

FIELD MANUAL }
No. 23-67 }

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MACHINEGUN 7.62-MM, M60

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*This manual supersedes FM 23-67, 22 October 1962.

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PART ONE

MECHANICS AND CREW TRAINING

CHAPTER 1

INTRODUCTION

1. Purpose and Scope

a. This manual is a guide for training on the machinegun, 7.62-mm, M60. Instructors will find that this manual, together with Army Subject Schedule 23-35 and Army Training Program 7-18, provides a sound and detailed basis for the conduct of training to include mechanics and crew training, techniques of fire and employment, and layout and operation of machinegun ranges and courses of fire. This manual and the aforementioned references provide for the utilization of concurrent training stations and recommends the subjects which should be taught concurrently. Range facilities, time allocations, and concurrent training stations are based upon training a 200-man unit. Units training substantially larger or smaller numbers of personnel should modify their training plans accordingly. Information in this manual is presented in a logical sequence from the basic to the more complex phases of instruction. All instruction can be given either on the ranges or in the near vicinity (concurrent training stations) of the ranges.

b. The material contained herein is applicable without modification to nuclear and non-nuclear warfare.

c. Users of this manual are encouraged to submit recommended changes or comments to improve the manual. Comments should be keyed to the specific page, paragraph, and line of the text for which the change is recommended. Reasons should be provided for each comment to

insure understanding and complete evaluation. Comments should be forwarded directly to the Commandant, U. S. Army Infantry School, Fort Benning, Ga.

2. Roles of the Machinegun

The machinegun supports the rifleman in both the attack and defense. The machinegun is capable of engaging distant targets with a heavy volume of controlled and accurate fire that is beyond the capability of individual weapons. It provides the rifleman with the heavy volume of close and continuous fire necessary to accomplish his mission in the attack. The long range, close defensive, and final protective fires delivered by this weapon form an integral part of the unit's defensive fires.

3. Description

a. General. The M60 machinegun is an air-cooled, belt-fed, gas-operated automatic weapon (fig. 1). The weapon fires from the open-bolt position. Ammunition is fed into the gun by a disintegrating metallic split-link belt. Two barrels are issued with each weapon. The weapon features fixed headspace which permits rapid changing of barrels.

b. Sights. The M60 has a front sight permanently affixed to the barrel. The rear sight leaf is mounted on a spring-type dovetail base (fig. 2). It can be folded forward to the horizontal when the gun is to be moved. The range plate on the sight leaf is marked for each 100 meters, from

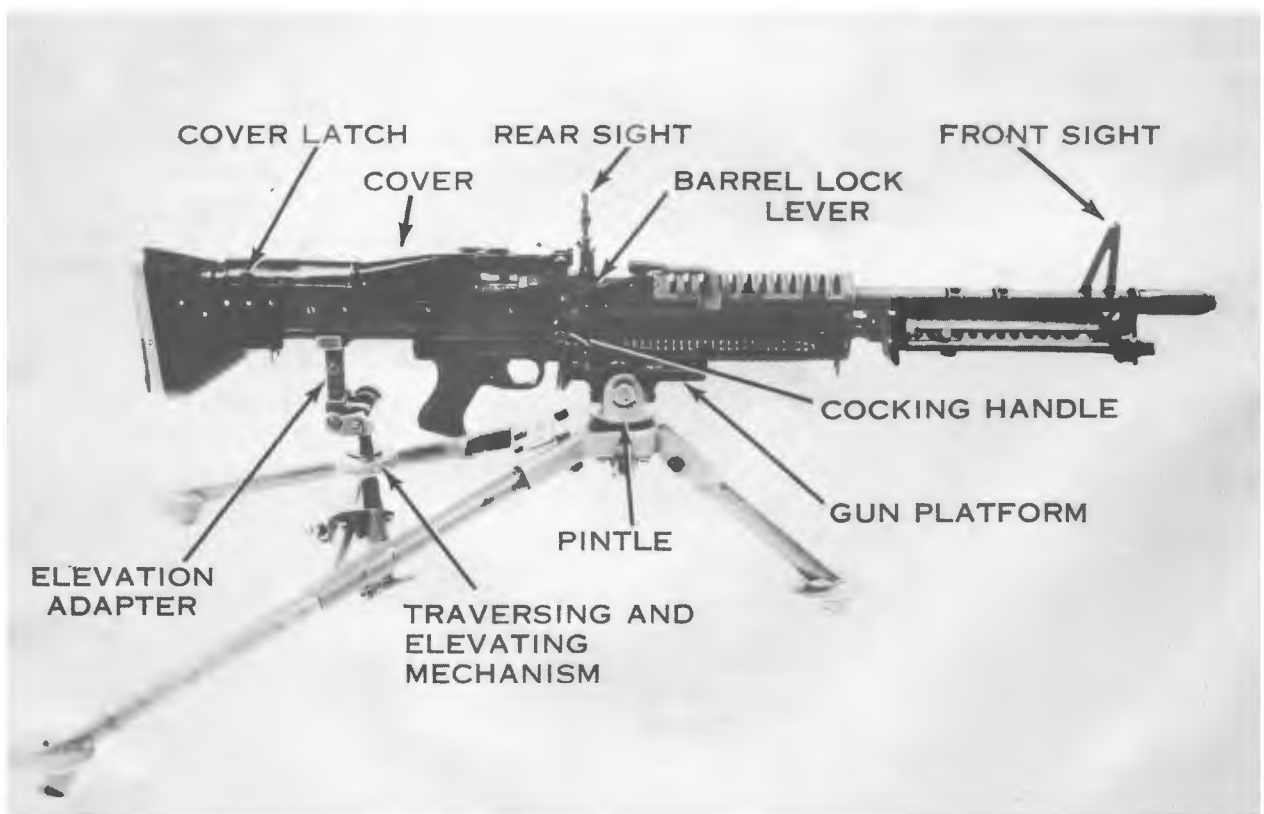


Figure 1. M60 machinegun bipod and tripod mounted.

300 meters, to the maximum effective range of 1,100 meters. Range changes may be made by using either the slide release or the elevating knob. The slide release is used for making major changes in elevation. The elevating knob is used for fine adjustments, such as during zeroing. Four clicks on the elevating knob equal a 1-mil change of elevation. The sight is adjustable for windage five mils right and left of zero. The windage knob is located on the left side of the sight. One click on the windage knob equals a 1-mil change of deflection.

c. *Safety.* A safety lever is located on the left side of the trigger housing. It has an S (SAFE) and an F (FIRE) position. On the SAFE position the bolt cannot be pulled to the rear or released to go forward. The cocking handle, on the right side of the gun, is used to pull the bolt to the rear. IT MUST BE RETURNED MANUALLY TO ITS FORWARD

POSITION EACH TIME THE BOLT IS MANUALLY PULLED TO THE REAR.

d. *Flash Suppressor.* A flash suppressor is affixed to the muzzle of the barrel. The ribs of this suppressor vibrate during firing and dissipate flash and smoke.

e. *Bipod Mount.* The M60 can be effectively fired from the integral bipod mount. The hinged shoulder rest provides support for the rear of the gun. The movable carrying handle provides a method for carrying the gun short distances and can be positioned out of the gunner's line of sight. (See paragraphs 28 and 29 for a detailed description of the bipod mount.)

f. *Tripod Mount.* The M122 tripod mount provides a stable and durable mount for the M60 machinegun. Firing the gun from a tripod permits a high degree of accuracy and control. (See paragraphs 30-32, for a detailed description of the tripod mount.)

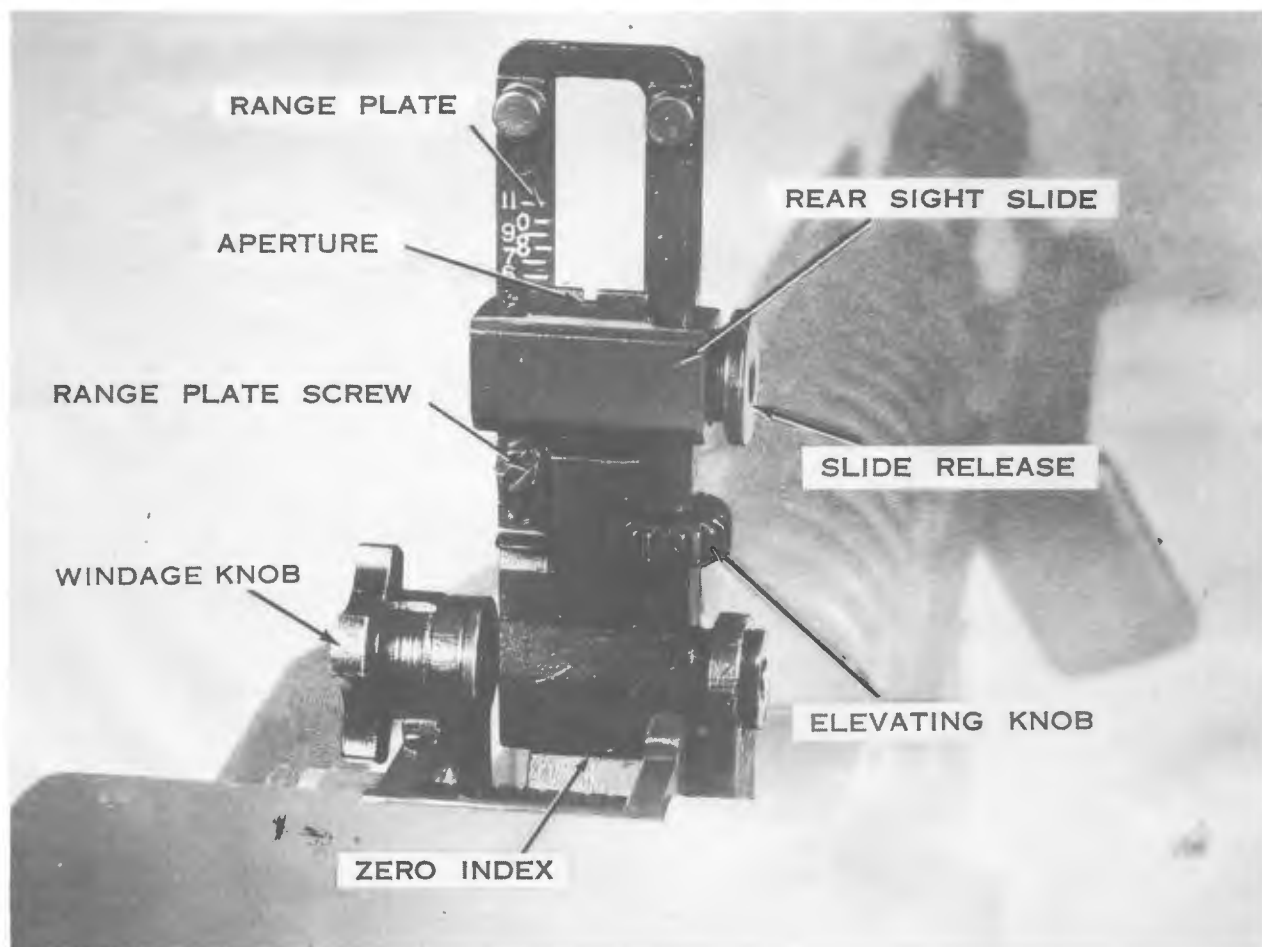


Figure 2. Rear sight leaf.

Table I. General Data

Ammunition.....	7.62-mm ball, tracer, armor piercing, armor piercing incendiary, blank, dummy. Armor piercing and armor piercing incendiary are not authorized for training.	Cyclic	Approximately 550 rounds per minute (Change barrel every one minute).
Length of gun.....	43½ inches.	Basic load of ammunition (on crew)	600 to 900 rounds.
Weight of gun.....	23 pounds.	Gunner carries three 100-round bandoleers (one attached to weapon).	
Weight of tripod mount M122 with traversing and elevating mechanism and pintle and platform group.....	19.5 pounds.	Assistant gunner carries three 100-round bandoleers.	
Maximum range	3,725 meters.	Ammunition bearer, when present, carries three 100-round bandoleers per gun.	
Maximum effective range.....	1,100 meters.	Maximum extent of grazing fire obtainable over level or uniformly sloping terrain....	600 meters.
Height of gun on tripod mount M122.....	16½ inches.	Elevation, tripod controlled....	+200 mils.
Rates of fire:		Elevation, tripod free.....	+445 mils.
Sustained	100 rounds per minute (Change barrel every 10 minutes).	Depression, tripod controlled....	—200 mils.
Rapid	200 rounds per minute (Change barrel every two minutes).	Depression, tripod free.....	—445 mils.
		Traverse, controlled by traversing and elevating mechanism	100 mils.
		Normal sector of fire.....	.875 mils (with tripod).
		Tracer burnout	Approximately 900 meters.

CHAPTER 2

DISASSEMBLY AND ASSEMBLY

Section I. INTRODUCTION

4. General

a. The M60 machinegun can be disassembled and assembled without the use of force. With the exception of the barrel group, all disassembly can be accomplished with a cartridge or other pointed object.

b. As the weapon is disassembled, place the parts (in the order in which they are removed) on a clean, flat surface such as a table, shelter half, or nomenclature mat (app. IV, fig. 144). This reduces the possibility of loss of parts and aids in assembling the gun. The parts are replaced in reverse order. The nomenclature of each part is learned by naming it as it is removed and replaced.

c. Disassembly and assembly of the gas sys-

tem and adjustment of the range plate must be kept to a minimum to avoid undue wear of these parts.

d. Disassembly of the weapon beyond that described in this manual is not authorized except by ordnance-trained personnel.

5. Types of Disassembly and Assembly

The two types of disassembly and assembly are *general* and *detailed*.

a. General disassembly and assembly involves removing and replacing the six *major groups* (fig. 3).

b. Detailed disassembly and assembly involves removing and replacing the *component parts* of the major groups.

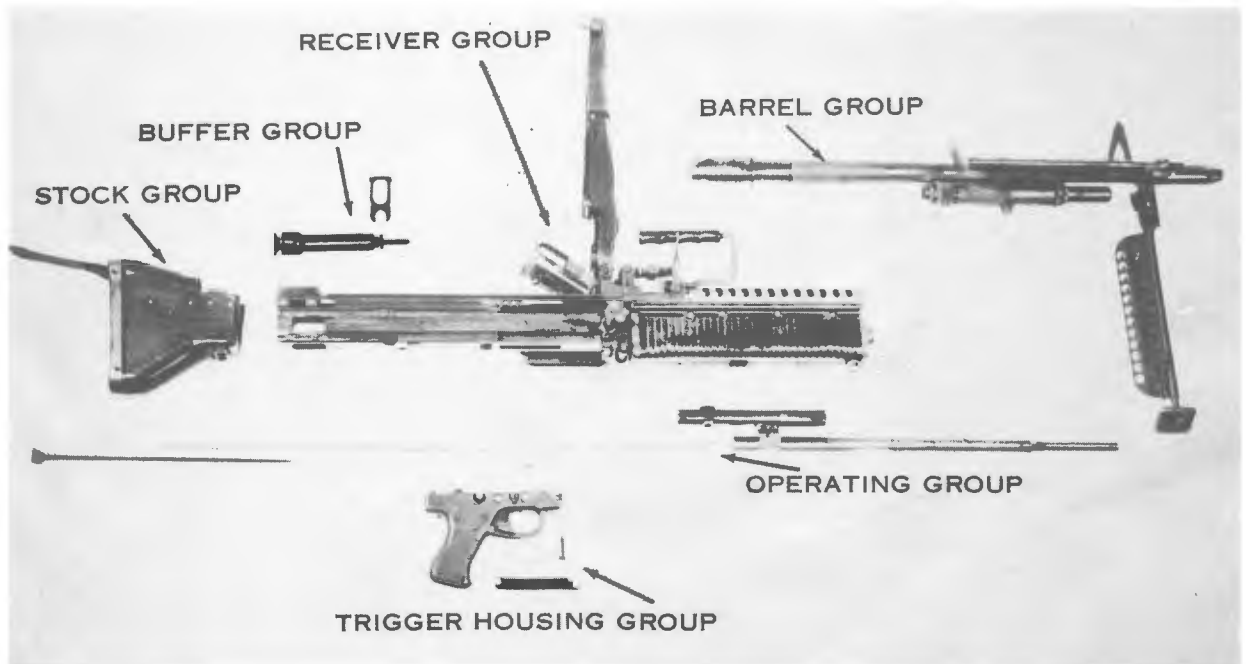


Figure 3. Machinegun disassembled into six major components.

Section II. GENERAL DISASSEMBLY

6. General

a. The six major groups are the *stock group*, *buffer group*, *operating group*, *trigger housing group*, *barrel group*, and *receiver group* (fig. 3).

b. General disassembly begins with the bolt forward, the cover closed, and the safety on SAFE. Before the weapon is disassembled it must be cleared as outlined in paragraph 38.

7. Removing the Stock Group

a. Raise the hinged shoulder rest and insert the nose of a cartridge into the latch hole (fig. 4).

b. With the latch depressed, remove the stock by pulling it directly to the rear.

8. Removing the Buffer Group

The buffer group consists of the buffer yoke and the buffer (fig. 3).

a. Hold the palm of the hand against the exposed buffer and press lightly (fig. 5). Remove the buffer yoke from the top of the receiver (fig. 5).

b. Withdraw the buffer slowly. Allow the drive spring to expand until the end of the drive spring guide is exposed at the rear of the receiver (fig. 6).

c. Pull the buffer plunger from the drive spring guide (fig. 6).

9. Removing the Operating Group

The operating group consists of the operating rod, bolt, drive spring, and drive spring guide.

a. Pull the drive spring guide and spring from the receiver and separate them.

b. With the left hand grasp the pistol grip and pull the cocking handle to the rear until the

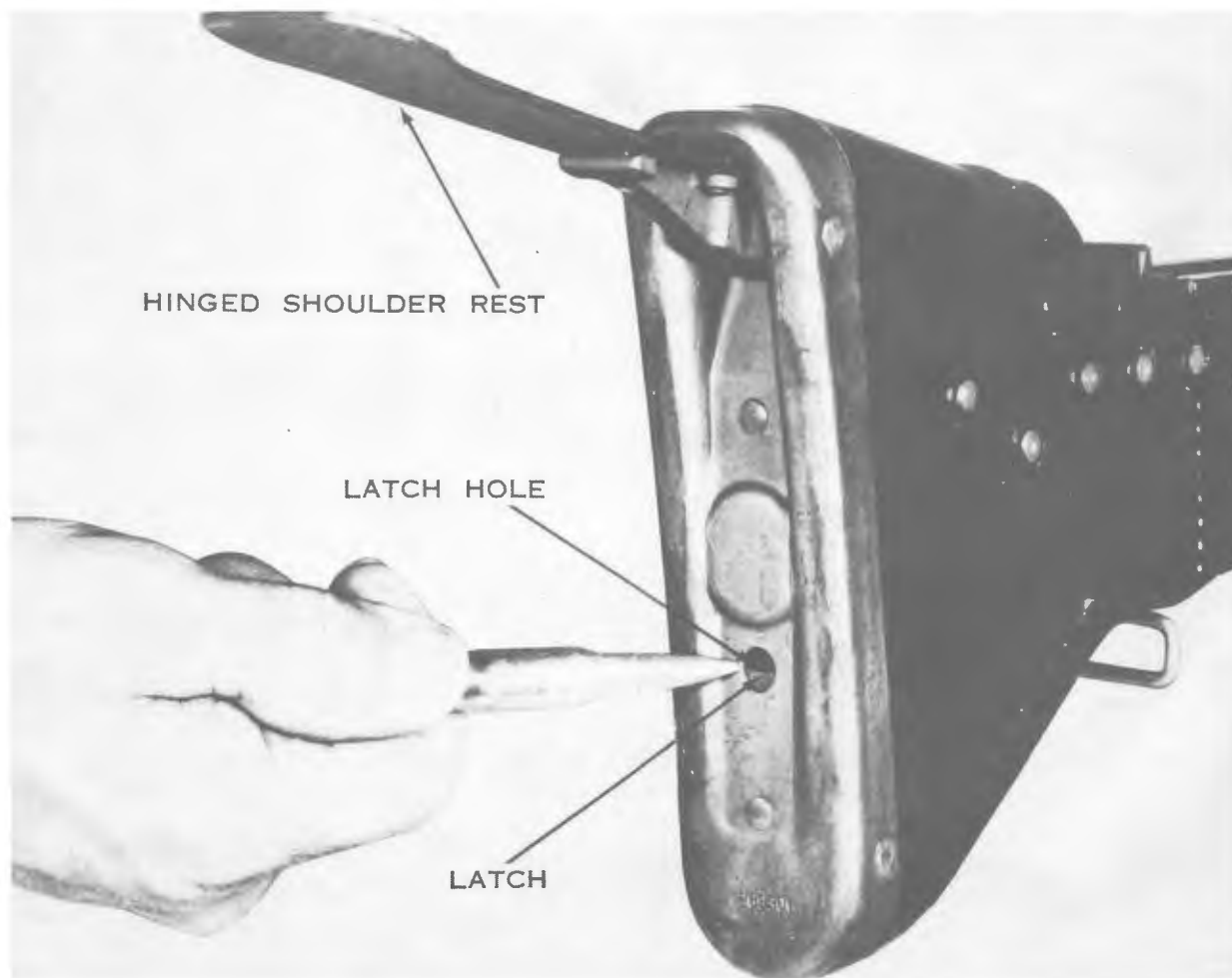


Figure 4. Releasing the stock latch.

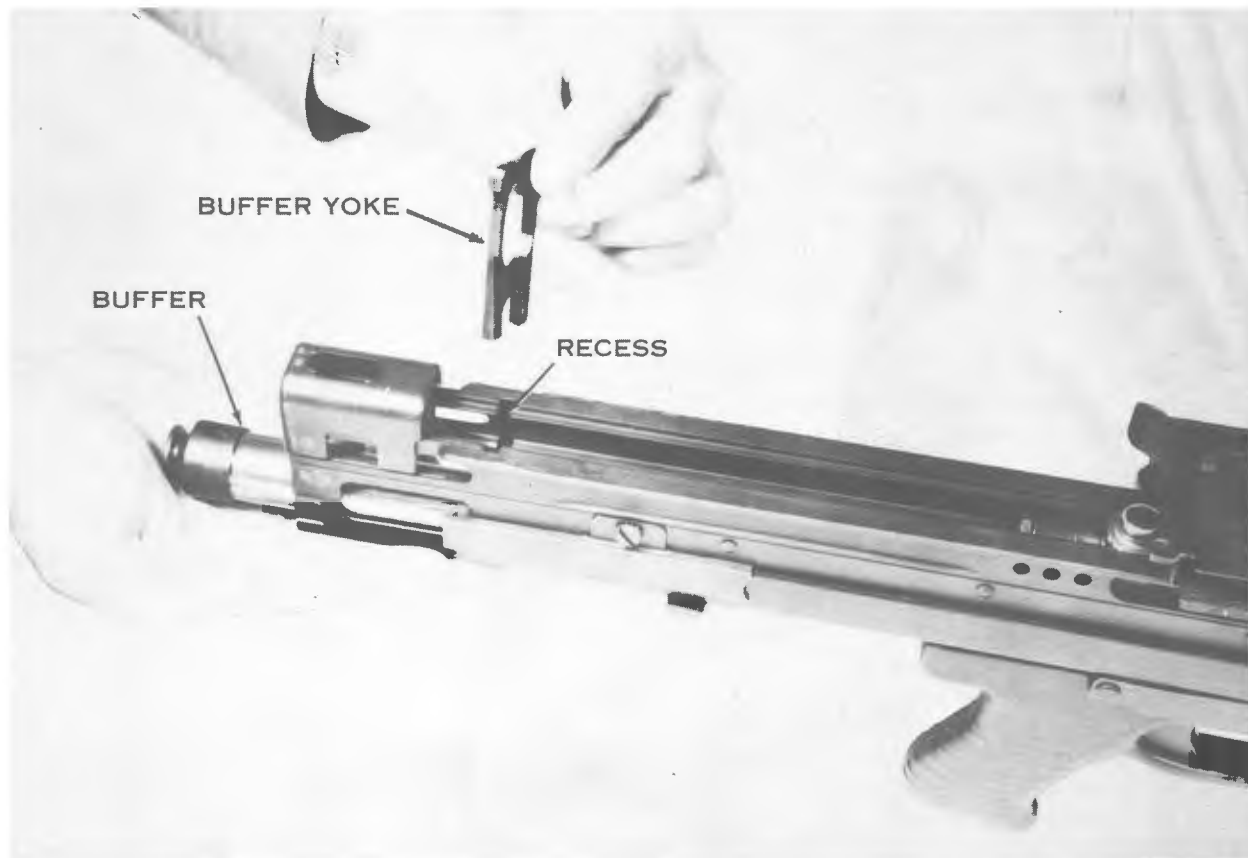


Figure 5. Removing the buffer group.

bolt is separated from the barrel socket. Continue to pull the operating rod and bolt to the rear by pulling on the cam roller (fig. 7).

c. When the operating rod and bolt are exposed approximately four inches to the rear of the receiver, grasp them securely to prevent the bolt from rotating, and remove them from the receiver (fig. 8). Relax the grip and allow the bolt to rotate slowly. Do not separate the bolt from the operating rod.

10. Removing the Trigger Housing Group

The trigger housing group consists of the trigger housing assembly (trigger housing, sear, sear plunger, sear plunger spring, trigger pin, and trigger), trigger housing pin (interchangeable with the sear pin, fig. 23), and leaf spring.

a. Press in on the front of the leaf spring and rotate the front end down to clear it from the trigger housing pin (fig. 9). Pull forward to

disengage the rear notch from the sear pin.

b. Remove the trigger housing pin by pushing it to the left.

c. Slide the trigger housing slightly forward, rotate the front of the housing down, and remove it (fig. 10).

11. Removing the Barrel Group

The barrel group consists of the barrel, flash suppressor, front sight bipod assembly, and gas cylinder. Raise the barrel lock lever to the vertical position and remove the barrel group by pulling it to the front (fig. 11).

12. The Receiver Group

The receiver group consists of the receiver, forearm assembly, rear sight, cover, feedtray, and carrying handle. General disassembly of the gun is completed after the removal of the other five groups from the receiver group.

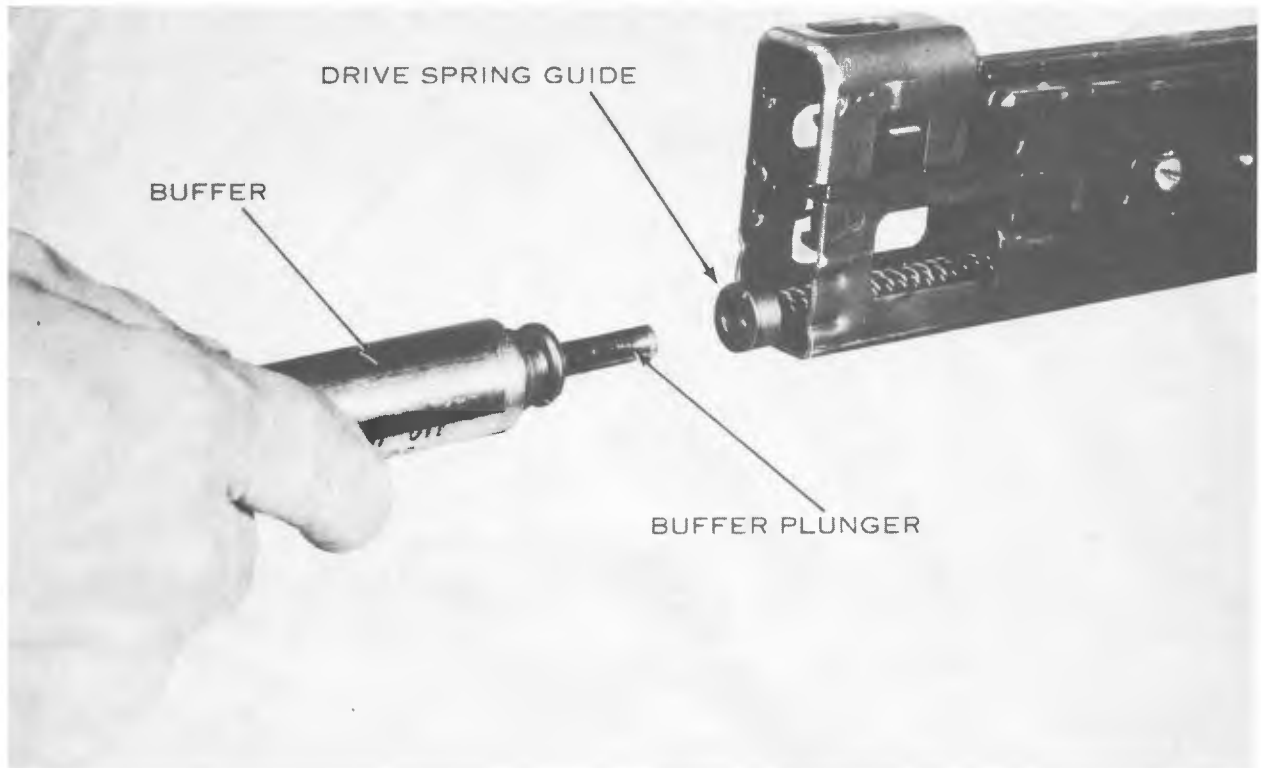


Figure 6. Separating the buffer group (buffer plunger) from the operating group (drive spring guide).

Section III. GENERAL ASSEMBLY

13. Replacing the Barrel Group

Insure that the barrel lock lever is in the vertical position (fig. 11). Insert the rear of the barrel under the barrel cover and aline the gas cylinder nut with its recess in the forearm assembly. Lower the barrel lock lever.

14. Replacing the Trigger Housing Group

a. Engage the holding notch of the trigger housing in its recess in the bottom of the receiver (fig. 10). Rotate the front of the trigger housing up and aline the holes of the trigger housing with the mounting bracket on the receiver. Insert the trigger housing pin from the left.

b. Engage the rear of the leaf spring with the sear pin (fig. 9). Insure that the leaf spring is positioned so that the bent portion is pressed against the side of the trigger housing. Rotate the front of the leaf spring up and engage it with the trigger housing pin.

15. Replacing the Operating Group

a. Insert the end of the operating rod into the receiver. Hold the rod with one hand. With the other hand, push forward on the rear of the bolt, causing the bolt to rotate until the locking lugs are in a vertical position (fig. 12).

b. With the cam roller up, push the operating rod and bolt into the receiver until the end of the operating rod is even with the rear of the receiver (fig. 13).

c. Insert the drive spring guide into the drive spring, then insert the opposite end of the drive spring in the recess of the operating rod (fig. 13). Pull the trigger, and push in the drive spring until the head of the guide is approximately an inch from the receiver (fig. 6).

16. Replacing the Buffer Group

a. Insert the buffer plunger into the drive spring guide (fig. 6). Push forward on the buffer until the operating rod and bolt go fully forward.

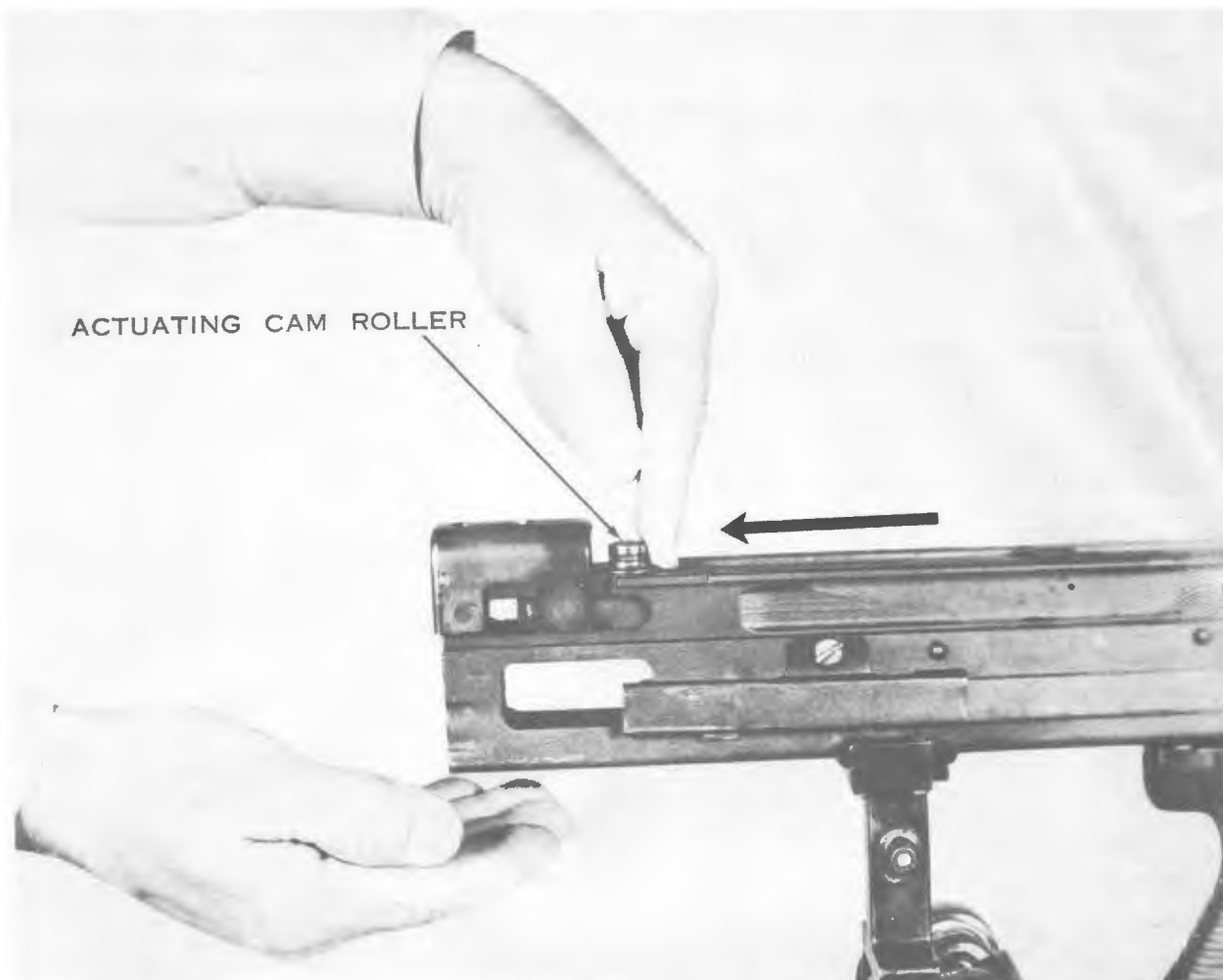


Figure 7. Moving the operating group to the rear of the receiver.

b. Push in on the buffer until the recesses on the buffer are aligned with the recesses in the receiver. Replace the buffer yoke from the top of the receiver (fig. 5).

