamber fulcrum. The front mounting bracket (fig. 27②), tube fulcrum yoke, is a circular removable bracket which is clamped and tightened on the tube by means of screws. These screws must be removed in order to attach the pintle. The position of the front mounting bracket can be adjusted so as to fit the mounting bracket of the gun to the tripod. The machine gun cradle pintle is



- ① Extendable handle slide.
- ② Extendable handle slide sleeve.
- ③ Extendable handle slide sleeve ferrule.

Figure 26. Elevation adjustments, extendable handle assembly, 57-mm rifle M18.



- ① Chamber fulcrum.
- ② Tube fulcrum yoke.
- ③ Machine gun cradle pintle.

*Figure 27. Mounting brackets, 57-mm rifle M18.*

attached to the front mounting bracket, and the chamber fulcrum fits over the elevating screw. The gun is mounted on the tripod with the trail (long) leg to the front, and with the traversing and elevating handwheels of the cradle to the rear. (When so mounted the long leg of the tripod is clear of the back blast area and tends to lend more stability to the rifle when forward movement develops.)

**d. Other mountings.** The gun may be mounted on any mount that will accommodate the machine gun; successful and efficient firing has been accomplished when the gun is mounted on the pedestal (fig. 28) and dashboard mounts of the  $\frac{1}{4}$ -ton truck. When firing from the  $\frac{1}{4}$ -ton truck (fig. 29), care must be taken that the back blast does not damage the vehicle.



*Figure 28. 57-mm rifle on pedestal mount, 1/4-ton truck.*



*Figure 29. 57-rifle on dash mount, 1/4-ton truck.*

## Section IX. FIRE CONTROL INSTRUMENTS

**30. GENERAL.** Fire control instruments for the 57-mm rifle consist of those items of equipment necessary to control direct fire. These include: the telescope M86C, with carrying case M76; sight mount M74, including the rear metal sight; front sight M26; instrument light M45; binocular; compass; plotting board M10; and clinometer M1917.

**31. SIGHTING EQUIPMENT. a. General.** The 57-mm rifle sighting equipment is designed for direct fire. The rifle is aimed with either the telescope M86C (fig. 30) supported in the sight mount M74, or with open sights (fig. 31) which consist of a leaf sight mounted in the sight mount and a front sight M26. The open sights are folded to a closed position when using the telescope. For installation, tests, adjustment, and maintenance of sighting equipment, see TM 9-314.

**b. Sight mount M74.** (See fig. 49.) The telescope is secured in position in the telescope holder with a telescope cam. When installing or removing the telescope, the cam is turned counterclockwise to

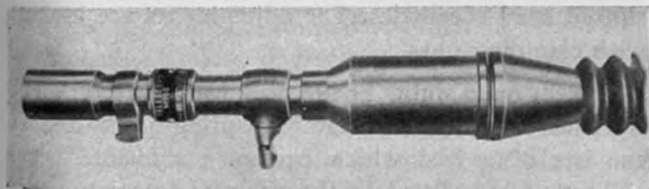
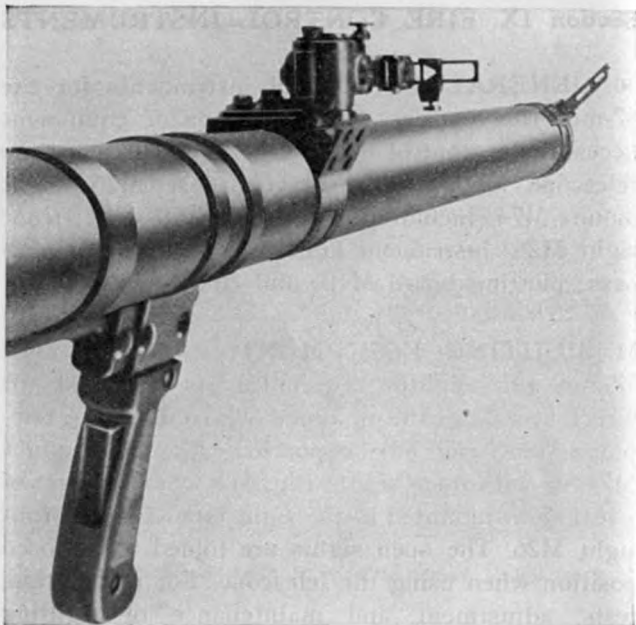


Figure 30. Telescope M86C for 57-mm rifle M18.



*Figure 31. Open metal sights, 57-mm rifle M18.*

clear the entrance for the bracket. Lateral and vertical adjusting mechanisms are provided for adjusting the line of sight when boresighting (see par. 58). The line of sight is shifted by turning the slotted head eccentrics. The adjustments are locked with clamping nuts.

**c. Rear open sight.** The folding leaf sight (fig. 31) is raised and lowered against spring pressure. It consists of a leaf which carries a movable peep sight that is secured in the desired elevation position by tightening a knurled head clamping screw.

A range scale on the left hand side of the leaf is graduated in 100-yard intervals from 0 to 1,100 and numbered every 100 yards. This is used for setting the peep sight to the desired range. Unnumbered graduations on the right hand side of the leaf are used for setting the peep sight when the desired range falls within a 100-yard interval. For precise aiming, the bottom edge of the peep sight is set to the desired graduation, and the notch in the base of the triangle is alined with the front sight and the target. For average ranges (up to 400 yards), the peep sight is secured at the bottom of the leaf and the notch in the top of the peep sight is alined with the front sight and the target. The sight is adjusted for windage by turning the windage screw. The adjustment is registered on a windage scale which is graduated in 2-mil intervals from 0 to 5 on either side of the center index line on the telescope holder.

**d. Telescope M86C.** (See fig. 30.) (1) This is a 2.8-power instrument having a  $7^{\circ} 30'$  field of view. A front lug and rear bracket on the telescope are provided to position the instrument in the telescope holder of the sight mount. A window in the telescope body transmits light from an instrument light to the reticle. This provides additional illumination during the hours of limited visibility.

(2) The reticle pattern of the telescope M86C (fig. 32) is based upon the data from firing table 57-E-1 (abridged) for 57-mm rifle M18 (using HE shell M306 and fired with a muzzle velocity of 1200 feet per second).

(3) The reticle pattern is composed of a cross,

a vertical broken line, and a series of broken horizontal lines. The point of intersection of the two solid lines, forming the cross, represents zero range and zero deflection and is used for boresighting. The broken vertical line which bisects the reticle represents range. Each segment of the line, and each space between segments, represents a range of 100 yards. The bottom of the broken vertical line represents 1,900 yards range. The broken horizon-

### 57 - M306

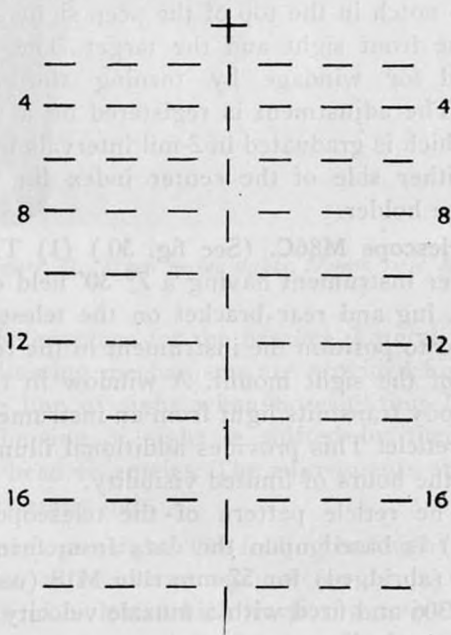
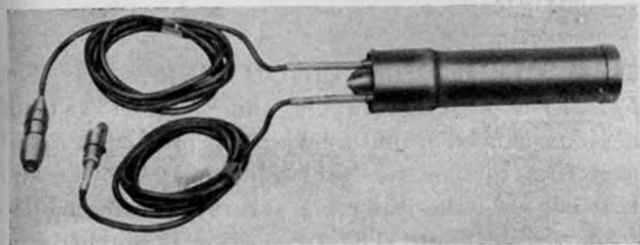


Figure 32. Sight reticle, telescope M86C, 57-mm rifle M18.

tal lines are provided at 200-yard intervals to indicate leads or deflection. Each segment of the horizontal line, and each space between segments, indicates a deflection change of 5 mils, or one lead. To facilitate rapid sight setting, numerals 4, 8, 12, and 16 indicating 400, 800, 1,200, and 1,600 yards of range are placed on the ends of the horizontal lines.

**e. Instrument light M45.** (See fig. 33.) The instrument light is used for illuminating the reticle in poor light conditions. Illumination is provided by two 3-volt electric lamps and the instrument light consists principally of two flashlight batteries, a rheostat, a lamp bracket, a hand light, and associated lead wires. The batteries are contained in a battery case and are held in position by a screw type cap and spring which fits over one end of the tube. The rheostat, which is mounted in the other end of the case, is rotated to turn the lamps on and off and to regulate the intensity of the illumination. A block or slide on the case holds the lamp bracket when it is not in use, and a clip holds the hand light when it is not in use. To replace a burned-out bracket lamp, unscrew the lamp bracket from the



*Figure 33. Instrument light M45 for 57-mm rifle M18.*

lead wire body and unscrew the lamp. To replace a burned-out hand lamp, unscrew the cap from the body and unscrew the lamp.

f. **Front sight M26.** The front sight M26 consists of a folding sight (fig. 31) mounted in a support at the muzzle end of the rifle. The sight is raised and lowered against spring pressure to insure stability. When aiming the rifle, the small square at the top of the sight is aligned with both the center of the target and the notch in the folding leaf of the sight mount. When using the telescope M86C, the front sight is folded down in the same manner as the rear sight leaf.

**32. BINOCULARS.** Standard binoculars are used by the squad leader to make the necessary adjustments for fire control and to compute the angle of site when firing from position defilade. (For description and operation, see FM 23-85.)

**33. COMPASS.** A lensatic compass is standard equipment for fire control with the 57-mm rifle and may be used to establish direction when firing from position defilade. (For description and operation, see FM 23-85.)

**34. MACHINE GUN CLINOMETER M1917.** (See fig. 34.) a. **Description.** The clinometer consists of a sector-shaped frame to which is pivoted a radial arm that carries the level holder. The lower and rear edges of the frame are accurately machined to form a right angle. The arc portion is notched and graduated at 20-mil intervals for 840 mils above and

160 mils below the zero mark. One end of the radial arm is pivoted on the frame opposite the arc, and the other end is fitted with a plunger carrying an index. The index engages the notches on the arc and is held against it by a spring contained within the radial arm. The radial arm is graduated on both sides from zero to 20 mils and numbered every 5 mils; this scale is used in conjunction with the scales on the arc. The level holder, which slides along the radial arm, carries an index showing the mil readings on the arm and can be clamped in position by the thumb screw.

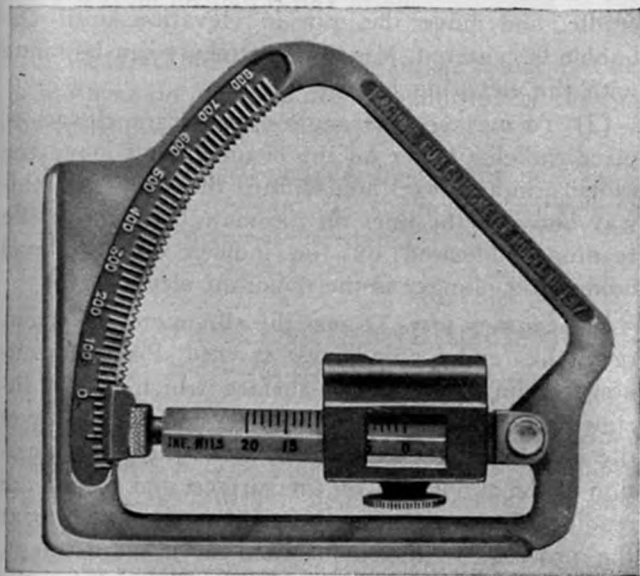


Figure 34. Machine gun clinometer M1917.

**b. Use.** The clinometer may be used for two purposes; i.e., to lay the gun at a given elevation or to measure the angle of quadrant elevation.

(1) To lay the gun at a given elevation, set the desired elevation on the clinometer by adjusting the index on the radial arm to the next lowest 20 mil reading, and then move the level holder on the radial arm until the index is opposite the graduation that will make the sum of the two settings equal to the desired elevation. (Example: The elevation desired is 348 mils. Set 340 on the arc and move the level holder until the index reads 8.) Place the instrument on top of the chamber with the arc to the rear. Loosen the clamping handle on the tripod cradle, and move the gun in elevation until the bubble is centered. Minor adjustments can be made with the elevating handwheel.

(2) To measure the angle of quadrant elevation, place the clinometer on the chamber and move the radial arm and level holder until the bubble is midway between the lines on the vial. The sum of the readings indicated by the indices on the level holder and plunger is the quadrant elevation.

**c. Accuracy test.** To test the clinometer for accuracy, the "end for end" test is used. Place the clinometer on any straight surface which is not inclined more than 40 mils from the horizontal. Level the bubble in the spirit level, mark the exact position of the clinometer on the surface, and record the reading shown. Reverse the clinometer and repeat the process. If the instrument is in adjustment, these two readings will be identical except for the sign prefixing them (plus or minus). If the two

readings differ, take the mean which is the error. The correction to be applied to the clinometer is the error with the sign reversed. (Example: The first reading is plus four; the second is minus six. The mean between these figures is minus 1 which represents the error. Therefore, plus 1 is the correction to be used with that particular clinometer.) If the error of the clinometer reaches 5 mils, it should be returned to Ordnance for repair. Special care should be taken to prevent burring, nicking, or denting the tooth portion of the arc, the curved top of the radial arm, or the smooth surfaces of the bases on the frame. *The clinometer must always be removed from the gun before firing.*

**35. PLOTTING BOARD M10.** a. **General.** Complete data on description and operation of the M10 plotting board can be found in FM 23-55.

b. **Use.** The M10 plotting board may be used by personnel of the 57-mm rifle section to facilitate the computation of initial fire data.

## **Section X. SPARE PARTS AND EQUIPMENT— SUBCALIBER DEVICE**

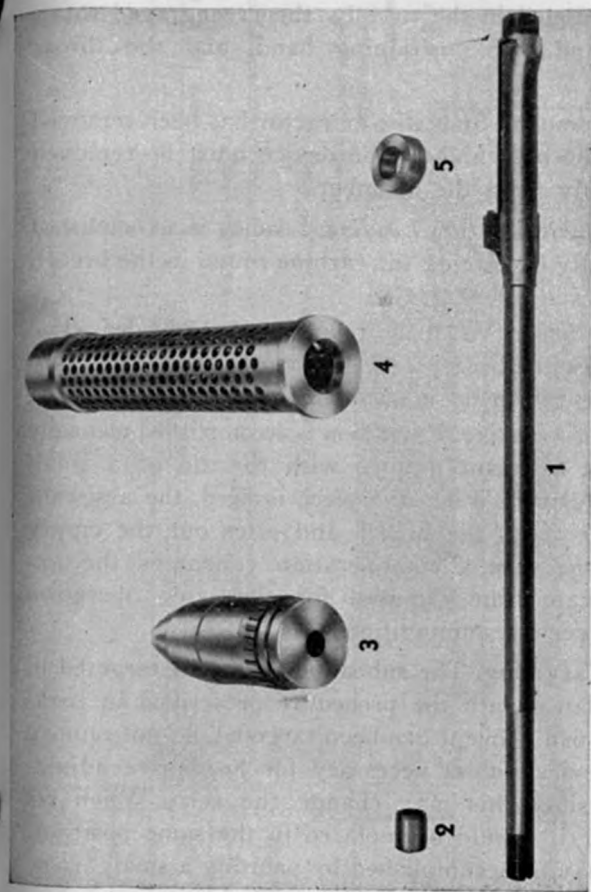
**36. SPARE PARTS AND EQUIPMENT.** a. **Spare parts.** A set of organization spare parts is supplied to the using arm for field replacement of those parts most likely to become broken, worn, or otherwise unserviceable. The set should be kept complete by requisitioning new parts to replace those used. The parts comprising the set are listed in TM

9-314 for information only, and this list will not be used for requisitioning. The correct authority on which requisitions are based is Supply Catalog ORD 7 SNL C-73 for the rifle, and Supply Catalog ORD 7 SNL A-5 for the tripod mount.

**b. Equipment.** Equipment includes the tools required for such disassembling and assembling as the using arm is authorized to perform; and for the cleaning and preservation of the rifle, mount, sighting and fire control equipment, and ammunition. Equipment also includes covers, tool rolls, and other items necessary to protect the matériel when not in use. The above items should not be used for purposes other than as prescribed and, when not in use, should be properly stored. The equipment comprising the set is listed in TM 9-314 for information only. When necessary to replace broken or missing items for the rifle or tripod mount, refer to references listed in a above.

**37. SUBCALIBER DEVICE (.30 CALIBER CARBINE).** (See fig. 35.) **a. Description.** The subcaliber device may be made from a 57-mm drill cartridge T7 (fig. 35). The projectile (3, fig. 35) is drilled through the center to receive a carbine barrel (1, fig. 35) which has the gas cylinder plugged. A barrel bushing (5, fig. 35) is mounted in the base of the cartridge case (4, fig. 35). The projectile fits over the forward portion of the barrel and is held in place by a barrel locking nut (2, fig. 35). A regular 57-mm rifle firing pin is used for subcaliber firing and needs no modification.

**b. Installation.** Remove the extractor from the



1. Carbine barrel. 2. Barrel locking nut. 3. Projectile. 4. Cartridge case. 5. Barrel bushing.  
*Figure 35. Subcaliber device, disassembled, 57-mm rifle M18.*

**breechblock**; insert the subcaliber device in the breech; match the preengraved rotating band with the lands and grooves, and fully seat. (The device is positioned in the tube by the preengraved rotating band, the positioning band, and the throat ring.)

**c. Removal.** Since the extractor has been removed from the breechblock, the device must be removed manually from the chamber.

**d. Operation.** (1) *Loading.* Loading is accomplished manually by placing the carbine round in the breech of the subcaliber device.

(2) *Firing.* When the round has been loaded, close and lock the breech as in normal service firing, and actuate the firing mechanism.

(3) *Extracting.* Extraction is accomplished manually by the assistant gunner with the aid of a small screw driver. When the piece is fired, the assistant gunner opens the breech and pries out the empty cartridge case. This operation consumes the approximate time required for the same operation using service ammunition.

**e. Targeting.** The subcaliber device is targeted in accordance with the procedure prescribed in paragraph 64d. Once it has been targeted, do not remove the device unless necessary for headspace adjustment since this may change the zero. When removed, it should be replaced in the same position; this may be accomplished by painting a small arrow on the base of the cartridge case.

**f. Headspace adjustment.** To adjust the headspace, loosen the barrel locking nut. Turn the pro-

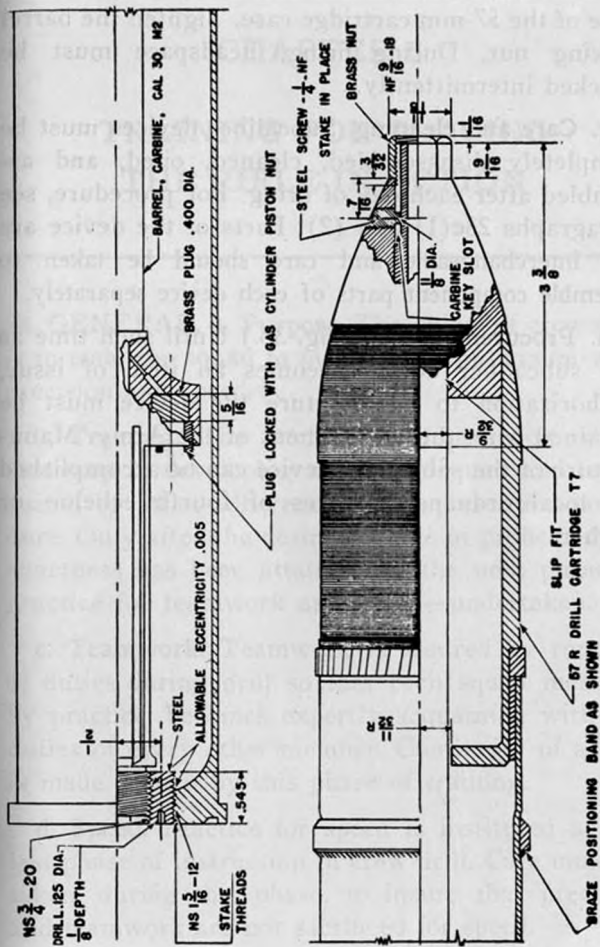
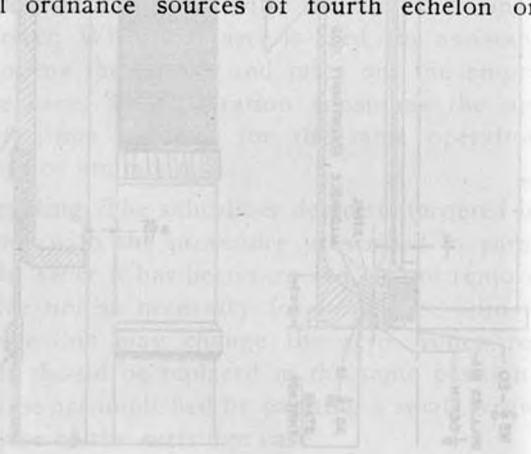


Figure 36. Specification drawing, subcaliber device, 57-mm rifle M18.

jectile, screwing the barrel into the barrel bushing until the projection in the breech is flush with the base of the 57-mm cartridge case. Tighten the barrel locking nut. During firing, headspace must be checked intermittently.

**g. Care and cleaning.** Subcaliber devices must be completely disassembled, cleaned, oiled, and assembled after each day of firing. For procedure, see paragraphs 23c(1) and (2). Parts of the device are *not* interchangeable and care should be taken to assemble component parts of each device separately.

**h. Procurement.** (See fig. 36.) Until such time as the subcaliber device becomes an item of issue, authorization to manufacture the device must be obtained from the Department of the Army. Manufacture of the subcaliber device can be accomplished by local ordnance sources of fourth echelon or higher.



## CHAPTER 3

# TRAINING FOR PLACING THE RIFLE IN ACTION

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**38. GENERAL. a. Purpose.** The object of crew drill is to train the squad to put its rifle into action with precision and speed.

**b. Training.** The attainment of precision is the first step in developing an expert squad and is acquired by strict adherence to the prescribed procedure. Only after the desired degree of proficiency in exactness has been attained are the next phases—practice for teamwork and speed—undertaken.

**c. Teamwork.** Teamwork is assured by rotation of duties during drill so that each squad member, by practice, becomes expertly acquainted with the duties of every other member. Continuity of action is made certain by this phase of training.

**d. Speed.** Practice for speed is instituted as the last phase of instruction in crew drill. Care must be taken, during this phase, to insure that precision and teamwork are not sacrificed for speed.

**e. Commands, signals, and reports.** Except when firing at moving targets, No. 1 repeats all commands

received, and No. 2 is alert to receive and transmit signals between the squad leader and gunner. At the completion of any ordered movement except OUT OF ACTION, the member of the team responsible for its correct execution reports UP and No. 2 signals READY. At the completion of OUT OF ACTION, No. 1 only calls UP; No. 2 does not signal ready in this instance.

f. **Quick and double time.** Unless otherwise stated, individuals move from one position to another at double time. Initial training for precision should be performed at quick time.

g. **Field conditions.** Under field conditions the procedure for crew drill, such as ACTION and OUT OF ACTION, should be followed as closely as the situation permits.

**39. CHANGING NUMBERS AND DUTIES DURING CREW DRILL.** The squad leader commands FALL OUT ONE (TWO, etc.). At this command, No. 2 moves to the position of No. 1 and calls out ONE. Each succeeding number will move up one number and call out his new number. No. 1 rotates to the position of No. 4. As soon as each member becomes thoroughly familiar with all squad duties, a command may be given to change duties during the progress of a movement.

**40. TO SECURE EQUIPMENT AND FORM FOR CREW DRILL.** (See fig. 37.) a. **Command.** The command is SECURE EQUIPMENT. Men secure equipment as follows:

<i>Personnel*</i>	<i>Equipment**</i>
Squad Leader .....	Binoculars. Compass (lensatic).

	Clinometer.
	Firing table.
Gunner (No. 1) .....	57-mm rifle with bipod tele- scopic sight M86C.
Assistant Gunner (No. 2) ....	Ammunition bag M2A1. Six rounds of ammunition.
Ammunition Bearer (No. 3) ..	Ammunition bag M2A1. Six rounds of ammunition.
Ammunition Bearer (No. 4) ..	Ammunition bag M2A1. Six rounds of ammunition. Rammer staff and cleaning ma- terial.

\*See current T/O for rank and individual arm.

\*\*Dependent upon current T/E.

(Normally, the squad will use the rifle with its integral mount for crew drill.)



Figure 37. Secure equipment and form for crew drill,  
57-mm rifle M18.

**b. Formation.** Having secured equipment, the squad forms in a column with five paces between men. No. 1 is five paces from and facing the squad leader. Each man grounds his load and takes the prone position with equipment placed as illustrated in figure 37.

**41. TO EXAMINE EQUIPMENT. a. Command.** The equipment being grounded, the squad leader commands: EXAMINE EQUIPMENT. At this command, each man, keeping well down, examines his equipment as follows:

(1) *Squad leader.*

(a) Determines that he has the proper firing table.

(b) Checks the binoculars for broken parts and clean lenses.

(c) Checks the clinometer for broken spirit level, lever arm or spring, and closes the cover.

(d) Checks the compass to see that it is not broken and that the needle is still on its pivot.

(e) After checking his equipment, he prepares to check the equipment of his squad and receive the reports from its other members.

(2) *Gunner (No. 1).*

(a) Checks the front sight leaf.

(b) Checks the rear sight leaf, the sight mounting bracket, and the tightness of the sight in the sight mount.

(c) Checks the chamber and the breech handles.

(d) Checks the operation of the bipod and the extendable handle.

(e) Checks the throat blocks and the firing pin bushing screws for proper tightness.

(f) Checks the firing mechanism and the safety lever for proper functioning.

(3) *Assistant gunner (No. 2).*

(a) Checks his ammunition for amount, type, and proper seal of the containers.

(b) Checks the amount and type of ammunition on hand in the squad and where it is carried.

(4) *Ammunition bearer (No. 3).*

(a) Determines what type of ammunition is in his possession.

(b) Inspects the seals of ammunition containers.

(5) *Ammunition bearer (No. 4).*

(a) Determines what type of ammunition is in his possession.

(b) Inspects the seals of ammunition containers.

(c) Inspects the cleaning materials and rammer staff.

**b. Reports.** When all equipment has been thoroughly and properly checked, each man assumes his original position and reports as follows:

(1) No. 4: Ammunition correct, \_\_\_\_\_ rounds HE, \_\_\_\_\_ rounds HE, AT \_\_\_\_\_ rounds WP, cleaning material correct (or reports any deficiencies which cannot be corrected).

(2) No. 3: Ammunition correct, \_\_\_\_\_ rounds HE, \_\_\_\_\_ rounds HE, AT \_\_\_\_\_ rounds WP (or reports any deficiencies which cannot be corrected).

(3) No. 2: Ammunition correct, \_\_\_\_\_ rounds HE, \_\_\_\_\_ rounds HE, AT \_\_\_\_\_ rounds WP. (Reports the total for the squad.)

(4) No. 1: Rifle and ammunition correct.

(5) Where necessary, the squad leader reports all correct.

#### 42. TO PLACE THE RIFLE IN ACTION.

**a. Command.** To place the rifle in action, the squad leader commands or signals ACTION and designates, by pointing, the direction of fire and the general area of the gun position. He places himself on the flank in a position affording cover and concealment and from which he can observe and control the fire.

**b. Procedure.** (See fig. 38.) At the command ACTION, the squad moves rapidly to the position area indicated. Where necessary, the squad leader also may indicate the type of position to be taken by the gunner (prone, sitting, etc.); otherwise, No. 1 selects the exact spot and assumes the firing position from which he can best accomplish his mission. (For positions, see par. 51.) No. 2 assists No. 1 in placing the rifle in action by holding the rifle while the gunner places his body in position or while the gunner adjusts the bipod. No. 2 loads the rifle as soon as the type of ammunition is designated in the fire command. No. 3 and No. 4 take up a position on the flank (No. 3 to the left and No. 4 to the right) from which they can readily bring up ammunition to the gun position and protect the position from small arms fire.

**c. Duties of squad members.** (1) *Squad leader.* The squad leader is in command of the squad. He conducts the squad in accordance with orders from his platoon or section leader, or the commander of the unit to which he is attached. He is responsible

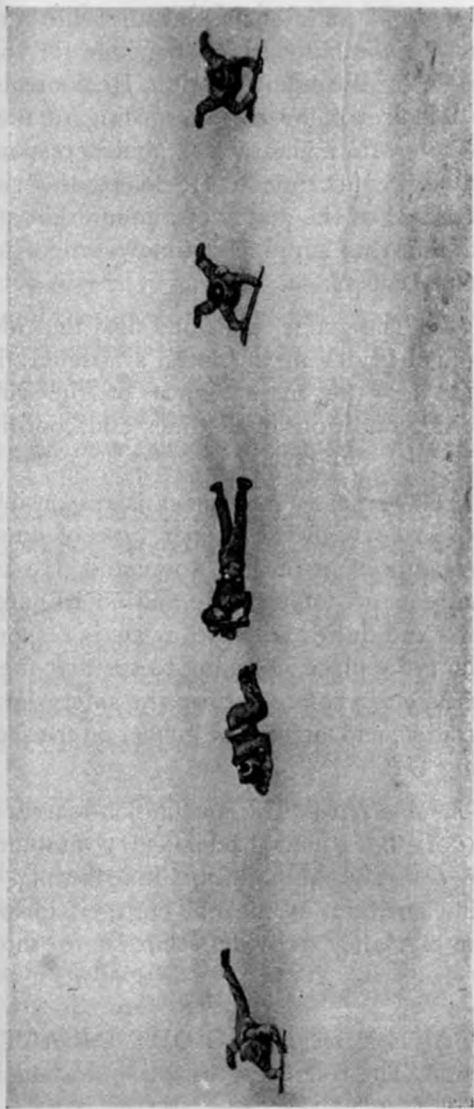


Figure 38. Squad in action, 57-mm rifle.

for the care and maintenance of the rifle and its equipment. In combat he is responsible for the accomplishment of the squad mission. He controls and conducts the fire of the rifle, according to the dictates of the terrain and situation, and is responsible for its proper concealment. He keeps the section leader informed of the status of ammunition supply and maintains this supply by timely orders to the ammunition bearers.

(2) *No. 1.* The gunner aims and fires the rifle and acts as squad leader in the latter's absence. He is responsible for the maintenance of the rifle in proper firing condition at all times and coordinates his actions with No. 2.

(3) *No. 2.* The assistant gunner is responsible for loading the rifle with the proper type of ammunition as announced in the fire command. He assists in the maintenance of the rifle and coordinates his movements and duties with No. 1. He is responsible for servicing the piece, checking to see that the back blast area is clear before setting the safety lever on the *fire* position, and tapping the gunner on the shoulder and calling UP.

(4) *No. 3 and No. 4.* The ammunition bearers at the direction of the squad leader carry ammunition from the company ammunition distributing point to the rifle position. While not engaged in ammunition supply, they provide security to the rifle position.

#### **43. TO TAKE THE RIFLE OUT OF ACTION.**

**a. Command.** The rifle being in action, to take it out

of action the squad leader commands or signals  
**OUT OF ACTION.**

**b. Procedure.** At the command **OUT OF ACTION**, No. 2 opens the breech, clears the gun, closes the breech, and removes the rifle from the gunner's shoulder. (Where the rifle is fired from the prone position, No. 2 holds the rifle while No. 1 adjusts the bipod for shoulder carry.) The squad leader indicates the line of march by facing in that direction. No. 1 receives the rifle from No. 2, places it on his shoulder, and falls in behind the squad leader. No. 2, No. 3, and No. 4 place themselves in column behind the gunner, and the squad moves on command from the squad leader.

**44. CREW DRILL WITH OTHER TYPE MOUNTS.** The commands and procedure for crew drill may be applied when mounts other than the bipod are used. Modifications are made when necessary according to the type of mount being used. When firing from a vehicular mount, care must be exercised to keep all portions of the vehicle out of the back-blast area.

**45. SUPPLEMENTARY GUN CARRIES.** **a. Two-man hand carry.** The two-man carry is used primarily in carrying the rifle for long distances. When the unit is not engaged in combat, the gun normally is carried in its cover. For movement in situations where action is imminent, the gun is carried without the cover.

(1) *In cover.* A reinforced canvas cover weighing 6.9 pounds is provided with each gun. The cover is

equipped with both hand and shoulder carrying straps which may be attached by means of snap buckles. The gun may be carried by either type straps.

(2) *Without cover.* In this method the gun is carried by means of two web straps encircling the barrel and chamber of the gun.

b. **One-man hand carry.** The one-man hand carry normally is used for carrying the gun for short distances. It is particularly useful during combat in displacing forward or moving from primary to alternate or supplementary firing positions.

(1) *In cover.* The gun is carried by means of the shoulder straps which may be tied together and slung over the right (left) shoulder or with both straps encircling the head and right (left) arm. The rifle may be carried either horizontally or with the muzzle elevated, and with the muzzle forward or to the rear.

(2) *Without cover.* The gun may be carried on the shoulder with the muzzle extended forward and the right hand grasping the extendable handle to balance the piece, or with the muzzle extended to the rear and the right hand grasping the chamber handle to balance the piece. For short distances the gun may be carried cradled in the arms with the left arm under the barrel and the left hand grasping the trigger handle assembly; the right arm is over the chamber and the right hand supports the chamber at a point in rear of the bipod.

c. **Vehicle.** The 57-mm rifle and ammunition may be transported on the organic transportation of the rifle company.

## CHAPTER 4

# MARKSMANSHIP

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### Section I. GENERAL

**46. PURPOSE.** The purpose of this chapter is to provide a thorough and uniform method of training individuals to deliver prompt and accurate direct fire on stationary or moving targets. Courses of instruction and regulations for the conduct of marksmanship are included.

**47. FUNDAMENTALS.** To deliver prompt and accurate fire on stationary or moving targets, the soldier must be thoroughly trained in the following fundamentals:

- a. Sighting and aiming.
- b. Positions.
- c. Trigger manipulation.
- d. Range estimation.
- e. Speed estimation.
- f. Lead estimation.
- g. Tracking.

**48. PRIOR TRAINING.** The soldier should be proficient in mechanical training and be thoroughly familiar with the operation and use of rifle accessories.

## Section II. PREPARATORY EXERCISES

**49. GENERAL. a. Purpose.** The purpose of preparatory exercises is to teach the soldier the essentials of marksmanship, and to develop fixed and correct habits of marksmanship before he begins range practice. A thorough, carefully supervised course in preparatory exercises will conserve time and ammunition during range practice and also will inculcate in the individual those automatic procedures necessary to eliminate accidents.

**b. Preparatory exercises.** Preparatory exercises are divided into eight steps and should be concentrated in the period of time allotted, and taught in the following sequence:

- (1) Sighting and aiming exercises.
- (2) Position exercises.
- (3) Trigger manipulation exercises.
- (4) Range estimation exercises.
- (5) Speed estimation exercises.
- (6) Lead estimation exercises.
- (7) Tracking exercises.
- (8) Examination.

### **50. SIGHTING AND AIMING EXERCISES.**

(For description of sight M86C, see par. 31d.)

**a. Sighting and aiming with sight M86C.** (1) *Aiming for range.* (See fig. 39.) To aim for range, the gunner selects the proper segment of the vertical line of the reticle and places it on the center of the visible mass of the target. Exercises should be conducted on stationary 1,000-inch A rifle targets or any

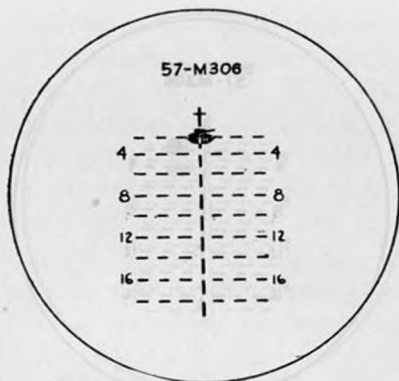


Figure 39. Correct sight picture, stationary target, range 200 yards.

other appropriate aiming point so that aiming will not involve tracking. The gunner then is required to select the correct sight picture for every 100 yards of range.