17. Replacing the Stock Group

Aline the guide rails of the stock with the guide rails on the receiver. Push forward until

the stock is fully seated. A distinct click will be heard when the latch engages.

18. Correct Assembly

To check for correct assembly, pull the cocking handle to the rear and return it to its forward position. Close the cover and pull the trigger. The bolt should go forward.

Section IV. DETAILED DISASSEMBLY AND ASSEMBLY

19. General

Detailed disassembly of the operating group, trigger housing group, barrel group, and re-

ceiver group is authorized at the unit level. Detailed disassembly of the stock group and the buffer group is not authorized.

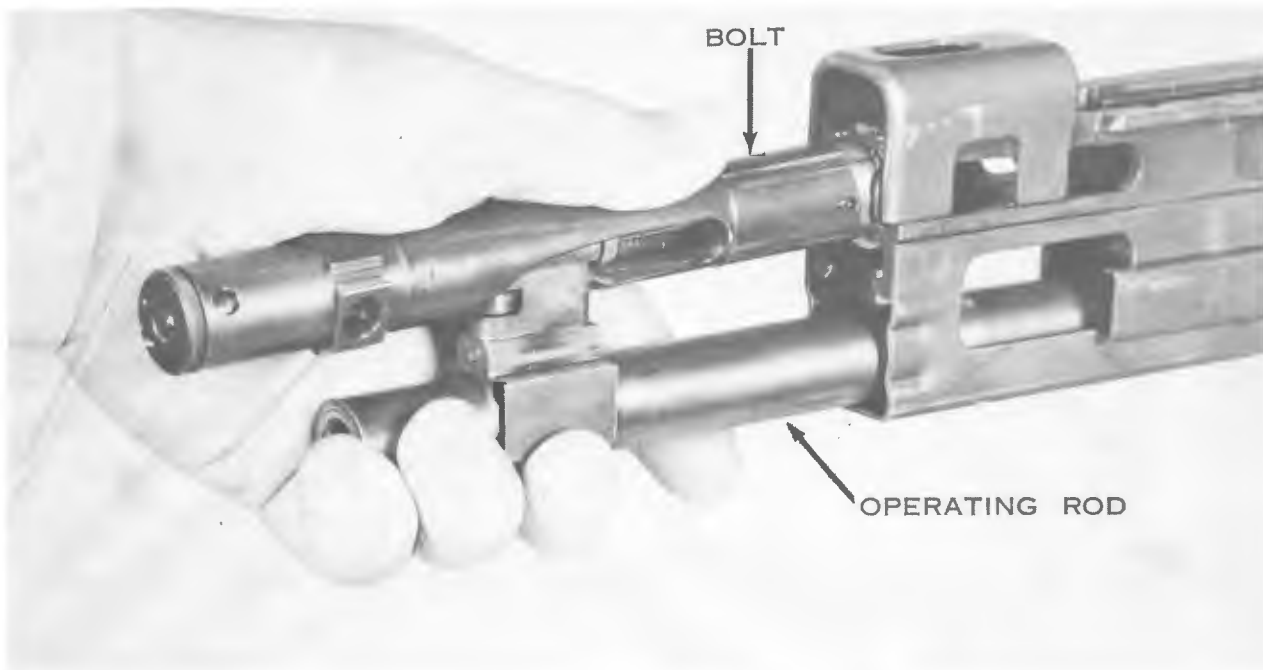


Figure 8. Withdrawing the operating group from the receiver.



Figure 9. Removing the leaf spring.

20. Disassembly of the Operating Group

a. Grasp the bolt in one hand with the bolt face toward the body, operating rod on top, grasp the operating rod securely in the other hand. Push forward on the operating rod, pivot the front of the operating rod up, and disengage it from the bolt (fig. 14).

b. Rotate the cam roller assembly on the bolt until the holes are aligned with the bolt plug pin. Use the pointed end of the drive spring guide to remove the bolt plug pin (fig. 15). Unscrew and remove the bolt plug.

c. Remove the cam roller assembly by pulling it from the rear of the bolt (fig. 16).

d. Remove the firing pin spring, firing pin bearing, and firing pin from the bolt body (fig. 16).

e. The extractor and ejector on the face of

the bolt are removed by an ordnance qualified armorer only (fig. 17).

21. Assembly of the Operating Group

a. Hold the bolt body in the palm of the hand, bolt face down, and insert the striker end of the firing pin into the rear of the bolt body. Prevent the firing pin from moving fully forward by holding the rear firing pin spool in the bolt camming slot with the thumb (fig. 18).

b. Insert the firing pin bearing into the bolt body, with the partially closed end first.

c. Position the firing pin spring within the firing pin bearing. Remove the thumb from the bolt camming slot and allow the parts to fully enter the bolt body.

d. Place the cam roller assembly over the rear of the bolt with the cam roller toward the front of the bolt.



Figure 10. Removing the trigger housing group.

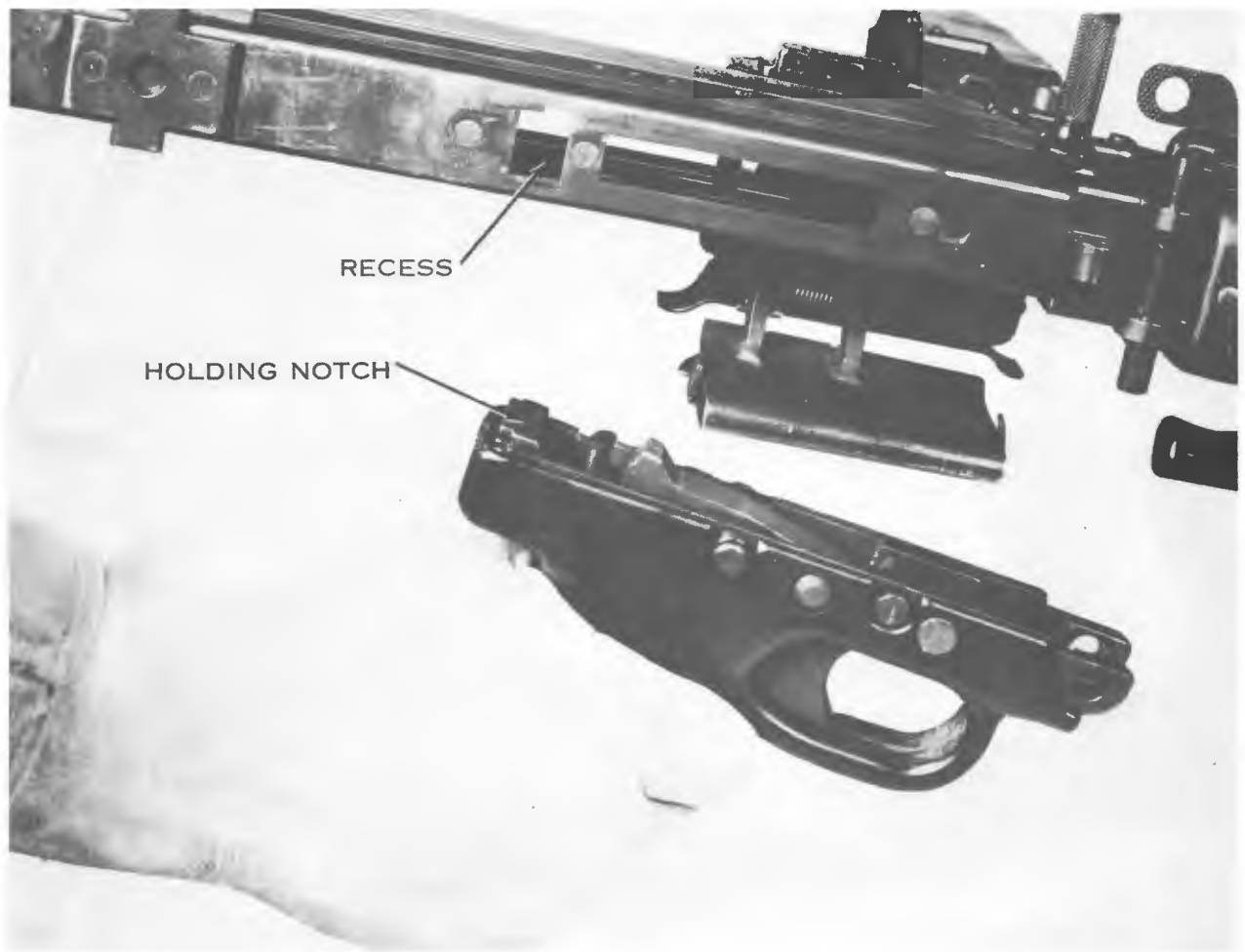


Figure 10—Continued.

e. Screw the bolt plug finger tight into the bolt body. Rotate the cam roller assembly until the holes are aligned with the holes in the bolt body. Unscrew the bolt plug until the holes align with the holes in the cam roller assembly and the bolt body. Insert the bolt plug pin so that it is within the cam roller assembly (fig. 15). The assembly should rotate freely around the bolt.

f. With the camming slot up, hold the bolt securely in one hand with the face of the bolt toward the body. With the other hand position the rear of the operating rod yoke against the rear firing pin spool (fig. 19). Push on the operating rod, compressing the firing pin spring, and position the operating rod yoke between the firing pin spools.

22. Disassembly of the Trigger Housing Assembly

- a. Depress the sear and remove the sear pin by pushing the pin to the left (fig. 20).
- b. Remove the sear from the top of the trigger housing.
- c. Remove the sear plunger and sear plunger spring (fig. 21).
- d. Remove the trigger pin by pushing it to the right (fig. 22).
- e. Remove the trigger through the top of the trigger housing (fig. 23).

23. Assembly of the Trigger Housing Assembly

- a. Position the trigger, with the trigger

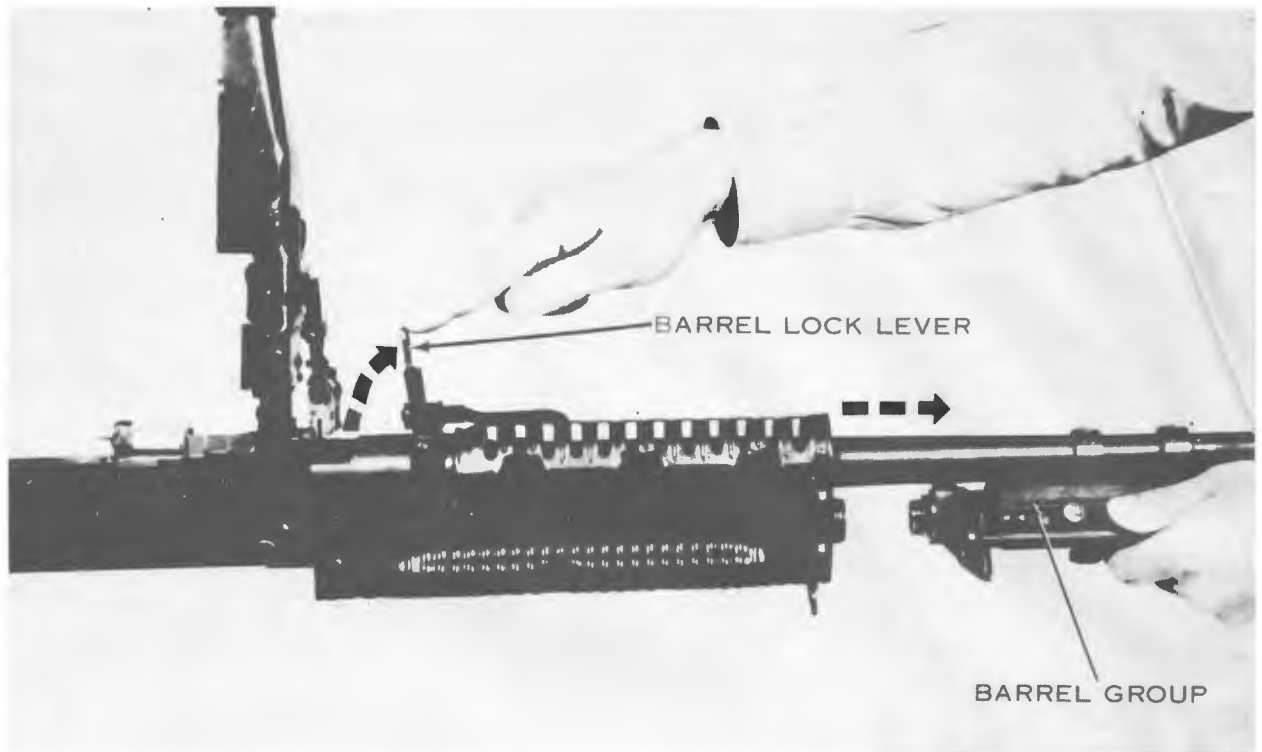


Figure 11. Removing the barrel group.

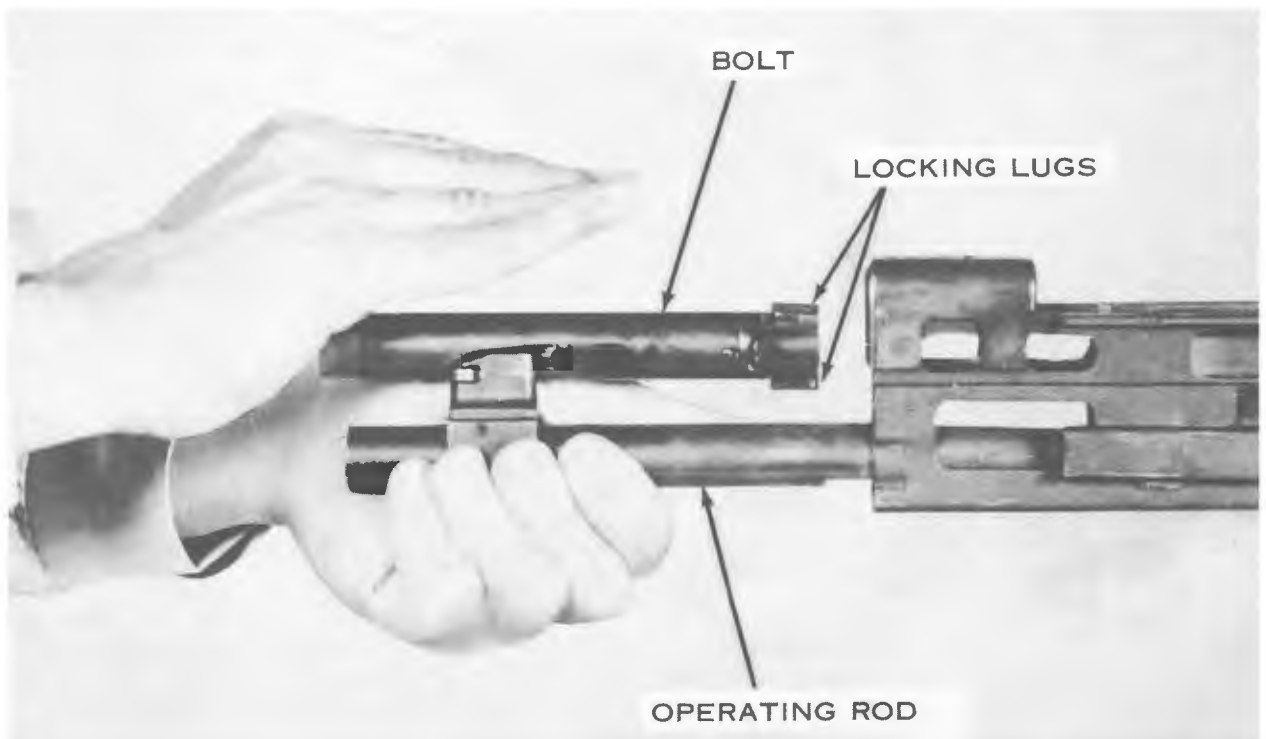


Figure 12. Inserting the operating group in the receiver.

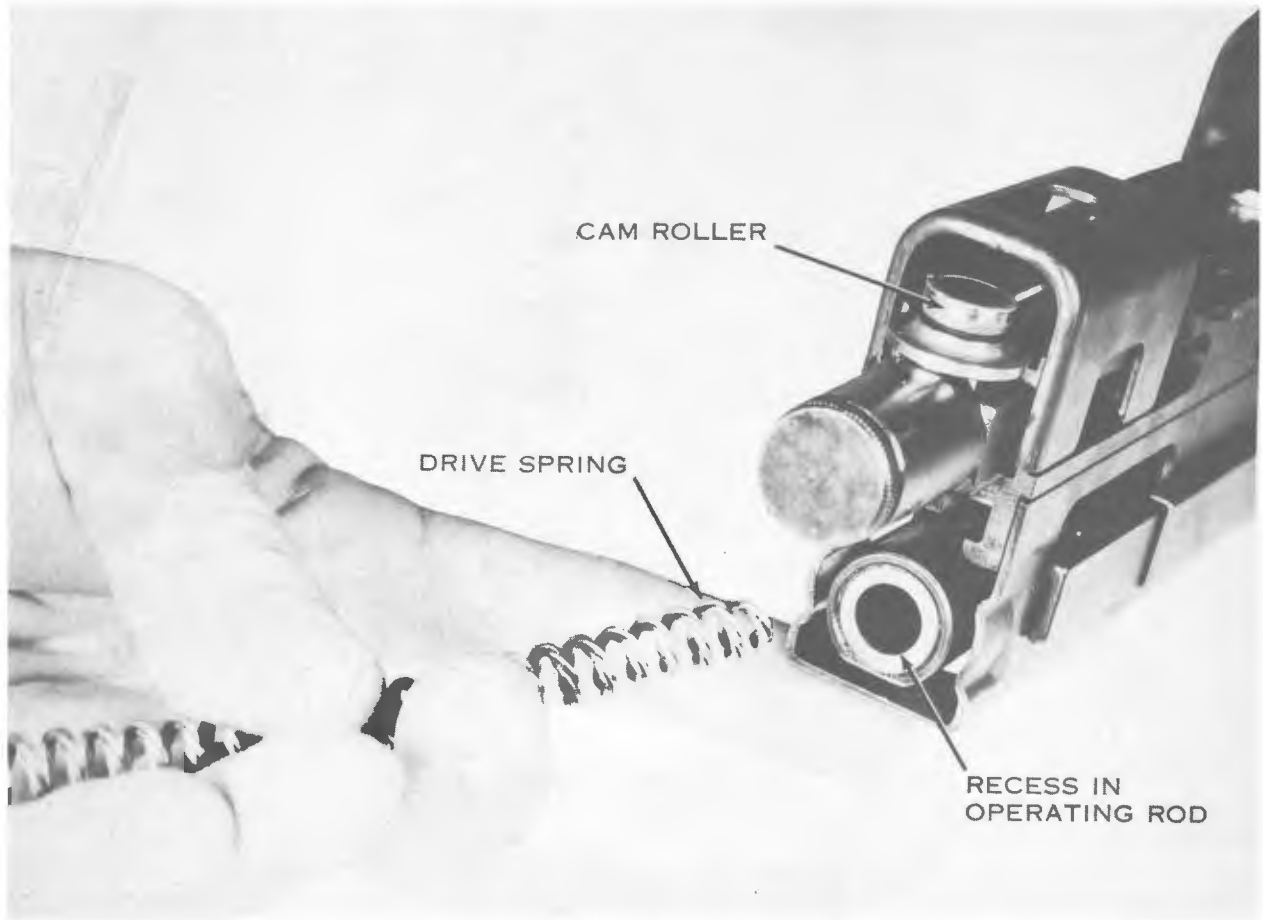


Figure 13. Inserting the drive spring.

spring to the rear, through the top of the trigger housing so the spring is under the channel surface (fig. 24). Align the hole in the trigger with the holes in the housing and replace the trigger pin from the right (fig. 22). Replace the sear plunger spring and sear plunger in their well in the trigger housing (fig. 21).

b. Position the sear with the shoulder up and to the rear (fig. 20). Press down on the sear and replace the sear pin from the left (fig. 20).

24. Disassembly of the Barrel Group

To disassemble the barrel group place the bipod legs in the down position (fig. 25). Use the combination wrench to unscrew and remove the cylinder nut (fig. 25). Allow the gas piston to slide out the rear of the cylinder. Unscrew and remove the gas port plug. Unscrew and remove the gas cylinder extension. This completes the disassembly of the barrel group.

25. Assembly of the Barrel Group

Assemble the barrel group in reverse order. Insure that the gas piston is inserted into the gas cylinder with the gas escape holes and the closed end to the rear.

26. Disassembly of the Receiver Group

a. To remove the cocking handle—

- (1) Unscrew and remove the cocking handle guide screw and lock washer (fig. 26).
- (2) Remove the cocking handle guide by rotating it downward and away from the receiver.
- (3) Pull the cocking handle to the rear and remove it from the guide slot.

b. To remove the forearm assembly, close the cover and turn the receiver group so the cover is down. Insert the nose of a cartridge into the latch hole at the bottom rear of the forearm

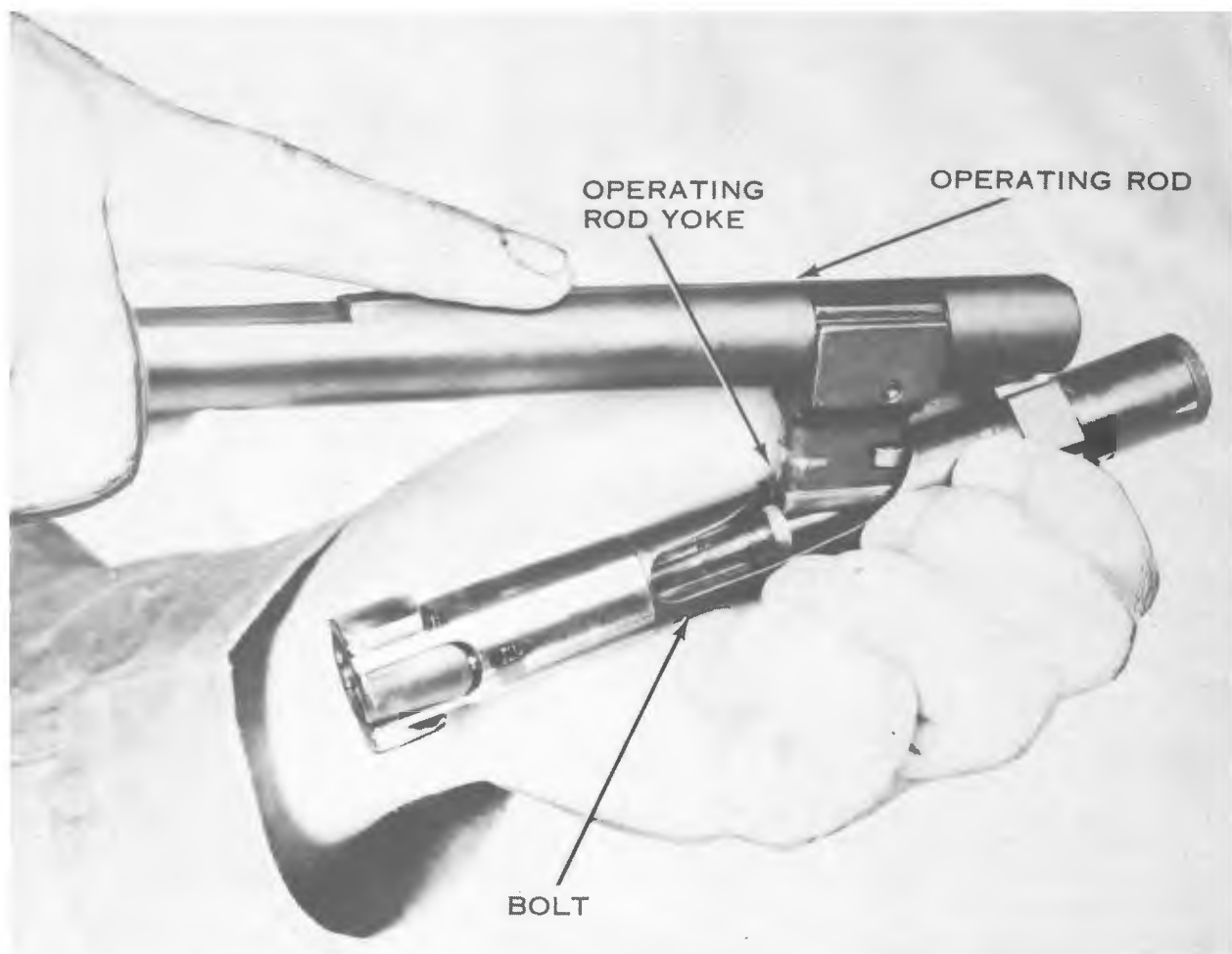


Figure 14. Removing the bolt.

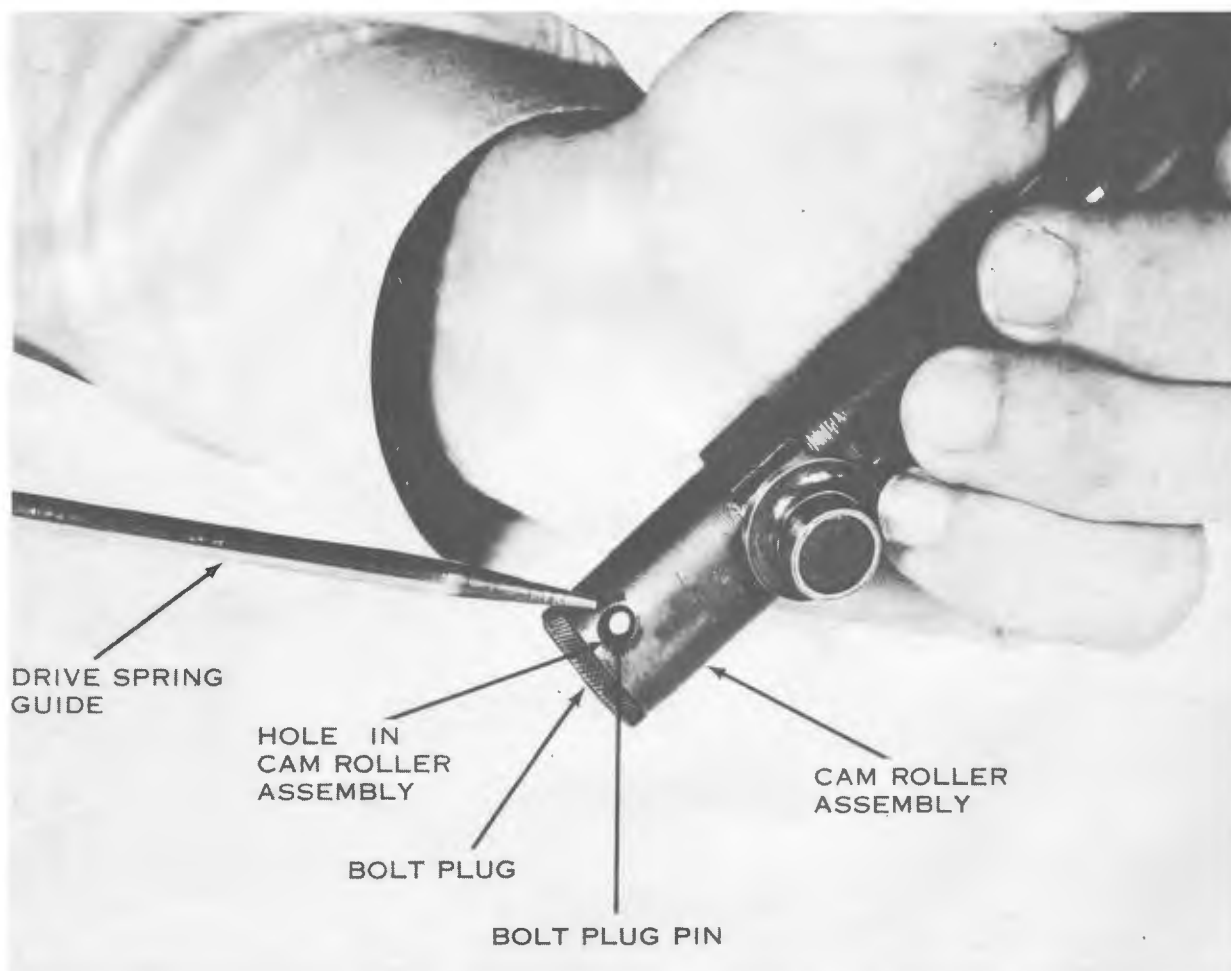


Figure 15. Removing the bolt plug pin.

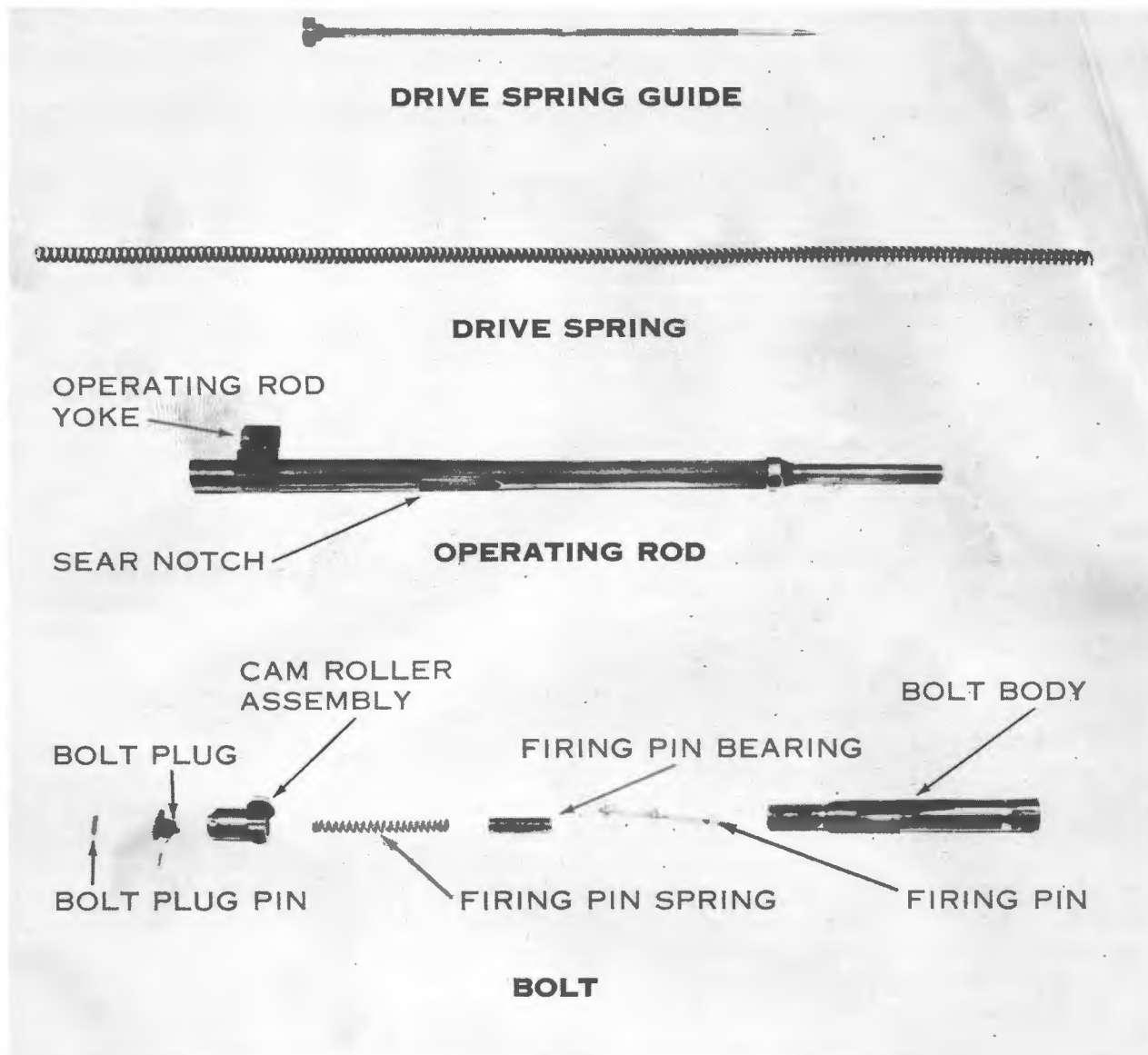


Figure 16. Disassembled operating group.