(2) *Aiming with leads.* To hit a target which has any lateral movement with respect to the direction of fire, it is necessary to aim ahead of the target. This process is referred to as *leading the target*. Angular leads are used for moving target firing. The sight reticle is provided with a horizontal scale graduated in five-mil (one lead) units to give the gunner a means for applying leads. (See paragraph 31d for description of the reticle.) When laying with leads (fig. 40), the vertical line must be kept ahead of the center of mass of the target by the proper amount of lead which is determined by the speed of the target and its direction of movement. (See par. 85 for method of lead determination.) Exercises are conducted which require the gunner to set an-

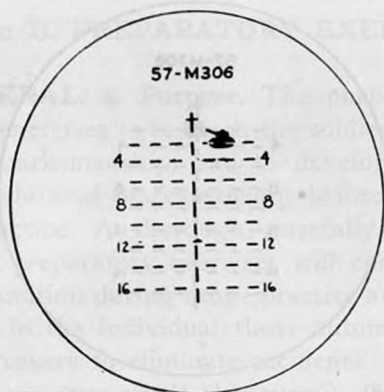


Figure 40. Correct sight picture, tank moving right to left, three leads, range 200 yards.

nounced leads on a caliber .22-.30 A subcaliber target (1,000-inch) or any other appropriate aiming point. The target remains stationary, but it is assumed to be at a range of 200 yards and moving right or left at various angles and speeds.

(3) *Aiming for range with leads.* Range and lead are combined automatically within the telescope by a series of horizontal lines extending right and left of center at 200-yard intervals. For targets requiring leads at ranges (under 1,900 yards) other than those etched on the reticle, interpolation is necessary. Select the appropriate range and lead points on the telescope reticle and project them to an imaginary point of intersection. This aiming point is laid on the center of the visible mass of the target (fig. 41). Each gunner is required to lay the rifle on the target at various ranges and leads. The target remains stationary with an assumed direction

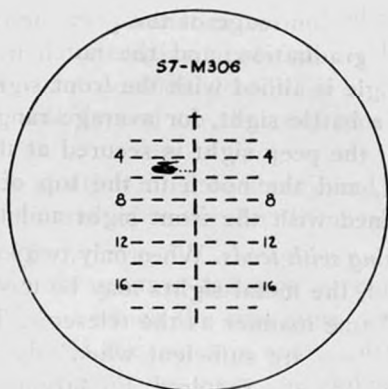


Figure 41. Correct sight picture, tank moving left to right, three leads, range 500 yards.

and speed being specified in each case. Ranges and leads requiring interpolation should be included. At least one period of training will be devoted to the use of the lighted reticle to accustom all men to sighting and aiming with the telescope during the hours of limited visibility.

**b. Sighting and aiming with the auxiliary metal sights.** (For description of sights, see par. 31c and f.) (1) *Aiming for range.* Before using the auxiliary metal sight for direct fire, the sights must be adjusted. This is discussed under *boresighting*, paragraph 60d. When this operation has been performed, the auxiliary metal sights may be used for direct fire. The point of aim to be used is again the center of mass of the target. Exercises may be conducted at any range by using a stationary 1,000-inch A rifle target or other appropriate aiming point with an assumed range. Using an assumed range to the target, set this range on the folding leaf sight. For precise

aiming, the bottom edge of the peep sight is set to the desired graduation, and the notch in the base of the triangle is alined with the front sight and the target. As a battle sight, for average ranges (up to 400 yards), the peep sight is secured at the bottom of the leaf, and the notch in the top of the peep sight is alined with the front sight and the target.

(2) *Aiming with leads.* When only two leads or less are required, the metal sights may be used for aiming in the same manner as the telescope. The windage graduations are sufficient when only two leads (10 mils) or less are required. For targets requiring more than two leads, accurate measurement cannot be made, and the gunner must estimate the number of leads. Exercises as given in a(1) and (2) above may be performed only where the number of required leads is two or less.

(3) *Aiming for range with leads.* Combinations of exercises as given in a(1), (2), and (3) above may be performed only where the number of required leads is two or less.

**51. POSITIONS.** a. **General.** Instruction in positions includes positions for prone and shoulder firing, firing from machine gun and vehicular mounts, holding the breath while aiming, and aiming. Initially attention should be given to the details of each position with the objective being to have the gunner automatically assume the proper position. Sufficient position exercises should be conducted until the desired objective is attained. (For information on positions of the squad leader and ammunition bearers, see par. 42.)

**b. General characteristics for all positions.** The following characteristics apply to all firing positions. The exact position details for any particular individual will depend on the conformation of his body.

(1) Each position must be steady and maintained with a minimum of muscular effort during prolonged firing.

(2) When the gunner assumes a position, there is some point at which the rifle aims naturally and without effort. If this point is not the center of the target, the whole body must be shifted so as to bring the rifle into proper alinement.

(3) The gunner, while firing, may be steadied by the assistant gunner in all positions except the prone.

**c. Prone position.** (See fig. 42① and ②.) (1) *Gunner.* The gunner lies on his stomach to the left of the gun and at an angle of approximately  $90^{\circ}$  to the piece. With his left hand he grasps the extendable handle. Reaching under the tube he places his right hand on the trigger handle assembly. His prone position with respect to the ground should be approximately the same as the prone position for firing the M1 rifle.

(2) *Assistant gunner.* When loading, the assistant gunner assumes a prone position on his left side parallel to the rifle and facing the chamber. All portions of the body are forward of the breech. After loading, he rolls to his right side and assumes a position as shown in figure 42②. He constantly observes the muzzle to keep his body out of the breech and muzzle blast danger areas.



① During loading.



③ During firing.

Figure 42. Prone position, gunner and assistant gunner, 57-mm rifle.

d. **Sitting position.** (See figs. 43 and 44.) (1) *Gunner.* There are two satisfactory sitting positions. Position *one* is preferable for tracking, since it permits quicker and easier movement of the body; whereas position *two* is preferable when firing at point targets, since it provides increased steadiness.

(a) *Sitting position ONE.* The gunner sits facing the target with his left (right) leg crossed over his right (left) leg and his feet drawn up under his legs so that the outer part of the calf of one leg rests on the inside of his opposite foot. His body is



Figure 43. *Sitting position ONE, gunner and assistant gunner, 57-mm rifle.*

bent slightly forward from the hips, and his back is held straight. His left hand grasps the extendable handle. His right hand grasps the trigger handle assembly with the right elbow held at shoulder level to form a pocket for the shoulder rest (fig. 43).

(b) *Sitting position TWO.* The principal difference between positions *one* and *two* is that, instead of the gunner's legs being crossed as in *one*, his legs are well apart, feet braced with the heels dug into the ground in the conventional sitting position, and elbows resting on the knees (fig. 44).



Figure 44. *Sitting position TWO, gunner and assistant gunner, 57-mm rifle.*

(2) *Assistant gunner.* The assistant gunner, kneeling on his left knee, is to the right of and facing the gunner. His right leg is bent at the knee and the lower leg is perpendicular to the ground. To keep out of the way of the breech and back blast, he watches the rifle for shift.

e. **Kneeling position.** (See figs. 45 and 46.) (1) *Gunner.* There are again two satisfactory positions. Kneeling position *one* is preferable for tracking, since it permits quicker and easier movement of the body; whereas position *two* is preferable when firing at point targets, since it provides increased steadiness.



Figure 45. *Kneeling position ONE, gunner and assistant gunner, 57-mm rifle.*

(a) *Kneeling position ONE.* The gunner kneels on his right knee, with his buttocks well up and away from the right heel and the left foot pointed toward the target. His left leg is bent at the knee and the lower leg is perpendicular to the ground. His body is held erect, arms free, his left hand grasping the extendable handle and his right hand grasping the trigger handle assembly. His right elbow is held high at shoulder level to form a pocket for the shoulder rest (fig. 45).

(b) *Kneeling position TWO.* The gunner kneels on his right knee with the buttocks resting on the right



Figure 46. *Kneeling position TWO, gunner and assistant gunner, 57-mm rifle.*

heel and the left foot pointed toward the target. His left leg is bent at the knee and the lower leg is perpendicular to the ground. His body is held erect, the left elbow resting on the left leg near the knee; the right arm held high. His left hand grasps the extendable handle, and his right hand grasps the trigger handle assembly (fig. 46).

(2) *Assistant gunner.* The assistant gunner takes the same position as described for the sitting position in d(2) above.



*Figure 47. Standing position, gunner and assistant gunner, 57-mm rifle.*

f. **Standing position.** (See fig. 47.) (1) *Gunner.* The gunner faces the target with his body erect and his feet approximately 12 inches apart. His left hand grasps the extendable handle, and his right hand grasps the trigger handle assembly. The right elbow is held even with or above his shoulder (fig. 47).

(2) *Assistant gunner.* The assistant gunner stands on the right of the rifle opposite the gunner and faces the chamber. He watches for shifting of the rifle in order to keep out of the way of the back blast. He may assist in steadying the gunner during firing by grasping him around the chest or waist.



Figure 48. Positions of gunner and assistant gunner, 57-mm rifle mounted on machine gun tripod M1917A1.

**g. Machine gun mount (M1917A1) positions.** (See fig. 48.) (1) *Gunner.* The gunner assumes a kneeling position to the left of and facing the rifle by kneeling on his right knee with the left leg bent at the knee. Bending forward from his waist, he reaches *under* the tube and grasps the trigger handle assembly with his *left* hand, fingers on the trigger and the thumb on the trigger safety. With his right hand he grasps the elevating or traversing handwheel of the tripod. When tracking, the traversing clamp of the tripod is loosened to permit free traverse.

(2) *Assistant gunner.* The assistant gunner assumes a kneeling position to the right of the rifle. He kneels on his left knee while servicing the piece. He watches the rifle for shift in order to keep out of the way of the breech and back blast.

**h. Vehicular mount positions.** (1) *Gunner and assistant gunner.* With the gun on a pedestal mount (fig. 28), or dash mount (fig. 29), the gunner takes a position to the left of the piece and the assistant gunner to the right. When firing from a vehicle, the rifle must be pointed in a direction which will avoid injury to the vehicle from the back blast.

**i. Holding the breath.** The proper method of holding the breath as outlined in FM 23-5 should be explained, demonstrated to each man, and practiced by each individual until the desired standard of efficiency is attained.

**j. Procedure in conducting position exercises.** Any type of target may be used for aiming points at any desired range. Where targets are placed at a range of 1,000 inches, they should be arranged at

different heights so that in aiming from various positions the rifle will be nearly horizontal. Procedure for instructors as outlined in FM 23-5 may be used.

#### **52. TRIGGER MANIPULATION EXERCISES.**

The telescopic sight magnifies any unsteadiness of position, jerking the trigger, or flinching. Proper manipulation of the trigger should be practiced to overcome the normal tendency to flinch. This is accomplished by a smooth steady rearward pressure on the trigger when the sights are properly alined. The trigger safety is first depressed by the crotch of the hand between the thumb and index finger. The breath should be held while depressing the trigger, and care must be taken not to throw the rifle off the target or aiming point. The correct sight picture should be held while firing.

**53. RANGE ESTIMATION.** Accurate range estimation is essential to obtain hits with the minimum expenditure of time and ammunition. Estimation of the range to stationary and moving targets should be stressed until the desired proficiency is attained. For the methods of training in range estimation see paragraph 77.

**54. SPEED ESTIMATION. a. Purpose.** Speed estimation is an essential phase of preliminary marksmanship training. Although the squad leader usually announces the number of leads, the gunner must be able to determine the required number of leads from his estimation of the target's speed and its

direction of movement. Constant practice in estimating speeds of moving targets is the only method by which the individual can acquire accuracy in speed estimation. Training must include the use of targets at various ranges, speeds, and directions of movement.

**b. Exercises.** Exercises in speed estimation should be conducted in the form of an examination with the targets moving according to a prearranged plan. The appearance of different targets moving at announced speeds and ranges is first demonstrated; then each man is required to estimate the speed of targets moving at unknown speeds, ranges, and directions.

**55. LEAD ESTIMATION EXERCISES.** Exercises in lead estimation are conducted with targets moving at different ranges, speeds, and directions. The individual determines the necessary leads, based on observation of the target in accordance with the method of lead determination described in paragraph 85.

**56. TRACKING EXERCISES.** When the gunner has become proficient in the previous steps of marksmanship, he may be trained on 1,000-inch ranges in tracking moving targets with assumed speeds and ranges. Training should be continuous, progressing to vehicles and tanks which first move at known ranges and speeds and finally at unknown ranges and speeds. Sufficient exercises should be conducted to bring the gunner to a high level of proficiency.

**57. EXAMINATION.** Before commencing range practice, each man should be examined to determine that he has attained the desired standard of proficiency. It is suggested that an examination be given at the end of each phase of marksmanship followed by a general review of all phases after the completion of preliminary marksmanship training. Deficiencies as determined by these examinations should be corrected with additional training.

### Section III. BORESIGHTING

**58. IMPORTANCE OF BORESIGHTING.** Accurate marksmanship with the rifle demands proper boresighting. Inaccuracy in the boresighting procedure will be directly reflected by inability of the gunner to hit the target. Therefore, each gunner should be instructed and tested in the proper boresighting procedure prior to receiving his marksmanship training.

**59. DEFINITION. a. Process.** Boresighting is the process or series of operations by which the axis of the bore of the weapon and the line of sight are made parallel; or, are made to converge on a distant point.

**b. Preliminary settings.** The rifle mounted on a tripod or bipod should be set up in a stable position, fairly level, with the legs on firm ground.

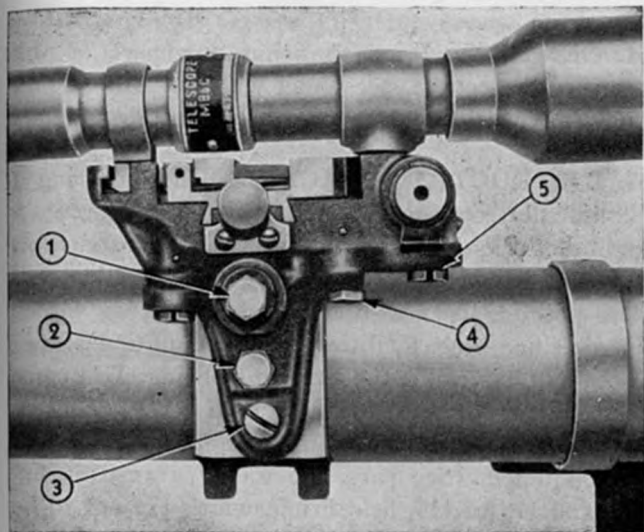
**60. VERIFICATION BY DISTANT TARGET METHOD. a. Method.** There are several methods

by which the rifle may be boresighted and the one described is practicable for use by units in the field. To boresight the rifle by this method it is necessary to make the axis of the bore (extended) intersect the line of sight at some distant point.

**b. Selection of target.** The target for boresighting should be clearly defined and lie beyond the range to any expected target.

**c. Sight M86C.** There are four notches  $90^\circ$  apart on the muzzle of the rifle. Threads are stretched across the alternate notches and their point of intersection defines the axis of the bore at the muzzle. Remove the breechblock and the breechblock carrier assembly. Insert the breechblock in the chamber and the firing pin aperture will then define the axis of the bore at the breech. (A 75-mm rifle shell case, cut off at the first perforation, with the primer punched out, may be inserted in the chamber in lieu of the disassembly of the breech mechanism.) By elevating and traversing the piece, the axis of the bore can be placed on the aiming point. Without disturbing the lay of the rifle, sight through the telescope and note the relationship between the cross of the reticle pattern and the aiming point. This sight picture should be the same as noted through the bore of the rifle. If the two sight pictures do not coincide, adjustment of the sight is required. (See fig. 49, sight mount, M74.) Adjust the line of sight by first loosening the lock nut (fig. 49①) just below the deflection knob of the rear sight. The elevation adjustment is on the side of the sight mount, below the telescope holder. Adjust the elevation of the sight by loosening the

elevation lock nut (fig. 49②) and turning the elevation eccentric (fig. 49③). The azimuth adjustment is underneath the telescope holder. Adjust the azimuth by loosening the azimuth lock nut (fig. 49④) and turning the azimuth eccentric (fig. 49⑤). When the sight is properly aligned on the target, tighten the elevation and azimuth lock nuts, and tighten the lock nut (fig. 49①) which holds the sight in adjustment.



- ① Bore sight adjustment locking nut.
- ② Elevation lock nut.
- ③ Elevation eccentric.
- ④ Azimuth lock nut.
- ⑤ Azimuth eccentric.

Figure 49. Sight mount M74 for 57-mm rifle M18.

d. **Auxiliary metal sights.** To boresight the rifle for firing with metal sights, determine the axis of the bore as outlined in **c** above. Adjust the front sight blade until it is alined on the target, making the minor adjustments in deflection on the rear sight. Note the number of mils either right or left windage which are to be used with metal sights when firing the rifle.

#### Section IV. QUALIFICATION COURSES

61. **GENERAL.** Prior to firing any part of the qualification course, personnel will be instructed in safety precautions and range procedure.

62. **INSTRUCTION PRACTICE.** Prior to firing a qualification course each man will complete, as a minimum requirement, the prescribed instruction practice firing for that course. However, instruction practice is not limited to the firing tables listed; since time, facilities, and ammunition allowances will determine the amount of firing. To insure progressive training and to qualify personnel as battlefield gunners, additional firing courses should be conducted. (See pars. 115 to 117, transition firing, and 118 to 119, field firing, which are not to be included in the qualification courses.)

63. **QUALIFICATION COURSES.** a. **General.** Qualification courses for the 57-mm rifle consist of—

(1) *Course A*—1,000-inch subcaliber, midrange subcaliber, and service firing.