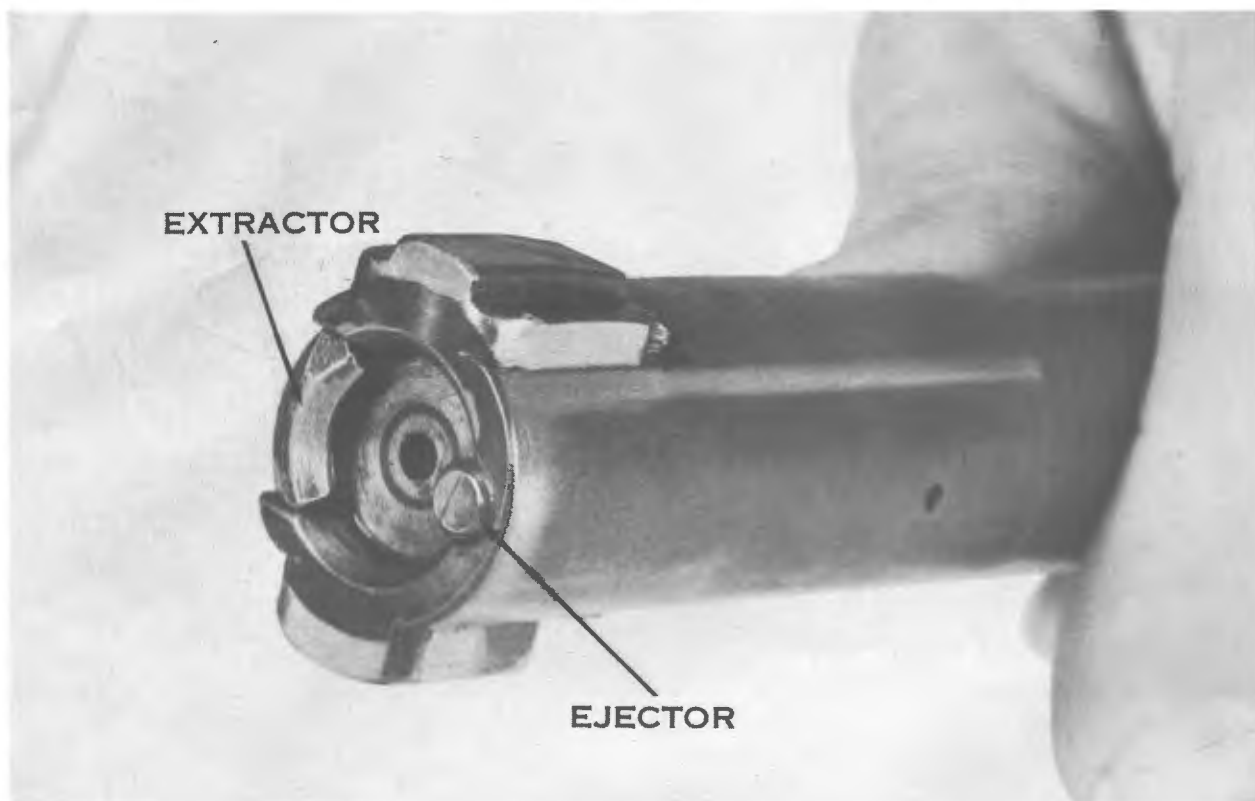


Figure 17. The face of the bolt.

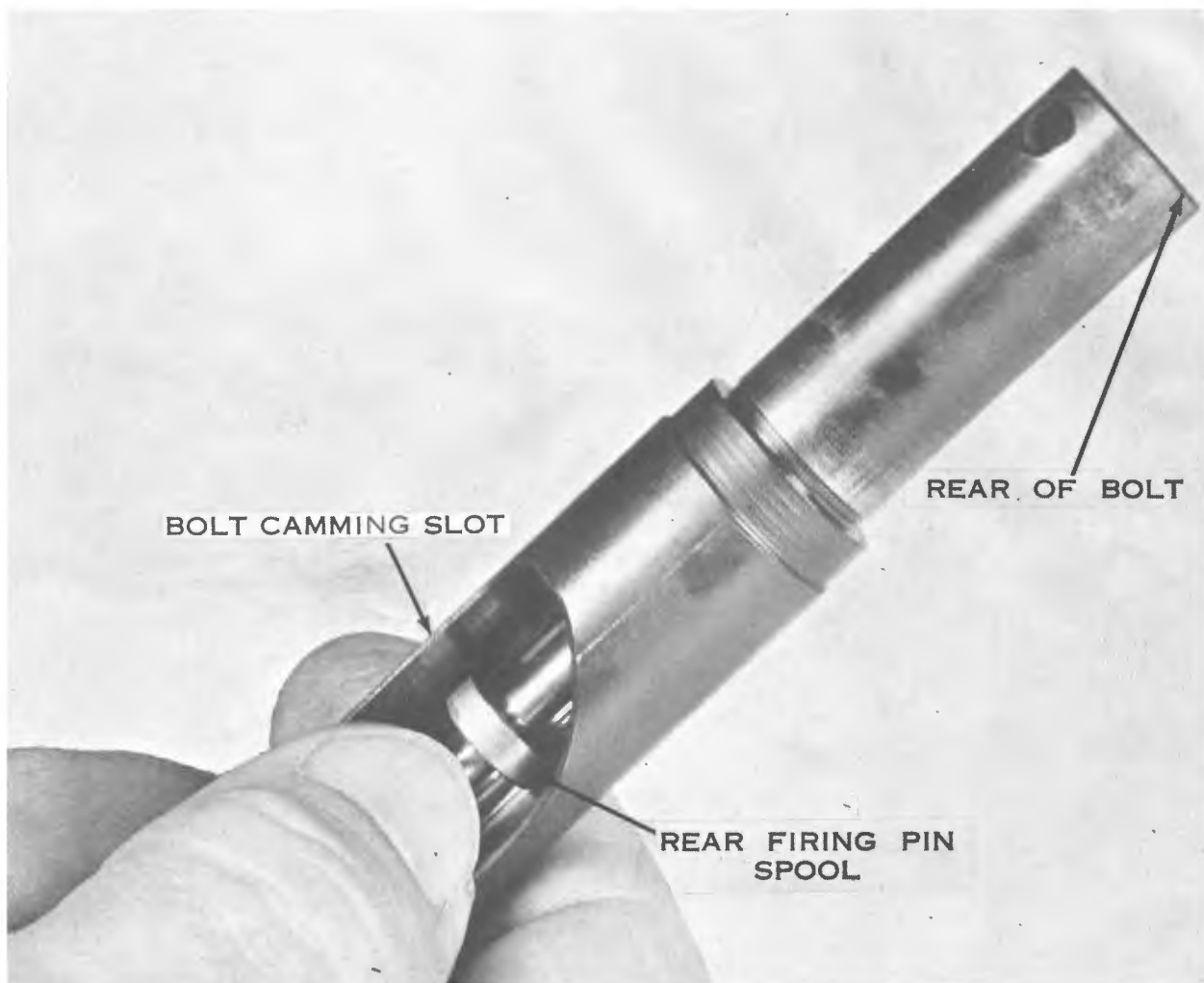


Figure 18. Assembly of the bolt.

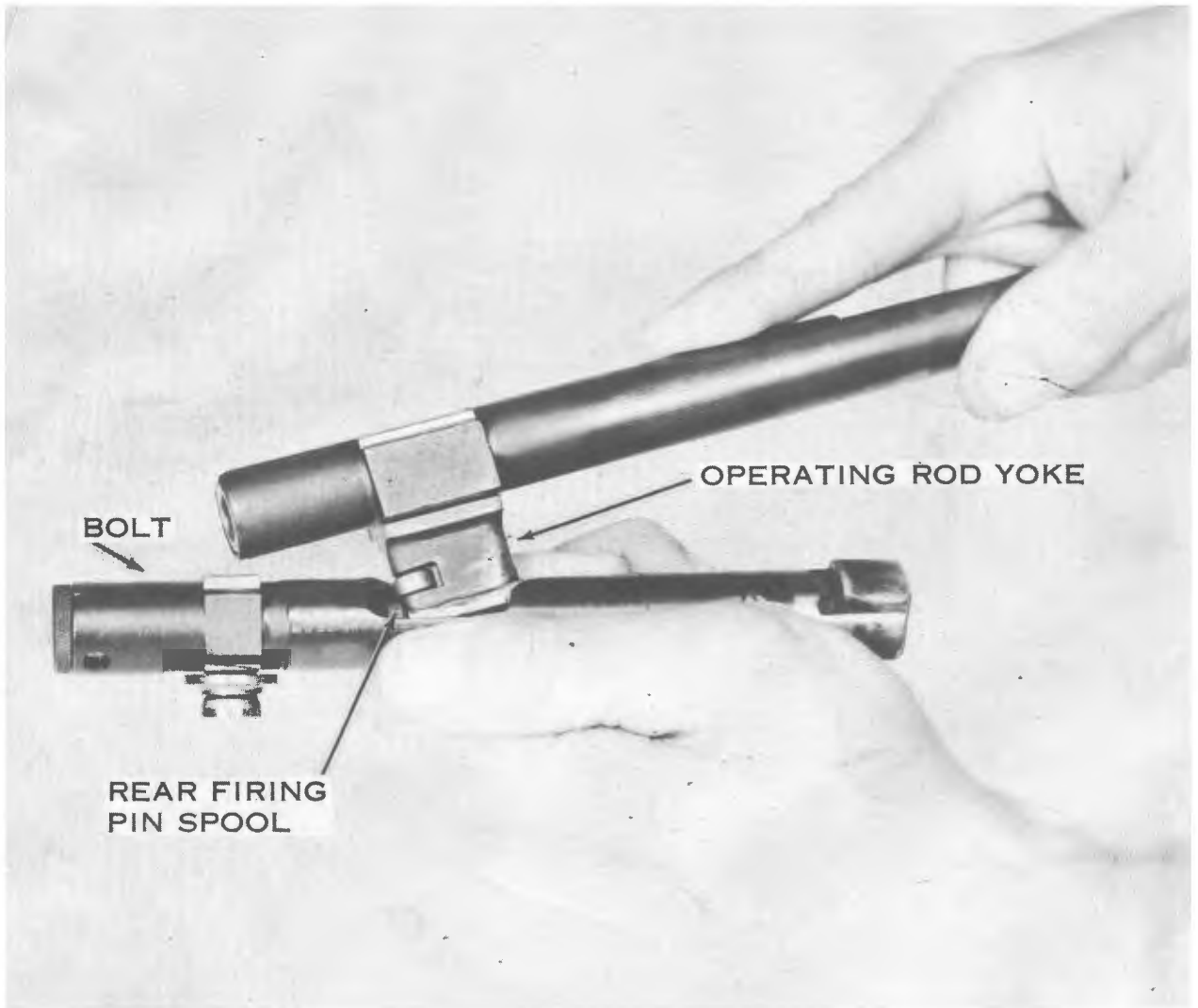


Figure 19. Assembly of the bolt to the operating rod.



Figure 20. Removing the sear pin.

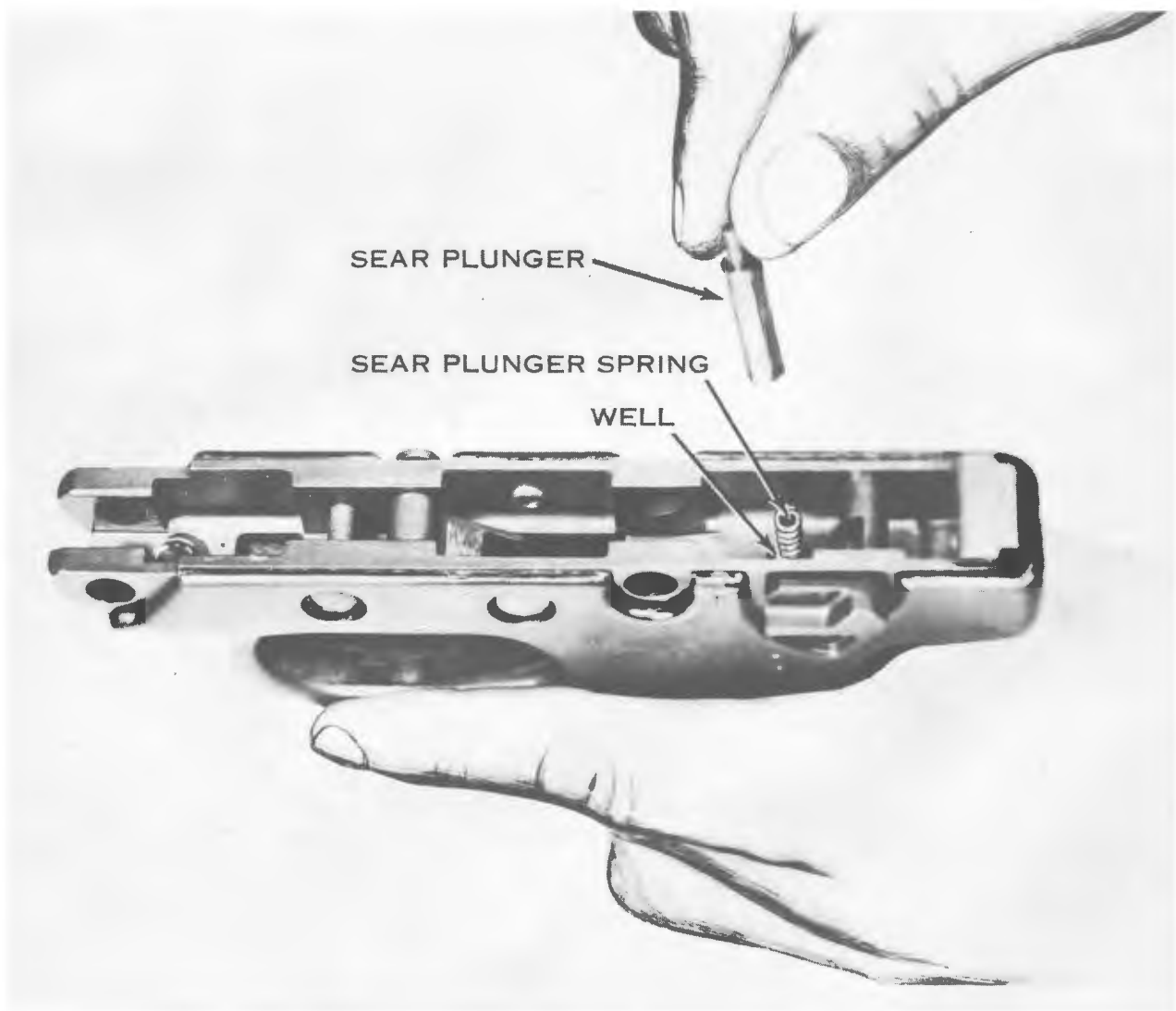


Figure 21. Removing the sear plunger.

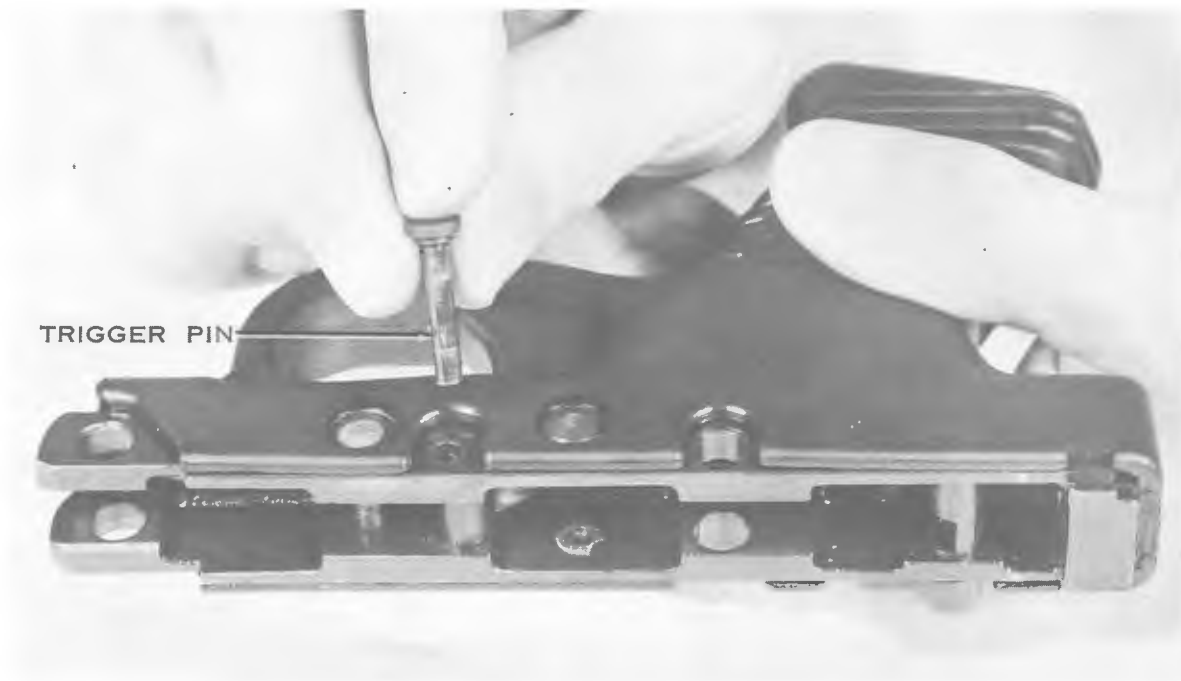


Figure 22. Removing the trigger pin.

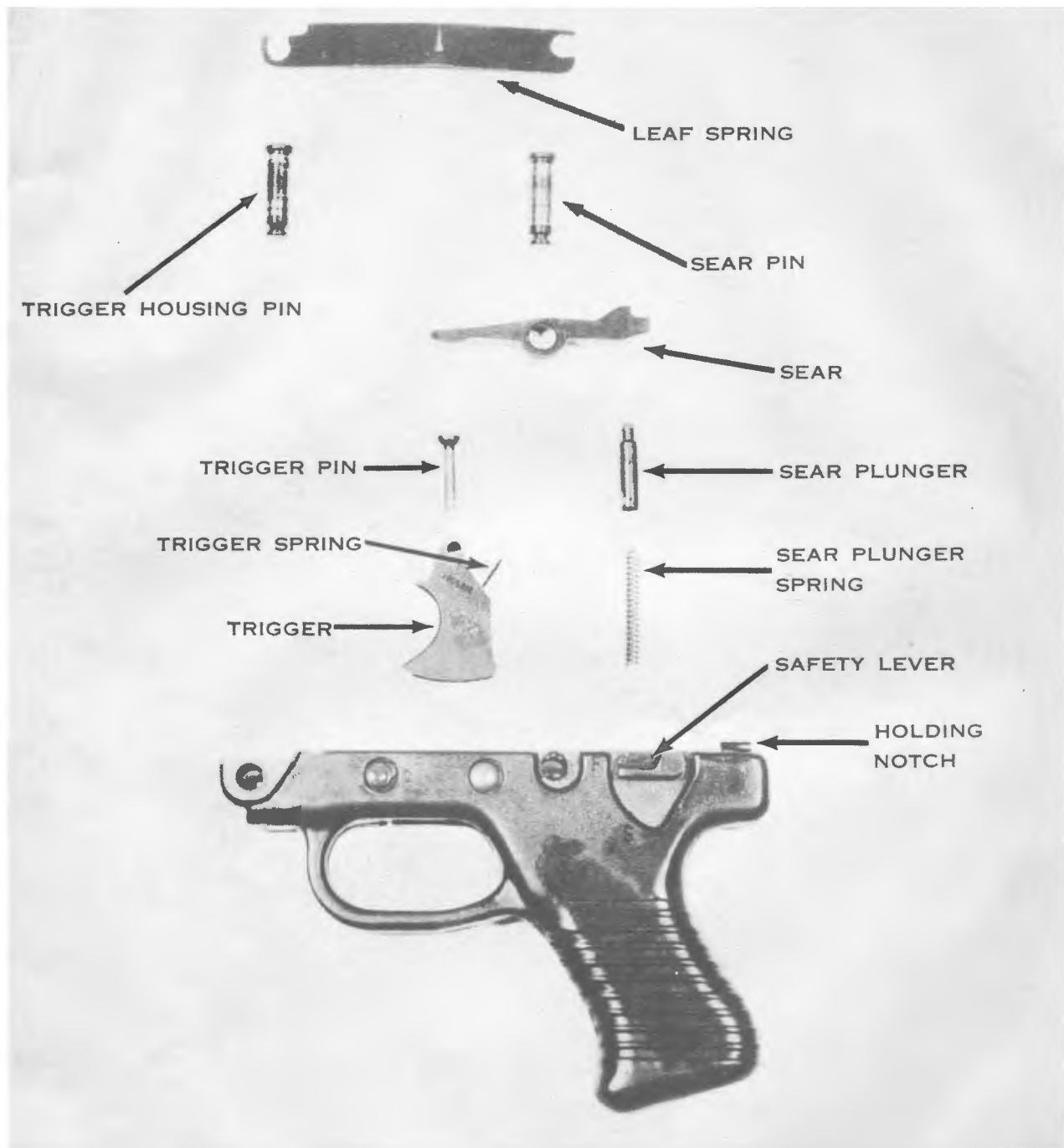


Figure 23. Trigger housing group disassembled.

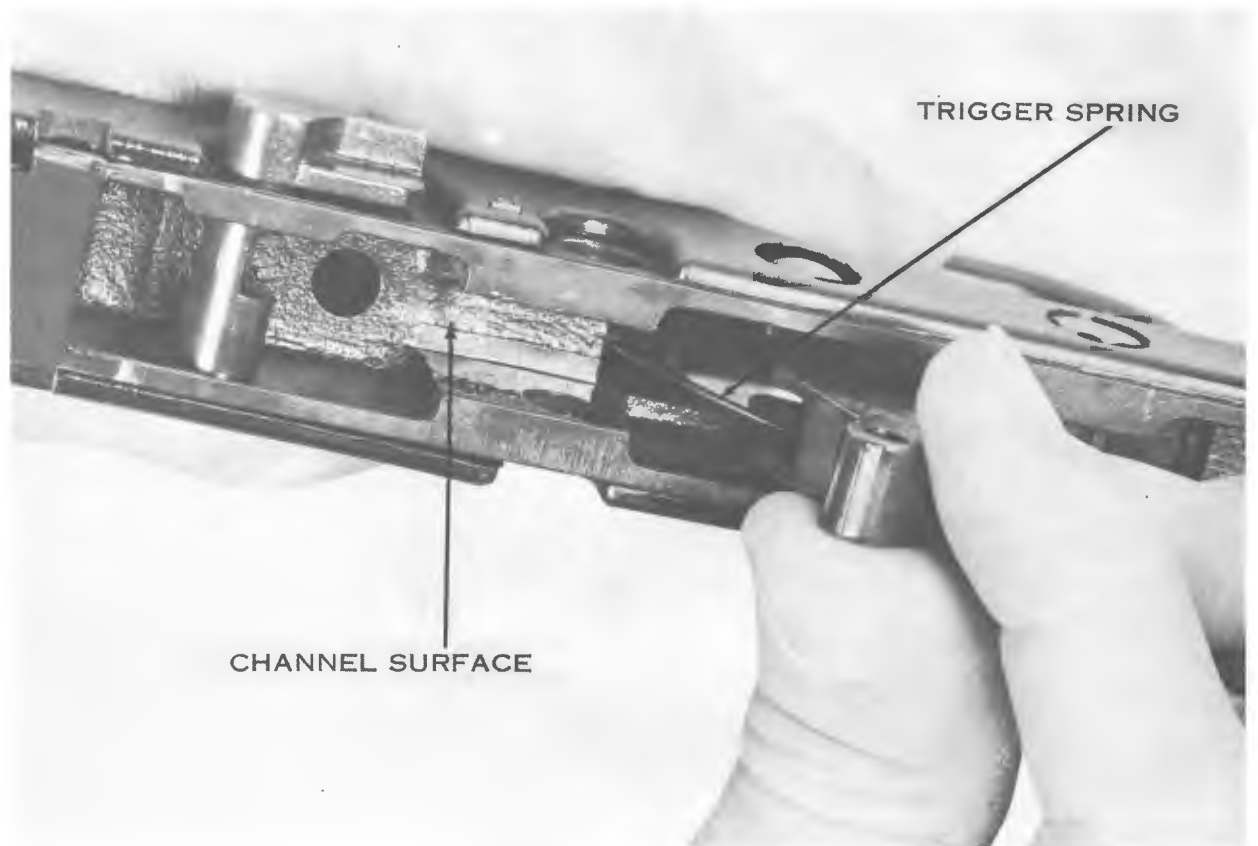


Figure 24. Inserting the trigger.

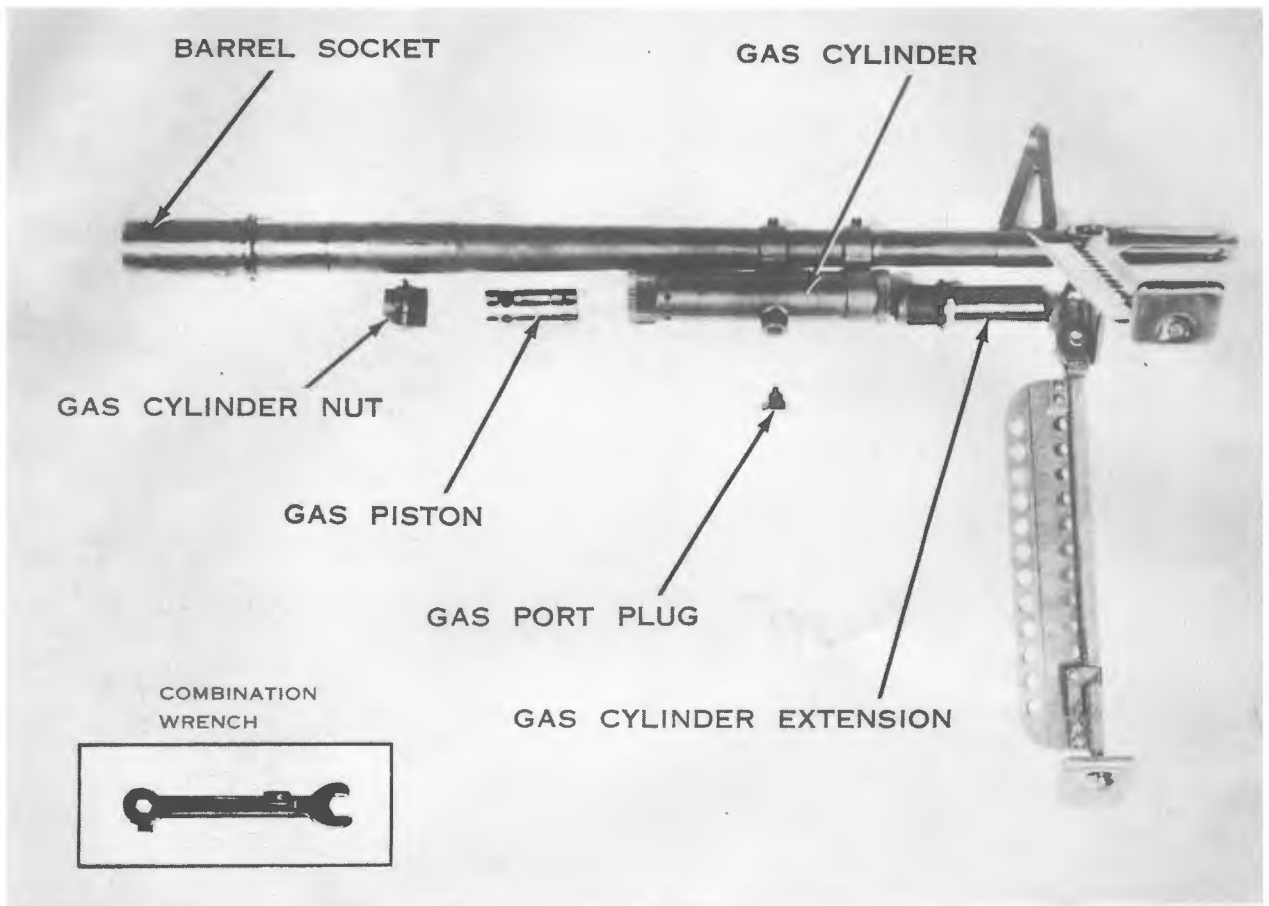


Figure 25. Disassembled barrel group.

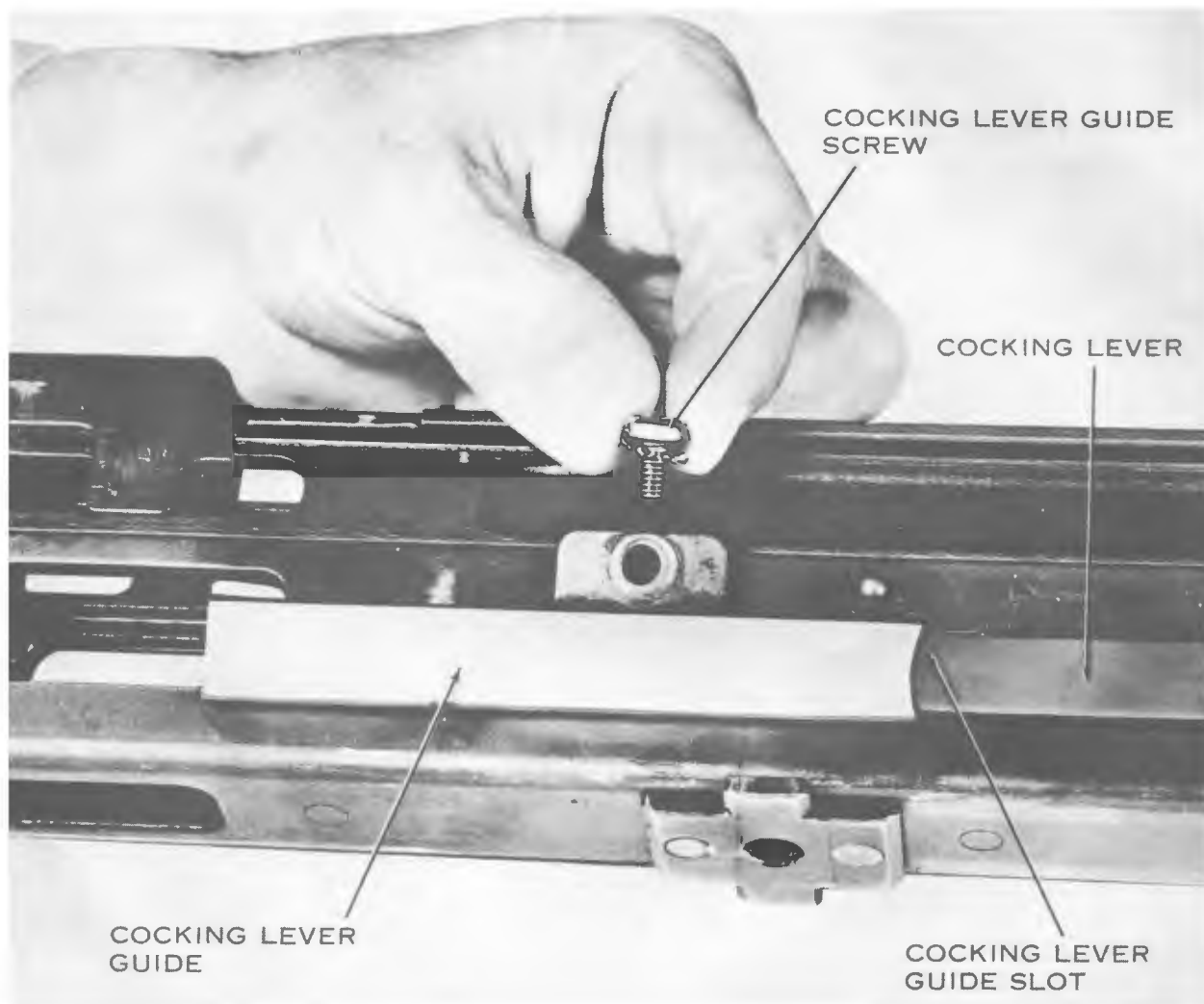


Figure 26. Right side of the receiver.

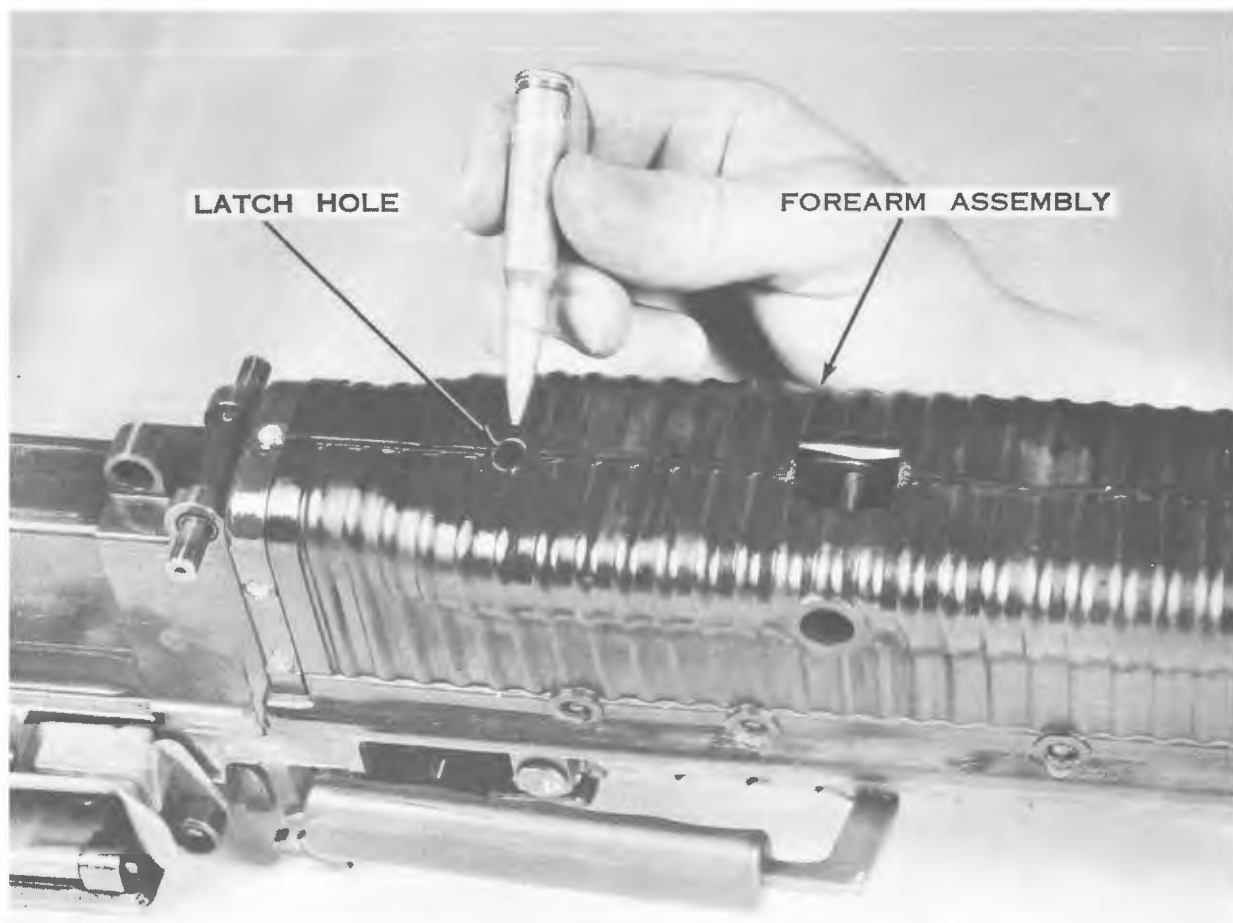


Figure 27. Removing the forearm assembly.

assembly (fig. 27). Press down on the cartridge, releasing the forearm latch, raise the rear of the forearm assembly slightly, and remove it to the front.

c. To remove the cover assembly—

- (1) Take a cartridge and push the hinge pin latch out of its recess (fig. 28).
- (2) Remove the hinge pin by pulling it from the opposite side of the recess (fig. 28).
- (3) Lift the cover from the receiver.

d. When the cover has been removed, raise the feedtray from the receiver and remove it (fig. 29).