(2) *Course B*—1,000-inch subcaliber and midrange subcaliber firing.

(3) *Course C*—1,000-inch subcaliber firing.

**b. Course A.** Course A is for use at posts, camps, and stations with range facilities which permit the firing of service ammunition in accordance with the provisions of AR 750-10.

**c. Course B.** Course B is for use where range facilities prohibit the firing of service ammunition.

**d. Course C.** Course C is for use where range facilities include only indoor ranges or miniature outdoor ranges.

**e. Fundamentals.** The fundamentals emphasized in the qualification courses are—

(1) Rapid and accurate delivery of initial round.

(2) Rapid and accurate delivery of subsequent rounds.

(3) Rapid determination of speed, lead, and range.

**f. Conduct of fire.** For safety precautions, range procedure, and operational diagrams, see paragraphs 67 through 71 inclusive.

**64. COURSE A. a. General.** Instruction practice consists of firing Tables I, II, III, and IV, *three* times. Record practice consists of firing Tables I, II, III, IV, and V *one* time under record conditions.

**b. Equipment.**

1—57-mm rifle (with tripod and bipod) per gunner.

- 1—Screwdriver per rifle.
- 1—Crescent wrench per rifle.
- 1—Subcaliber device per rifle.
- Boresighting equipment.
- Necessary targets.

**c. Conditions.** Organization of the range will be in accordance with the provisions of paragraphs 67 through 71 inclusive and AR 750-10.

**d. Procedure.** With the rifle mounted on a tripod the gunner will zero his sight by firing ten rounds of caliber .30 carbine ball ammunition at a 1,000-inch A rifle target. This will be done by firing a group of 5 rounds using a normal sight picture with an assumed range of 700 yards and then adjusting the sight to cover the shot group and firing a second group of 5 rounds. Bipods will then be attached for range practice and will be used in such practice except where otherwise indicated in Tables I to V.

**e. Table I—1,000-inch subcaliber firing stationary target.**

<i>No. rounds</i>	<i>Position</i>	<i>Maximum score</i>
4 .....	Prone .....	20
4 .....	Sitting .....	20
4 .....	Kneeling .....	20
4 .....	Standing .....	20
4 .....	Tripod .....	20
		Total: 100

Target used is 1,000-inch A target rifle (fig. 50).

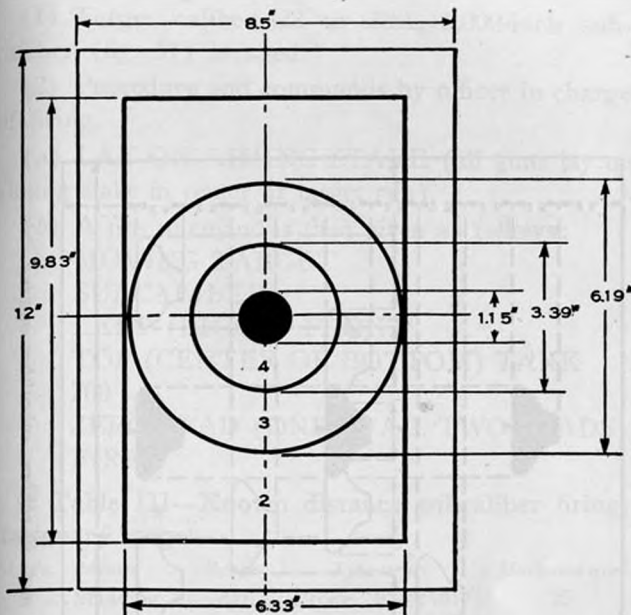


Figure 50. Target, 1,000-inch A rifle.

f. Table II—1,000-inch subcaliber firing moving target (level track). (See TM 9-855 figs. 41 and 42.)

No. rds.	Position	Speed per sec.	Time traverse in sec.	Lead	Maximum Score	Remarks
4	Prone	12 in.	41	0	20	L to R 2 rd R to L 2 rd
4	Sitting	16 in.	31	1	20	L to R 2 rd R to L 2 rd
4	Tripod	24 in.	21	2	20	L to R 2 rd R to L 2 rd

Total: 60

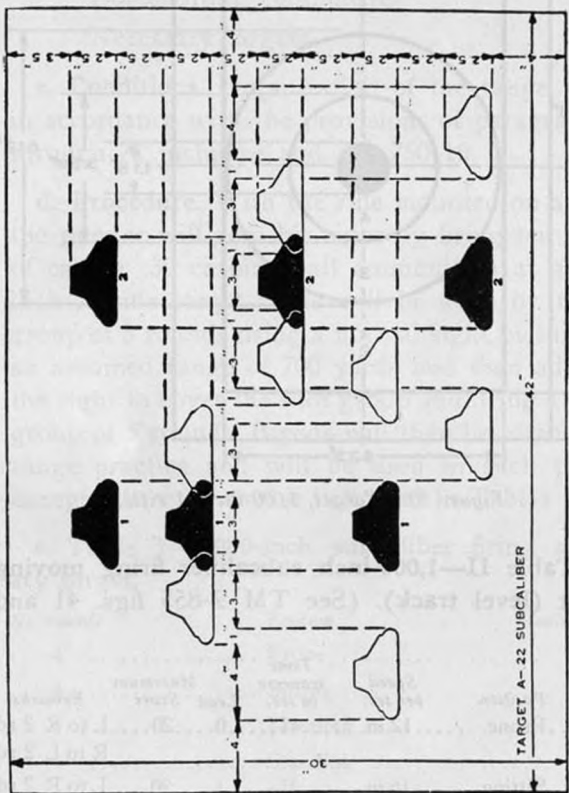


Figure 51. Target, .22 and .30 caliber, subcaliber moving.

(1) Target caliber .22 to .30A, 1,000-inch sub-caliber (fig. 51) is used.

(2) Procedure and commands by officer in charge of firing.

(a) LAY ON AIMING STAKE (all guns lay on aiming stake in center or target run).

(b) A fire command is then given as follows:

MOVING TARGET

SUBCALIBER

LEFT (RIGHT) FRONT

TOP (CENTER OR BOTTOM) TANK

700

ZERO LEAD (ONE LEAD, TWO LEADS)

FIRE

g. Table III—Known distance subcaliber firing, stationary target.

<i>No. rds.</i>	<i>Position</i>	<i>Range</i>	<i>Type target</i>	<i>Maximum score</i>
5....	Standing	....200....	Prone "F" M1917 complete (fig. 52).	25
5....	Kneeling	....200....	Prone "F" M1917 complete.	25
5....	Sitting	.....300....	Prone "F" M1917 complete.	25
5....	Prone	.....400....	Kneeling "E" M1917 complete (fig. 53).	25
Total:				100

(1) Gunner will target his rifle and draw ammunition on basis of 5 rounds caliber .30 carbine tracer per target.

(2) Firing will be conducted on a field firing range which has terrain suitable for the gunner to observe the strike of his bullet and adjust therefrom.

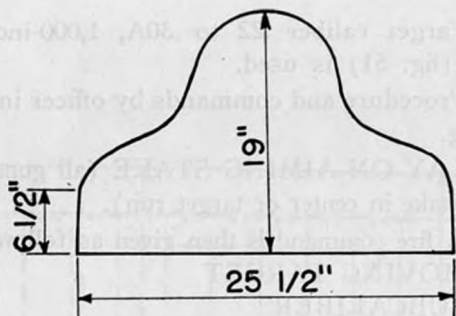


Figure 52. Target, prone F M1917.

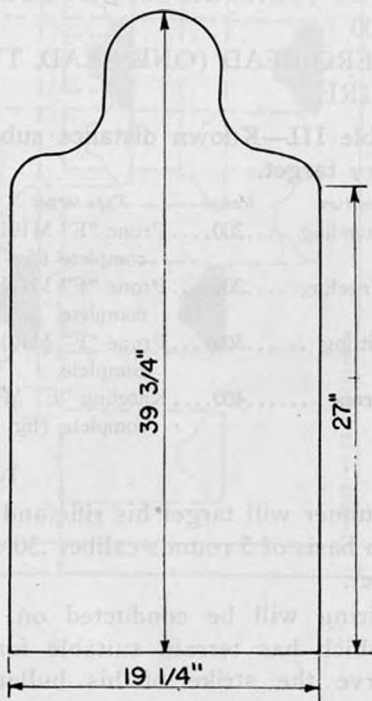


Figure 53. Target, kneeling E M1917.

(3) Scoring will be done by individuals in pits at the various distances. Communication with the firing line will be by telephone.

(4) A known-distance rifle range with "E" targets is an authorized substitute.

**h. Table IV—Known distance subcaliber firing, moving target.**

<i>No. rds.</i>	<i>Position</i>	<i>Speed</i>	<i>Lead</i>	<i>Score</i>	<i>Remarks</i>
3.....	Prone .....	10 mph.....	3 .....	15.....	L to R
3.....	Prone .....	15 mph.....	4½.....	15.....	R to L
3.....	Sitting .....	10 mph.....	3 .....	15.....	L to R
3.....	Sitting .....	15 mph.....	4½.....	15.....	R to L

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Total: 60

(1) Firing will be conducted on a known-distance moving target range.

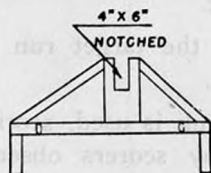
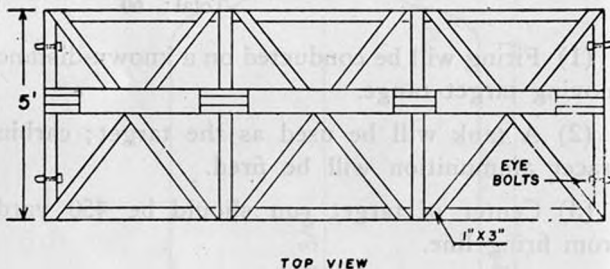
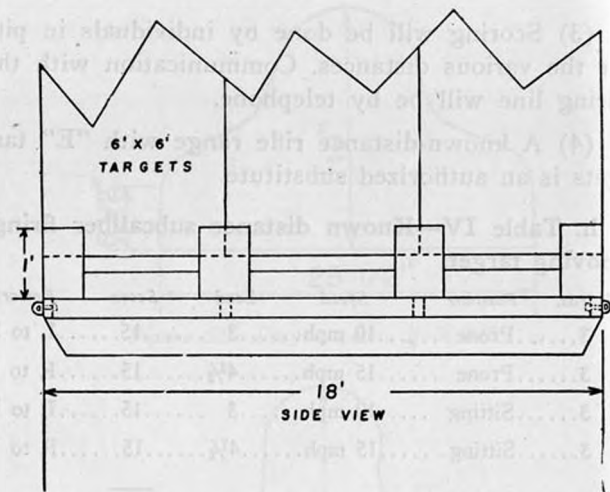
(2) A tank will be used as the target; carbine tracer ammunition will be fired.

(3) Center of target run should be 450 yards from firing line.

(4) A towed target (fig. 54) is an authorized substitute for a tank.

(5) Length of the target run will be approximately 300 yards.

(6) When a tank is used, scoring is done from the firing line by scorers observing the strike. When a towed target is substituted, the target will be marked rather than scored by observation.



ALL CONSTRUCTION 2x4'S EXCEPT AS NOTED

Figure 54. Target, towed.

i. Table V—Service firing, known distance.

No. rds.	Position	Range	Maximum score	Type target	Remarks
2..	Standing	..300...	10...	Log barrier, 55 gal. drum or similar object 2½ ft. wide by 4 ft. high.	A direct hit must be secured to count for score.
2..	Kneeling	..300...	10...	Log barrier, 55 gal. drum or similar object 2½ ft. wide by 4 ft. high.	A direct hit must be secured to count for score.
2..	Sitting	....500...	10...	Log barrier, 3 ft. wide by 5 ft. high.	A direct hit must be secured to count for score.
2..	Prone	....800...	10...	Log barrier, 3 ft. wide by 5 ft. high.	A direct hit must be secured to count for score.

---

Total: 40

Scoring is accomplished by observation of strike from firing line by scorer.

j. Qualification scores. Course A:\*

Expert .....	270-260
First Class Gunner .....	240-269
Second Class Gunner .....	175-239
Unqualified .....	Below 175

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\*(Note. Organization commanders should, prior to range practice, assure themselves that the qualification scores agree with the latest published regulations, and should make changes in the manual in pencil to agree with these regulations.)

**65. COURSE B. a. General.** Instruction practice will consist of firing tables I, II, III and IV *three* times. Record practice will consist of firing these tables *one* time under record conditions. Equipment, conditions and procedures will be the same as for Course A.

**b. Qualification scores, Course B:\***

Expert .....	250-320
First Class Gunner .....	225-249
Second Class Gunner .....	160-224
Unqualified .....	Below 160

**66. COURSE C. a. General.** Instruction practice will consist of firing Tables I and II *three* times. Record practice will consist of firing these tables *one* time under record conditions. Equipment, conditions and procedure will be the same as for Course A.

**b. Qualification scores, Course C:\***

Expert .....	130-160
First Class Gunner .....	115-129
Second Class Gunner .....	80-114
Unqualified .....	Below 80

**Section V. SAFETY PRECAUTIONS AND  
PROCEDURE FOR FIRING**

**67. GENERAL. a. Training precautions.** The back blast from recoilless weapons is extremely dangerous to personnel, hence, extreme care must be

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\*(Note. Organization commanders should, prior to range practice, assure themselves that the qualification scores agree with the latest published regulations, and should make changes in the manual in pencil to agree with these regulations.)

exercised in all phases of instruction. This danger must be emphasized from the earliest stages of training. Any crew drill, position exercises, tracking exercises, and subcaliber firing must be conducted as though actual service ammunition were being fired.

**b. Danger zone.** The danger zone (fig. 55) is triangular in shape. It extends approximately 50 feet to the rear of the point of emplacement and at its widest point covers a space of 20 feet on either side of the axis of the emplaced rifle. Within 100 feet of the rear of its breech no personnel should face the weapon because of the danger of flying particles thrown up by the blast action.

**c. Firing from confined spaces.** It is dangerous for operating personnel to fire the weapon from closely confined spaces because of the back blast. The weapon can be fired from rooms of buildings without danger, provided the room is large enough and there is sufficient outlet for the back blast. Firing from rooms where there is a wall too close to the breech will result in damage to the wall and discomfort to the operating personnel even when there are sufficient outlets for the back blast.

**d. Emplacements.** Most conventional type weapon emplacements are unsuitable for this weapon since any obstruction too near the breech will tend to deflect the back blast toward the operating personnel. The most suitable types of emplacements are those which leave the gun exposed, or semi-exposed, have no obstructions behind the breech, and provide cover for the operating personnel on either side of the gun (see FM 5-15).

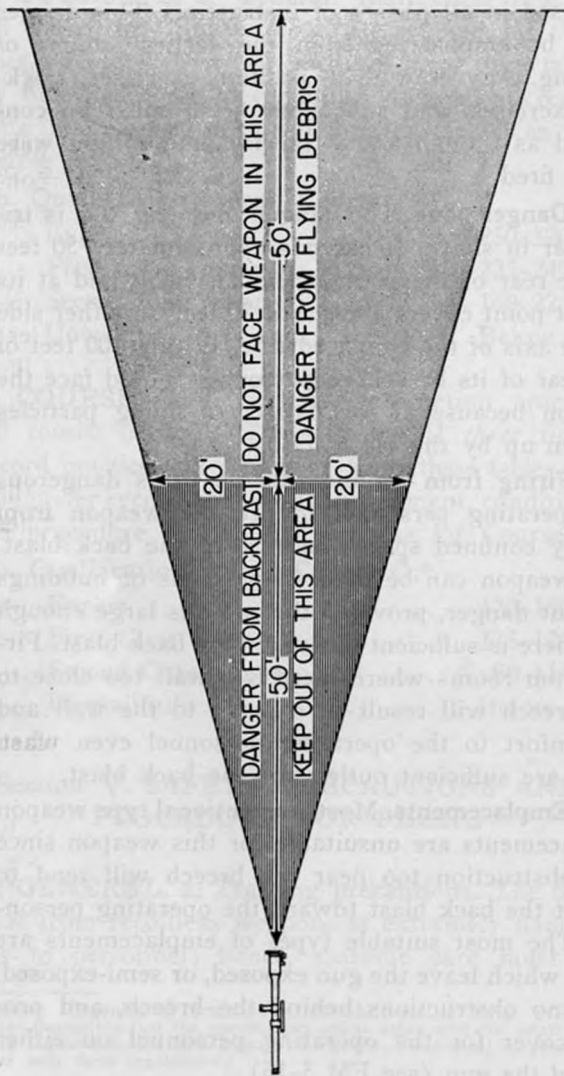


Figure 55. Danger areas, 57-mm rifle.

e. **Fire control.** All firing will be controlled by definite fire commands.

f. **Training procedure.** During the initial phases of instruction firing, the officer conducting firing may, at his discretion, reduce the speed of the target and the number of rounds fired in each run. The object of this procedure is to increase confidence and place emphasis on manipulation and accuracy.

g. **Sequence.** All exercises will be fired in the order in which they are listed in the tables.

h. **Moving target firing.** During instruction firing only, moving target firing may be preceded by one or more dry runs.

**68. DUTIES OF PERSONNEL.** a. **Officer in charge.** The officer in charge of range practice, detailed by the unit commander, is responsible for—

(1) Assignment, coordination, and supervision of the firing line. Emphasis should be placed on safe and smooth operation of all firing.

(2) Issuance of fire commands and general instructions to the firing line.

(3) Enforcement of safety precautions as prescribed in both AR 750-10 and this manual.

b. **Company commander.** The company commander is responsible for the efficiency of the marksmanship training and the conduct of firing by his organization.

c. **Scoring officers.** (1) Scoring officers will be detailed to supervise record practice firing. Officers for this duty will be detailed from organizations other than the one firing. They will familiarize

themselves thoroughly with their duties and firing procedures prior to the date of record practice firing.

(2) Specific duties of scoring officers are to—

(a) Check dimensions of the targets, aiming silhouettes, and scoring spaces, and to see that the range is organized as prescribed.

(b) Inspect each target before firing to insure that it contains no unpasted holes.

(c) Count the number of rounds of ammunition to be fired by the gunner for each exercise.