27. Assembly of the Receiver Group

a. To replace the feedtray, align the feedtray guides to the left of the receiver mounting brackets and replace it (fig. 29).

b. To replace the cover—

- (1) Insert the cover spring in the well in the receiver and align the cover in the mounting bracket (fig. 29).
- (2) Insert the hinge pin from one side and the hinge pin latch from the opposite side (fig. 28).

c. To replace the forearm assembly—

- (1) Guide the forearm assembly over the operating rod tube, insuring that the operating rod tube does not strike the baffles inside the assembly. Align the recess in the forearm assembly with the end of the operating rod tube.
- (2) Tap up on the bottom rear of the forearm assembly firmly with the palm of the hand to lock it into position.

d. To replace the cocking handle—

- (1) Position the cocking handle in the

square opening at the rear of the cocking handle guide slot and push it forward (fig. 26).

- (2) Position the cocking handle guide over the cocking handle by inserting the bottom tabs in the slots in the receiver

then properly align the screw holes and rotate it upward into position (fig. 26).

- (3) Replace the lockwasher and screw.

e. The disassembled receiver group is shown in figure 30.

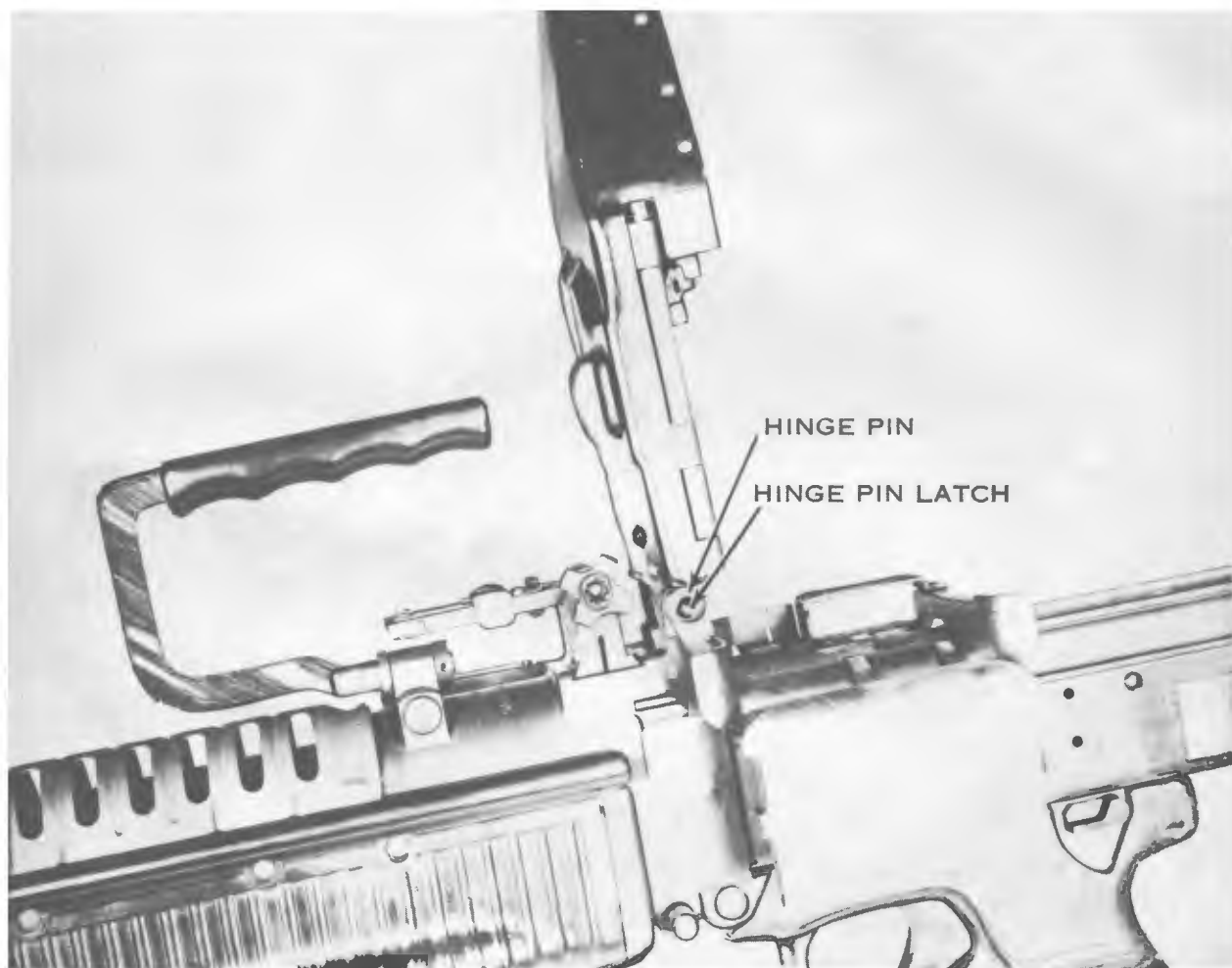


Figure 28. Hinge pin and latch.



Figure 29. Removing the feedtray.

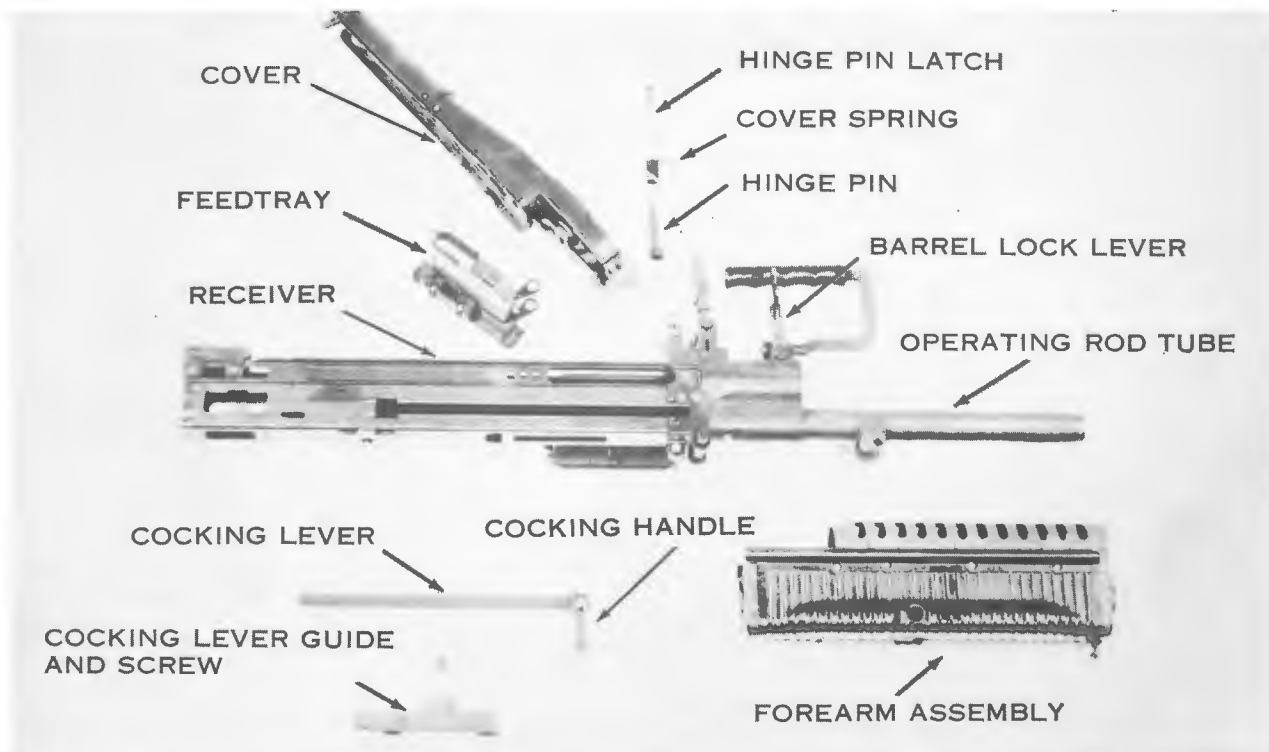


Figure 30. Disassembled receiver group.

CHAPTER 3 MOUNTS

Section I. BIPOD MOUNT

28. General

The bipod mount is an integral part of the barrel group. It is not removed at unit level. The bipod yoke fits around the barrel and is held in position by the flash suppressor (fig. 31).

29. Lowering, Adjusting, and Raising the Bipod Legs

a. Lowering. To lower a bipod leg, pull it

to the rear (compressing the lock spring) and push it downward (fig. 32). The leg automatically locks when in the down position.

b. Adjusting. To lengthen a bipod leg, pull down on the foot (fig. 33). The bipod leg plunger engages a notch in the bipod leg extension and holds it in the desired position. To shorten the bipod leg, depress the bipod leg plunger and push up on the bipod foot (fig. 33).

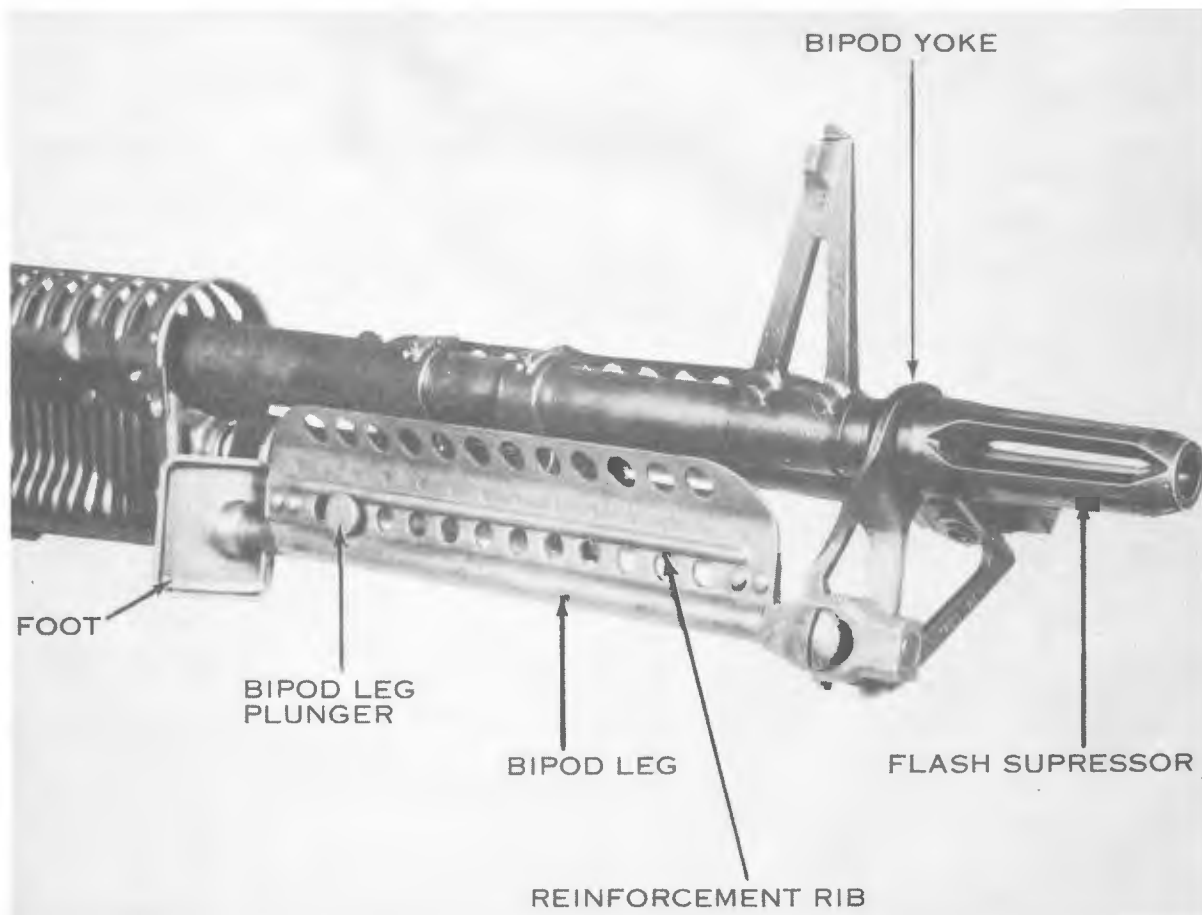


Figure 31. Bipod assembly.

c. *Raising.* To position the bipod leg in the up position, pull down on the bipod leg (com-

pressing the lock spring) and raise it until it locks into position alongside the barrel.

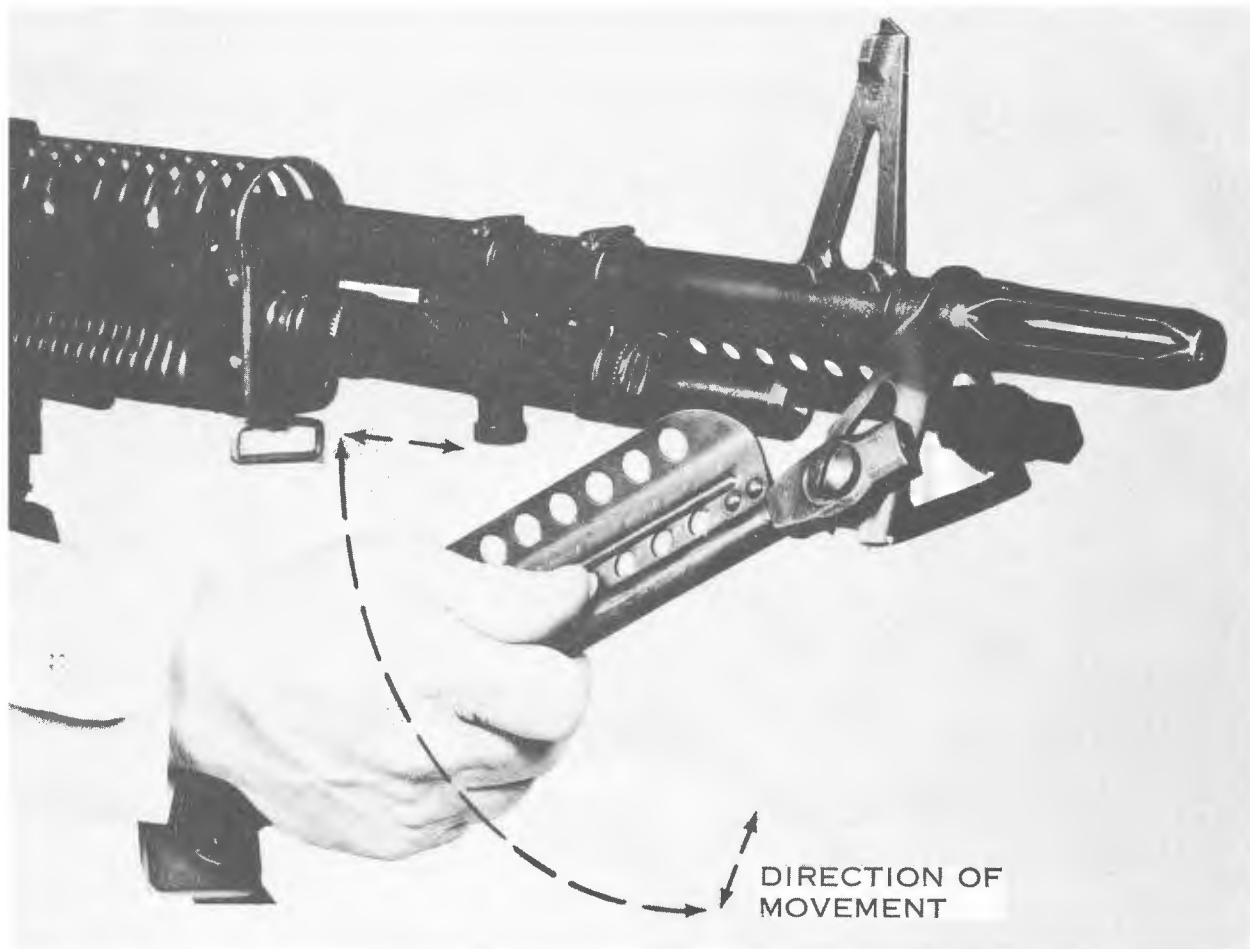


Figure 32. Lowering the bipod leg.

Section II. TRIPOD MOUNT M122

30. Description

The M122 tripod mount consists of the tripod assembly, the traversing and elevating mechanism, and the pintle and platform group.

a. The *tripod assembly* consists of the tripod head with the pintle bushing and the pintle lock, one front and two rear legs, and a traversing bar (fig. 34). The traversing bar connects the two rear legs and supports the traversing and elevating mechanism. Engraved on the bar is a scale which is divided into 100-mil major divisions and 5-mil subdivisions, 450 mils to the left and 425-430 mils to the right of center. A sliding

sleeve connects the traversing bar and a rear leg to permit folding the legs. Position stops are provided to stop the traversing bar in the open or closed position. The sleeve latch on the right rear leg secures the traversing bar when in the open position (fig. 34).

b. The *traversing and elevating mechanism* (fig. 35) consists of—

- (1) The elevation adapter which connects to the mounting plate on the bottom of the receiver.
- (2) The traversing handwheel which has a mil click device built into it. One click

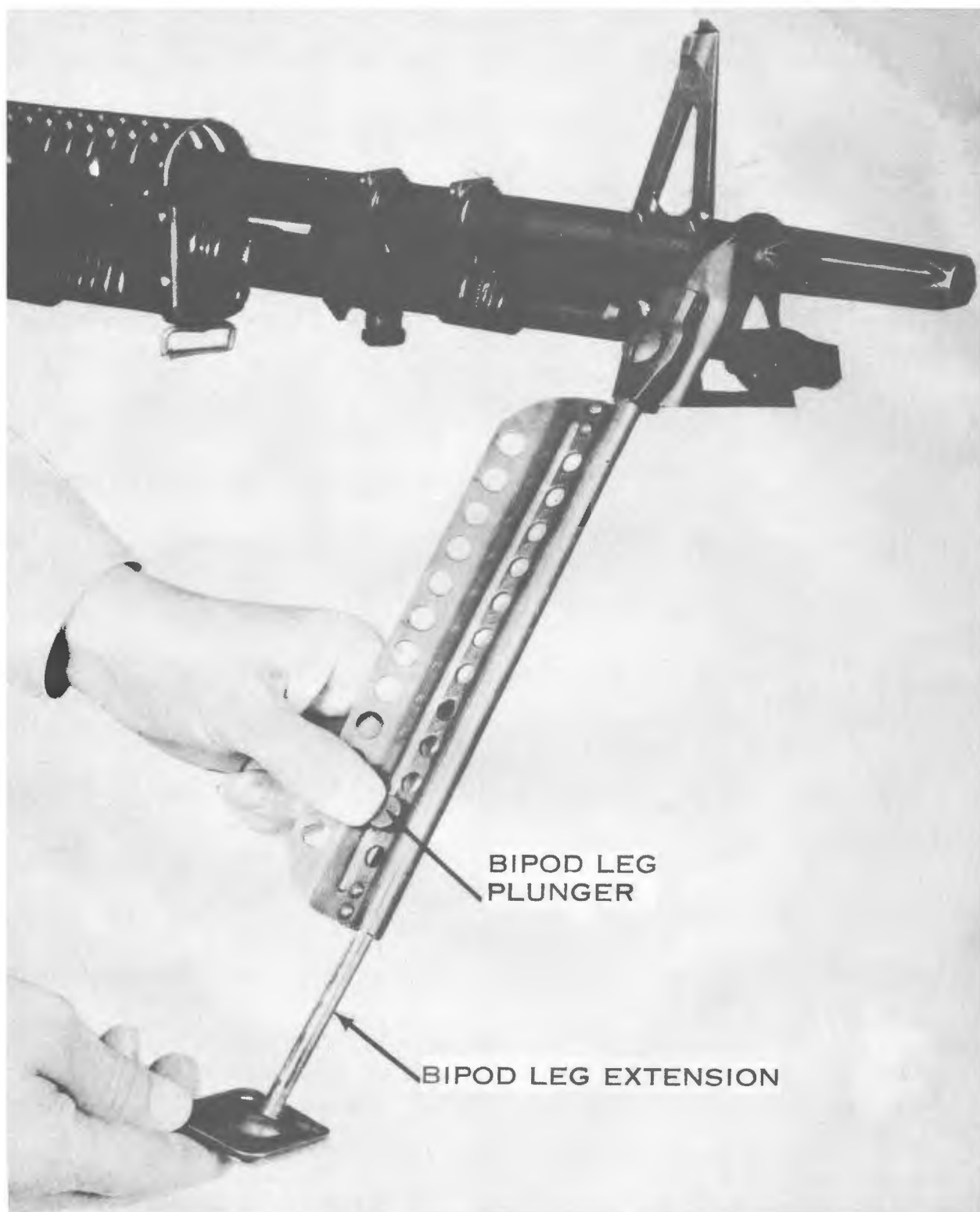


Figure 33. Adjusting bipod leg extension.

equals a 1-mil change. Engraved on the traversing handwheel is a scale which is divided in 1-mil increments for a total of 25 mils. By using the traversing mechanism the gun can be traversed approximately 100 mils (50 mils right and left of center).

- (3) The elevating handwheel, and the upper and lower elevating screw. The elevating handwheel has a mil-click device built into it. One click equals a 1-mil change. Engraved on the handwheel is a scale which is divided into 5-mil major divisions and 1-mil subdivisions. The scale is read directly

from the indicator. The upper elevating screw has the elevating screw plate which is graduated into 50-mil increments. There are 200 mils above and 200 mils below the zero mark for a total of 400 mils in elevation change.

- (4) The traversing slide lock with the traversing slide lock lever. These allow rapid lateral adjustments along the traversing bar. Readings are taken from the left side of the slide.

c. The pintle and platform group (fig. 35) consists of the gun platform to which the gun is attached and the pintle which is secured to the tripod assembly.

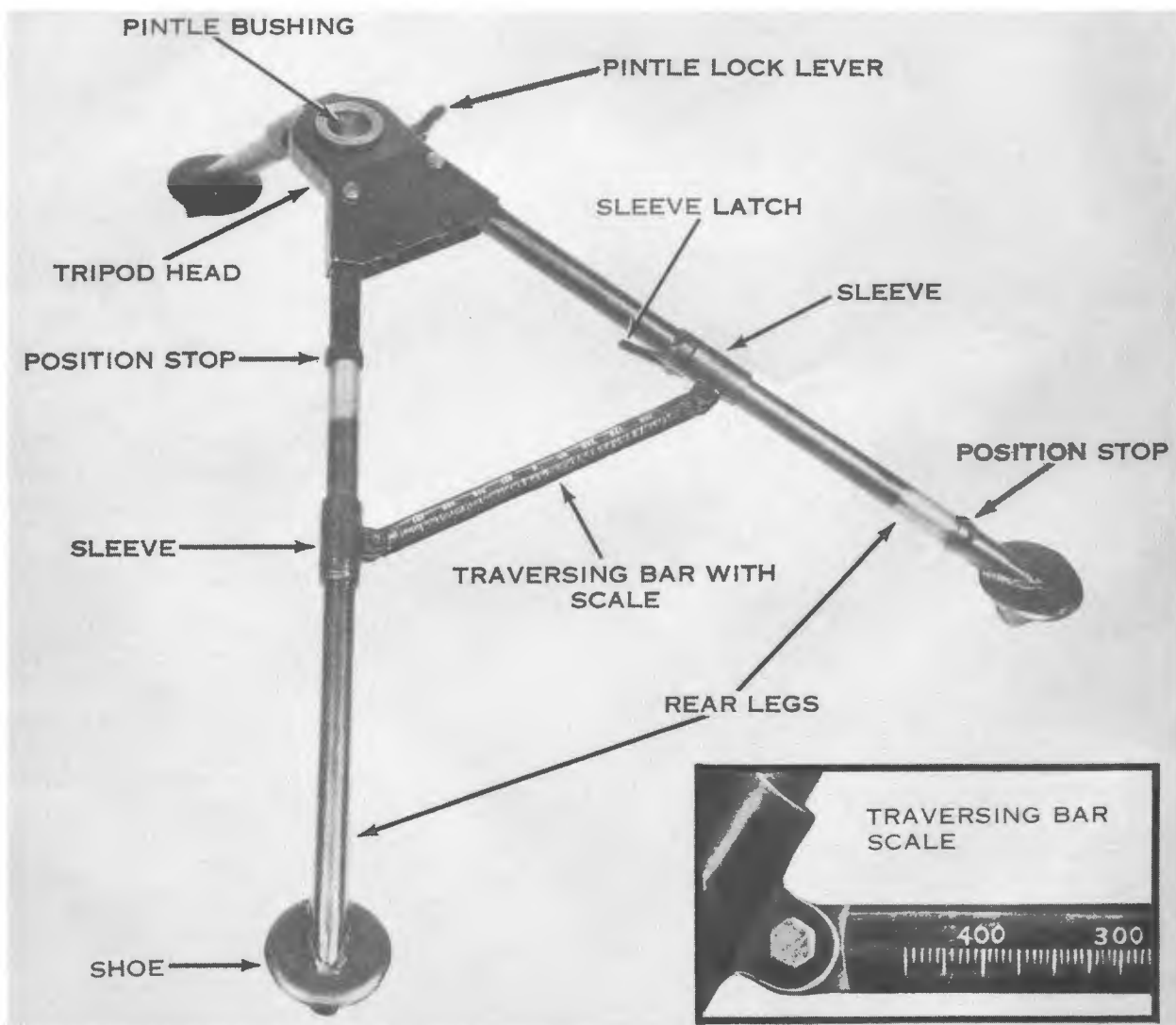


Figure 34. M122 tripod assembly.

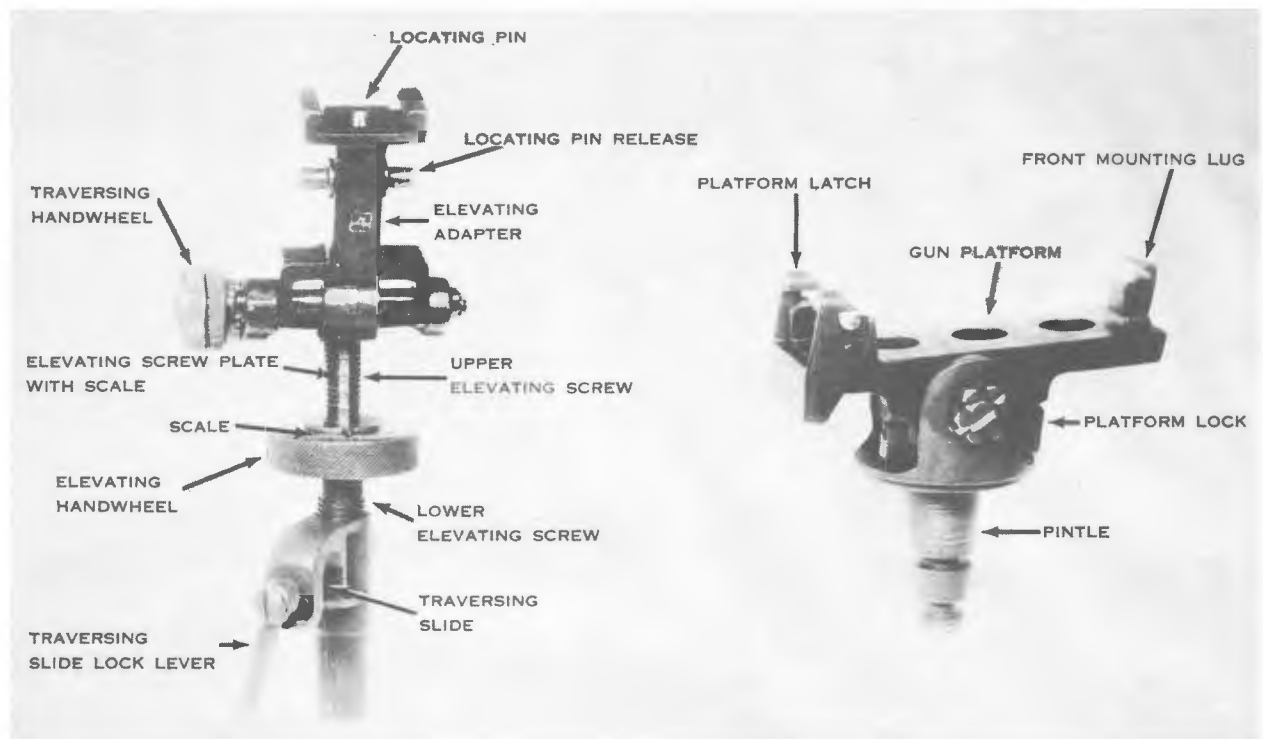


Figure 35. Traversing and elevating mechanism, pintle and platform group.

31. Mounting the Gun

- a. To mount the gun—
 - (1) Lock the pintle and platform group into the pintle bushing (fig. 36).
 - (2) Position the front locating pin (in the forearm assembly) in the front mounting lug.
 - (3) Lower the receiver so the rear locating pin snaps under the platform latch.
- b. Attaching the traversing and elevating mechanism—
 - (1) With the gun mounted on the tripod, release the platform lock and raise the rear of the gun.
 - (2) Place the mounting plate recess on the rear of the mounting plate and push it forward (fig. 37). The adapter pin automatically locks into position in the bottom of the mounting plate.
 - (3) Lower the rear of the gun, place the

traversing slide (with the traversing slide lock lever to the rear) on the traversing bar and lock it into position.

32. Removing the Gun From the Mount

- a. To remove the traversing and elevating mechanism, release the traversing slide lock lever and raise the rear of the gun. Pull down on the adapter pin release and pull the mechanism straight back, off the mounting plate (fig. 38).
- b. Return the platform lock to the down position. Stand to the left of the gun and grasp the carrying handle with the left hand. With the right hand depress the platform latch and raise the rear of the gun slightly, thus removing the rear locating pin from under the platform latch. Place the right hand on the top of the stock, pull the gun slightly to the rear, push down on the stock, and lift the gun from the mount.

Section III. VEHICULAR MOUNTS

33. General

The standard vehicular mount for firing the M60 machinegun is the M4 pedestal mount for

the M151 1/4-ton truck (fig. 39). One component of this mount, the M142 gun mount which serves as a cradle for the M60 machinegun, is adaptable

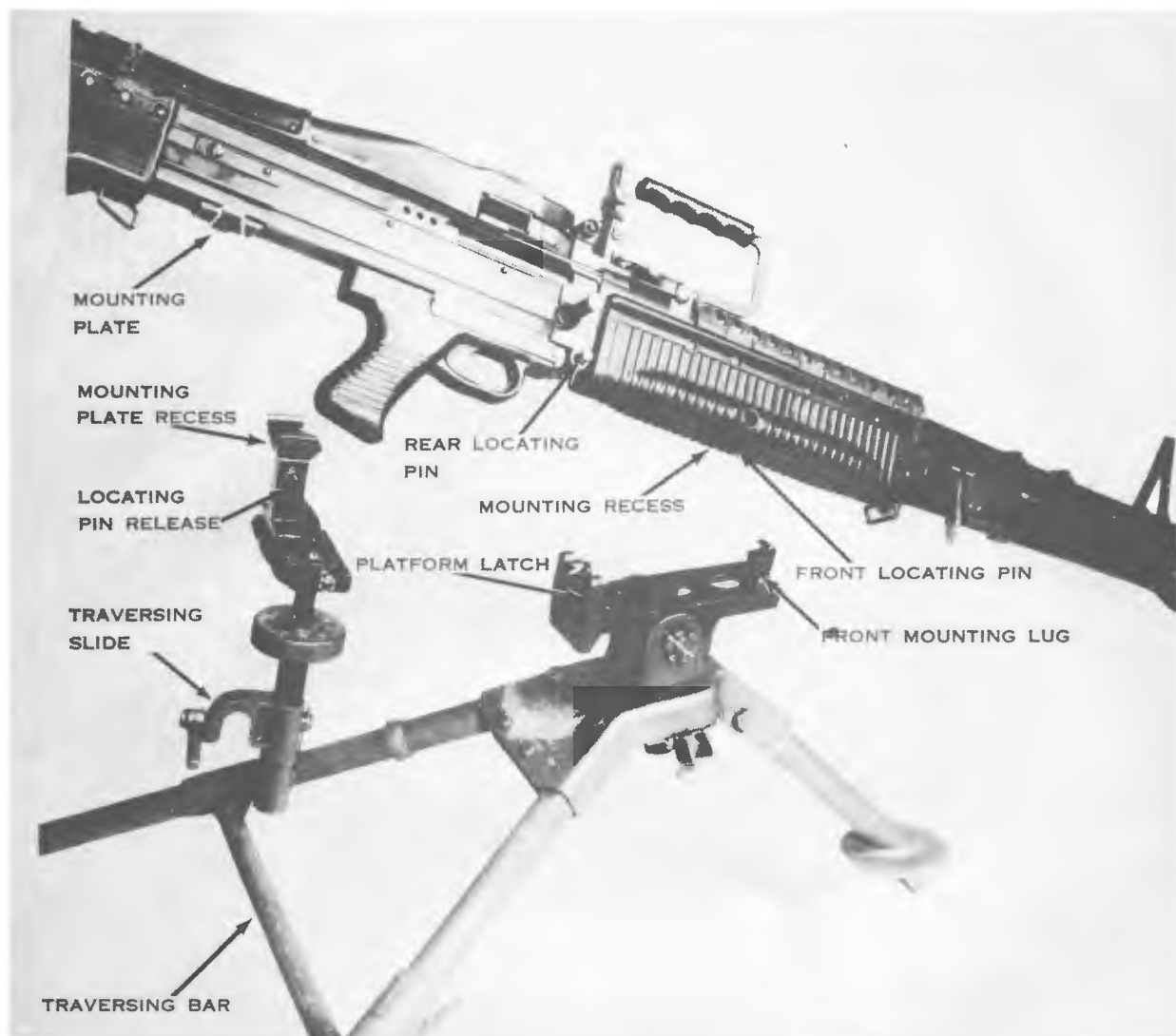


Figure 36. Gun in relation to tripod.

to use in other vehicles which will mount this weapon (fig. 40). The M142 gun mount has a travel lock which permits locking the gun in a horizontal position. The gun platform in this mount is identical to that used in the M122 tripod mount.