(d) See that firing is conducted in accordance with the prescribed procedure.

(e) Check the time of exposure on moving target runs and render a decision in the event of irregularities.

(f) Verify and render decisions on all misfires and malfunctions at the rifles.

(g) Render a decision in the event of breakage or stoppage of any of the range apparatus.

(h) Score targets on each exercise fired and record the score.

**d. Coaches.** (1) During all instruction practice a coach will be present at each rifle to instruct and assist the gunner. No coach will be present at the rifle for record firing.

(2) Specific duties of a coach are to—

(a) Require each gunner and loader to observe all pertinent individual and general safety precautions and see that they comply with the instructions pertaining to the service of the piece.

(b) See that the proper number of rounds is present at the piece for each exercise.

(c) Supervise the work at the rifle and make sure that the commands are executed properly. Repeat orders and instructions where necessary to insure correct understanding and timely execution.

(d) Report all misfires, malfunctions, or discrepancies to the officer conducting firing.

(e) Score the targets and critique the firing.

**e. Loader.** (1) The primary duty of the loader is to serve the piece during all firing exercises. During instruction practice he may also act as assistant coach. During record firing he will not coach or instruct the gunner in any way.

(2) Specific duties of the loader are to—

(a) Load the rifle in accordance with the commands of the officer conducting firing.

(b) Tap the gunner and report UP when the weapon is loaded and he is completely clear of the breech and the back blast area is clear.

(c) Signal READY to the officer who is conducting firing.

(d) Repeat all commands to unload, cease firing, and clear rifle.

(e) Announce to the gunner, when required, the number of rounds fired on each exercise.

**f. Feeder.** (1) The feeder controls the movement of personnel to and from the firing line and allows no movement behind the line of rifles except under the direction of the officer conducting firing.

(2) Specific duties of the feeder are to—

(a) Allow no personnel to move to or from the firing line except when all breeches are open and personnel are standing clear of the rifle.

(b) After each order has completed firing and on command of the officer conducting firing, send subsequent orders to the rifles.

(c) Raise a red flag at the end of the firing line except when all breeches are open, all personnel are clear of the rifles, and instructions are received from the officer conducting firing.

(d) Permit no personnel to move behind the rifles while the red flag is raised.

**69. ORGANIZATION. a. Firing point.** Organization of the firing line will be in accordance with figure. 56.

**b. Personnel.** Duties of personnel will be in accordance with those outlined in paragraph 68.

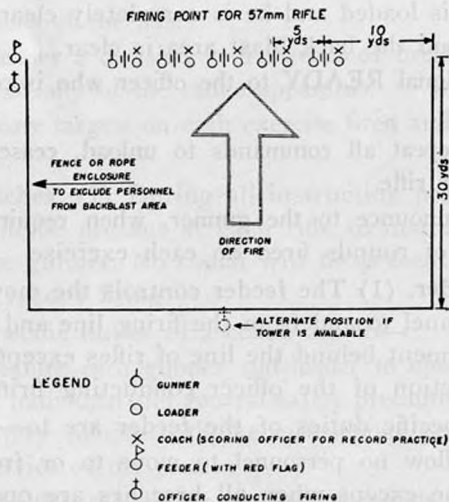


Figure 56. Firing point, 57-mm rifle.

**c. Control.** No personnel, except those actually required on the firing line, will be allowed to enter the fenced or roped off inclosure at any time.

**d. Red flag.** When the red flag is raised, no personnel will enter or leave the firing line and no movement between rifles will be allowed.

**e. Inspections.** Prior to any firing, each rifle will be carefully checked by an officer to insure that it is in firing condition.

## 70. INSTRUCTION PRACTICE FIRING. a.

**General.** (1) Before firing, the officer in charge of firing will give a description of the range and announce specific instructions pertaining to firing procedure.

(2) The coach, loader, and gunner take positions at the rifle. The gunner tests the firing, elevating and traversing mechanisms; the loader secures the necessary ammunition.

(3) When all rifles are prepared for firing and the safety regulations checked, the officer conducting firing gives the fire command.

(4) At the completion of an exercise the officer conducting firing commands: CEASE FIRING. The loader rapidly unloads the rifle. All personnel stand clear of the rifle, and the loader then signals to the officer in charge that this has been accomplished.

**b. Moving target firing.** An example of the sequence of a fire command is as follows: RIFLES ON AIMING STAKE. When all rifles have signalled READY, a subsequent fire command is

given as follows: MOVING TARGET, SUBCALIBER, LEFT FRONT, TANK FOUR FIVE ZERO, TWO LEADS, FIRE. The assistant gunner will load on the ammunition element of the fire command. When the target has completed its run the command CEASE FIRING will be given. The same type sequence will be used for the return run.

**c. Record practice firing.** The same procedure as that described for instruction practice firing will, except as noted below, be employed for record firing.

(1) As a rule, record practice firing will not be fired on the same day that any portion of instruction practice is fired. However, when the time allotted is very limited, the unit commander may authorize record practice firing on the same day.

(2) Before firing any exercise for record, the gunner will be given a reasonable length of time to check the condition of his rifle, sight, and ammunition.

(3) The gunner will be required to boresight or target his own weapon prior to any record firing.

(4) The target speed or allotted time will be given each gunner prior to firing.

(5) In record firing, when a misfire, stoppage, or malfunction occurs, the gunner or loader will hold up his hand and call, STOPPAGE. Thereafter, neither the loader nor gunner will touch the rifle until so instructed by the scoring officer. The scoring officer will examine the rifle.

(6) If a misfire, stoppage, or malfunction occurs

through no fault of the gunner, the score will be disregarded and the gunner permitted to refire the exercise.

(7) Decision to disregard scores and to authorize refiring of portions of the course rests with the scoring officer.

(8) If a misfire or malfunction is manifestly the fault of the gunner, he will not be permitted to refire the portion of the course affected.

**71. SCORING AND INDIVIDUAL QUALIFICATION.** a. Any departure from the mandatory provisions of this course will disqualify the man affected for qualification.

b. After a man has started an exercise, all shots fired by him will count as a part of the exercise.

c. The gunner who fires at the wrong target or scoring space will be given credit only for those hits which strike the proper target or scoring space.

d. A hit will be scored for each bullet hole found in a target or scoring space, except that no more than the prescribed number of shots will be counted. Where more than the prescribed number of hits are found on a target, the total score will be the lowest value of the proper number of rounds. In moving target firing (table IV) where a tank is used, observation of the tracer strike on the tank will count as a hit. In scoring Table V, observation of the strike of the projectile on the target will count as a hit. The target need not be marked.

e. For 1,000-inch firing, the name of the gunner will be placed on each target before firing. Except under the supervision of the scoring officer, no person will handle any target until it has been scored.

f. A bullet hole which touches the line of a scoring space will be classified as a hit.

g. During moving target firing, ammunition not fired during the time of exposure of the target will be forfeited.

h. Holes made by ricocheting bullets, rocks, or other foreign matter will not be counted.

i. Each individual entry for record practice will be made on the score card in ink or indelible pencil and will be authenticated by the scoring officer. Erasures are not permitted. Alterations will be made only by the scoring officer.

j. The following score card, DA AGO Form R-5552, may be reproduced locally.

# INDIVIDUAL SCORE CARD QUALIFICATION COURSE

57-mm RIFLE

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(Name)                      (Grade)                      (Serial No.)                      (Organization)

## Firing Phase

	1st Instruc- tion Practice	2d Instruc- tion Practice	3d Instruc- tion Practice	Record Practice	Scorer's Initials
TABLE I					
TABLE II					
TABLE III					
TABLE IV					
TABLE V					
<b>TOTAL</b>					

## QUALIFICATION

Certified Correct \_\_\_\_\_

DA/AGO Form R-5552  
1 April 1948

## CHAPTER 5

# TECHNIQUE OF DIRECT FIRE

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### Section I. GENERAL

**72. DEFINITIONS.** The proper and effective application of fire on a target is called "technique of fire." The operation involved in pointing a rifle for direction and elevation by directing the line of sight on a target visible to the gunner is called "direct laying." Since the primary mission of the 57-mm rifle M18 is direct fire at point targets, this phase of technique of fire is particularly important.

**73. SCOPE. a.** Direct laying involves a knowledge of the subjects listed below:

- (1) Characteristics of fire.
- (2) Range, speed, and lead determination.
- (3) Target designation.
- (4) Fire control.
- (5) Fire commands.
- (6) Range cards.

**b.** Training in marksmanship is a prerequisite to instruction in direct laying.

## Section II. CHARACTERISTICS OF FIRE

74. **TRAJECTORY.** (See fig. 57.) The trajectory is the imaginary line traced by the projectile from the rifle to the point of impact. The 57-mm rifle M18 is classed as a flat trajectory weapon; however, because of the action of air resistance and the force of gravity the trajectory of the projectile is actually a curve. The angle of fall is greater than the angle of elevation; therefore, the projectile reaches its maximum ordinate (highest point) closer to the point of impact than to the rifle (fig. 57). A tangent to the trajectory at the point of impact is called the line of impact. The angle between the line of impact and the ground at the point of impact is called the angle of impact.

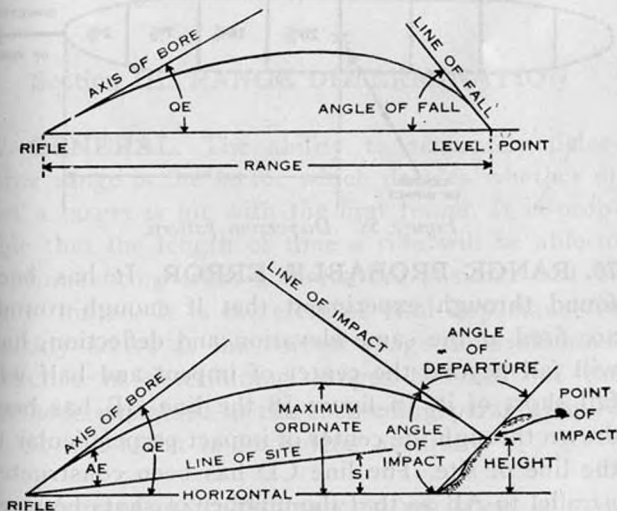


Figure 57. Elements of trajectory.

**75. DISPERSION PATTERN.** Factors such as difference in weight and composition of propellants, differences in weight of projectiles, and varying atmospheric conditions cause dispersion of the points of impact of projectiles fired under otherwise similar conditions. A number of projectiles fired at the same elevation and deflection will form a definite pattern in the impact area. This pattern will be roughly elliptical in shape with its longer axis along the line of fire (fig. 58). In other words, the shots will be scattered more in range than in deflection with the density of the shots being greater at the center of the pattern than toward the edges.

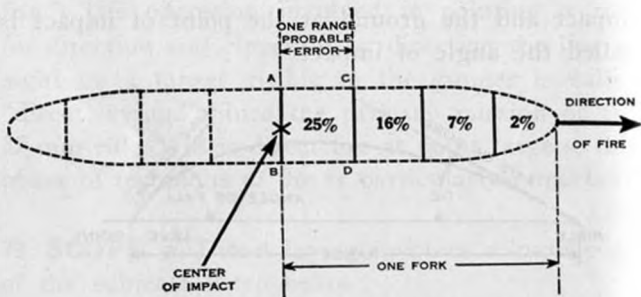


Figure 58. Dispersion pattern.

**76. RANGE PROBABLE ERROR.** It has been found through experiment that if enough rounds are fired at the same elevation and deflection, half will fall beyond the center of impact and half will fall short of it. In figure 58 the line AB has been drawn through the center of impact perpendicular to the line of site. The line CD has been constructed parallel to AB so that the number of shots between AB and CD is the same as the number remaining

in the right half of the dispersion pattern. The area ABCD will therefore contain 25 per cent of the shots fired. The length (in the direction of fire) of the 25 per cent zone represents one range probable error because this error is exceeded as frequently as it is not exceeded. If lines are drawn parallel to AB at a distance of one probable error from the center of impact the small areas thus created will contain percentages of total shots fired approximately as is shown in figure 58. Eight probable errors (four on either side of the center of impact) will cover the dispersion pattern. The value in yards of a range probable error, which value varies directly with the range (gun to center of impact), is given in the firing table 57-E-1 (abridged).

### Section III. RANGE DETERMINATION

**77. GENERAL.** The ability to accurately determine range is the factor which decides whether or not a target is hit with the first round. It is probable that the length of time a rifle will be able to continue firing from a direct fire position will be very limited. It is therefore of vital importance to quickly arrive at the correct range determination. Practice in determining ranges by most of the methods explained in the succeeding paragraphs 78 to 82 will assist in improving accuracy.

**78. ESTIMATING DISTANCE BY EYE.** a. Estimation of distance by eye is the quickest method of

range estimation, and the degree of accuracy depends on the observer and his training and experience. In many cases it will be the only possible means whereby ranges can be determined. Accuracy can be attained through practice in exercises which require the soldier to observe a measured 100-yard marked distance from various angles and from various ranges. After the soldier has attained a mental picture of 100 yards from these various angles and ranges, he is required to estimate an unknown distance. He does this by applying successively his mental 100-yard "yardstick" to the range to be estimated. For ranges over 500 yards, the observer should pick out a point which is half-way, estimate the distance to the halfway point, and multiply the answer by two.

b. Objects appear closer or farther away with different conditions of light and terrain. Whenever the appearance of objects is used as a basis for range estimation, the observer should make allowance for the effects noted below:

(1) Objects seem nearer—

(a) When the object is in a bright light.

(b) When the color of the object contrasts sharply with the color of the background.

(c) When looking over water, snow, or uniform surfaces like a wheat field.

(d) When looking downward from a height.

(e) In the clear atmosphere of high altitudes.

(f) When looking over a depression most of which is hidden.

(2) Objects seem more distant when—

(a) Looking over a depression all of which is visible.

(b) There is poor light or fog.

(c) Only a small part of the object can be seen.

(d) Looking from low ground toward higher ground.

**79. FIRING THE RIFLE.** When determining range by firing the rifle, the gunner fires with the sights set at the estimated range and, by observation, adjusts until he brings fire on the target. He then reads the range from the sight reticle. Only in exceptional cases is it advisable to use this method.

**80. TAKING RANGE FROM A MAP.** The accuracy of this method will depend on the experience of the observer and the accuracy of the map. The distance gun-target is measured on the map and by means of the map scale the measured distance is converted into yards of range.

**81. OBTAINING RANGE FROM OTHER UNITS.** A unit being relieved in a combat position, should turn over to the relieving unit, range cards and other firing data. Other units of the same organization may have the desired information which is usually valuable, especially if the other unit has tested it.

**82. MEASURING THE RANGE ON THE GROUND.** This method presupposes that the situation will permit the observer to traverse the ground. This being the case, he paces off the range or measures it with tape or speedometer.

## Section IV. SPEED AND LEAD DETERMINATION

83. **GENERAL.** Speed and lead determination are very closely allied since the observer cannot arrive at the correct lead estimation without first having correctly estimated the target's speed.

84. **SPEED ESTIMATION.** For discussion of speed estimation, see paragraph 54.

85. **LEAD DETERMINATION.** The telescope provides a measure of angular leads, five mils being equal to one lead (see par. 31d(3)). The number of leads varies with the speed and direction of movement of the target but not with the range. The ballistic qualities of the various projectiles for this weapon are such that three angular leads (15 mils) should be allowed for each 10 mph of speed that the target is moving, when the path of the target is at an angle of  $45^{\circ}$  or greater to the line of fire. When the path of the target is at an angle of *less* than  $45^{\circ}$  to the line of fire, half this number of leads should be used. For targets traveling directly toward or away from the gun, no leads are necessary.

## Section V. FIRE CONTROL

86. **GENERAL.** a. Fire control implies the ability of the leader to open fire at the instant he desires, adjust the fire of his rifle or rifles upon the target,

shift it from one target to another, regulate its rate, and cease firing at will. He must be able to do all these things promptly if the fire is to be effective. Lack of proper fire control results in loss of surprise effect, premature disclosure of position, application of fire on unimportant targets, loss of time in securing adjustment, and waste of ammunition.

b. Fire control is founded primarily on thorough discipline and technical training. There must be sufficient flexibility to provide for adequate decentralization in order to compensate for the difficulties encountered in firing rifles from widely separated positions.

**87. CHAIN OF FIRE CONTROL.** The organization commander usually gives his initial commands orally direct to the platoon leader on the ground and subsequent commands by radio, wire, or signal. The platoon leader will communicate similarly his fire commands to his section leader and/or his squad leaders and they in turn to the gunners. Because of such factors as noise, semi-isolation of firing positions, limited vision, and fleeting opportunity, fire control must be based on simple methods to insure effective execution and the engagement of new and unexpected targets which appear after the unit has become engaged.

**88. ADJUSTMENT OF FIRE.** a. For ranges less than 1,000 yards, direct readings for deflection and estimated range corrections necessary to bring the burst to the target will be employed. Where pos-

sible the gunner will, under the supervision of the squad leader, make his own corrections and apply them to the weapon without command. The squad leader will issue subsequent commands when, in his estimation, speed or effectiveness of fire can be enhanced by so doing.

b. For ranges in excess of 1,000 yards, the squad leader issues subsequent fire commands using the bracketing method of adjustment for range and direct readings from his binoculars for deflection. In the adjustment of fire by the bracketing method, the observer senses the first round and estimates the distance in range from the burst to the target. The sensing will be either over or short. He then makes a sufficient elevation correction to insure that the next round lands definitely over (if the first burst was short) or short (if the first burst was over). Each subsequent round is fired at the mean of the last over and the last short. This process of reducing the size of the bracket is repeated until the distance between bursts is not greater than 25 yards or a target hit is obtained. The initial range change should be bold enough to insure that a definite bracket is obtained. This range change should never be less than 200 yards unless knowledge of the terrain or other factors make it apparent to the gunner or squad leader that the application of the procedure in a above for targets less than 1,000 yards will result in more rapid adjustment on the target.

**89. OVERHEAD FIRE.** a. **Definition.** Overhead fire is fire delivered over the heads of friendly

troops. The 57-mm rifle is capable of delivering this type of fire provided it is in a stable stationary position.