34. Mounting and Dismounting the Gun

a. Mounting.

- (1) Lock the gun platform in the horizontal position by inserting the pin into the travel lock.
- (2) Position the front locating pin (in the

forearm assembly) in the front mounting lug.

- (3) Lower the receiver so the rear locating pin snaps under the platform latch.

b. Dismounting.

- (1) Insure that the travel lock is engaged (holding the gun platform in a horizontal position).
- (2) Grasp the carrying handle with one hand and depress the platform latch with the other. Raise the rear of the gun slightly and lift the gun from the mount.

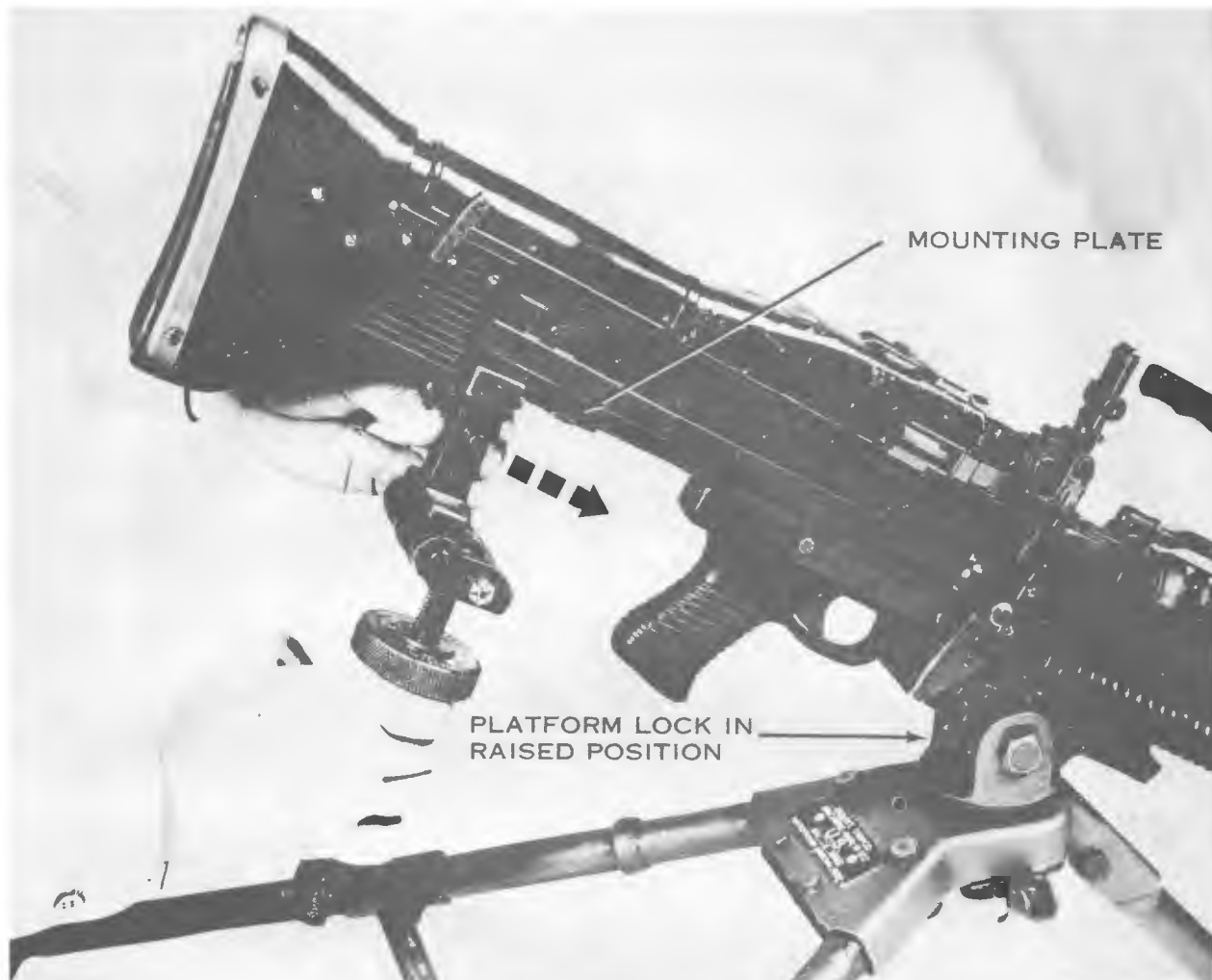


Figure 37. *Attaching the traversing and elevating mechanism*



Figure 38. *Removing the traversing and elevating mechanism.*



Figure 39. M4 pedestal mount.

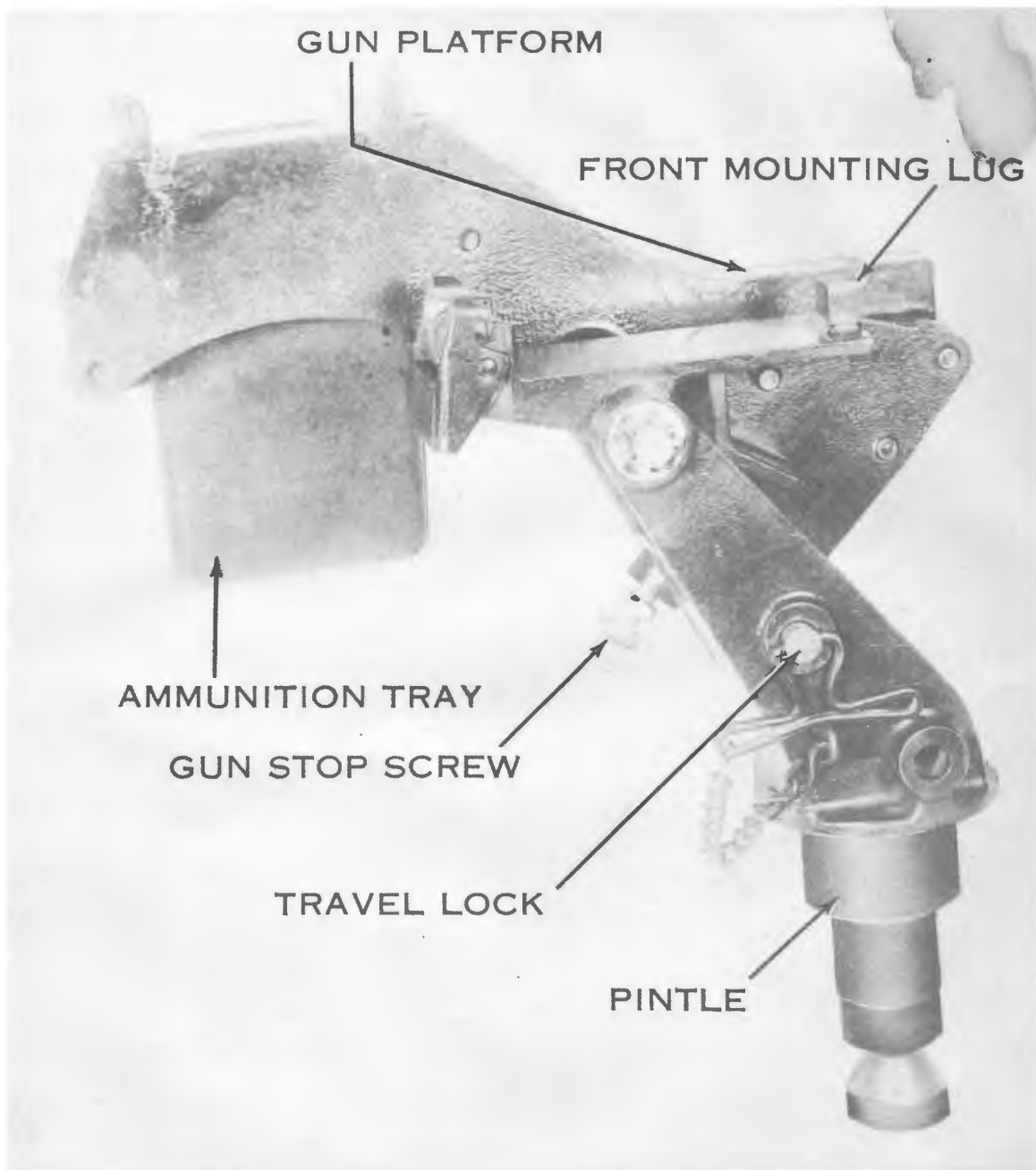


Figure 40. M142 gun mount.

CHAPTER 4

OPERATION AND FUNCTIONING

Section I. OPERATION

35. General

The M60 machinegun is loaded, fired, unloaded, and cleared in the open-bolt position. The safety must be placed on the FIRE position before the bolt can be pulled to the rear.

36. Loading

- a. Place the safety on the FIRE position.
- b. Pull the bolt to the rear, using the cocking handle.
- c. When the bolt is held to the rear by the sear, return the cocking handle to the forward position, and place the safety on the SAFE position.
- d. Raise the cover and insure that feedtray, receiver, and chamber are clear (fig. 41).
- e. Place the first round of the belt in the feedtray groove and close the cover, INSURING THAT THE ROUND REMAINS IN THE FEEDTRAY GROOVE (fig. 41).

37. Unloading

Pull the bolt to the rear, place the safety on

the SAFE position, and return the cocking handle to the forward position. Raise the cover and remove any ammunition or links from the feedtray.

38. Clearing the Gun

a. After the gun is unloaded—

- (1) The cover, feedtray, receiver, and chamber are checked to insure they are clear.
- (2) The safety is placed on the FIRE position, the trigger is pulled, and the safety is placed on the SAFE position.

b. The gun is clear during mechanical training instruction *with the bolt forward, safety on the SAFE position, and the cover raised*. During live fire exercises a cleaning rod is run through the bore until the end is visible in the receiver and is then removed.

c. For detailed clearing procedures see appendix V paragraph 25.

Section II. FUNCTIONING

39. General

- a. By having a basic knowledge of how the M60 machinegun functions, the crew members are better able to recognize and correct stoppages which occur during firing.
- b. The machinegun is designed to function automatically as long as ammunition is fed into the gun and the trigger is held to the rear. Each time a round is fired, the parts of the machine-

gun function in a certain sequence. Many of the actions occur simultaneously and are only separated for teaching purposes. The sequence of operation is known as the *cycle of functioning*.

c. For ease of understanding, the complete cycle of functioning is taught in eight separate steps.

- (1) *Feeding*. A round is positioned in the feedtray groove.

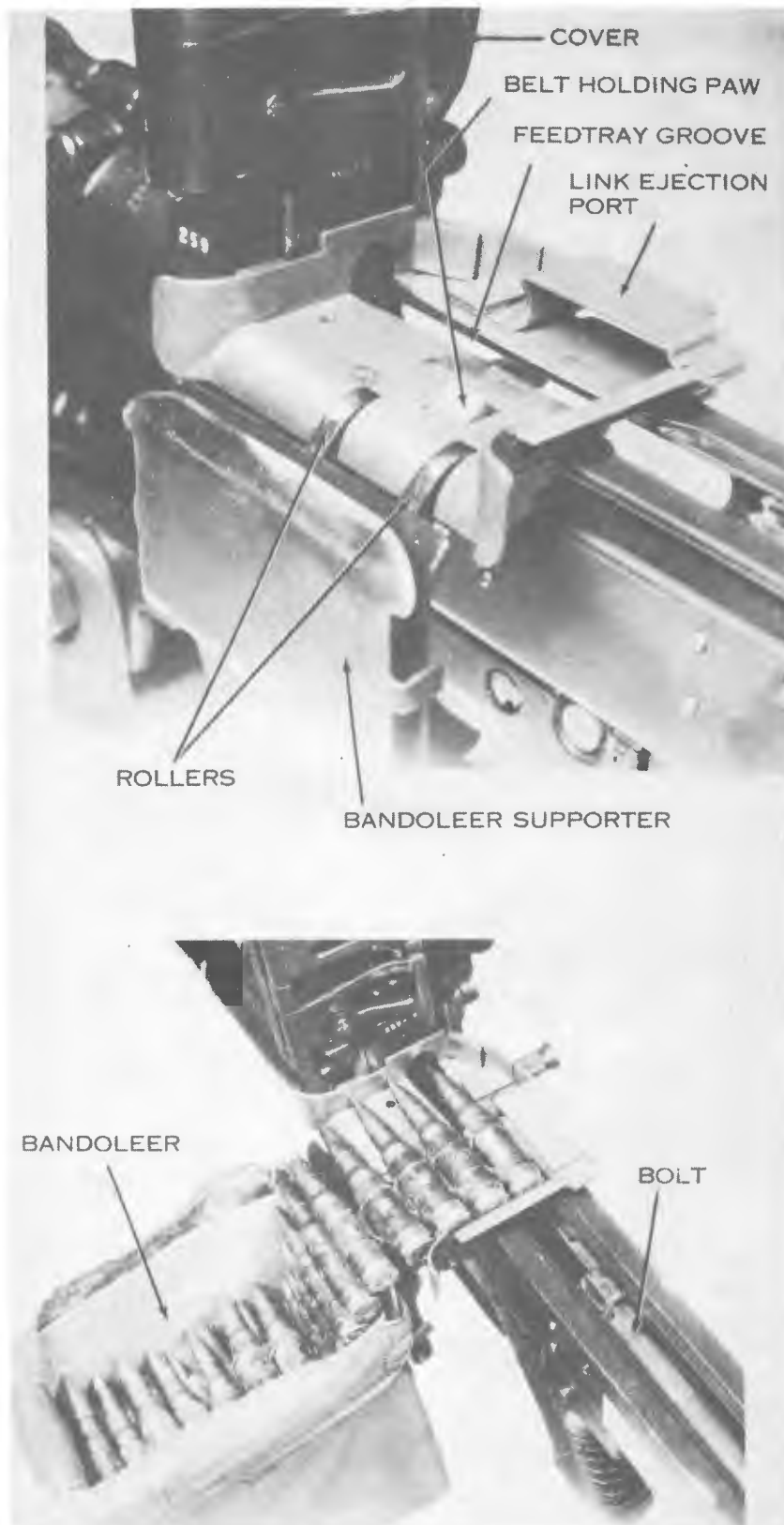


Figure 41. Feedtray, unloaded and loaded.

- (2) *Chambering.* A round is stripped from the belt and placed in the chamber.
- (3) *Locking.* The bolt is locked inside the barrel socket.
- (4) *Firing.* The firing pin strikes and detonates the primer of the cartridge.
- (5) *Unlocking.* The bolt is unlocked from the barrel socket.
- (6) *Extracting.* The empty case is pulled from the chamber.
- (7) *Ejecting.* The empty cartridge case is thrown from the receiver.
- (8) *Cocking.* The sear engages the sear notch.

40. Cycle of Functioning

The cycle starts by putting a round in the feedtray groove and then pulling the trigger, releasing the sear from the sear notch (fig. 42). It stops when the trigger is released and the sear again engages the sear notch in the operating rod. When the trigger is held to the rear, the

rear of the sear is lowered and disengaged from the sear notch. This allows the operating rod and bolt to be driven forward by the expansion of the operating rod spring. Now that the gun is functioning, the steps of the cycle can be traced.

a. Feeding.

- (1) As the bolt begins its forward movement, the feed cam is forced to the right, causing the feed cam lever to pivot in the opposite direction and forcing the feed pawl over the next round in the belt, ready to place it in the feedtray groove when the rearward action occurs again (fig. 43).
- (2) As the bolt moves to the rear after firing, the cam roller on the top of the bolt forces the feed cam to the left. The feed cam lever is forced to pivot, moving the feed pawl to the right, placing a round in the feedtray groove (fig. 43).

b. Chambering.

- (1) As the bolt travels forward, the upper

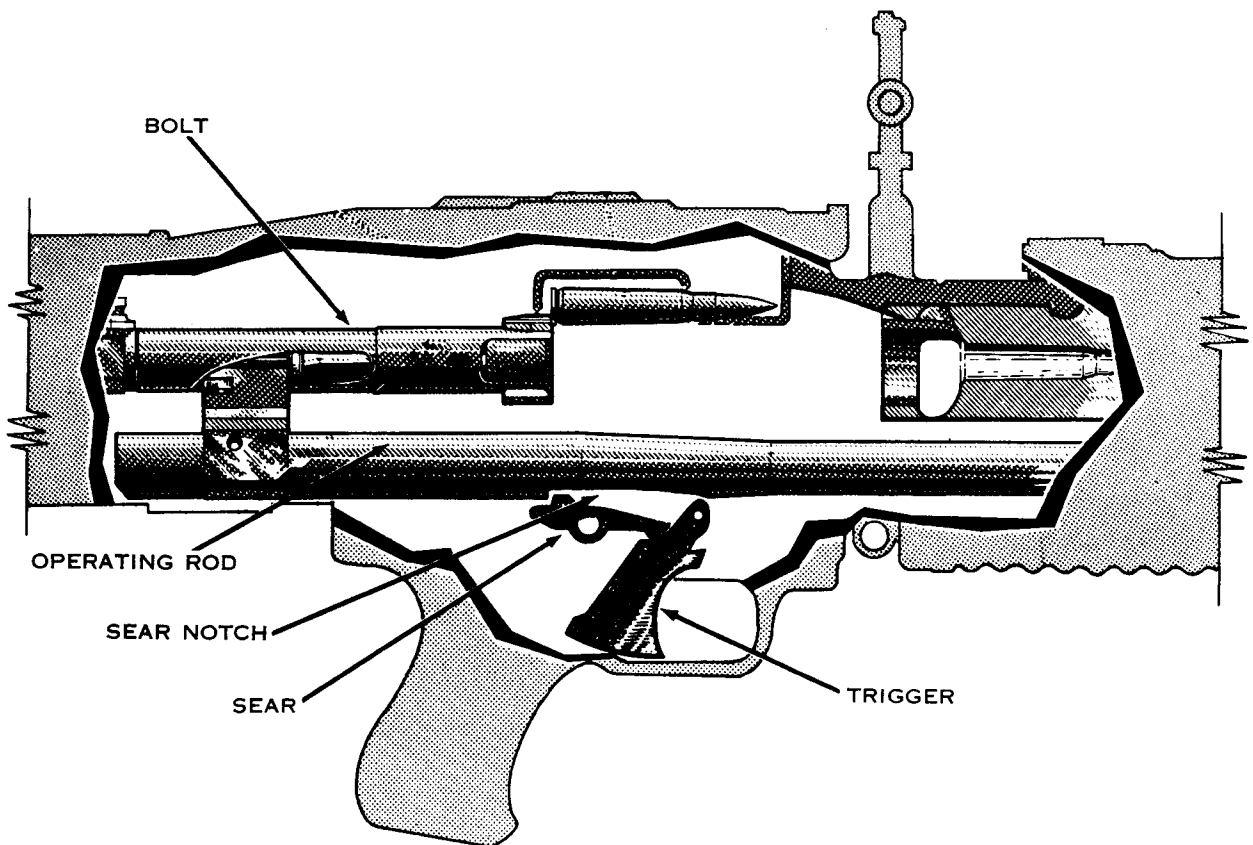


Figure 42. Sear disengaging from sear notch.

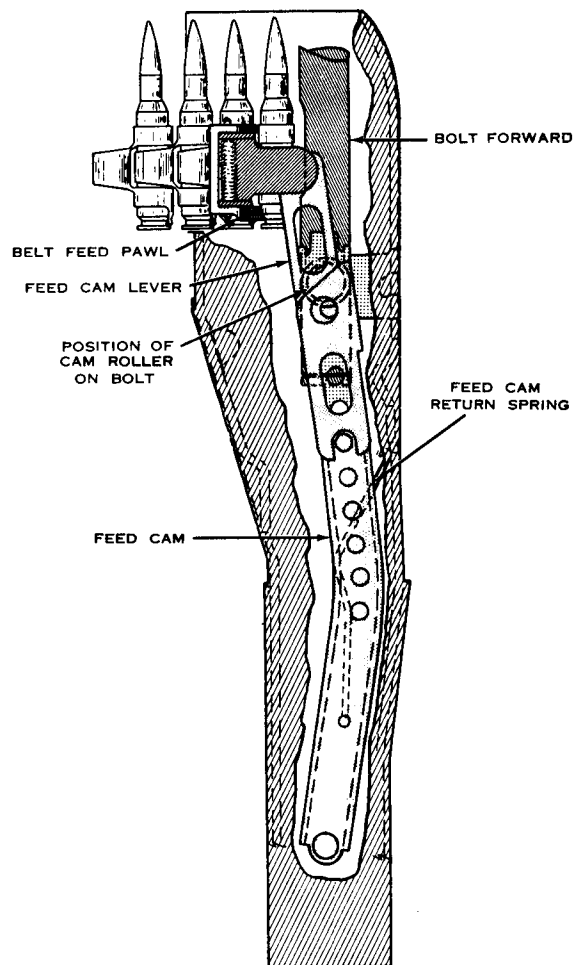
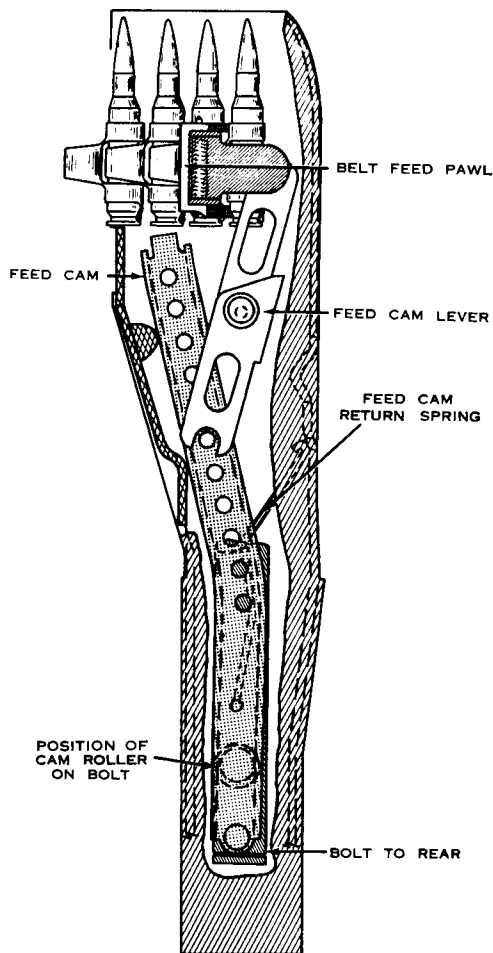


Figure 43. Feeding.

locking lug engages the rim of the cartridge (fig. 44). The pressure of the front and rear cartridge guides hold the round so that positive contact is made with the upper locking lug of the bolt. The front cartridge guide prevents the link's forward motion as the round is stripped from the belt.

- (2) The upper locking lug carries the round forward, the chambering ramp causes the nose of the cartridge to be cammed downward into the chamber (fig. 45).
- (3) When the round is fully seated in the chamber, the extractor snaps over the extractor rim of the cartridge, and the ejector on the face of the bolt is depressed.

c. Locking. As the round is chambered, the bolt enters the barrel socket. The upper and

lower locking lugs contact the bolt camming surfaces inside the barrel socket and start the rotation of the bolt clockwise. The action of the operating rod yoke against the bolt camming slot, as the operating rod continues forward, causes the bolt to complete its one-quarter turn clockwise rotation (fig. 46). Locking is then completed.

d. Firing. After the bolt reaches its fully forward and locked position, the operating rod continues to go forward, independently of the bolt, for a short distance. The yoke, engaged between the firing pin spools, carries the firing pin forward. The striker of the firing pin protrudes through the aperture in the face of the bolt, striking the primer of the cartridge and detonating it (fig. 47).

e. Unlocking.

- (1) After the cartridge is ignited and the projectile passes the gas port, part of

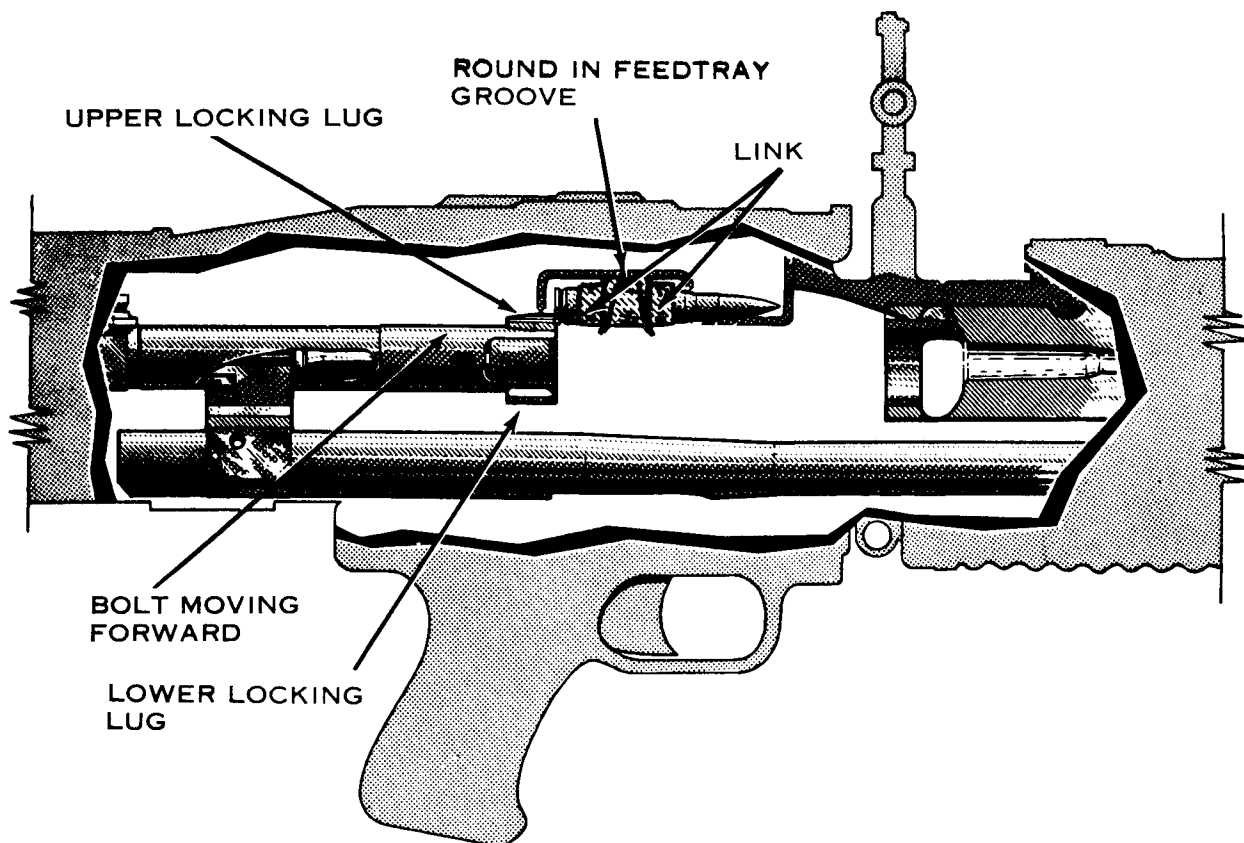


Figure 44. Bolt contacting cartridge.

the expanding gases enter the gas cylinder through the gas port. The rapidly expanding gases enter the hollow gas piston and force it to the rear. The operating rod, being in contact with the piston, is pushed to the rear (fig. 48).

- (2) As the operating rod continues to the rear, the operating rod yoke acts against the bolt camming slot. This causes the bolt to begin its counterclockwise rotation. The upper and lower locking lug of the bolt, contacting the bolt camming surfaces inside the barrel socket, cause the bolt to complete its one-quarter turn rotation (counterclockwise) and unlocks the bolt from the barrel socket. Unlocking begins as the yoke of the operating rod contacts the curve of the bolt camming slot, and ends as the bolt clears the end of the barrel socket.

f. Extracting. While unlocking is going on, extraction is beginning. The rotation of the bolt

(in unlocking) loosens the cartridge case in the chamber. As the operating rod and bolt continue to the rear, the extractor (gripping the rim of the cartridge) pulls the cartridge case from the chamber (fig. 49).

g. Ejecting. As the case is withdrawn from the chamber, the ejector spring expands. The ejector presses on the base of the cartridge case, forcing the front of the spent case against the right side of the receiver. As the bolt continues to the rear, the action of the ejector pushing against the base of the cartridge case and the extractor gripping the right side of the case causes the cartridge case to spin from the gun as the case reaches the ejection port (fig. 49). The empty link is forced out of the link ejection port as the rearward movement of the bolt causes the next round to be positioned in the feedplate groove.

h. Cocking.

- (1) As the expanding gases force the gas piston to the rear, the operating rod is initially moved independently of the bolt. The yoke of the operating rod

acts against the rear firing pin spool, withdrawing the firing pin from the primer of the spent cartridge case. The action of the operating rod yoke continuing to the rear against the rear firing pin spool fully compresses the firing pin spring (fig. 47).

(2) As long as the trigger is held to the

rear, the weapon will continue to complete the first seven steps of functioning automatically. When the trigger is released and the sear again engages the sear notch, the cycle of functioning is stopped and the weapon is cocked (fig. 42).

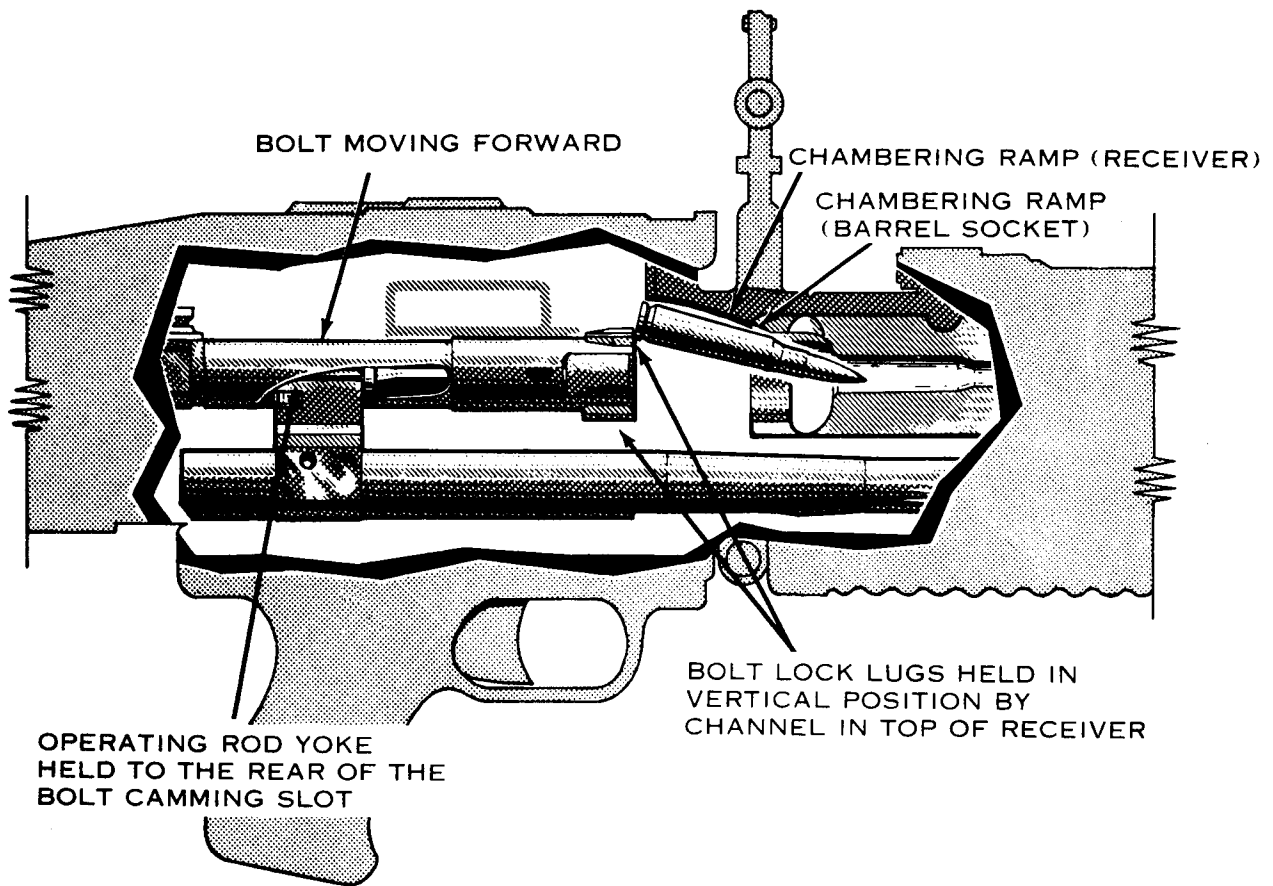


Figure 45. Cartridge being deflected into chamber.

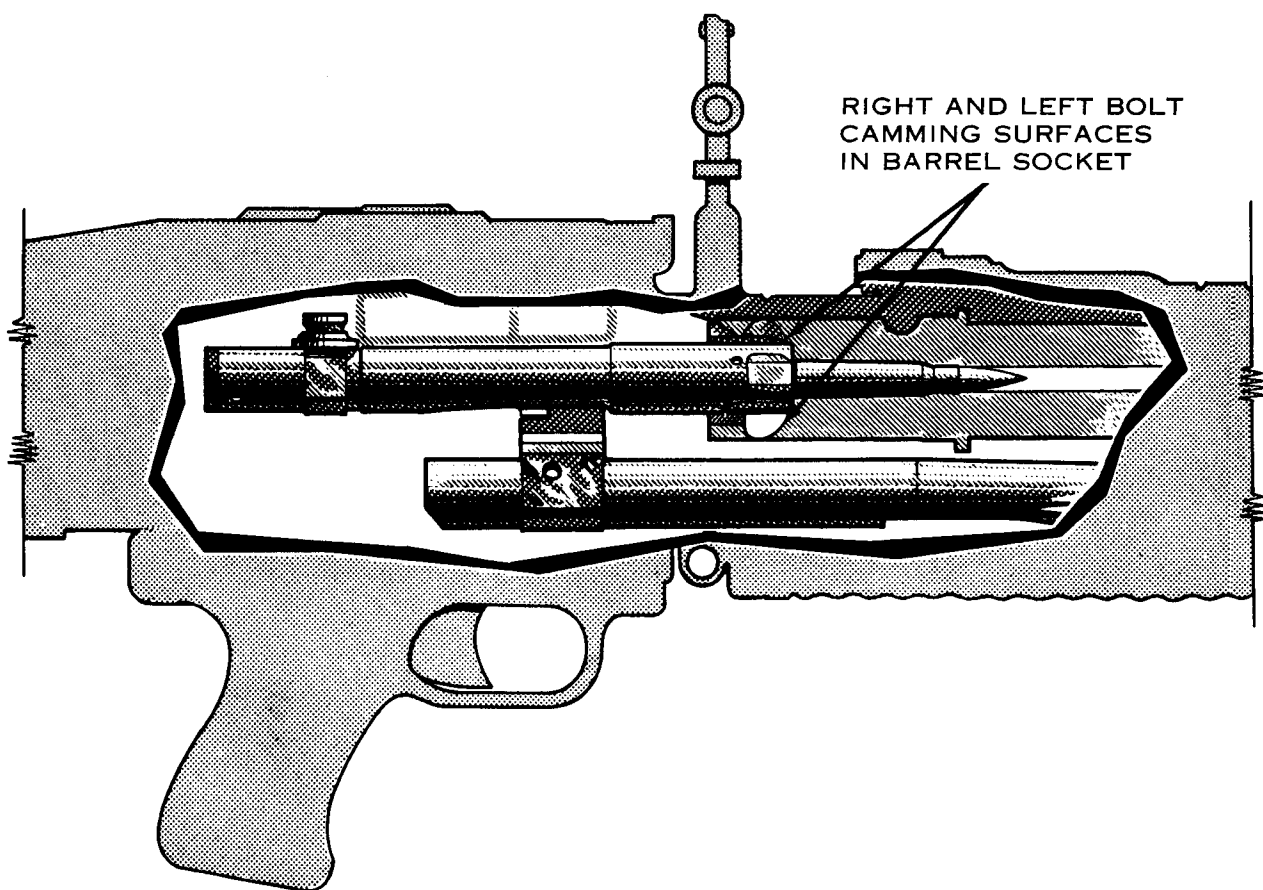


Figure 46. Weapon locked, ready to fire.

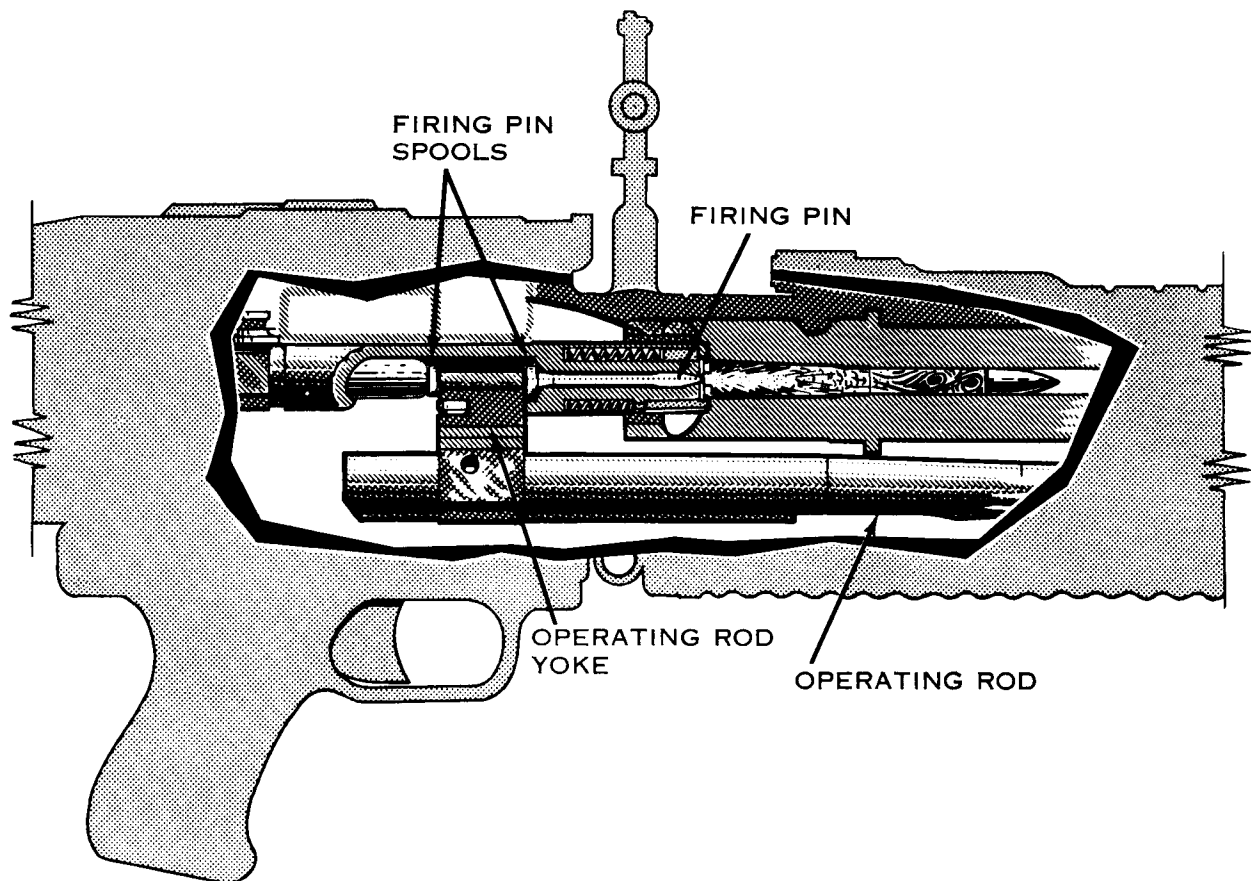


Figure 47. Firing.

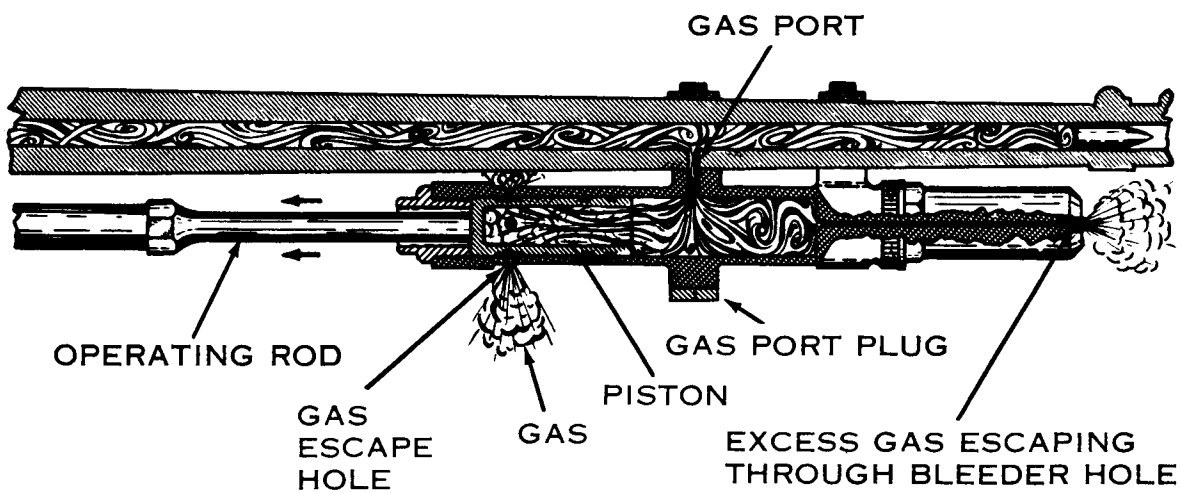


Figure 48. Unlocking action of gases.

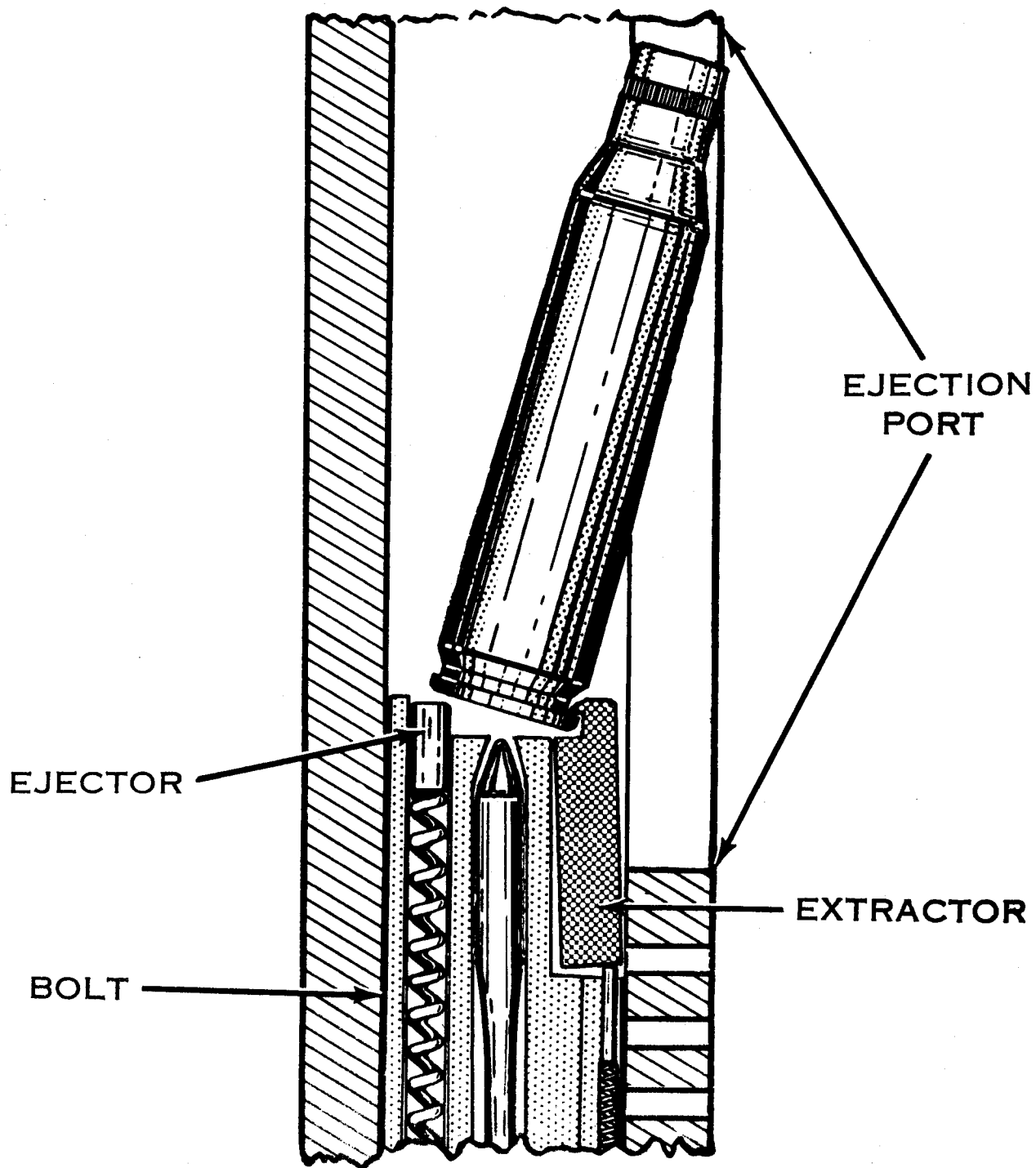


Figure 49. Extraction and ejection.

MALFUNCTIONS, STOPPAGES, IMMEDIATE ACTION, MAINTENANCE, AND DESTRUCTION

Section I. MALFUNCTIONS, STOPPAGES AND IMMEDIATE ACTION

41. Malfunctions

A malfunction is a failure of the gun to function satisfactorily. Defective ammunition or improper operation of the gun by a crew member is not considered a malfunction of the gun. Two of the more common malfunctions of the M60 machinegun are sluggish operation and runaway gun.

a. Sluggish Operation and Corrective Action. Sluggish operation of the gun usually is due to excessive friction caused by dirt or carbon, lack of proper lubrication, burred parts, or excessive loss of gas. Excessive loss of gas usually is due to a loose or missing gas port plug. Clean and lubricate the gun. Inspect thoroughly for burred parts and replace parts as necessary.

b. Runaway Gun and Corrective Action. A runaway gun is a gun that continues to fire after the trigger is released. It may be caused by a worn sear, worn sear notch, or short recoil (where the operating group recoils sufficiently to feed and fire but not sufficiently for the sear to engage the sear notch) caused by loss of gas or excessive carbon buildup in the operating rod tube.

- (1) *Hold the fire on the target until feeding is stopped or the ammunition is expended.* The best method of stopping the gun depends on many factors such as the amount of ammunition remaining in the belt, how the gun is mounted, and whether an assistant gunner is

present. For example, in assault firing with the bandoleer attached to the gun, the gunner continues to move forward, keeping the gun on the target until the ammunition is expended. In other types of firing the primary consideration is keeping the gun on target; however, either the gunner or assistant gunner may be able to stop the gun by—

- (a) Raising the cover, thus stopping the feeding action.
 - (b) Twisting or breaking the belt to stop the feeding.
 - (c) Grasping the cocking handle firmly and pulling it to the rear to stop the bolt from going forward.
- (2) When the gun has ceased firing, disassemble it and check the sear and sear notch for excessive wear. Check gas system to insure that the gas port plug, gas cylinder extension, and gas cylinder nut are tight. Clean the operating rod tube. Replace parts as necessary.

42. Stoppages

A stoppage is any interruption in the cycle of functioning caused by faulty action of the gun or faulty ammunition. Stoppages are classified by their relationship to the cycle of functioning. Table II shows types of stoppages, their causes, and corrective action to be taken.

Table II Malfunctions and Stoppages

Malfunction or stoppage	Probable cause	Corrective action	Malfunction or stoppage	Probable cause	Corrective action
Failure to feed.	Gas pressure insufficient.....	Clean gas port.	Failure to extract.	Ammunition faulty.....	Replace ammunition.
	Feed pawl or feed pawl spring defective.....	Return to higher echelon.		Chamber dirty....	Clean or change barrel.
	Front and rear cartridge guides defective.....	Return to higher echelon.		Operating rod drive spring weakened or damaged.....	Replace spring.
	Cover latch defective.....	Return to higher echelon.		Extractor or spring broken..	Replace.
	Feed lever cam spring defective.....	Return to higher echelon.		Short recoil.....	Clean gas port, operating rod tube, and lubricate.
	Cam roller defective.....	Return to higher echelon.		Gas piston installed backwards.....	Install properly.
	Lubrication inadequate.....	Apply lubricant.		Short recoil.....	Clean gas port.
	Ammunition or link defective...	Insert new ammunition or link.		Ejector or ejector spring frozen or damaged.....	Clean or replace.
	Ammunition belt installed wrong	Reverse belt with open portion of link down.		Sear broken.....	Return to higher echelon.
	Operating rod spring damaged or weakened....	Replace spring.		Operating rod sear notch worn.....	Return to higher echelon.
Failure to chamber.	Obstruction in receiver.....	Remove obstruction.	Failure to eject.	Sear plunger or spring broken or defective....	Return to higher echelon.
	Ruptured cartridge case.....	Remove cartridge case.		Obstruction in receiver.....	Clear as required.
	Caked carbon in gas cylinder...	Remove carbon.		Short recoil.....	Clean gas port.
Failure to fire.	Caked carbon in receiver.....	Remove carbon.	Failure to cock.	Sear broken or worn.....	Return to higher echelon.
	Round damaged...	Remove round.		Sear notch on operating rod worn.....	Return to higher echelon.
	Firing pin damaged or broken.....	Replace firing pin.		Excessive friction.....	Clean and lubricate.
	Firing pin spring damaged or broken.....	Replace spring.	Runaway gun.	Excessive loss of gas.....	Tighten or replace gas port plug.
			Sluggish operation.		

43. Immediate Action

Immediate action is the action taken to reduce the stoppage without investigating the cause. This action must be accomplished within 10

seconds, including waiting time, when the barrel is hot enough to cause a cookoff. One hundred and fifty rounds fired in a 2-minute period may heat the barrel sufficiently to cause a cookoff.

a. If a stoppage occurs, *wait five seconds*. (The bolt must remain forward for the first five seconds due to the possibility of a hangfire.)

b. After the five-second wait, raise the cover and remove the ammunition belt and links from the feed tray.

c. Pull the cocking handle to the rear, making sure that the sear engages the sear notch in the operating rod; close the cover immediately; then return the cocking handle to its forward position.

d. During the retraction of the bolt, observe if the round is extracted and ejected.

- (1) If the round is *NOT* extracted, pull the trigger, attempting to fire the round.

If the round *does not* fire and the barrel is hot, *wait* at least five minutes with the bolt in the forward position to preclude damage or injury in the event of a cookoff.) After the five-minute wait, remove the round by using a cleaning rod inserted from the muzzle of the weapon.

- (2) If a round *is* extracted, or when a round is removed from the chamber, inspect the weapon and the ammunition to determine the cause of the stoppage.

e. After clearing the weapon, reload, relay on the target, and attempt to fire.

Section II. MAINTENANCE AND DESTRUCTION

44. General

Maintenance of the M60 machinegun includes inspection, cleaning, and replacement of parts. A complete operator's and organizational maintenance guide is found in TM 9-1005-224-12, TM 9-1005-224-20P, and LO 9-1005-224-10.

45. Inspection

Inspection begins with the weapon disassembled into its six major groups.

a. Stock.

- (1) Must not be cracked. Should fit securely on receiver.
- (2) Guide rails should not be cracked, bent, or burred.
- (3) The hinged shoulder rest and stock latch should function correctly.
- (4) The rubber covering on the stock and all other parts of the gun should be checked for signs of cleaning with unauthorized solvents. If these parts are cleaned with unauthorized solvents, the rubber will soften and become unserviceable.

b. *Buffer Group*. The buffer contains composite rubber pads and should not be oiled inside.

- (1) The buffer yoke and yoke recess should not be burred, cracked, or bent.
- (2) The buffer plunger must fit easily into the recess in the drive spring guide.

c. Operating Group.

- (1) The sear notch should not show signs of excessive wear. (Excessive wear indicates the probability of improper trigger manipulation.)
- (2) The yoke roller, bolt plug, bolt plug pin, firing pin, and cam roller assembly should be checked for serviceability.
- (3) The firing pin should be checked for wear on the tip.
- (4) The operating rod, operating rod spring, and the firing pin spring must not be bent or broken.
- (5) The ejector and extractor should be checked to see that they are under spring pressure and not chipped or worn.

d. Trigger Housing Group.

- (1) The sear should not show signs of excessive wear. (Excessive wear on the sear indicates the probability of improper trigger manipulation.)
- (2) A check should be made for cracks near the trigger housing pin.
- (3) Insure that the leaf spring is properly bent.
- (4) The safety should function properly. (The sear should not move when the trigger is pulled with the safety on SAFE, and it should move when the safety is on FIRE.)

e. Barrel Group.

- (1) The flash suppressor should be tight. (Both barrels should be checked.) Front sight and barrel locking cams should not be bent, cracked, or burred.
- (2) The bipod assembly should be checked visually to insure that it functions properly.
- (3) The gas cylinder bleeder hole should be clear.
- (4) The gas piston and cylinder should not be burred and the piston should move freely. The tolerance between the wall of the gas cylinder and the piston is so small that the moving piston cleans itself. The gas system should be disassembled and cleaned *only* when the gun fires sluggishly and no other reason for the sluggishness can be found, or for a minimum of training.

f. Receiver Group.

- (1) The forearm assembly, cover, feed-

tray, cocking handle, and receiver housing should not be cracked or bent.

- (2) The feed cam and lever, feedtray rollers, belt holding pawl, and barrel lock lever should all function smoothly.
- (3) The range plate must be legible. The range plate screw should not be worn or burred to the extent that it cannot be readily loosened and tightened.

g. Mount.

- (1) The traversing and elevating mechanism should not bind. The numbers on the scales should be easily read.
- (2) The pintle should fit snugly, and the pintle lock should hold the pintle securely in the pintle bushing.
- (3) The sleeve latch should function properly, and the traversing bar should be tight.

h. Spare Barrel Case (fig. 50).

- (1) The maintenance equipment should be checked for completeness and serviceability.

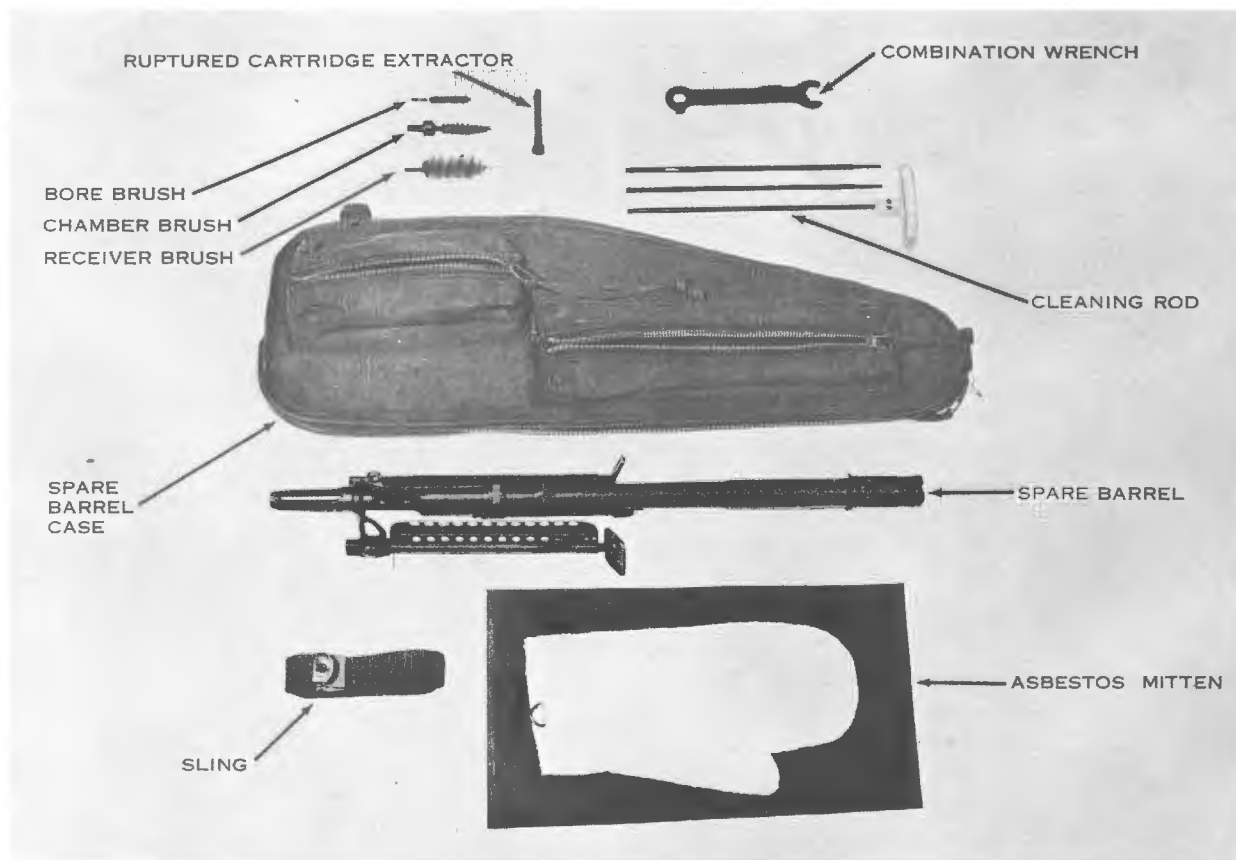


Figure 50. Spare barrel case complete.

- (2) The case should not show signs of excessive washing. Frequent washing of the case destroys its waterproofing and causes the canvas to deteriorate.

46. Cleaning and Lubricating

a. *Cleaning.*

- (1) Immediately after firing and on two consecutive days thereafter, thoroughly clean the bore, chamber, and the parts that have become powder fouled with bore cleaner (cleaning compound, solvent; CR). Do not wipe dry. On the third day after firing, clean with bore cleaner, wipe dry, and lightly coat with oil.
- (2) Weekly thereafter when the gun is not being fired, clean the bore and chamber with bore cleaner, wipe dry, and oil.
- (3) The rest of the gun should be cleaned with dry cleaning solvent (SD) immediately after firing and weekly thereafter. Wipe dry and oil.
- (4) Do not clean the inside of the gas system unless blank ammunition has been used, or unless the gun fires sluggishly after all other reasons for sluggishness have been checked.

b. *Lubricating.*

- (1) *Cold climates (consistently below 0°F.)* Lubricate the gun with weapon lubricating oil (LAW) and keep it covered as much as possible. For further information, see TM 9-207 and FM 31-70.
- (2) *Average climate (60°-80° F.)*. Lubricate the gun with lubricating oil, general purpose (PL Special).
- (3) *Hot, humid climates.* Inspect the gun more frequently for signs of rust. Keep the gun free of moisture and lightly oiled with lubricating oil, general purpose (PL Special). If exposed to salt air, high humidity, or water, clean and oil more frequently to remove contaminated lubricants.
- (4) *Hot, dry climates.* Clean the gun daily (more frequently if necessary). In sandy or dusty areas, keep the gun free of oil to prevent sand and dust from collecting in working parts.

c. *Maintenance Equipment.* All equipment necessary for first echelon maintenance is issued as components of the spare barrel case.

47. Actions Before and During Firing

a. *Before Firing.*

- (1) Wipe bore dry.
- (2) Inspect the weapon as outlined in crew training.
- (3) Follow same procedure with the spare barrel.
- (4) Insure the weapon is properly lubricated.

b. *During Firing.*

- (1) Change the barrels as prescribed in chapter 1, table I. Barrel changing will prolong barrel life and equalize barrel wear.
- (2) Periodically inspect the weapon to insure it is properly lubricated.
- (3) When malfunctions or stoppages occur, follow procedures covered in paragraphs 41 and 42.

48. Maintenance Under CBR Conditions

a. If contamination is anticipated, apply oil to all outer metal surfaces of the machinegun and accessories. *Do not oil ammunition.* Keep the weapon covered as much as possible.

b. If the weapon is contaminated, decontaminate it by following the procedures outlined in FM 21-40 and TM 3-220, then clean and lubricate.

49. Destruction of Material to Prevent Enemy Use

a. Destruction of the machinegun and mount will be undertaken only when subject to capture or abandonment.

b. *Methods of destruction.*

- (1) *Mechanical means.* Disassemble as completely as time permits. Using the barrel or some other heavy equipment, smash the cover, feedtray, receiver group, operating group, buffer, stock, and gas cylinder.
- (2) *Burning.* To destroy the weapon by burning, use a thermite grenade placed on the receiver over the bolt (with the cover resting on the grenade) and fire the grenade.

(3) *Disposal.* Bury the disassembled weapon in suitable holes or dump parts into streams, mud, snow, sumps, or latrines.

(4) *Destruction of mount.* Smash the traversing and elevating mechanism and platform group. Bend the legs.

CHAPTER 6

CREW TRAINING

Section I. INTRODUCTION

50. General

a. Crew training not only gives crew members training in the rudiments of machinegun operation, but gives them confidence in their ability to put the machinegun into action with precision and speed. Rotation of duties during training insures that every member becomes well trained in the duties of each crew position. Precision is obtained by strict adherence to the specific procedures such as inspections before firing, the manner of handling the gun during training, and following the prescribed safety procedures. Speed is integrated into the training after precision has been developed. *Precision is never sacrificed for speed.*

b. Crew training is conducted during transition firing and concurrently during other courses of fire at the discretion of the unit commander. It should be emphasized that the organization for crew training as discussed in this chapter is designed as a means of training the crew members in the rudiments of machinegun operation and not as the organization that must be employed in every tactical situation.

c. Crew training, as discussed here, involves the weapons squad leader and the crew of one machinegun: gunner, assistant gunner, and ammunition bearer. The crew may consist of only a gunner and assistant gunner. When this is done, the assistant gunner carries both the spare barrel case and the tripod and performs the duties listed for the ammunition bearer in addition to his own.

d. All commands are given by the squad leader. The gunner and assistant gunner repeat all commands. After the gun is mounted, the assistant gunner transmits all signals from the squad leader to the gunner and from the gunner to the squad leader.

51. Crew Equipment

In addition to individual arms and equipment, crew members carry equipment for both bipod and tripod training. The following is a suggested division of the equipment among the crew members and may be changed as the situation dictates.

<i>Squad leader and crew member</i>	<i>Equipment</i>
Squad leader	Binoculars, compass.
Gunner	Machinegun, three bandoleers (with dummy ammunition).
Assistant gunner	Spare barrel case (spare barrel, traversing and elevating mechanism, and accessories), three bandoleers (with dummy ammunition).
Ammunition bearer	M122 tripod mount, three bandoleers (with dummy ammunition).

52. Forming for Crew Training (Bipod or Tripod Mounted)

The squad leader commands FORM FOR CREW TRAINING. The crew forms in column, with five steps between men in the following order: gunner, assistant gunner, ammunition bearer; the gunner is five steps from and facing the squad leader. When the crew members reach their correct position, they assume the prone position and are ready for crew training (fig. 51).

53. Rotation of Duties During Crew Training

a. Duties are rotated during crew training to insure that each member learns all duties within the crew.

b. The command to rotate all personnel is FALL OUT LEADER. At this command each member of the crew rises, moves forward, and

assumes a new duty. The squad leader becomes the ammunition bearer. The gunner moves forward and becomes the squad leader, the assistant gunner becomes the gunner, and the ammunition bearer becomes the assistant gunner. If it is not desired to change the squad leader, the command FALL OUT GUNNER is given. At this command, the crew members

rise, the gunner becomes the ammunition bearer, the assistant gunner becomes the gunner, and the ammunition bearer becomes the assistant gunner. When the crew members have assumed their new positions, they call out their new duties in order, AMMUNITION BEARER, ASSISTANT GUNNER, GUNNER.



Figure 51. Crew in prone position formed for crew drill.

Section II. CREW TRAINING—BIPOD MOUNTED GUN

54. Inspection of Equipment Before Firing

A thorough inspection of equipment is made at the beginning of each exercise. After the crew is formed for crew training, the squad leader commands INSPECT EQUIPMENT BEFORE FIRING, BIPOD. At this command each crew member inspects his equipment as explained in paragraphs 55–57.

55. Inspection By Gunner

a. The gunner inspects his ammunition first. He insures that the ammunition is properly linked, free of dirt and corrosion, and that the double link is up (ready for loading). After he inspects the ammunition, he reinserts the cardboard flaps in the bandoleer and places the cloth slings over his shoulder (except the last bandoleer which he prepares for loading).

b. He then inspects the gun. To do this he—

- (1) Grasps the forearm with the left hand, reaches over with the right hand, pulls to the rear on the right bipod leg, and lowers it. He then reaches under the right leg, lowers the left bipod leg (fig. 52), and rests the gun on the bipod.
- (2) Attaches the bandoleer to the gun.
- (3) Places the safety on FIRE, pulls the cocking handle to the rear, places the safety on SAFE, returns the cocking handle to the forward position, raises the cover and feedtray, and checks the chamber to insure it is clear (fig. 53).
- (4) Calls for the cleaning rod and combination wrench and receives them from the assistant gunner.



Figure 52. Gunner lowering bipod legs.

- (5) Crawls forward and runs the cleaning rod through the bore of the barrel to insure it is clear. While in this position, he visually checks the bleeder hole of the gas cylinder to insure it is clear (fig. 54).
 - (6) Checks the flash suppressor for cracks.
 - (7) Checks the front sight for tightness and for damage to the blade.
 - (8) Checks the gas cylinder extension, gas port plug, and gas cylinder nut for tightness with the combination wrench.
 - (9) Checks the carrying handle to insure it can be positioned so it will not interfere during aiming and firing.
 - (10) Insures the barrel lock lever is down and the barrel is securely locked to the receiver.
 - (11) Returns the cleaning rod and combination wrench to the assistant gunner.
 - (12) Moves to the rear of the gun and checks the moving parts in the cover. He—
 - (a) Insures that the feed cam is clean and properly lubricated.
 - (b) Pushes back and forth on the feed cam to check for free functioning.
 - (c) Pushes on the feed pawl to insure it has spring tension.
 - (d) Pushes on the cartridge guides to insure they have spring tension.
 - (13) Checks the feedtray to insure that the bandoleer is fully seated. He pushes the belt holding pawl to insure it has spring tension.
 - (14) Lowers and latches the cover (without inserting the belt).
 - (15) Pulls the trigger to check the functioning of the safety.
 - (16) Places the safety on FIRE and pulls the trigger to allow the bolt to go forward.
 - (17) Checks the rear sight, sets it at 500 meters and zero windage, and lowers it.
 - (18) Checks the hinged shoulder rest for proper operation and leaves it in the down position.
- c. This completes the gunner's inspection of equipment; he resumes his position parallel to the gun, head on line with the feedway.