**b. Requirements.** Overhead fire must pass a safe, carefully determined distance above the friendly troops over whose heads it is to be delivered; that is, the minimum clearance or safety angle must be accurately established. The minimum clearance for ranges up to 1,000 yards is determined by applying the gunner's rule.

**90. GUNNER'S RULE.** (See fig. 59.) This method will insure ample troop clearance at all ranges up to 1,000 yards. However, it will not insure that troops will be far enough from the impact to avoid all shell fragments. Where a more accurate determination for closer support is desired consult FM 6-40, Mask and Troop Clearance.

**a. Initial lay.** Lay the rifle on the target with the correct sight setting to hit the target.

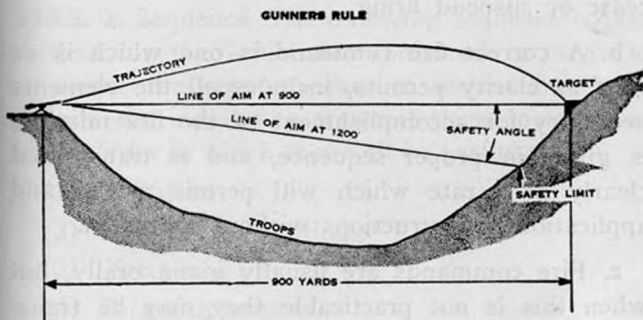


Figure 59. Application of gunner's rule, range gun—target 900 yards.

**b. Safety limit.** Without disturbing the lay of the piece, sight down the reticle scale to the 1,200-yard graduation and fix the point where the line of sight strikes the ground. If friendly troops are beyond this point it is unsafe to fire. Overhead fire can be delivered until friendly troops reach this point.

**c. Ranges over 1,000 yards.** For determination of safety factors for ranges over 1,000 yards, computation of mask and troop clearance must be made by the method described in FM 6-40.

## Section VI. FIRE COMMANDS

**91. GENERAL.** a. Fire commands are the technical instructions issued to enable a weapons crew to engage a desired target. There are two types of fire commands: initial fire commands, issued to get the first round on the way; and subsequent fire commands, issued to adjust or shift fire, and to cease or suspend firing.

b. A correct fire command is one which is as brief as clarity permits, includes all the elements necessary for accomplishment of the fire mission, is given in proper sequence, and is transmitted clearly at a rate which will permit receipt and application of instructions without confusion.

c. Fire commands are usually given orally, but when this is not practicable they may be transmitted by telephone, radio, messenger, or arm-and-hand signals.

d. Numbers are announced as illustrated in the following examples:

10	ONE ZERO.
25	TWO FIVE.
300	THREE HUNDRED.
875	EIGHT SEVEN FIVE.
1400	ONE FOUR HUNDRED.
1925	ONE NINE TWO FIVE.
3000	THREE THOUSAND.
4050	FOUR ZERO FIVE ZERO.
100.7	ONE ZERO ZERO POINT SEVEN.
254.4	TWO FIVE FOUR POINT FOUR.

e. Repeat-back of commands is required at all times except when firing at moving targets.

f. The phonetic alphabet (FM 24-12) is used whenever necessary to insure complete understanding; for example, CP (command post) would be announced as CHARLIE PETER.

**92. INITIAL FIRE COMMANDS FOR DIRECT FIRE.** a. **Sequence.** The following sequence is prescribed for the initial fire command in order to accustom the crew to execute instructions in a definite routine and to transmit these instructions in the order in which they will be performed.

- (1) The alert.
- (2) Type of ammunition.
- (3) Direction.
- (4) Target description.
- (5) Range.

(6) Leads.

(7) Command to open fire.

**b. Omissions.** Any unnecessary elements are omitted from the fire command.

**93. ALERT.** The alert is always the first element of the initial fire command. Its purpose is to designate the crew or individual who will fire and bring them to a state of readiness to receive the command. The alert consists of—

**a. The designation of the crew or individual to fire.**

**b. The target alert.** The alert for stationary targets is FIRE MISSION; for moving targets, MOVING TARGET.

**94. AMMUNITION.** The ammunition is designated as follows:

**a. High explosive . . . . .HE.**

**b. High explosive, antitank. . . . .HE, AT.**

**c. Smoke, WP . . . . .SMOKE or WP.**

**d. Target practice . . . . .TP.**

**95. DIRECTION.** Any of the following methods are suitable for designating direction. The method selected should be that which best fits the situation.

**a. General direction and clock system.** FRONT is understood as the direction in which the muzzle points. Directions varying therefrom by successive angles of 45° are designated as RIGHT (LEFT) FRONT; RIGHT (LEFT) FLANK; RIGHT (LEFT) REAR. The clock system, in which the

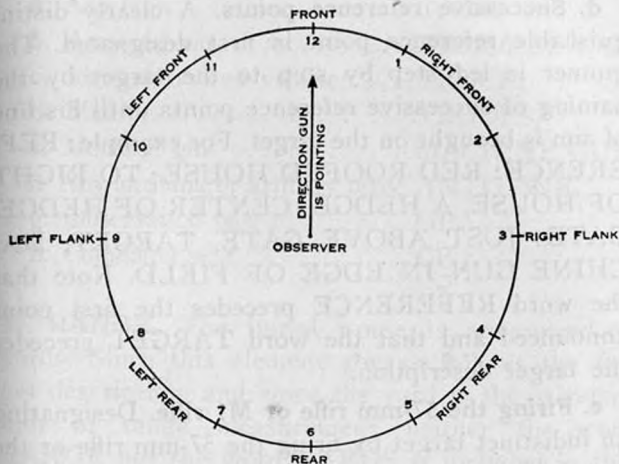


Figure 60. Diagram of clock system indicating direction.

rifle position is assumed to be the center of a clock with the muzzle pointing to 12 o'clock, defines the direction even more specifically (fig. 60). For example: TWO O'CLOCK.

**b. Reference point and mils.** Whenever time permits in occupying a position, a reference point should be designated in the center of the sector of fire. The gunner should lay on the reference point at a zero setting and, by using the sight reticle of the telescopic sight, he can measure horizontal angles up to thirty mils. For example: REFERENCE POINT, RIGHT TWO FIVE.

**c. Reference point and distance.** This method should be used at very short ranges only. Example: REFERENCE POINT LEFT ONE HUNDRED YARDS.

**d. Successive reference points.** A clearly distinguishable reference point is first designated. The gunner is led step by step to the target by the naming of successive reference points until his line of aim is brought on the target. For example: REFERENCE: RED ROOFED HOUSE; TO RIGHT OF HOUSE, A HEDGE: CENTER OF HEDGE, GATE: JUST ABOVE GATE, TARGET, MACHINE GUN IN EDGE OF FIELD. Note that the word REFERENCE precedes the first point announced and that the word TARGET precedes the target description.

**e. Firing the 57-mm rifle or M1 rifle.** Designating an indistinct target by firing the 57-mm rifle or the squad leader's M1 rifle is a simple, rapid, and accurate method but may disclose the position. The person designating the target orally gives the general direction of fire as RIGHT FRONT, then commands WATCH MY BURST (TRACER).

**f. Laying the rifle.** The person designating the target may actually lay the rifle himself to give the gunner his direction.

**96. DESCRIPTION.** A brief description, usually a word or two, is all that is required, but it must create in the gunner's mind a picture of his target. If several targets are in view, or if two or more rifles are engaging a wide or deep target, the particular target or part on which fire must be placed is designated as: LEADING TANK; RIGHT BUILDING; FAR END; HALTED COLUMN; etc. The following words are used to designate usual targets:

- a. Any tank .....TANK.
- b. Armored car .....ARMORED CAR.
- c. Any unarmored vehicle.....TRUCK.
- d. Men .....TROOPS.
- e. Machine gun .....MACHINE GUN.
- f. Any antitank or artillery piece.ANTITANK.
- g. Observation post .....OP.
- h. Command post .....CP.

97. **RANGE.** The initial range is announced in yards. Since this element always follows the target description, and since the yard is the standard unit of range measurement, neither the word RANGE nor the word YARDS is included in this announcement.

98. **LEADS.** This element is included in the initial fire command only when firing at moving targets. One lead comprises an angular measurement of 5 mils.

99. **COMMAND TO OPEN FIRE.** This is a fire control element. The command to open fire is FIRE. Strictly interpreted, this is an order for the gunner to open fire when ready. If the leader desires to open fire at a specific time, he can give AT MY COMMAND or AT MY SIGNAL. If a specific number of rounds are desired, he can specify that number as THREE ROUNDS, FIRE.

100. **EXAMPLES OF INITIAL FIRE COMMANDS.** a. *Direct fire at stationary target:*

Alert .....FIRE MISSION.  
Ammunition .....HE.  
Direction .....RIGHT FRONT.  
Target description .....MACHINE GUN.  
Range .....NINE HUNDRED.  
Command to open fire....FIRE.

b. *Direct fire at a target moving left to right at a speed requiring a 15-mil lead and at a range of 700 yards:*

Alert .....MOVING TARGET.  
Ammunition .....HE, AT.  
Direction .....LEFT FRONT.  
Target description .....TRUCK.  
Range .....SEVEN HUNDRED.  
Leads .....THREE LEADS.  
Command to open fire. .FIRE.

**101. SUBSEQUENT FIRE COMMANDS, DIRECT FIRE.** a. **Sensings.** In direct fire, each round or burst is sensed for deflection and range. Neither sensing is announced. See paragraph 88 for discussion of sensing and conduct of fire.

b. **Subsequent fire commands.** (1) *Elements.* Elements of a subsequent fire command include a correction in deflection, a correction in range, a correction in leads, and the command to fire.

(2) *Announcing subsequent fire commands.* (a) Subsequent commands are announced as corrections to the sight picture at which the last round was fired.

(b) The following terms are used to announce the above corrections:

Fire at the same range...REPEAT RANGE.  
 Increase range .....ADD \_\_\_\_\_.  
 Decrease range .....DROP \_\_\_\_\_.  
 Move the burst or strike  
     to right .....RIGHT \_\_\_\_\_.  
 Move the burst or strike  
     to left.....LEFT \_\_\_\_\_.  
 Increase leads .....MORE.  
 Decrease leads .....LESS.

**c. Corrections in deflection.** (1) When firing against stationary targets, corrections in deflection are given in mils as RIGHT FIVE; LEFT TWO; etc.

(2) When deflection is correct, this element is eliminated from the subsequent fire command.

**d. Correction in range.** This element is always included in the subsequent fire command. If a correction is needed, it is announced as ADD FIVE HUNDRED; DROP TWO HUNDRED (yards); etc. If the range is correct, this element is given as REPEAT RANGE.

**e. Correction in leads.** When firing at moving targets, the correction in leads is given as TWO MORE; ONE LESS; etc. This element is included in the subsequent fire command only when necessary.

**f. Command to fire.** (See par. 99.)

## 102. EXAMPLES OF SUBSEQUENT FIRE COMMANDS. a. Stationary target.

(1) LEFT TWO ZERO

DROP TWO HUNDRED  
FIRE.

(2) RIGHT FIVE  
ADD ONE HUNDRED  
FIRE.

(3) REPEAT RANGE  
FIRE.

**b. Moving targets.**

(1) DROP TWO HUNDRED  
FIRE.

(2) ADD ONE HUNDRED  
TWO MORE  
FIRE.

(3) REPEAT RANGE  
FIRE.

**103. REPEATING AND CORRECTING COMMANDS.** **a. Repeating.** If the loader or gunner fails to understand any element of the fire command, he must request a repetition of that element by announcing the misunderstood element using a rising inflection to denote a question. When any crew member asks that the deflection or range element be repeated, misunderstanding is avoided by prefacing the repeated element with the phrase **THE COMMAND WAS \_\_\_\_\_**. This phrase is used only when repeating an element of an unexecuted fire command.

**b. Corrections.** In all fire commands, an incorrect command is corrected by saying: **CORRECTION** and giving the correct command. To correct an erroneous range command of 500 yards to a correct

command of 600 yards, the procedure is: CORRECTION, SIX HUNDRED, FIRE. (Note the corrected command is followed by the command to fire.)

**104. CEASE FIRING.** CEASE FIRING is announced when the crew leader desires to interrupt firing for any reason. It indicates the completion of firing with the data in the gunner's possession. Firing must then be renewed by an initial fire command.

**105. TERMINATION OF ALERT.** So that the crew may relax between fire missions, and so that their response to subsequent alerts will be more complete, the termination of the alert will be announced as CEASE FIRING END OF MISSION.

## Section VII. RANGE CARDS

**106. RANGE CARDS.** (See fig. 61.) a. A range card is a diagrammatic or panoramic sketch showing the position of the rifle, magnetic north, ranges and azimuths to prominent terrain features and probable targets. By showing the ranges and angles of sight to nearby objects, it enables the crew to determine quickly and accurately the range to any target in the sector; also, the squad leader, by using aiming stakes, can lay the rifle for night firing on predetermined target positions.

b. Range cards may be constructed as follows:

(1) Place a dot in the approximate center of a

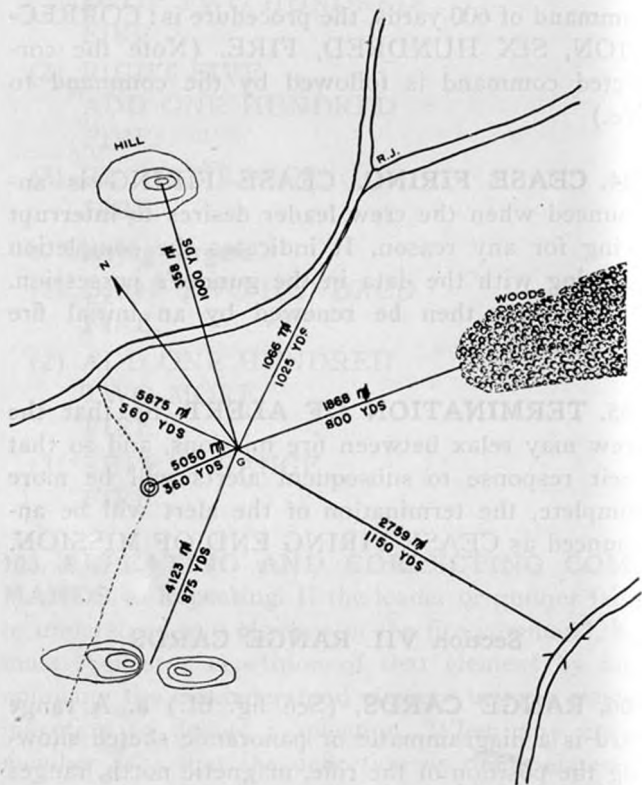


Figure 61. Range card.

piece of blank paper to represent the position of the rifle.

(2) Draw a straight line through the dot to represent magnetic north and label the line.

(3) Using the center dot, determine the range and measure the azimuth in mils to the prominent terrain features to be shown on the card.

(4) Using a protractor and a convenient scale, plot and label each terrain feature.

(5) Draw straight lines from the rifle position to the terrain features and label each line with range and azimuth.

## Section VIII. DIRECT LAYING ON LANDSCAPE TARGETS 1000-INCH

**107. SCOPE AND IMPORTANCE.** a. Upon satisfactory completion of the qualification course, the soldier may practice what he has learned by sub-caliber firing at landscape targets.

b. The advantages of landscape target firing are—

(1) It permits close supervision of all members of the firing unit.

(2) It clearly and quickly demonstrates the application and effect of fire.

(3) It can be conducted indoors when lack of facilities or weather conditions make this desirable.

(4) It emphasizes target designation and fire control.

**108. DESCRIPTION.** A landscape target (fig. 62) is a panoramic picture of a landscape. It is so drawn that all or nearly all of the salient features are recognizable at a distance of 1,000 inches. The standard target is the five-sheet Series A in black and white.

**109. PREPARATION OF TARGETS.** a. **Mounting.** The sheets are mounted on 1-inch by 2-inch wood frames which are 24 by 60 inches and covered with target cloth tacked to the edges.

b. **Range indicators.** Assumed ranges must be used on landscape targets to permit proper designation of targets. Small cards with appropriate numbers representing yards of ranges are tacked along one or both edges of a series of panels (fig. 62). The gunner zeros his rifle at a given range, and he must be cautioned that the range announced in any target designation is for the sole purpose of designating the target, and the sight setting which was necessary to zero rifles must not be changed.

c. **Direction cards.** In order to provide the direction element in oral target designation, small cards marked FRONT, RIGHT FRONT, LEFT FRONT, RIGHT FLANK, and LEFT FLANK are tacked above the appropriate panels of the landscape series.

**110. SCORING DEVICES.** a. Scoring the exercise tends to create competition between individuals or squads and enables the instructor to grade their relative proficiency. For a point target, a scoring device conforming in size to the 50 per cent and 75 per cent shot groups can be made from wire, celluloid, plywood, or similar material (fig. 63). The scoring space can be outlined on the target in pencil before the target is shown to the squad leaders. This procedure prevents squad leaders from misunderstanding the limits of the designated tar-

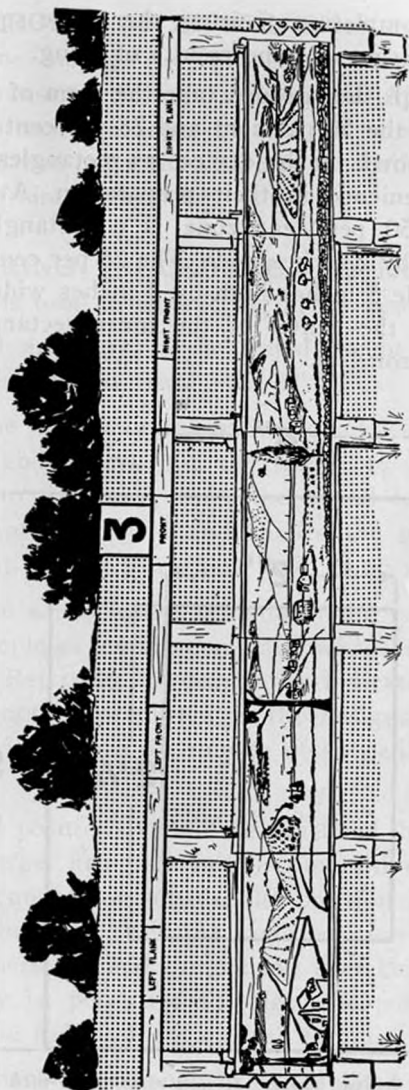


Figure 62. Landscape target with range and direction indicators.

get. Upon completion of firing, the entire squad is shown the target and the results of firing.

b. Although shot groups take the form of a vertical ellipse, the 50 per cent and 75 per cent zones should be shown by the devices as rectangles. This is for convenience in their preparation. At 1,000 inches the 50 per cent zone is a rectangle  $2\frac{1}{2}$  inches high by 2 inches wide. The 75 per cent zone is a rectangle 5 inches high by 4 inches wide. The target is at the center of the inner rectangle or 50 per cent zone.