56. Inspection By Assistant Gunner

- a. Remaining in the prone position, the assistant gunner begins by inspecting the ammunition as explained in paragraph 55a.
- b. He takes the cleaning rod and combination

wrench from the spare barrel case and assembles the cleaning rod.

c. He then removes the traversing and elevating mechanism (fig. 55). He—

- (1) Rotates the elevating handwheel, exposing approximately $1\frac{1}{2}$ inches of threads below the handwheel.
- (2) Rotates the elevating mechanism sleeve, exposing approximately $1\frac{1}{2}$ inches of threads below the handwheel.
- (3) Rotates the traversing handwheel until an equal number of threads are exposed on each side of the traversing mechanism.
- (4) Checks the adapter pin of the adapter assembly to insure it functions and that it has spring tension.
- (5) Replaces the traversing and elevating mechanism and removes the spare barrel from the spare barrel case.

d. Inspecting the spare barrel, he—

- (1) Checks the barrel and the bleeder hole of the gas cylinder extension to insure they are clear.
- (2) Checks the flash suppressor for cracks.
- (3) Checks the front sight for tightness and for damage to the blade.
- (4) Checks the bipod assembly for proper operation.
- (5) Checks the gas cylinder extension, gas port plug, and gas cylinder nut for tightness using the combination wrench.
- (6) Insures the barrel socket is clean.

e. The assistant gunner's inspection is completed when he returns the spare barrel to its case, closes the case, disassembles the cleaning rod and returns it and the combination wrench to the accessory pocket, and checks the ruptured cartridge extractor, bore brush, cham-

ber brush, receiver brush, and asbestos mitten for serviceability (fig. 50).

57. Inspection By Ammunition Bearer

a. Remaining in the prone position, the ammunition bearer inspects his ammunition as explained in paragraph 55a.

b. He then inspects the tripod. He—

- (1) Insures the legs are folded closely together.
- (2) Checks the sleeve latch to insure it has spring tension and will function.
- (3) Checks the pintle lock lever to insure it is locking in the pintle bushing and the pintle rotates freely in the bushing.
- (4) Checks the front mounting lug to insure it is free of dirt and is pointing forward.
- (5) Lowers the platform lock.
- (6) Depresses the platform latch, insuring that it is free of dirt and has spring tension.

c. This completes the ammunition bearer's inspection of equipment.

58. Reporting Completion of Inspection of Equipment

On completion of the inspection of equipment, each member reports as follows:

a. Ammunition bearer—AMMUNITION BEARER CORRECT, or he reports deficiencies.

b. Assistant gunner — AMMUNITION BEARER AND ASSISTANT GUNNER CORRECT, or he reports deficiencies.

c. Gunner—ALL CORRECT, or he reports deficiencies.

d. Discrepancies that cannot be corrected during the inspection are reported.



Figure 53. Gunner checking chamber.



Figure 54. Gunner inspecting barrel and bleeder hole.

59. Placing the Gun in Action

To place the gun in action, the squad leader commands and signals **GUN TO BE MOUNTED HERE** (pointing to the position where the gun is to be mounted), **FRONT** (pointing in the direction of fire), **ACTION** (vigorously pumping fist in the direction of the designated gun position).

a. At the command **ACTION**, the gunner rises to his feet, grasps the carrying handle with his left hand, the top of the stock with his right hand, raises the gun to a carrying position, muzzle to the front, and moves to the gun position (fig. 56).

b. On arrival at the gun position, the gunner places the gun on the ground. He then assumes

a prone position to the rear of the gun. He positions the carrying handle so it will not interfere during aiming and firing. He aligns the gun in the direction of fire and raises the rear sight (fig. 57). He raises the cover, places the first round of ammunition in the feedtray groove, and lowers the cover (insuring that the round does not slip out of the feedtray groove). He raises the hinged shoulder rest and places it on his shoulder, assuming a proper firing position (fig. 58).

c. The assistant gunner times himself so he arrives at the gun position as the gunner is assuming the prone position. He assumes a prone position on his left hip, feet to the rear, on the left side of the gun. He places the spare barrel case parallel to the gun with the zippered side toward the gun. He opens the spare barrel case

and removes the spare barrel. He extends the bipod legs and places the spare barrel on the case, muzzle to the front and even with the muzzle of the gun (fig. 58).

d. The ammunition bearer times himself so he arrives at the gun position as the assistant gunner is assuming the prone position. He places the tripod one step to the left of the muzzle of the gun and on line with it, the head of the tripod away from the gun. He unslings his bandoleers and places them next to the tripod legs. He then assumes a prone position approximately ten meters to the left and on line with the gun position and prepares to deliver fire into the target area with his individual weapon (fig. 59).

e. If the bipod legs must be adjusted, the assistant gunner crawls forward and supports the



Figure 55. Assistant gunner removing traversing and elevating mechanism for inspection.



Figure 56. Gunner moves to the gun position.

muzzle of the gun by grasping the bipod yoke with the left hand. The assistant gunner wears an asbestos mitten. He adjusts the height of the bipod legs with his right hand.

f. When ready to fire (fig. 60), the gunner places the safety on FIRE and reports UP. The assistant gunner signals READY to the squad leader (para. 78*a*; fig. 81).

60. Changing the Barrel

To insure proficiency and speed in changing barrels, this is included in crew training. The procedure is as follows:

a. When the gunner has reported UP and the assistant gunner has signaled READY, the

squad leader commands CHANGE BARRELS.

b. The gunner places the stock on the ground and the safety on SAFE. He then raises the barrel lock lever with his right hand. He moves his right hand to the rear and places it on the top of the stock. He places his left hand under the rear of the forearm assembly and raises the muzzle of the gun by applying pressure down on the stock with his right hand and raising the muzzle with his left hand (fig. 61).

c. The assistant gunner (wearing the asbestos mitten) grasps the barrel by the gas system, removes it from the gun, and places it down with the barrel socket on the spare barrel case. He grasps the replacement barrel by the gas



Figure 57. Gunner prepares gun for firing.

system and inserts the barrel into the forearm assembly.

d. The gunner lowers the barrel lock lever, moves the safety to the FIRE position, assumes his correct firing position, and reports UP. The assistant gunner signals READY to the squad leader.

61. Taking the Gun Out of Action

To take the gun out of action the squad leader commands and signals OUT OF ACTION. The gunner and assistant gunner repeat the command.

a. At the command OUT OF ACTION, the ammunition bearer moves to the gun position, slinging his individual weapon. He picks up and slings the bandoleers that he previously left there. He secures the tripod and returns to his

original position, approximately 15 steps to the rear of the gun position. He assumes the prone position with the tripod in front of him, tripod head to the left.

b. The assistant gunner raises the bipod legs of the spare barrel and places it in its case. Before rising, he insures that the spare barrel case is closed sufficiently to retain the spare barrel and the traversing and elevating mechanism. He returns to his original position approximately 10 steps to the rear of the gun position and assumes the prone position. At this time he fully closes the spare barrel case if he was unable to do so at the gun position.

c. The gunner places the stock on the ground, insures the bolt is to the rear, places the safety on SAFE, and raises the cover. He removes the ammunition from the feedtray, replaces it in



Figure 58. Gunner assumes firing position.



Figure 59. Ammunition bearer in position.



Figure 60. Ready to fire.

the bandoleer, and closes the bandoleer. The gunner examines the chamber to insure it is clear, closes the cover, places the safety on FIRE, pulls the trigger, and places the safety on SAFE. He lowers the shoulder rest with his right hand and the rear sight with his left hand. He grasps the carrying handle with his left hand and the stock with his right hand. Rising, he pivots to his right leg without turning the

gun as he raises the gun to his left hip and moves to his original position (fig. 62). On reaching his original position, he visually checks to insure the ammunition bearer and the assistant gunner are in their original positions. He assumes the prone position with the gun on his right, folds the bipod legs alongside the barrel, and reports UP to the squad leader.



Figure 61. Correct position for barrel change.

Section III. CREW TRAINING—TRIPOD MOUNTED GUN

62. Inspection of Equipment Before Firing

The inspection of equipment for tripod mounted training is the same as for bipod with the following exceptions:

a. The squad leader's command to initiate inspection of equipment is **INSPECT EQUIPMENT BEFORE FIRING, TRIPOD**.

b. The gunner returns the bipod legs to their position alongside the barrel after inspecting them.

63. Placing the Gun Into Action

The squad leader commands and signals **GUN TO BE MOUNTED HERE, FRONT, ACTION** in the same manner as for the bipod training (para. 59).

a. At the command **ACTION**, the ammunition bearer rises to his feet, grasps the tripod

in his right hand, and moves forward to the gun position, moving to the left of the gunner. On arrival at the gun position, he kneels on his right knee and rests the shoes of the rear tripod legs on the ground with the mount in a vertical position. Steadying the mount with the right hand near the tripod head, he raises the front leg with the left hand. He grasps the right shoe with his right hand, the left shoe with his left hand, and raises the tripod chest high. He separates the tripod legs with a quick jerk (fig. 63). Insuring that the sleeve latch engages the sleeve, he places the tripod on the ground with the front leg pointing in the direction of fire. He rises to his feet and stamps the rear shoes into the ground. He then unslings his bandoleers and places them on line with the front leg of the tripod, one step to the left of the



Figure 62. Gunner returning to his original position.



Figure 63. Opening the tripod.

tripod. He moves approximately 10 meters to the left of the gun position, unslings his individual weapon, assumes a prone position, and prepares to deliver fire into the target area.

b. The assistant gunner times himself to arrive at the gun position as the ammunition bearer clears it. He places the spare barrel case (zippered side toward the gun) so it will be parallel to and on line with the muzzle of the gun when the gun is mounted. He assumes the prone position on his left hip, with his hip at the left tripod shoe. He unzips the spare barrel case and takes out the spare barrel and the traversing and elevating mechanism. He places the spare barrel on the case with the sight toward the gun.

c. The gunner times himself to arrive at the gun position as the assistant gunner assumes the prone position. He rises to his feet, grasps the carrying handle in his left hand, the stock in his right hand, raises the gun to the carrying position (muzzle to the front), and moves forward to the gun position. Upon arrival at the gun position, he engages the front locating pin (in the forearm assembly) with the front mounting lug of the gun platform. He lowers

the rear of the gun until the rear locating pin engages the platform latch (fig. 64). Then he positions the carrying handle so it will not interfere during aiming and firing, raises the rear sight, and assumes the prone position.

d. The gunner moves his head to the right, raises the platform lock, and swings the rear of the gun up and to his left. The assistant gunner hands him the traversing and elevating mechanism and steadies the rear of the gun. The gunner then positions and locks the traversing and elevating mechanism on the gun and the slide on the traversing bar (fig. 65).

e. The gunner raises the cover. The assistant gunner places the first round of ammunition in the feedtray groove and supports the belt while the gunner closes the cover. The gunner assumes the correct firing position and grip, places the safety on FIRE, and reports UP. The assistant gunner signals READY to the squad leader (fig. 66).

64. Changing the Barrel

The procedure for changing the barrel is as follows.

a. When the gunner has reported UP and the



Figure 64. Mounting the gun.



Figure 65. Attaching the traversing and elevating mechanism.

assistant gunner has signaled READY, the squad leader commands CHANGE BARREL.

b. The gunner puts the safety on SAFE and places his left hand on top of the cover. He raises the barrel lock lever with his right hand and keeps his hand at this position (fig. 67).

c. The assistant gunner grasps the bipod legs, removes the barrel from the gun, and places it on the spare barrel case. He then grasps the replacement barrel by the bipod legs and inserts it in the forearm assembly.

d. The gunner lowers the barrel lock lever, moves the safety to FIRE, assumes his correct firing position, and reports UP. The assistant gunner signals READY to the squad leader.

65. Taking the Gun Out of Action

a. At the command OUT OF ACTION, the gunner insures that the bolt is to the rear, places the safety on SAFE, and raises the cover. The assistant gunner removes the ammunition from the feedway, returns it to the bandoleer, and closes the bandoleer. The gunner inspects the chamber to insure it is clear, closes the cover, places the safety on FIRE, pulls the trigger, and places the safety on SAFE. He raises the slide from the traversing bar, supports the gun with his left hand, moves his head to the right, and elevates the rear of the gun.

b. The assistant gunner removes the traversing and elevating mechanism and places it in the spare barrel case. He places the spare barrel in the case and closes it sufficiently to retain the spare barrel and the traversing and elevating mechanism. He rises, moves 10 steps to the rear of the gun position and assumes the prone position, facing to the front. At this time he fully closes the spare barrel case if he was unable to do so at the gun position.

c. When the assistant gunner has removed the traversing and elevating mechanism, the gunner moves the rear of the gun back to its normal position and places the platform lock in the down position. He rises to his feet, lowers the rear sight, and secures the carrying handle with his left hand. With his right hand, he reaches down and depresses the platform latch, raises the rear of the gun, and removes it from the tripod. Grasping the stock with his right hand, he pivots to his right as he raises the gun to the carrying position and returns to his original position (fig. 68).

d. The ammunition bearer rises, slings his individual weapon, and approaches the gun position, timing his arrival so that when he has slung his bandoleers, the gunner and assistant gunner will be clear of the tripod. He grasps the tripod in his left hand and returns to his original position. On reaching his position, he



Figure 66. Ready to fire.



Figure 67. Correct procedure for barrel change.

kneels on his right knee. He places the tripod in a vertical position with the rear shoes on the ground and supports the tripod with the right hand near the head of the tripod. He reaches up with his left hand and lowers the front leg, slides his right hand down the right leg, and

releases the sleeve latch. He grasps the left leg near the shoe with the left hand and closes the left leg to the right (fig. 69). He lowers the tripod to the ground, head to the left, and assumes a prone position behind it. Upon completion of this action, he reports UP.



Figure 68. Gun crew moving back to original positions.



Figure 69. Closing the tripod legs.

PART TWO
TECHNIQUE OF FIRE AND EMPLOYMENT
CHAPTER 7
TECHNIQUE OF FIRE DURING PERIODS OF GOOD VISIBILITY

Section I. INTRODUCTION

66. General

a. Each member of the machinegun crew must be trained in standard methods of applying fire either as a crew or an individual and must perform his assigned task automatically and effectively.

b. The easiest, quickest, and most effective means of delivering fire with the gun mounted on its bipod, tripod, or vehicular mount is by alining the sights of the weapon on the target and properly applying fire. This technique of fire is called *direct laying*.

c. At times, techniques of fire other than di-

rect laying are more appropriate and effective. When delivering fire in the assault, overhead fire, and fire from position defilade, the gunner must use the appropriate techniques described in paragraphs 89 through 101.

67. Fundamentals and Firing Techniques

Before the machinegun can be employed to the best advantage using any firing technique, certain fundamentals must be understood and applied. These include characteristics of fire, classes of fire, range determination, and lateral distance measurements.

Section II. FUNDAMENTALS

68. Characteristics of Fire

a. *Trajectory*. This is the path of the projectile in its flight. It is almost flat at ranges of 300 meters or less. At ranges beyond 300 meters the trajectory is curved and the curve becomes greater as the range increases (fig. 70).

b. *Maximum Ordinate*. This is the highest point which the trajectory reaches above an imaginary line from the muzzle of the gun to the base of the target. It always occurs at a point approximately two-thirds of the distance from the gun to the target. The maximum ordinate increases as the range increases (fig. 70).

c. *Cone of Fire*. When several rounds are fired in a burst from a machinegun, each projectile takes a slightly different trajectory. This

is caused by vibrations of the gun and variations in ammunition and atmospheric conditions. The pattern formed by the multiple trajectories of each burst of fire is called the *cone of fire*. (fig. 71).

d. *Beaten Zone and Center of Impact*. The area where the cone of fire strikes the ground or the target is called the beaten zone (figs. 71 and 72).

- (1) The size and shape of the beaten zone changes when the range to the target changes and when the gun is fired into different types of terrain. On uniformly sloping or level terrain, the beaten zone is elliptical (long and narrow) in shape (fig. 72). As the range

(H = MAXIMUM ORDINATE—HIGHEST POINT OF TRAJECTORY)

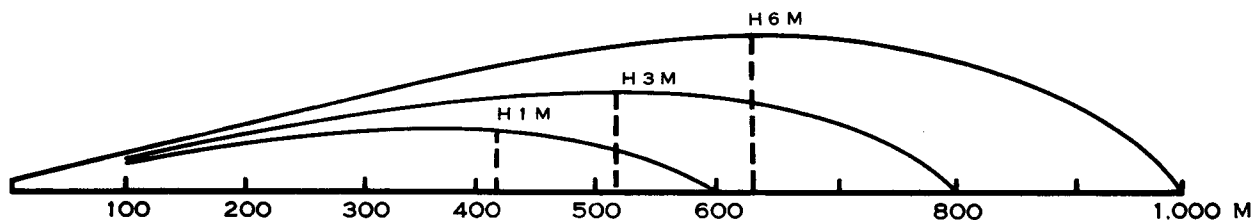


Figure 70. Trajectory and maximum ordinate.

to the target increases beyond 500 meters, the beaten zone will become shorter and wider. When fires are delivered into falling ground, the beaten zone will become longer. When fires are delivered into rising ground, the beaten zone will become shorter. The terrain has no appreciable effect on the width of the beaten zone.

- (2) The center of the beaten zone is called the *center of impact*. The center of impact will coincide with the line of aim if the weapon is properly zeroed.

e. Danger Space. This is the space between the gun and the target where the trajectory does not rise above the average height of a standing soldier (1.8 meters). This includes the area encompassed by the beaten zone.

- (1) When a machinegun (on its bipod or tripod mount) is fired over level or uniformly sloping terrain at a target less than 700 meters away, the trajectory will not rise above the average

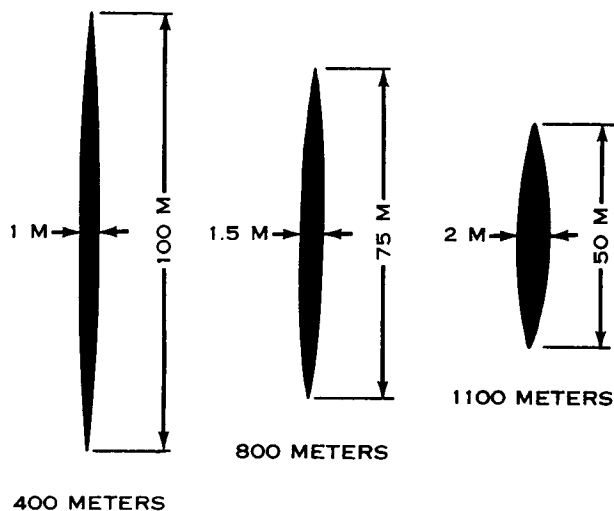


Figure 72. Size and shape of beaten zones.

height of a standing soldier (fig. 73).

- (2) When firing at targets at ranges greater than 700 meters, the trajectory will rise above the height of an average standing soldier; therefore, not all the distance between the gunner and the target is danger space (fig. 73).

69. Classes of Fire

Machinegun fire is classified with respect to the ground, target, and gun.

a. Fire with respect to the ground (fig. 74) is—

- (1) *Grazing* when the center of the cone of fire does not rise above one meter. When firing over level or uniformly sloping terrain, a maximum of 600 meters of grazing fire can be obtained.

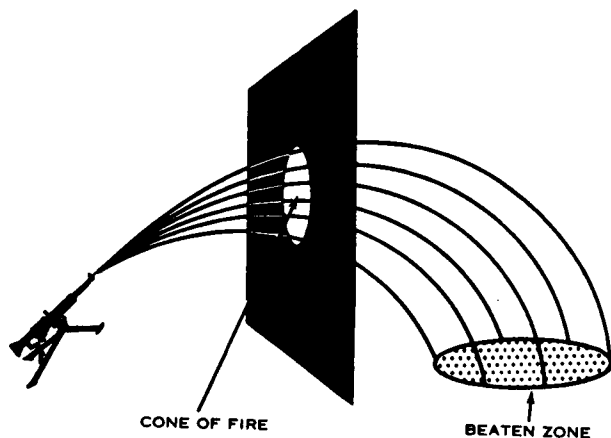


Figure 71. Cone of fire and beaten zone.

- (2) *Plunging* when the danger space is practically confined to the beaten zone. Plunging fire occurs when firing at long ranges, when firing from high ground to low ground, and when firing into abruptly rising ground.

b. Fire with respect to the target (fig. 75) is—

- (1) *Frontal* when the long axis of the beaten zone is at a right angle to the front of the target.
- (2) *Flanking* when delivered against the flank of a target.
- (3) *Oblique* when the long axis of the

beaten zone is at an angle other than a right angle to the target.

- (4) *Enfilade* when the long axis of the beaten zone coincides or nearly coincides with the long axis of the target. This type of fire is either frontal or flanking and is the most desirable type of fire with respect to a target because it makes maximum use of the beaten zone.

c. There are six types of fire classified with respect to the gun: fixed, traversing, searching, traversing and searching, swinging traverse, and free gun (fig. 76). Swinging traverse and

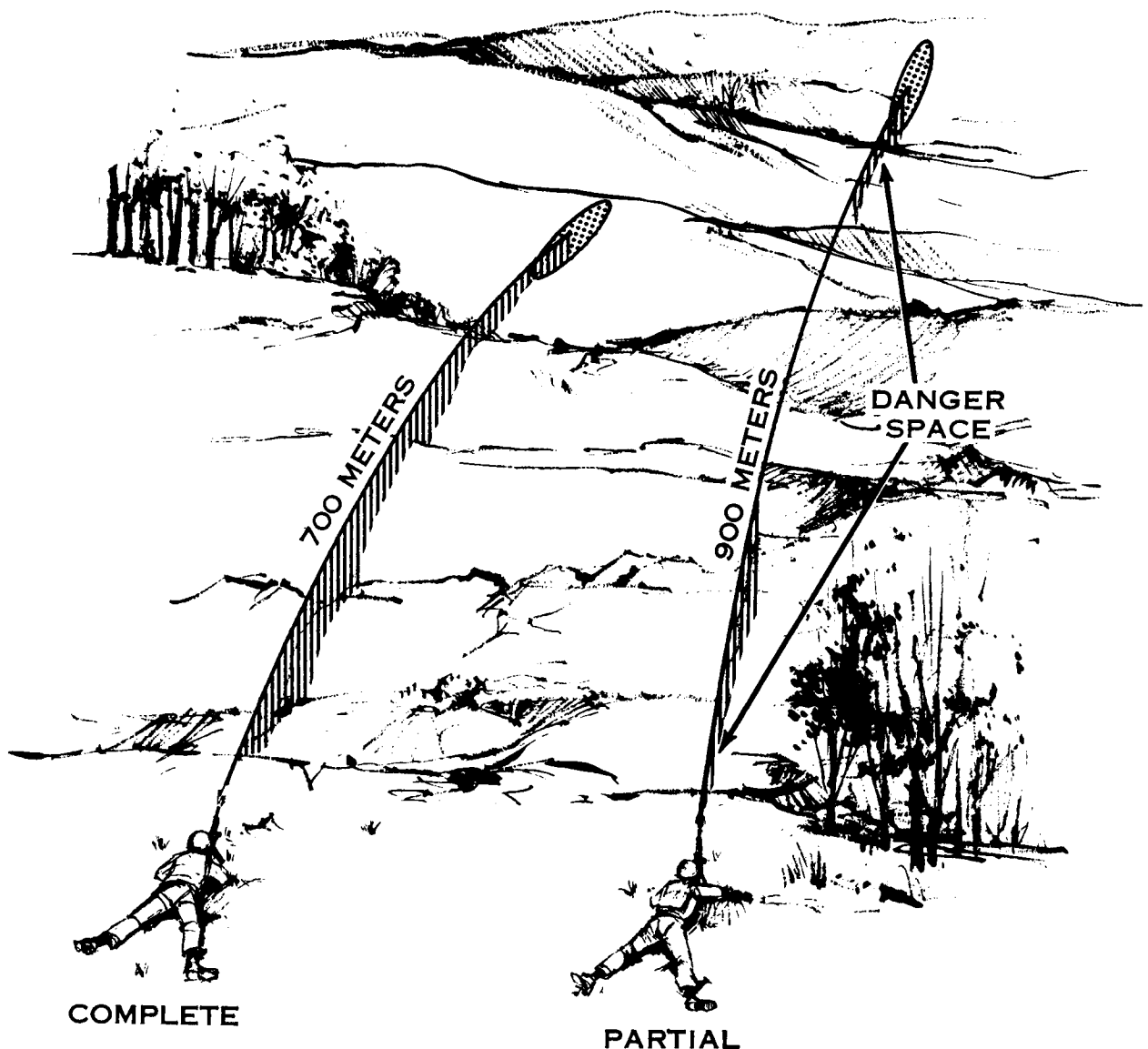


Figure 73. Danger space.

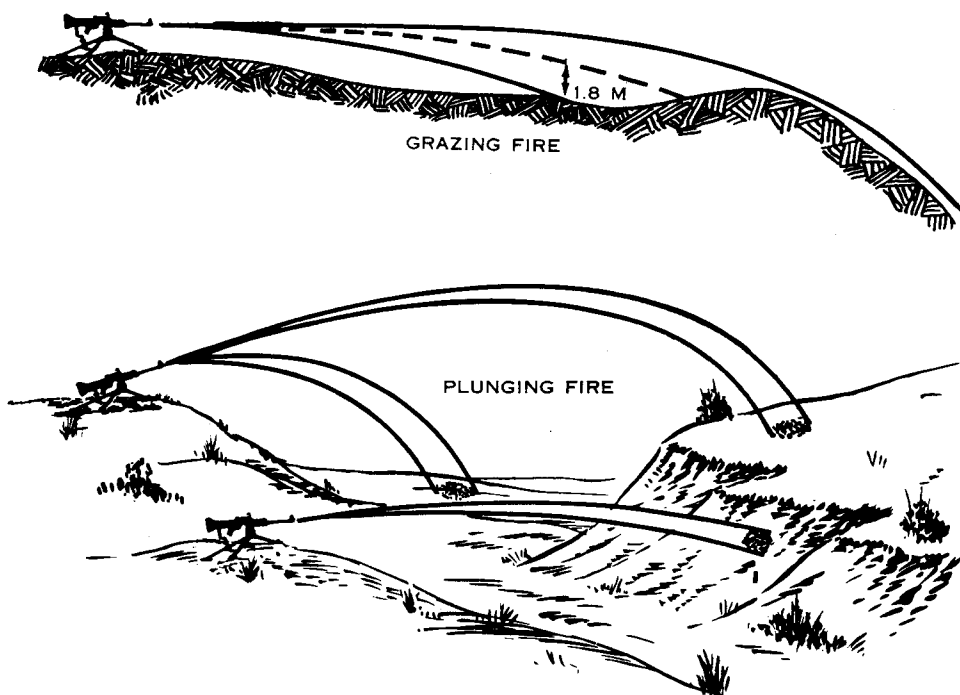


Figure 74. Plunging and grazing fire.

free gun fire cannot be delivered with the bipod mounted gun. With the vehicular mounted gun, swinging traverse fire cannot be delivered. The other types of fire can be delivered with either the bipod, tripod, or vehicular mounted gun.

(1) Fire with respect to the gun is—

- (a) *Fixed* when delivered against targets which require a single aiming point.
- (b) *Traversing* when distributed in width by successive changes in direction. With the tripod mounted gun, the changes are made in 4- to 6-mil increments on the traversing handwheel. To insure adequate target coverage, a burst is fired after each direction change.
- (c) *Searching* when distributed in depth by successive changes in elevation. When firing the tripod mounted gun over level or uniformly sloping ground, the changes are made on the elevating handwheel in 2-mil increments. When fires are delivered into rising ground, more than two mils of change are required. When fires are delivered into falling ground, less than two

mils of change are required. Gunners learn the amount of change to apply through experience. To insure adequate target coverage, a burst is fired after each elevation change.

- (d) *Traversing and searching* when distributed in width and depth by successive changes in direction and elevation. With the tripod mounted gun, the changes in direction are made in 4- to 6-mil increments on the traversing handwheel. The amount of elevation change is determined by the slope of the terrain and the angle of the target. To insure adequate target coverage, a burst is fired after each *combined* change in direction and elevation.
- (e) *Swinging traverse* when delivered against targets too wide to cover with the traversing handwheel and targets moving so rapidly across the gunner's front, that he cannot maintain effective fire while using the traversing handwheel. To deliver this type of fire, the gunner loosens the traversing slide lock lever to

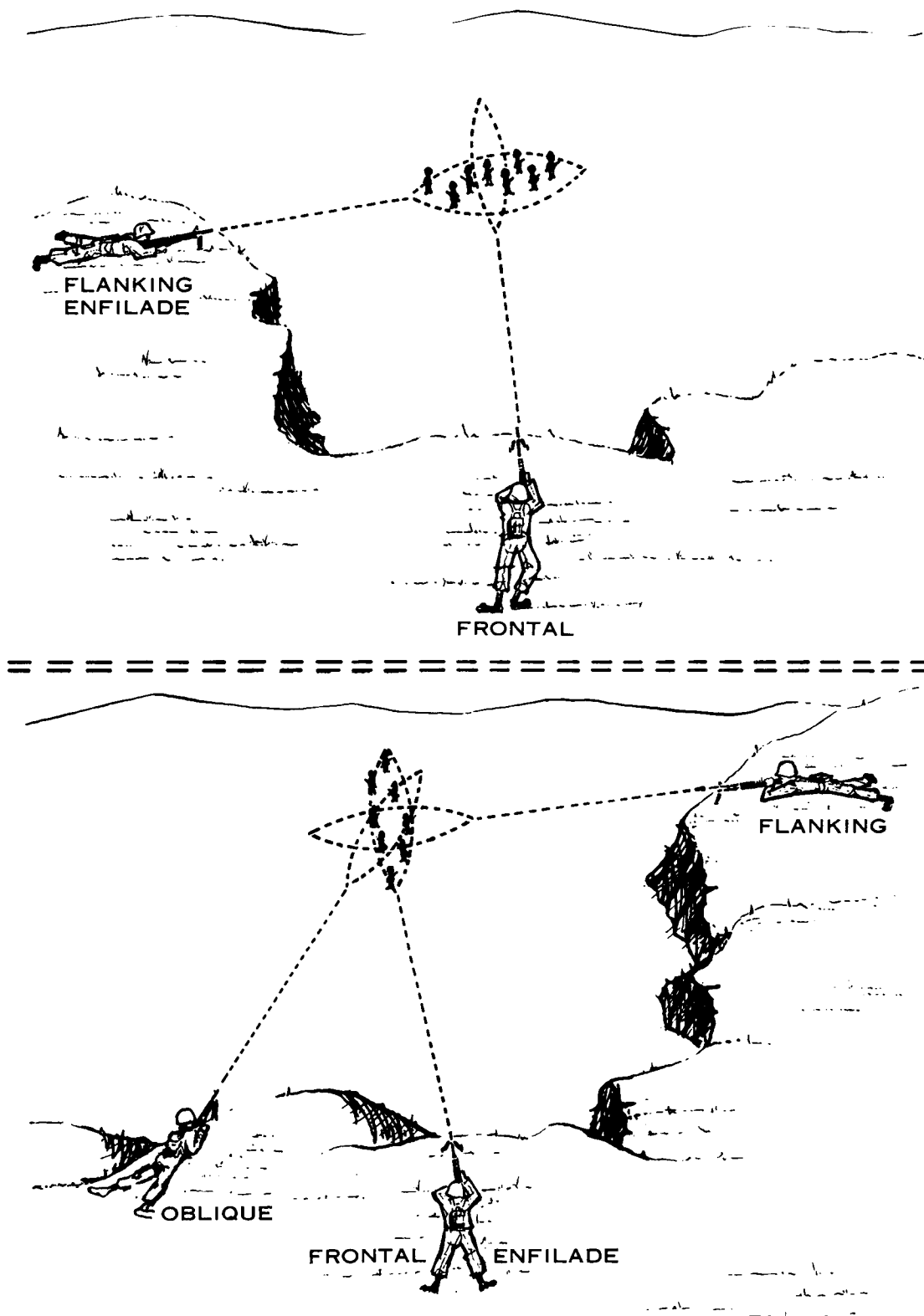


Figure 75. Classes of fire with respect to the target.

allow the traversing and elevating mechanism to slide freely on the traversing bar. Changes in direction are made by applying pressure to the rear of the gun. Minor changes in elevation are made by manipulating the elevating hand-wheel.

- (f) *Free gun* when delivered from the tripod mount against targets requiring rapid, major changes in direction and elevation which cannot be applied with the traversing and elevating mechanism, and when delivered from the vehicular mount against targets which cannot be adequately covered by selecting a series of aiming points. To deliver this type of fire from the tripod mount, the gunner loosens the traversing slide lock lever and lifts the traversing and elevating mechanism from the traversing bar to allow the gun to be moved freely in any direction. To deliver this type of fire from the vehicular mount, the gunner allows the weapon to rest freely on the mount. Changes in direction or elevation are made by applying pressure to the rear of the gun.
- (2) With the bipod or vehicular mounted gun, fixed fire is delivered by firing a

series of bursts at a single aiming point. To deliver traversing, searching, or traversing and searching fire with the bipod or vehicular mounted gun, the gunner selects a series of successive aiming points on the target and fires a succession of aimed bursts. To insure adequate target coverage, he observes the width and length of the beaten zone of the initial burst and selects each succeeding aiming point a sufficient distance from the previous burst to allow an overlap of the beaten zone.

70. Range Determination and Lateral Distance Measurement

a. Range Determination. This is the process of determining the distance between the gunner's position and his target. The gunner's ability to engage a target depends on his ability to accurately determine the range to the target. There are many methods for determining range. Some of these are estimating by eye, firing the gun, measuring range from a map or aerial photograph, stepping off the distance, and securing the data from other units. Ranges are determined to the nearest 100 meters for machinegun firing. In combat the most commonly used methods are—

- (1) *Estimating by eye.* This is the method most often used in the field. There are two methods of estimating by eye, the

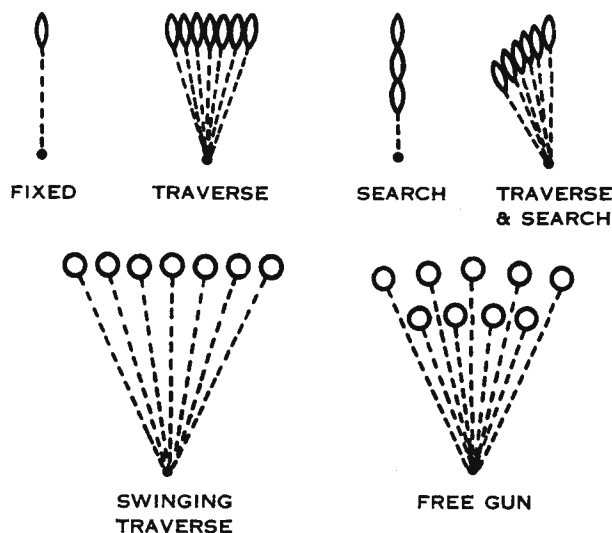


Figure 76. Classes of fire with respect to the gun.