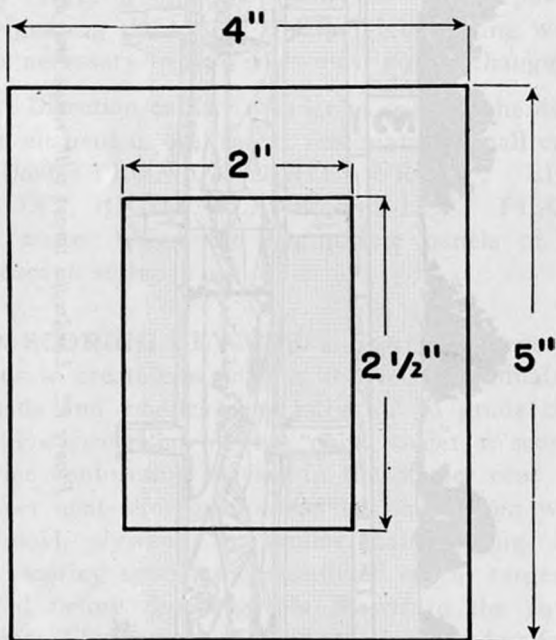


Figure 63. Scoring device, 57-mm rifle, 1,000-inch range.

**111. ZEROING OF RIFLES.** Rifles are zeroed in the same manner as outlined in paragraph 64d, using an assumed range of 700 yards. At a distance of 1,000 inches changes of one mil in elevation or windage will move the strike of the bullet one inch in the desired direction.

**112. FIRING PROCEDURE.** The following sequence is used in conducting firing exercises:

a. All members of the squad except the squad leader face to the rear.

b. The instructor takes the squad leader to the panels and points out the target to him. They return to the firing line; the squad leader takes charge of the squad and causes the gunner and assistant gunner to resume their firing positions.

c. The squad leader designates the target orally and completes his fire command with the command FIRE. Reference to panels to indicate direction should not be permitted in the designation. Each gunner is allowed 10 rounds of subcaliber ammunition.

d. All positions should be practiced during landscape target firing. In initial competitive firing between gunners or squads, the position is specified by the instructor and the same position is used by all gunners. In final competitive exercises, the gunner may be permitted to select the position from which he can best engage the target.

e. When the gunner has completed firing the

squad leader commands: CEASE FIRING, CLEAR RIFLE. He checks to see that this is done. The target is then examined and scored.

f. The instructor holds a short critique after each exercise.

g. For squad competition, each squad is required to engage successive targets until, by rotation of duties, each member of the squad has acted as both gunner and squad leader. At the completion of this firing, the total score for all targets fired is divided by the number of targets to determine the score of the squad.

**113. SCORING.** The sum of the value of the hits within the two zones is the score for the exercise. For convenience in scoring and comparison, 100 is fixed as the maximum score. Any method of scoring and of distribution of ammunition among members of the squad may be used. For example:

a. Number of rounds fired, 50.

b. Value of each hit in 50 per cent zone, 2.

c. Value of each hit in the area of the 75 per cent zone outside the 50 per cent zone, 1.

**114. EXERCISES.** a. **Number 1.** (1) *Purpose.* To teach target designation and to show the effect of concentrated fire.

(2) *Method.* The section (squad) leader directs the fire of his section (squad) at a point target indicated to him by the instructor.

b. **Number 2.** (1) *Purpose.* To teach target desig-

nation and the division of the section's fire on two points of concentration.

(2) *Method.* The instructor indicates two point targets to the section leader and gives him the nature of each. The section leader applies the fire of his section on the two targets in proportions indicated by the nature of each. The scoring will be the same as for concentrated fire on each target; the two scores are combined to obtain the total score of the exercise.

**c. Number 3.** (1) *Purpose.* To teach target designation and fire control in diverting part of the fire of the section (3 rifles in action) to a suddenly appearing target.

(2) *Method.* The instructor indicates a target to the section leader. The section leader applies the fire of one or more rifles to this target. After firing has commenced, the instructor indicates and gives the nature of a point target to the flank. He then directs the section leader to shift one or more rifles from the first to the second target. The method of scoring is to total the value of hits on both targets.

## Section IX. TRANSITION FIRING

**115. PURPOSE AND SCOPE.** This phase of training gives the individual gunner practice in searching areas, estimating ranges, and firing rapidly and accurately. It emphasizes the necessity for continued application of the principles stressed in earlier marksmanship training and prepares him for field firing exercises which follow later.

**116. RANGES, PERSONNEL, AND PROCEDURE.** **a. Ranges.** Ranges are constructed to provide targets as outlined in the firing table in paragraph 117. For protection of the pit detail, individual open pits of the foxhole type should be used. To control the raising and lowering of targets, communication between the firing points and the pits is necessary. Targets are fastened to poles of sufficient length to permit exposure of the target from the pit without endangering personnel in the pits. The number of lanes constructed will depend upon the number of persons to fire.

**b. Personnel.** One officer is required at each firing point to control the firing. Pit details will consist of one or two men per target and a telephone orderly at the firing point to transmit scores and orders for control of targets.

**c. Procedure.** After the command LOAD, the officer in charge of firing gives the signal for raising the targets. Unless hit, all targets remain up until the signal to withdraw them is given. When all targets are withdrawn, the target operator scores the targets and reports the score to the firing line. A coach at each firing point records the score. Since a hit is indicated by the lowering of the target, no extra credit is given for more than one hit on a target. However, if two targets are hit by one bullet both targets are scored.

**117. FIRING TABLE.** Firing will be conducted in accordance with the following table.

<i>No. rds.</i>	<i>Position</i>	<i>Type of target</i>	<i>Range</i>	<i>Maximum score</i>
3...Prone	Prone	"F" M1917 complete.	Unknown (0—200 yards)	5
3...Prone	Same	.....	Unknown (100—300 yards)	5
3...Prone	Kneeling	"E" M1917 complete.	Unknown (200—400 yards)	5
3...Prone	Same	.....	Unknown (300—500 yards)	5
TOTAL .....				20
SCORE FOR ROUNDS NOT FIRED..				8
POSSIBLE SCORE .....				28

#### REMARKS:

1. Carbine tracer ammunition will be used.
2. Three minutes are allowed to fire the entire table.
3. Gunner will be allowed 3 rounds to hit each target. If he does not get a hit in 3 rounds, he proceeds to the next target. He will be given a credit of one point for each round not fired per target if the target is hit. No credit will be given for rounds not expended per target if the target is not hit. It is not necessary that all targets be hit to receive credit for unexpended rounds on targets that were hit with less than 3 rounds.
4. Target scoring will be done by operators in pits.
5. Fifteen points will be considered as a satisfactory score for this exercise.

## Section X. FIELD FIRING

**118. PURPOSE AND SCOPE.** The purpose of field firing is to develop individual and crew proficiency in combat firing for the squad and section. The unit is conducted through a series of exercises

which, as nearly as possible, simulate battlefield conditions. The situation for each exercise will be given by the instructor who will act as umpire. The tactical commanders will direct and control their units in the actions required. At the completion of each exercise a critique will be held by the umpire.

**119. EXERCISES.** Where possible, the terrain should be varied for each exercise so that the unit will be presented with a new situation. The following exercise is given as a guide for the preparation of such training.

**a. Purpose.** (1) The squad leaders practice control of their units in order to properly engage various types of targets.

(2) Members of the squad apply the factors which govern the selection of positions, the use of individual cover and concealment, ammunition supply, and technique of fire.

**b. Unit.** One squad.

**c. Situation.** The squad is located in an assembly area and is issued ammunition. The squad leader is given pertinent portions of an operation order to include position area, target areas and sectors of fire, and the location of friendly troops.

**d. Method.** The squad leader selects his route of approach, his rifle position, and issues the necessary commands to place the rifle in position. When the target is indicated, the squad leader issues his fire command, opens fire, and adjusts his fire. *Fire for effect is not a part of these exercises.* As soon as the

fire has been adjusted, the duties of the crew are rotated and a new target is designated. The squad leader must be prepared at any time to displace forward, move to an alternate position, or withdraw to a covered area. Selection of the proper type of ammunition is the responsibility of the squad leader.

**e. Targets.** Some possible types of targets are—

(1) Cave type fortification with natural camouflage. The cave opening is 2 by 1 feet; range 400—600 yards.

(2) Mock tank or tank chassis; range 600—800 yards.

(3) Camouflaged log and earth pillbox; range 800—1000 yards.

(4) Pillbox requiring squad leader to smoke the apertures; range 400—500 yards.

**f. Ammunition.** This exercise is designed for service ammunition; however, where range facilities are limited, subcaliber ammunition may be used. Where subcaliber ammunition is used, the section (squad) leader should be required to specify what type of ammunition he would use were he firing service ammunition. Also, when subcaliber ammunition is used, the ranges of targets suggested in **e** above must be modified to less than 500 yards in order to observe the tracer strike.

**g. Critique.** At the completion of each exercise the instructor should conduct a critique covering the following points (care should be taken by the officer conducting the critique to avoid confusing effectiveness of fire with over-all unit performance):

- (1) Reconnaissance.
- (2) Actions and orders of unit leaders.
- (3) Suitability of observation posts.
- (4) Suitability of firing positions.
- (5) Suitability of alternate positions.
- (6) Use of cover and concealment.
- (7) Technique of fire.
- (8) Ammunition resupply plans.
- (9) Proper employment of types of ammunition.
- (10) Effectiveness of fire.
- (11) Speed of adjustment.
- (12) Action of crew members in selection of position, ammunition resupply, technique of fire, and individual cover and concealment.

## CHAPTER 6

# TECHNIQUE OF FIRE FROM DEFILADE

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### Section I. GENERAL

**120. CAPABILITIES.** The 57-mm rifle is primarily a direct fire weapon. The sights and equipment provided are designed for direct fire; and the projectile, due to its small bursting radius, is more efficient on point targets than on area type targets common to indirect fire. However, by careful application of indirect laying principles, it is possible and practicable to use this weapon for *limited* defilade fire missions. The information contained herein is for use when such defilade fire with the 57-mm rifle becomes desirable.

### Section II. DEFILADED FIRING POSITIONS

**121. POSITION DEFILADE. a. General.** A rifle is in position defilade when it is placed so that the weapon and its crew are hidden from enemy ground observation and aimed small arms fire from the target area by a crest or mask; but an observer standing at or near the gun can see the target and adjust the fire. The position may be on the reverse slope of the mask, on the forward slope of the next

high ground in rear of the mask, or in a small fold in the ground. A defiladed firing position does not necessarily reduce the effectiveness of fire against a stationary enemy target nor preclude fire being delivered over the heads of friendly troops.

(1) *Advantages.* (a) The rifle and crew have concealment and cover.

(b) The crew has some freedom of movement in the vicinity of the position.

(c) Control and supply are facilitated.

(d) The muzzle blast, backflash, and any dust raised by the back blast are not as readily discernible to the enemy.

(2) *Disadvantages.* (a) Rapidly moving targets are not easily engaged, because adjustment of fire is made by an observer rather than the gunner.

(b) Targets which are at a relatively close range to the mask, and those having a relatively large negative (minus) angle of site, usually cannot be engaged.

(3) *Characteristics.* (a) *Reverse slope position.* A reverse slope position has some protection from enemy high angle fire when the rifle is placed in *minimum* position defilade, and affords protection from enemy direct fire cannon. It may, however, be grazed by enemy machine gun fire. It is well concealed from observation by enemy personnel near the target area.

(b) *Forward slope position on next high ground in rear of the mask.* A forward slope position is not vulnerable to grazing fire from the target area. However, mortar and artillery fire are more effective against this type of a position.

(c) *Maximum position defilade.* A rifle is in maximum position defilade when it is placed in position defilade at the lowest point on a slope from which it can engage the target. In this position the rifle has relatively good cover but lacks flexibility for engaging new targets.

(d) *Minimum position defilade.* A rifle is in minimum position defilade when it is placed at the highest point on a slope at which it will be in position defilade. This position offers considerable flexibility in engaging new targets, but does not possess maximum cover.

**b. Partial defilade.** A rifle is in partial defilade when the rifle and the gunner have some protection by a mask from direct fire from the target area, and the gunner is able to engage the target by direct laying. Partial defilade is desirable whenever a fire mission cannot be accomplished from position defilade. A rifle may be held in position defilade and moved into a partially defiladed position just prior to firing.

## 122. SELECTION OF POSITION. a. Location.

The platoon or section leader indicates the approximate location of the rifle. The squad leader selects the exact location.

**b. Procedure.** To select a position in minimum position defilade, the squad leader moves up the slope until he reaches a point where, sighting from a height equal to that of the sight, he has the target in view above the mask. This point he marks as the rifle position.

c. **Examine equipment.** While the squad leader selects the position, the crew examines equipment and prepares the rifle for action.

d. **Movement into position.** Upon signal from the squad leader, the rifle is carried to the selected firing position.

### **Section III. FIRING PROCEDURE FROM POSITION DEFILADE**

(Using integral bipod and extendable handle)

**123. ESSENTIAL ELEMENTS.** The essential elements in the engagement of a target from position defilade are direction, elevation, mask clearance, and adjustment of fire. For further information on determining these elements see FM 23-55.

**124. DIRECTION.** Either of the two following methods may be used to establish direction.

a. **Aiming point method.** The observer posts himself on the line gun-target (preferably behind the rifle) and in a position from which he can see the target. He then directs the gunner to traverse the rifle right or left until the tube is alined on the target. A prominent landmark which is visible to the gunner through his sights is selected as an aiming point. An aiming point on the line gun-target and at an equal or greater range than the target is desirable. However, an aiming point on the mask may be used. The aiming point chosen should not be more than 30 mils off the line gun-target since the reticle of the telescope M86C will not accommodate a greater deflection.

b. **Aiming stake method.** If no natural aiming point is available, an aiming stake may be set out and the rifle alined on the target as prescribed in a above.

**125. ELEVATION.** To determine elevation, estimate or measure the range gun-to-target and determine from the firing table the necessary *angle of elevation* in mils. Estimate or measure the *angle of site* gun-to-target and add it to the angle of elevation. Place this *quadrant elevation* on the tube by means of the machine gun clinometer.

**126. MASK CLEARANCE.** When necessary, determine mask clearance by looking through the tube. *Load and recheck quadrant elevation with the clinometer.*

**127. FIRE ADJUSTMENT.** Corrections in deflection are measured with the binocular and applied directly to the rifle. For corrections in range, the bracketing method is used. For observer—target ranges of less than 1,000 yards, a minimum 200 yard bracket is used. For observer—target ranges of 1,000 yards or greater, a minimum 400-yard bracket is used.

**128. FIRE COMMANDS.** Fire commands contain the information in the sequence given in paragraph 100. To indicate direction, reference is made to aiming points or stakes. Quadrant elevation is substituted for range.

**129. USE OF MACHINE GUN TRIPOD, M1917A1.** When firing from defilade, the machine gun tripod M1917A1, if available and practicable, should be used as a mount for the 57-mm rifle. Much more effective fire can be delivered when the rifle is so mounted, since it offers the advantages of stability and a more accurate and flexible means of laying for direction by use of the traversing dial. However, it has the disadvantages of placing an additional weight load on the crew and of presenting a higher silhouette.

#### **Section IV. FIRING TABLES**

**130. FIRING TABLES.** The firing tables shown in figure 64 are for use with the 57-mm RIFLE, M18 or T15E13, firing CARTRIDGE, HE, M306 (T22) and CARTRIDGE, Smoke, WP, M308 (T23) with FUZE, PD, M89 (T119E1).

#### **Section V. TRAINING ON LANDSCAPE TARGETS FROM DEFILADED FIRING POSITIONS**

**131. SCOPE AND IMPORTANCE.** a. **Scope.** Indirect laying on landscape targets at 1,000 inches provides a convenient method of training observers, section and squad leaders, and crews in the principles of defilade fire. The instructions given in this section are for a single 57-mm rifle; their application to battery problems is obvious.

b. **Advantages.** This type of training may be given on indoor ranges or on miniature outdoor ranges

Range yd	Elevation mil	Change in elevation for 100 yd change in range mil	Drift mil	Probable error		Time of flight sec	Angle of fall mil
				Range yd	Deflection yd		
0	0.0	3.3	0	4	0	0.0	0
100	3.5	3.6	0	5	0	0.2	4
200	7.2	3.8	0	5	0	0.5	9
300	11.1	4.1	0	5	0	0.8	14
400	15.3	4.3	0	5	0	1.1	19
500	19.8	4.6	0	6	0	1.5	24
600	24.5	4.8	1	6	0	1.8	30
700	29.4	5.0	1	6	0	2.1	37
800	34.5	5.3	1	6	0	2.4	44
900	39.9	5.5	1	7	1	2.8	51
1000	45.6	5.8	1	7	1	3.2	58
1100	51.5	6.0	2	7	1	3.5	66
1200	57.7	6.3	2	8	1	3.9	75
1300	64.2	6.6	2	8	1	4.3	84
1400	70.9	6.8	2	8	1	4.7	94
1500	77.9	7.1	3	9	1	5.1	104
1600	85.2	7.5	3	9	1	5.5	115
1700	92.8	7.8	3	10	1	5.9	127
1800	100.7	8.1	3	10	1	6.4	140
1900	109.0	8.5	4	11	1	6.8	153
2000	117.7	8.8	4	11	1	7.3	167
2100	126.7	9.2	4	12	1	7.8	182
2200	136.1	9.6	5	12	1	8.3	198
2300	146.0	10.1	5	13	1	8.8	215
2400	156.3	10.5	5	13	2	9.4	233
2500	167.0	11.0	6	14	2	9.9	252
2600	178.3	11.5	6	14	2	10.5	272
2700	190.1	12.1	7	15	2	11.1	293
2800	202.5	12.8	7	16	2	11.7	316
2900	215.6	13.5	8	16	2	12.3	340
3000	229.5	14.3	8	17	2	13.0	366
3100	244.2	15.2	9	18	2	13.7	393
3200	259.9	16.2	10	19	2	14.4	422
3300	276.6	17.3	11	19	2	15.2	453
3400	294.5	18.6	11	20	2	16.0	487
3500	313.9	20.2	12	21	2	16.8	523
3600	335.0	22.0	13	22	2	17.7	562
3700	358.1	24.2	14	23	3	18.7	603
3800	383.6	26.9	16	25	3	19.8	647
3900	412.1	30.2	18	26	3	21.0	695
4000	444.4	34.6	20	27	3	22.2	748
4100	482.2	41.5	22	28	3	23.6	806
4200	529.4	54.5	25	30	3	25.4	873
4300	601.0		31	31	3	27.9	964
4340	683.8		39	32	4	30.7	1055

Figure 64. Firing table (FT 57-E-1 abridged), 57-mm rifle.

where range facilities are not adequate for field firing. It permits close supervision of all members of the firing unit, enables the instructor to check correctness of method and accuracy of results in a minimum of time, develops teamwork, and arouses a competitive spirit among the participants. It clearly and quickly demonstrates the application and effect of fire and prepares gunners for field firing.

**132. TARGETS, RANGE INDICATORS, DIRECTION CARDS, SCORING DEVICES.** (See pars. 108 and 109.) Targets are mounted with the bottom of the target 1 foot above the ground when firing from the bipod, or 3 feet above the ground when firing from the tripod.

**133. INSTALLATION OF RIFLES.** The rifle is located at an unknown range from the targets. For battery fire rifle intervals are reduced to a minimum. A screen (representing a mask) is set up in front of the rifle in order to prevent the gunner from observing the target while laying. Bullets pass through, rather than over, the mask.

**134. ZEROING THE RIFLE.** The rifle is targeted for direct fire as prescribed in paragraph 64d, except that the aiming point will be a zeroing paster of the 1,000-inch target. A round is fired at this zeroing paster. Without disturbing the lay of the tube, the sight is adjusted for elevation and deflection until the cross hair of the reticle is alined on the hole made by this shot.

**135. AIMING POINT ADJUSTMENT.** Upon completion of the zeroing operation, the instructor selects a base point on the landscape target. He requires each rifle to fire and register on this base point, noting the elevation required. He then erects the mask and marks an aiming point on the mask for each rifle.

**136. FIRE ADJUSTMENT AND FIRE COMMANDS.** See paragraphs 127 and 128.

**137. CONDUCT OF THE PROBLEM.** An OP is established at a position on one flank. The observer is given the location of the base point and the elevation on the rifle. The deflection for the rifle should be zero when it is alined on the aiming point. The observer is given a target to engage. He adjusts the fire of the rifle on the target and fires for effect. Upon completion of his mission, it is critiqued by the officer conducting the firing. Duties are then rotated among the gunners, squad leaders, and observers.

## **Section VI. FIRING AT FIELD TARGETS FROM DEFILADE POSITIONS**

**138. PURPOSE AND SCOPE.** The purpose of field firing for the squad and section is to demonstrate individual and crew proficiency in all phases of combat. The unit is conducted through a series of exercises which simulate battlefield conditions. The situations for each exercise are given by the

instructor, who also acts as umpire. The tactical commanders direct and control their units in the actions required. At the completion of each exercise a critique is held by the umpire.

**139. EXERCISE. a. General.** Where possible the terrain should be varied for each exercise, so that the unit will be presented with a new situation. The following outline is given as a guide for the preparation of an exercise.

**b. Purpose.** These exercises are designed to give leaders practice in reconnaissance and selection of positions, routes of approach, observation posts, and control of units, and to teach individuals proper application of those factors which govern selection of positions, use of cover and concealment, ammunition supply, and technique of fire.

**c. Unit.** 57-mm rifle squad or section.

**d. Situation.** The unit which is located in an assembly area is issued ammunition. The unit leader then is given pertinent portions of an operation order to include: position areas, target areas, sectors of fire, and the location of friendly troops.

**e. Method.** The situation should be presented in such a manner that position defilade fire is indicated. The unit leader selects his route of approach, his rifle position(s), and issues the necessary orders to place the rifle(s) in position. When a target is indicated, the unit leader issues his fire command, opens fire, and adjusts his fire. *Fire for effect is not a part of this exercise.* As soon as the fire has been

adjusted, the duties of the crew are rotated and a new target is designated. The unit leader must be prepared at any time to displace forward, move to an alternate position, or withdraw to a covered area. Selection of the proper type of ammunition will be the responsibility of the unit leader.

**f. Targets.** The nature of the targets selected for this exercise should clearly indicate point target or limited area fire.

**g. Ammunition.** See paragraph 119f.

**h. Critique.** See paragraph 119g.

## CHAPTER 7

# ADVICE TO INSTRUCTORS

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### Section I. GENERAL

**140. PURPOSE.** The purpose of this chapter is to aid the instructor in the organization, preparation, and presentation of instruction for recoilless weapons units. It is not intended to have the force of regulations, but is presented only as a guide.

**141. METHODS OF INSTRUCTION. a. General.** The standard methods of instruction in TM 21-250 apply to 57-mm rifle instruction. Decentralization of training is desirable. It is recommended that trainees be formed in groups of not more than five per weapon. Each group is an instructional group, and forms a basis of team work throughout the entire period of training. Emphasis throughout is placed on application.

**b. Instructor.** The chief instructor is usually the platoon leader or some other especially qualified instructor. Time limitations and the rate of learning limit the amount of new material to be presented during each phase of training.

**c. Assistant instructors.** Assistant instructors are selected and trained in advance. They are the best qualified men available—preferably noncommis-

sioned officers. The number trained should be sufficient to assign one per group, with additional assistant instructors available to assist in supervision and to replace losses. In the event it is not possible for the principal instructor to train assistant instructors prior to training his organization, he may select individuals from his own organizations and attach them for training to the first organization to undergo this training. These individuals will then act as instructors and assistant instructors when their own unit begins training.

**d. Demonstration groups.** Outstanding assistant instructors should be selected and trained as special demonstration groups. Constant practice and rehearsals will form teams which attain proper timing and a thorough knowledge of instructional duties. Demonstration groups are used to demonstrate each step in the following training: squad organization, crew drill, boresighting, ammunition, mounts, safety precautions (individual) and effect of back blast, position defilade, section firing, subcaliber targeting, landscape firing, transition firing, qualification course firing, and field firing.

**142. TRAINING AIDS.** Training aids which will facilitate instruction are—

**a. Nomenclature boards.**

**b. Charts.**

Breech mechanism

Trigger group

Phases of functioning

Stoppages and immediate action

Ammunition and fuzes

- 'Acetate sight reticles (large)
- Acetate sight reticles (small, individual)
- Sight mount
- Position defilade
- Color cut-away of complete rifle
- Danger zones
- Boresighting
- Range organization of a firing point
- Elements of a trajectory
- Dispersion pattern
- Range cards
- Fire commands.

**c. Models.**

- Breech mechanism
- Trigger group
- Gunner's rule

**143. SUBJECT SCHEDULES.** For convenience in the preparation of schedules and subsequent training, a suggested sequence of instruction with a minimum allotment of hours is as follows:

Mechanical training .....	16 hours
Training for placing the rifle in action .....	4 hours
Preparatory marksmanship .....	24 hours
Marksmanship (qualification course) ..	40 hours
Technique of direct fire.....	4 hours
Landscape target firing .....	4 hours
Transition firing .....	8 hours
Technique of fire, position defilade..	4 hours
Field firing .....	8 hours
Total .....	112 hours

(This schedule should be adjusted to meet local conditions.)

## Section II. MECHANICAL TRAINING

144. **GENERAL. a. Method.** The unit to be instructed is assembled in a suitable area with rifles, tools, and equipment, and is divided into squad groups each under the supervision of an assistant instructor. Instruction is controlled by the principal instructor. The explanation and demonstration phases of instruction can be conducted concurrently.

**b. Schedule.** Subjects to be covered during the mechanical training phase of instruction are: general data, nomenclature, disassembly, assembly, functioning, stoppages, immediate action, care and cleaning, destruction of matériel, ammunition and fuzes, mountings, fire control instruments, and spare parts and equipment to include the subcaliber device. The recommended distribution of the 16 hours allotted to mechanical training is—

(1) *First day:* General data, nomenclature, disassembly, assembly, and functioning.

(2) *Second day:* Stoppages, immediate action, restoration of balance, ammunition and fuzes, care and cleaning (initial conference only), demolition, mountings, fire control instruments, spare parts and accessories, and subcaliber device.

**c. Nomenclature, disassembly, and assembly. (1) Equipment.** Equipment needed per group is one rifle, one screw driver, one crescent wrench, one set of cleaning equipment, charts of the breech mechanism, and nomenclature boards.

(2) *Procedure.* The assistant instructors disassemble and assemble the rifle while the principal instructor

**i. Fire control instruments.** (1) *Equipment.* The fire control equipment is listed in paragraphs 30 to 35 inclusive.

(2) *Procedure.* Explain and demonstrate the operation of each instrument and its use with the 57-mm rifle.

**j. Spare parts and equipment.** (1) *Equipment.* Equipment should include the current standard nomenclature list (SNL) with available spare parts as listed therein, and a gun book and a subcaliber device.

(2) *Procedure.* (a) Explain and demonstrate the purpose of an SNL, the spare parts and equipment provided for the rifle, and the use of the gun book.

(b) Explain and demonstrate the use, disassembly, assembly, and care and cleaning of the subcaliber device.

### **Section III. TRAINING FOR PLACING THE RIFLE IN ACTION**

**145. TRAINING FOR PLACING THE RIFLE IN ACTION.** a. **Method.** The method of instruction used for training in placing the rifle in action will vary somewhat depending upon the size of the class. In a small class, equipment should be available for each squad. Where larger groups are instructed, equipment may not be available in sufficient quantities to provide each squad with all of the required equipment. In this event a demonstration squad, fully equipped and trained, is used, and the available equipment is subsequently rotated

among groups for application of the techniques demonstrated. Regardless of the size of group undergoing instruction, a demonstration is given, accompanied by an explanation of each item of equipment, its use, and the duties of each member of the squad. This is followed by a demonstration of each phase of placing the rifle in action and practical exercises by the group before the next phase is introduced.

**b. Detailed schedule.** The 4 hours allotted for this training should be distributed over a period of days. One-hour periods, including explanation, demonstration, and practical exercises in each phase, should be the maximum devoted during any one day. Otherwise lack of interest results and the value of the training is lessened.

**c. Equipment.** Equipment needed is that listed in the current table of equipment for the squad.

## Section IV. MARKSMANSHIP

### 146. PREPARATORY MARKSMANSHIP.

**a. Method.** The instructor follows the explanation, demonstration, and application phases when presenting this instruction. Also, the instructor presenting the training should be the same one held responsible for the conduct of firing. Instruction in the use of the rifle is the same in nature as that required for teaching any mechanical operation. The instruction is divided into groups of exercises as outlined in paragraph 49b. The gunner is taught

each exercise and practices it before going to the next. After each phase of instruction, by means of a brief review, the instructor emphasizes the salient points covered and stresses the need for care and accuracy. When the gunner has mastered the exercises, he applies what he has learned by firing the qualification course.

**b. Organization.** (1) Proper allocation of time and personnel must be carefully checked during marksmanship training.

(2) A definite schedule of instruction should be adhered to during all phases of marksmanship training and a detailed check made on the progress of each man.

**c. Detailed schedule.** The subjects to be covered in the 24 hours allotted to preparatory marksmanship are: sighting and aiming, positions, trigger manipulation, range estimation, speed estimation, lead determination, tracking exercises, fire commands, boresighting, targeting the subcaliber device, safety precautions, and procedure for firing. Training has continuity and is progressive by phases. A review of each phase is conducted before continuing to the next. There is no clear cut dividing line between any phase and the previous exercises should be included in succeeding steps. For example: sighting and aiming exercises should be included in position exercises by requiring the gunner to take the proper position, align his rifle on a target, hold his breath, and squeeze the trigger. As the training progresses, a fire command may be required. A suggested schedule for preparatory marksmanship is—

(1) *First day*: Sighting and aiming with telescopic sight and metal sights. (See par. 50a(1), (2), and (3), and b(1), (2), and (3) for types of exercises to be conducted.) Position exercises, to include holding the breath and trigger manipulation.

(2) *Second day*: Range estimation, speed estimation, lead determination and tracking exercises.

(3) *Third day*: Continue sighting and aiming and positions. Give range, speed, and lead estimation exercises in examination form. Instruct in fire commands, boresighting, targeting the subcaliber device, and safety precautions.

**d. Equipment.** Equipment required includes: rifles (with bipod and heavy machine gun tripod, M1917A1), cleaning materials, boresighting discs, subcaliber devices, screw drivers, crescent wrenches, targets, acetate sight reticles (large and small), and charts on the sight mount, boresighting, fire commands, range organization of a firing point, and danger zones.

#### 147. QUALIFICATION COURSES. a. Method.

The qualification courses are conducted as outlined in paragraphs 61 to 71 inclusive. Concurrent training should be conducted in the rear areas behind the firing line. Firing with service ammunition must be rigidly controlled; there should be an assistant instructor for each rifle and a safety officer for each six rifles. Firers leave their rifles *only* on command from the principal instructor (control officer). Only a gunner and loader of the gun crew are present at the rifle during firing. All rifles must be inspected by an officer for proper

firing and operating condition prior to firing. Prior to firing, ammunition should be prepared, left in the boxes, and inspected by an officer to determine that—

(1) The correct type of ammunition is present and placed to the right front of each rifle.

(2) The rotating band is clean and not burred.

(3) The projectile is tight in the casing and does not rotate.

(4) The propellant container paper is not punctured.

**b. Detailed schedule.** The qualification course includes the firing of the five tables (par. 64) for practice and record. The distribution of the 40 hours allotted for this training is as follows:

(1) *First half day*: Instruction practice, Table I, concurrent training, mechanical training (review).

(2) *Second half day*: Instruction practice, Table I, concurrent training, mechanical training (review).

(3) *Third half day*: Instruction practice, Table II, concurrent training, mechanical training and/or marksmanship (review).

(4) *Fourth half day*: Instruction practice, Table III, concurrent training, marksmanship (review).

(5) *Fifth half day*: Instruction practice, Table IV, concurrent training, boresighting and/or marksmanship (review).

(6) *Sixth half day*: Record practice, Table I, concurrent training, organization equipment and duties of the squad.

(7) *Seventh half day*: Record practice, Table II,

concurrent training, organization equipment and duties of the squad.

(8) *Eighth half day*: Record practice, Table III, concurrent training, placing the rifle in action.

(9) *Ninth half day*: Record practice, Table IV, concurrent training, placing the rifle in action.

(10) *Tenth half day*: Record practice, Table V, concurrent training, fire commands, boresighting, and safety precautions.

**c. Equipment.** The equipment required for conduct of the qualification course is as outlined in paragraph 64b.

## Section V. TECHNIQUE OF FIRE

**148. TECHNIQUE OF FIRE. a. General.** Instruction in the technique of fire is partially concurrent with other instruction; for example: range determination, speed and lead determination, and fire commands are included in preparatory marksmanship instruction. Additional instruction is required to complete the subject of technique fire. This includes the characteristics of fire, fire control, fire adjustment and the use of smoke, range cards, direct laying on landscape targets (1,000-inch), transition firing, technique of fire from position defilade, and field firing.

**b. Method.** (1) General instruction in the characteristics of fire, fire control, fire adjustment, and the use of smoke may be conducted in the form of conferences and practical exercise with addi-

tional practical application continued during landscape target firing and field firing. Instruction in the preparation and use of range cards may be conducted where convenient to the local schedule, and should include conference, demonstration, practical application, examination, and discussion. Transition firing, position defilade, and field firing should be conducted as outlined in paragraphs 115 to 139 inclusive.

(2) In field firing, proper analysis of terrain, use of camouflage, selection and occupation of firing positions, fire commands, and fire discipline and control are essential to proper instruction. The construction of a range and the placement of targets are the responsibility of the principal instructor. Ranges should allow for direct and position defilade firing problems. Targets should be numerous, varied in type, and camouflaged. Some suggested types are: log emplacement, 55-gallon oil drums, cave type emplacements, armored vehicles, prone and kneeling silhouettes arranged in tactical formations, dummies, and snipers in trees or in windows or houses. The squad leader should be familiar with the general area in which the target is located. This may be accomplished by detonating previously prepared charges to indicate the target position. Taking advantage of cover and concealment, the squad leader should bring his squad forward to the firing position and issue his fire command. He should be permitted considerable latitude in selecting types of ammunition or combinations thereof which will produce maximum effect on the particular targets. Speed should be

stressed in occupation of position, firing, and movement to alternate positions. Upon completion of the exercise, the principal instructor should point out the difficulties encountered during firing, the outstanding errors, and methods for correcting these errors. He should stress the type of target in use and the ammunition combinations used to destroy these targets. He also should develop and maintain a team spirit by commending good work.

**c. Detailed schedule.** A suggested schedule and allotment of hours for instruction in the technique of fire follows:

- (1) *First half day*: Characteristics of fire, fire control, and range cards.
- (2) *Second half day*: Landscape target firing.
- (3) *Third half day*: Transition firing.
- (4) *Fourth half day*: Transition firing.
- (5) *Fifth half day*: Technique of fire, position defilade.
- (6) *Sixth half day*: Field firing.
- (7) *Seventh half day*: Field firing.

**d. Equipment.** Charts on the danger zones, elements of a trajectory, dispersion pattern, range cards, and position defilade. A simple model of the gunner's rule will assist in instruction. Equipment as mentioned in paragraphs 108, 109, 110, and 132 is required for landscape target firing, and as outlined in paragraphs 116 and 117 for transition firing. Equipment for field firing will include those items listed in the current T/O&E, and such ammunition as is listed in current allowances.

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