100-meter unit of measure method and the appearance of objects method.

(a) *100-meter unit of measure method.*

To use this method the gunner must be able to visualize a 100-meter distance on the ground. With this unit in mind, he can mentally determine how many of these 100-meter units there are between his position and the target. In training his estimates should be checked by pacing off the distance (the average soldier takes about 130 steps per 100 meters). Constant practice in applying the 100-meter unit of measure is essential. This method is used for ranges up to 500 meters (fig. 77).

1. For ranges from 500 to 1,000 meters, the soldier selects a point halfway to the target, determines the range to the halfway point by applying the 100-meter unit of meas-

ure, then doubles the estimate (fig. 78). This method of determining range is not accurate beyond 1,000 meters.

2. Certain types of terrain will affect the appearance of 100-meter units of measure. On terrain that slopes upward toward the target, 100 meters appears longer than on level terrain; on ground that slopes downward toward the target, 100 meters appears shorter than on level terrain.

- (b) *The appearance-of-objects method.* Many times it is impossible to observe all of the terrain to the target. In this case, it is impractical to apply the 100-meter unit of measure and ranges must be determined by the appearance-of-objects method. To use this method, the soldier must learn through practice how



Figure 77. Applying the 100-meter unit of measure method for ranges up to 500 meters.

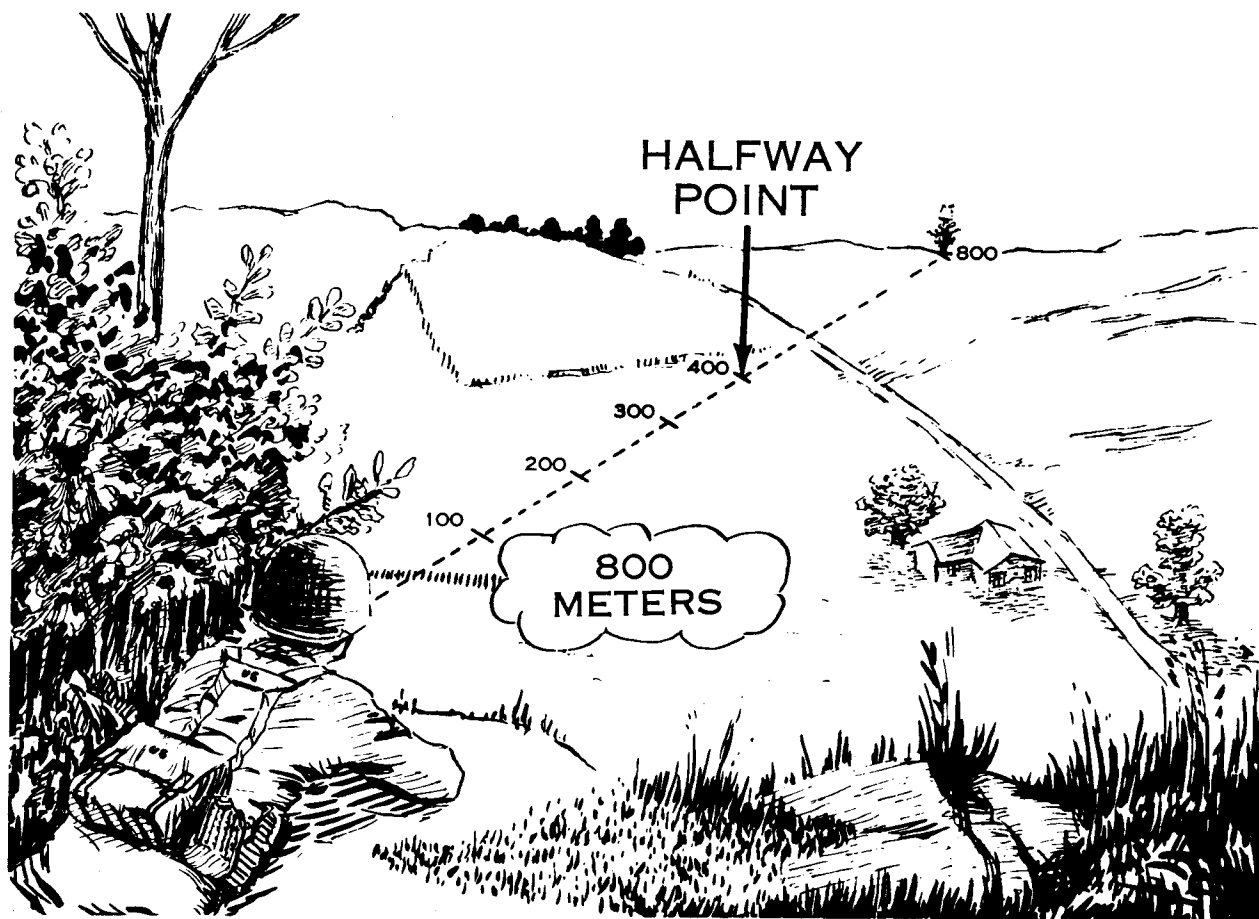


Figure 78. Applying the 100-meter unit of measure method for ranges greater than 500 meters.

familiar objects look at various known ranges. For example, he studies the appearance of a man when he is standing 100 meters away. He fixes his appearance firmly in mind—his size and the details of his uniform and equipment. Next he studies the man in the kneeling position, then in the prone position. This same procedure is followed at various known ranges out to 500 meters. By comparing the appearance of the man in these positions at known ranges, he can establish a series of mental images which will help him to determine range on unfamiliar terrain out to 500 meters.

1. Training should be conducted to familiarize the soldier with the appearance of other familiar objects such as weapons and vehicles.

2. Certain factors affect the appearance of objects, and an understanding of them will help to make estimates more accurate (table III).

(2) *Firing the gun.* To determine range by firing either the tripod, bipod or vehicular mounted gun, it must have been previously zeroed (para. 161). Open fire on the target with the sight set at the estimated range. If the center of impact is at the base of the target, the actual range is the range setting on the rear sight.

- (a) With the tripod mounted gun, if the center of impact is not placed on the base of the target, move it onto the base by means of the traversing and elevating mechanism. Cease fire and reset the rear sight slide so the new line of aim is on the target.

The rear sight will then be set at the actual range to the target.

Table III. Factors Affecting Range Determination

Factors to be considered in estimating range by eye	Objects appear nearer than they really are and ranges are underestimated	Objects appear more distant than they really are and ranges are overestimated
The target: its clearness of outline and details.	When most of the target is visible and offers a clear outline.	When only a small part of the target may be seen or is small in relation to its surroundings.
Nature of terrain or position of the observer.	When looking across a depression, most of which is hidden from view.	When looking across a depression, all of which is visible.
	When looking downward from high ground.	When looking from low ground toward high ground.
	When looking down a straight open road or along a railroad track.	When vision is narrowly confined as in streets, draws, or forest trails.
	When looking over uniform surfaces like water, snow, desert, or grain fields.	
Light and atmosphere.	In bright light or when the sun is shining from behind the observer.	In poor light such as dawn and dusk, in rain, snow, fog, or when the sun is in the observer's eyes.
	When the target is in sharp contrast with the background or is silhouetted, by reason of size, shape, or color. When seen in the clear atmosphere of high altitudes.	When the target blends into the background or terrain.

(b) With the bipod or vehicular mounted gun, if the center of impact falls short of the target, raise the rear sight slide after each burst; or if it goes over the target, lower the rear sight slide after each burst until the line of aim coincides with the strike of the projectile on the target. The rear sight will then be set at the actual range to the target.

(c) When the ground in the vicinity of the target does not permit observation of the beaten zone, the gunner must select an alternate point on the ground that will permit him to see the strike of the projectiles. The selected point must be at the same range as the target. The gunner then determines the actual range to the alternate point on the ground by firing the weapon. This is also a method of determining range to a target upon which surprise fire is to be delivered.

b. *Lateral Distance Measurement.* In addition to being able to determine range accurately, the gunner needs a quick method of measuring lateral distance right or left from a reference point to a target.

- (1) When the gun is mounted on tripod, width can be measured by aiming on a point and manipulating the traversing handwheel and counting the clicks from one point of aim to another point of aim. Each click equals one meter at 1,000 meters, or half a meter at 500 meters. This method is accurate but time consuming.
- (2) The finger measurement method is not a method of range determination, but only a method of measuring the lateral distance (in fingers) between two points. To measure the distance in fingers between a reference point and a target, extend the arm with the palm outward, the fingers cupped, and the elbow locked. Close one eye, raise the index finger, and sight along its edge, placing the edge of the finger along the flank of the target or reference point. Note the space remaining between the two points, and then fill this space by raising fingers until the space is covered (fig. 79). The measurement from the reference point to the target is then stated as being one or more fingers, depending on how many fingers are raised to cover this distance. It should be emphasized that fingers cannot be calibrated to any unit of measure.



Figure 79. The finger measurement method.

Section III. FIRE CONTROL

71. General

a. Fire control includes all actions of the leader and crew(s) that are connected with the preparation for and application of effective fire on a target. It is the ability to select and designate targets for the appropriate gun(s), open fire at the instant desired, adjust the fire of the gun(s), regulate the rate of fire, shift from one target to another, and cease fire.

b. Ability to exercise fire control depends primarily on the ability of the leader and the discipline and training of the crew. Failure to exercise fire control results in ineffective employment of the machinegun and can result in danger to friendly troops, loss of surprise effect, premature disclosure of positions, fire on unimportant targets, loss of time in adjusting fire, and a waste of ammunition.

72. Methods of Fire Control

There are several methods of controlling machinegun fire. The noise and confusion of battle will limit the use of some of these methods; therefore, the leader must select the best method or combination of methods which will best accomplish his purpose.

a. *Oral.* This is an effective method of control; but at times, the leader will be too far away from the gun crew(s) or the noise of battle will make it impossible for the gun crew(s) to hear him.

b. *Arm-and-Hand Signals.* This is an effective method when the gun crew(s) can see the leader. All crew members must understand the standard arm-and-hand signals discussed in paragraph 78.

c. *Prearrange Signals.* These are either vis-

ual or sound signals such as pyrotechnics or blasts on a whistle. These signals should be included in appropriate SOP's and must be clearly understood by all crew members.

d. Personal Contact. In many situations, the leader must move to individual crew members to issue orders. This method of control is used more than any other by small unit leaders. The leader must use maximum cover and concealment to keep from disclosing the gun crew's position.

e. Standing Operating Procedures. Standing operating procedures are actions the gun crews perform automatically without command. SOP's such as those described in paragraph 77e are developed during the training of the gun crews, and their application eliminates many commands and simplifies the leader's job of fire control.

73. Fire Commands

a. When the leader decides to deliver fire on a target which is not obvious to the gunners, he must give them the information they will need to place effective fire on the target. He must get

their attention, tell them what the target is, where it is located, which rate of fire to use, and give the command to open fire.

b. A fire command is given in order to accomplish this quickly and without confusion. Fire commands are either initial or subsequent. Initial fire commands are issued to begin firing at a target, and subsequent fire commands are issued to adjust fire, change the rate of fire, interrupt fire, shift fire to a new target, or to terminate the alert.

c. The noise and confusion of combat, and the separation of the guns make the use of complete fire commands, particularly oral commands, difficult and impractical. Therefore, abbreviated, informal fire commands (initial and subsequent) are more appropriate. However, before the crew members can react properly when they receive informal or abbreviated fire commands, they must have a complete understanding of the standardized fire command.

74. Elements of the Fire Command

Fire commands for all direct fire weapons follow a pattern that includes similar elements.

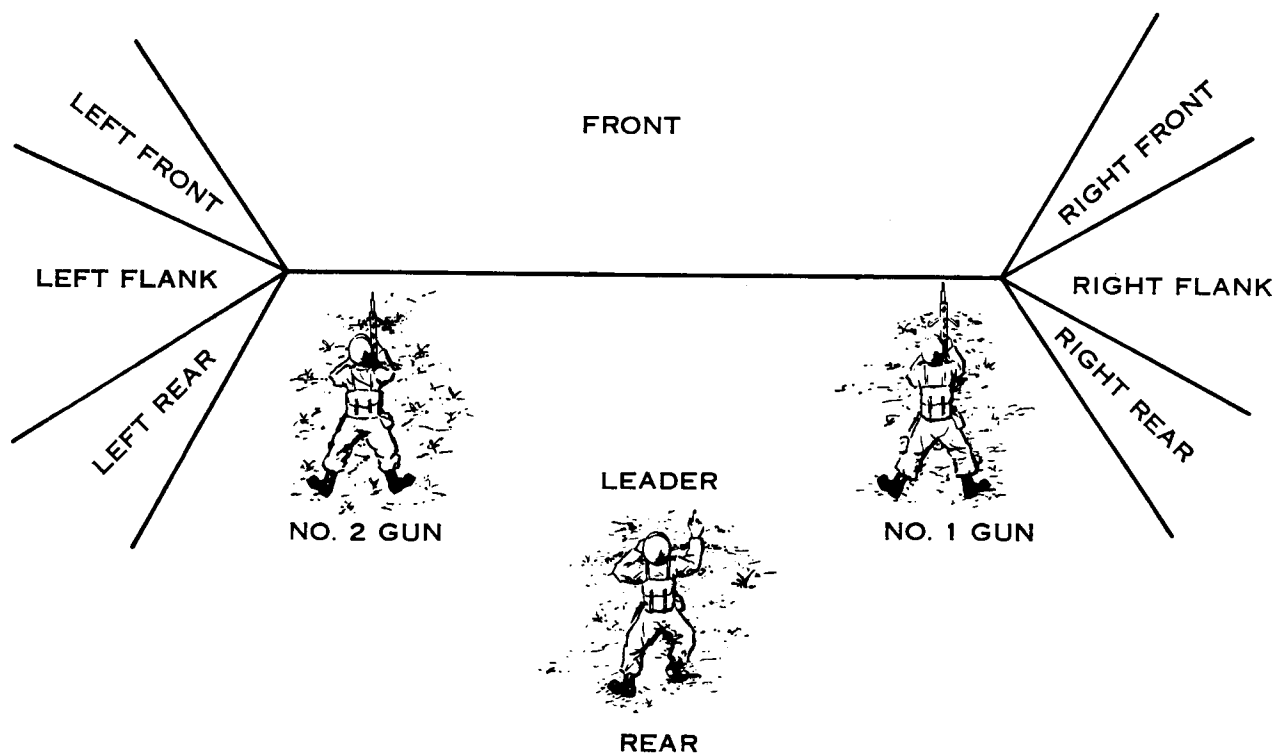


Figure 80. General direction.

There are six essential elements for the machinegun that are either given or implied by using one or more of the methods of control. During training the gun crew repeats each element of the fire command as it is given. This is done to avoid confusion and to train the crew to think and act in the proper sequence. The six elements of the fire command as they apply to the machinegun are *alert, direction, description, range, method of fire, and command to open fire.*

a. *Alert.* This element brings the crew(s) to a state of readiness to receive further instruction. The leader may alert both gun crews or only one, depending on the situation. Once alerted the assistant gunners frequently check with the leader in order to pass on to the gunners any instructions from the leader. The oral alert consists of FIRE MISSION, which is announced to alert the gunner(s) that a target has been detected and will receive fire. If both guns are to fire, the fire unit leader announces FIRE MISSION; if only one gun is to fire, he will announce NUMBER ONE (TWO) FIRE MISSION. If he desires to alert both guns but fire only one, he will announce FIRE MISSION NUMBER ONE (TWO).

b. *Direction.* This element indicates the general direction to the target and may be given in one or a combination of the following ways.

- (1) *Orally.* The leader gives the direction to the target in relation to the position of the gun(s) as shown in figure 80.
- (2) *Pointing.* The leader can designate a small or obscure target by pointing with his arm or aiming with the machinegun(s). When pointing with his arm, a man standing behind him should be able to look over his shoulder and sight along his arm and index finger to locate the target. When a gun has been aimed at a target, a soldier looking through the sights should be able to see the target.
- (3) *Use of tracer ammunition.* Tracer ammunition is a quick and sure method of designating a target which is not clearly visible. When using this method, the leader should first give the general direction to direct the gun crew's attention to the desired area. To minimize the loss of surprise when using tracer ammunition, the leader does not

fire until he has given all of the elements of the fire command except the command to fire. When using this method of designating a target, the leader may use his individual weapon or fire one or more bursts from a machinegun. The firing of the tracer(s) then becomes the last element of the fire command and is the signal to open fire. For example:

FIRE MISSION
FRONT
BUNKER
WATCH MY TRACER(S)
(BURST)

The leader fires his individual weapon or a machinegun at the enemy bunker, then his gun crew(s) opens fire.

- (4) *Reference points.* Another method of designating obscure targets is by using easily recognizable reference points. Prominent terrain features and man-made objects make good reference points. All leaders and members of the gun crew(s) must be familiar with the terrain features and the terminology used to describe them (FM 21-26). When using a reference point, the word "reference" precedes its description and the word "target" precedes the target description. This is done to avoid confusion. The general direction to the reference point should be given. Here are some examples of the use of reference points.

FIRE MISSION, NUMBER ONE
FRONT
REFERENCE: LONE PINE
TREE
TARGET: TRUCK

Sometimes a target must be designated by using successive reference points. For example:

NUMBER ONE, FIRE MISSION
RIGHT FRONT
REFERENCE: RED ROOFED
HOUSE, LEFT TO HAY-
STACK, LEFT TO BARN
TARGET: MACHINEGUN

Finger measurements (para. 70b(2)) can be used to direct the gun crews'

attention to the right or left of reference points. For example:

FIRE MISSION
LEFT FRONT
REFERENCE: CROSS ROADS
RIGHT FOUR FINGERS
TARGET: LINE OF TROOPS

When the guns are mounted on tripod, lateral distance from reference points can be accurately announced. When gunners are firing the tripod mounted gun, lateral distance is assumed to be in mils unless otherwise indicated, so the word "mils" is not necessary. For example:

FIRE MISSION
FRONT
REFERENCE: KNOCKED OUT
TANK
LEFT FOUR ZERO
TARGET: COLUMN OF
TROOPS

c. Description. The target description is used to create a picture of the target in the minds of the gun crew. The gun crew(s) must know the type of target they are to engage to properly apply their fire. The leader should describe it briefly, but accurately. For example:

Dismounted enemy personnel	LINE OF TROOPS COLUMN OF TROOPS
----------------------------	---------------------------------------

Automatic weapon	MACHINEGUN
Armored vehicle	TANK
Unarmored vehicle	TRUCK
Artillery or antitank weapon	ANTITANK
Airplanes or helicopter	AIRCRAFT

If the target is obvious, no description is necessary. Finger measurements or mil measurements can be used to designate the width of a linear target when the flanks cannot be pinpointed.

d. Range. The range to the target is given so the gun crew(s) knows how far to look for the target and knows immediately what range setting to place on the rear sight. Range is determined and announced in meters. Since the meter is the standard unit of range measurement, the word meters is not used. With machineguns the range is determined and announced in even hundreds and thousands, for example: THREE

HUNDRED, ONE THOUSAND, ONE ONE HUNDRED. This element may be omitted when the gunners can obviously determine the range for themselves; however, it is desirable in some situations to announce the range.

e. Method of Fire. This element includes manipulation and rate of fire.

(1) Manipulation is used to prescribe the class of fire with respect to the gun (para. 69c). It is announced as FIXED, TRAVERSE, SEARCH, TRAVERSE AND SEARCH, SWINGING TRAVERSE, or FREE GUN.

(2) Rate is used to control the rate of fire. There are three rates of fire which may be announced for the gun(s), sustained, rapid, and cyclic (para. 81b).

f. Command to Open Fire. If surprise fire is required, the command FIRE is given without pause. It is often of great importance that machinegun fire be withheld for maximum effect and that both guns of a pair open fire at the same time. To insure this, the leader may preface the command to commence firing with the words AT MY COMMAND. When the gunners are ready to engage the target, they report UP to the assistant gunners who signal READY (para. 78a) to the leader. The leader then gives the command FIRE at the specific time desired. For example:

FIRE MISSION
FRONT
COLUMN OF TROOPS
AT MY COMMAND (Pause until crew members are ready and fire is desired.)
FIRE

75. Subsequent Fire Commands

If the gunner fails to adjust his fire on the target, the leader must promptly correct him by announcing or signaling the desired change(s). When these changes are given, the gunner makes the required corrections and continues to engage the target without further command. When firing under the control of a leader, the assistant gunner checks with the leader for instructions which he passes on to the gunner.

a. Adjustment for direction is always given first, such as RIGHT ONE ZERO or LEFT FIVE. Adjustment for elevation is given next, such as ADD FIVE or DROP ONE FIVE. These may be given orally or with arm-and-hand sig-

nals (para. 78c, d). Adjustments in direction and elevation are always implied as mils for guns on tripod. For guns on bipod or vehicular mount, direction and elevation adjustments are made by announcing or signaling *SHIFT LEFT (RIGHT)* or *DROP (ADD)*. The word "mils" is not used in subsequent fire commands.

b. Changes in the rate of fire are given orally or by arm-and-hand signals (para. 78b).

c. To interrupt firing, the leader announces *CEASE FIRE* or gives a signal to cease fire (para. 78e). The gun crew(s) remains on the alert and firing can be resumed on the same target by announcing *FIRE*.

d. To terminate the alert, the leader announces *CEASE FIRE, END OF MISSION*.

76. Doubtful Elements and Corrections

a. *Doubtful Elements*. When the gunner is in doubt about any element of the fire command, he repeats the element in question with a rising inflection in his voice to denote a question. The leader then announces *THE COMMAND WAS*, repeats the element in question, and continues with the fire command.

b. *Corrections*.

- (1) *Initial fire commands*. When the leader makes a mistake in the initial fire command, he corrects it by announcing *CORRECTION*, and then gives the corrected elements(s). For example:

FIRE MISSION
FRONT
LINE OF TROOPS
FIVE HUNDRED
CORRECTION
SIX HUNDRED
TRAVERSE
AT MY COMMAND

- (2) *Subsequent fire commands*. When the leader makes an error in the subsequent fire command, he may correct it by announcing *CORRECTION*, and then repeating the entire subsequent fire command. For example:

LEFT FIVE, DROP ONE
CORRECTION
LEFT FIVE, DROP ONE ZERO

77. Abbreviated, Informal Fire Commands

Fire commands need not be complete or formal

to be effective. In combat the leader's fire command will seldom include all of the elements. He will use only the elements necessary to place fire on a target quickly and without confusion. However, initially during training he should use all of the elements to instill in the crew members the habit of thinking and reacting in the proper manner when a target is to be engaged. After the crew members' initial training in fire commands, they should be taught to react to abbreviated, informal fire commands, using the various methods of control. Here are some examples of abbreviated, informal fire commands using the various methods of control.

a. *Oral*. The leader desires to place the fire of one gun on an automatic weapon that he has located. He gives the following fire command:

FIRE MISSION, NUMBER ONE
REFERENCE: TOP OF SILO
LEFT THREE ZERO (Gun is on tripod
mount.)
TARGET: MACHINEGUN
FIRE

When a range card has been prepared (para. 112 and 113) the leader can place fire on targets, which the gunner cannot see, by using only the alert, description, and the command to fire. The leader describes the target by its number, prefacing the number of the target with the word target. For example:

FIRE MISSION, NUMBER ONE
TARGET NUMBER THREE
AT MY COMMAND
FIRE

b. *Arm-and-Hand Signals*. The leader desires to have one gun engage a halted truck about 400 meters away. The leader throws a pebble at the gun that will fire. The gunner or assistant gunner turns to look at the leader. The leader points to the target. The assistant gunner signals the leader when they are ready to fire. The leader then signals *FIRE*.

c. *Prearranged Signals*. Assume that a pair of machineguns is placing supporting fire on an objective. The leader desires to shift the fire at a specific time. When the time arrives, he fires a smoke streamer and the gunners, upon seeing the signal, shift their fire to a prearranged point.

d. *Personal Contact*. Assume that both guns are engaging the same target and the leader wishes to shift the fire of one gun to a new target. The leader moves to the gun that he desires to

have shift fire, obtains the gunner's attention, points out the new target, and commands FIRE.

e. SOP's That Can Be Developed.

(1) *The search-fire-check SOP.*

- (a) *Search.* The crew members search their sector.
- (b) *Fire.* Gunners open fire automatically on appropriate targets that appear in their sector.
- (c) *Check.* While the gunner is firing, the assistant gunner must check the leader for instructions.

(2) *The return fire SOP.* The gun crews are trained to return enemy fire without order, concentrating on enemy automatic weapons.

(3) *The shifting fires SOP.* The gunners should be trained to engage all appropriate machinegun targets in their sector and shift their fire automatically when more dangerous targets appear.

(4) *The rate of fire SOP.* When gunners engage a target, they fire at the rate necessary to gain fire superiority, then they decrease the rate of fire to a point that is sufficient to maintain fire superiority.

(5) *Mutual support SOP.*

- (a) When both machineguns are engaging the same target and one of the guns stops firing, the other gunner increases his rate of fire and covers the entire target.
- (b) When only one gun is required to engage a target and the leader has alerted both guns, the gun not firing must lay on the target and follow the movements of the target so that he can fire instantly should the other gun malfunction or cease fire before the target has been eliminated.

78. Arm-and-Hand Signals

Due to battlefield noises and the possibility of guns being located considerable distances from the leader, it will often be necessary to use arm-and-hand signals to control the machinegun fire. When an action or movement is to be executed by only one of the gun crews, a preliminary signal is given by pointing toward the crew to execute the action. When necessary all signals are relayed to the gunner by the assistant gun-

ner. The following are the most commonly used signals for machinegun fire control.

a. The assistant gunner signals that the gunner is ready to fire by raising his right hand and arm above his head toward the leader (fig. 81).

b. To commence firing, the leader brings his hand, palm down, to the front of his body about waist level and moves it horizontally in front of his body (fig. 82). To fire faster, increase the speed of the hand movement; to fire slower, decrease the speed of the hand movement.

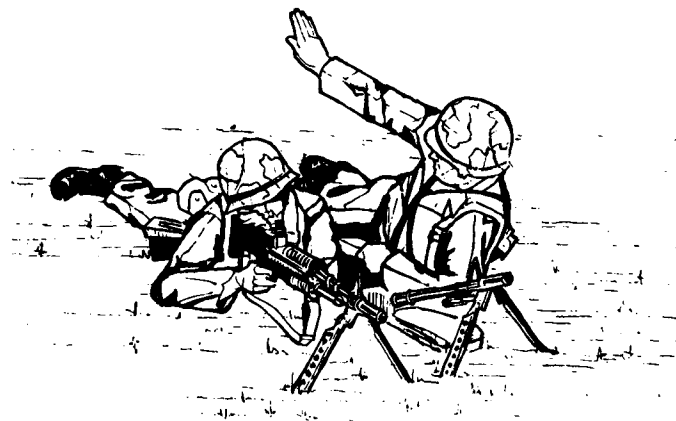


Figure 81. The ready signal.

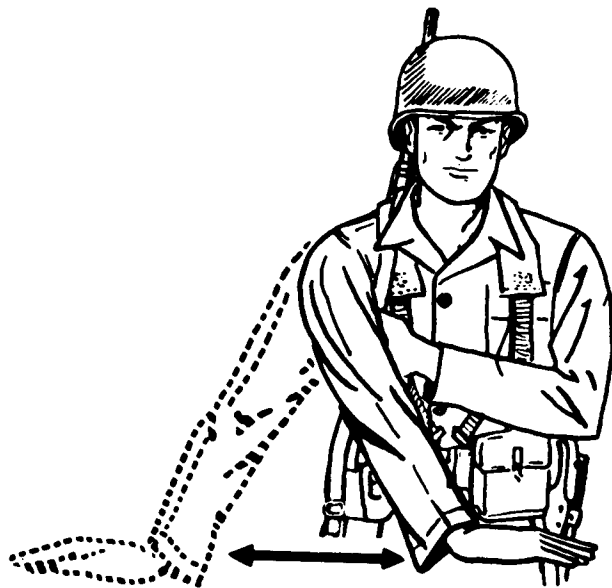


Figure 82. Commence firing.

c. To signal changes in direction and elevation, with the tripod mounted gun, extend the arm and hand in the direction of the desired

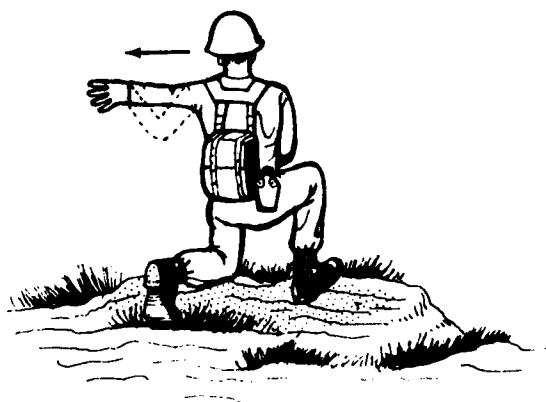
change and indicate, by the number of fingers extended, the amount of change necessary. The fingers must be spread so the assistant gunner can easily see the number of fingers extended. Each finger indicates one mil of change (fig. 83). If the desired change is more than five mils, the leader extends his hand the number of times necessary to indicate the total amount of change. For example, RIGHT NINE would be indicated by extending the hand once with five fingers showing and a second time with four fingers showing for a total of nine fingers.

d. To signal changes in direction and elevation with the bipod or vehicular mounted gun, extend the arm and hand in the direction of the

desired change with the fingers extended and joined (fig. 84). If the gunner makes too bold or too slight a change, issue subsequent signals until the fire is placed in the desired area.

e. To interrupt firing, the leader raises his arm and hand in front of his forehead, palm outward, and cuts it downward sharply. The assistant gunner then slaps the gunner on his back to indicate CEASE FIRE (fig. 85).

f. The leader can devise other signals to control his guns; for example, signals to change barrels, remove the gun from the tripod, or emplace the gun in a certain position. A more detailed discussion of arm-and-hand signals can be found in FM 21-60.

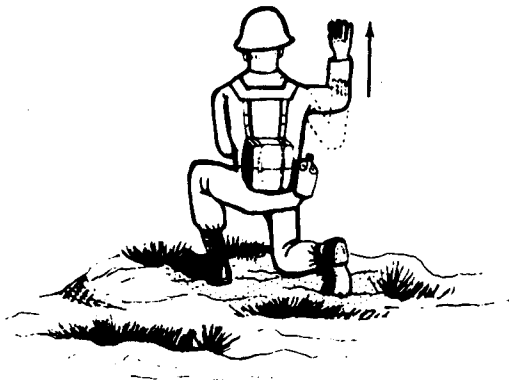
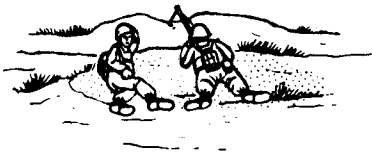


LEFT 4

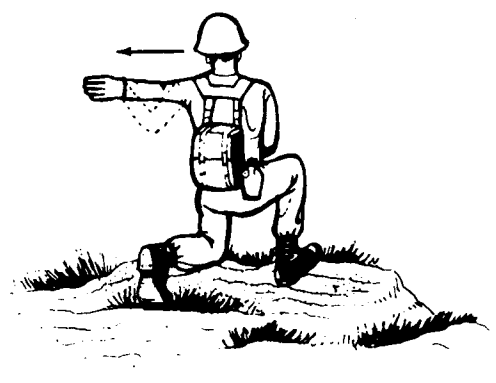


ADD 4

Figure 83. Adjusting fire with the tripod mounted gun.



ELEVATE FIRE



SHIFT FIRE LEFT

Figure 84. Adjusting fire with the bipod mounted gun.

Section IV. PRINCIPLES OF APPLICATION OF FIRE

79. General

a. Application of fire consists of the methods the gun crews use to insure complete and effective coverage of a designated target to include suspected areas in which the enemy might be located.

b. Training in the methods of applying machinegun fires can be accomplished only after the crew members have learned to recognize the various types of targets they might encounter in combat, how to properly distribute and concentrate their fire, and how to maintain the proper rate of fire.

80. Types of Targets

Targets presented to the machinegunners during combat will in most cases consist of enemy personnel in various formations which require distribution and concentration of fire. These targets have width and depth, and the application



Figure 85. Cease fire.

of machinegun fire is designed to thoroughly cover the area in which the enemy is known or

suspected to be. These targets may be easily distinguishable or may be indistinct and difficult to locate.

a. *Point targets* are targets which require the use of a single aiming point. Enemy bunkers, weapons emplacements, vehicles, small groups of personnel, and aerial targets such as helicopters or descending paratroopers are examples of point targets.

b. *Linear targets* have sufficient width to require traversing fire and no more depth that can be effectively covered by the beaten zone (fig. 86).

c. *Linear targets with depth* are targets which have sufficient width to require traversing fire and depth which cannot be covered by the beaten zone. They require a combined change in direction and elevation (traversing and searching fire) to maintain effective fire on them (fig. 87).

d. *Deep targets* have depth but very little width and can be effectively covered by searching fire (fig. 88).

e. *Area targets* as discussed in this manual have considerable width and depth and require extensive traversing and searching fire. This type target exists when the enemy is in a certain

area but his exact location is not known. An objective such as a hilltop is a typical area target.

81. Distribution, Concentration, and Rate of Fire

In combat the size and nature of a target may call for the firepower of one or both guns. The method of applying fire to a target is generally the same for either a single gun or a pair of guns.

a. *Distribution and Concentration of Fire.*

(1) Distributed fire is delivered in width, depth, or in a combination of these two. To distribute fire properly, gunners must know where to aim and adjust their fire and which direction to manipulate the gun.

(a) *Point of initial lay and adjustment.*

The gunner must aim, fire, and adjust on a certain point of the target. It is extremely important that fire be adjusted boldly, rapidly, and continuously. Binoculars can be used by the leader to facilitate fire adjustment. The gunner insures throughout his firing that the center of impact is maintained at the base of the target for maximum effect from

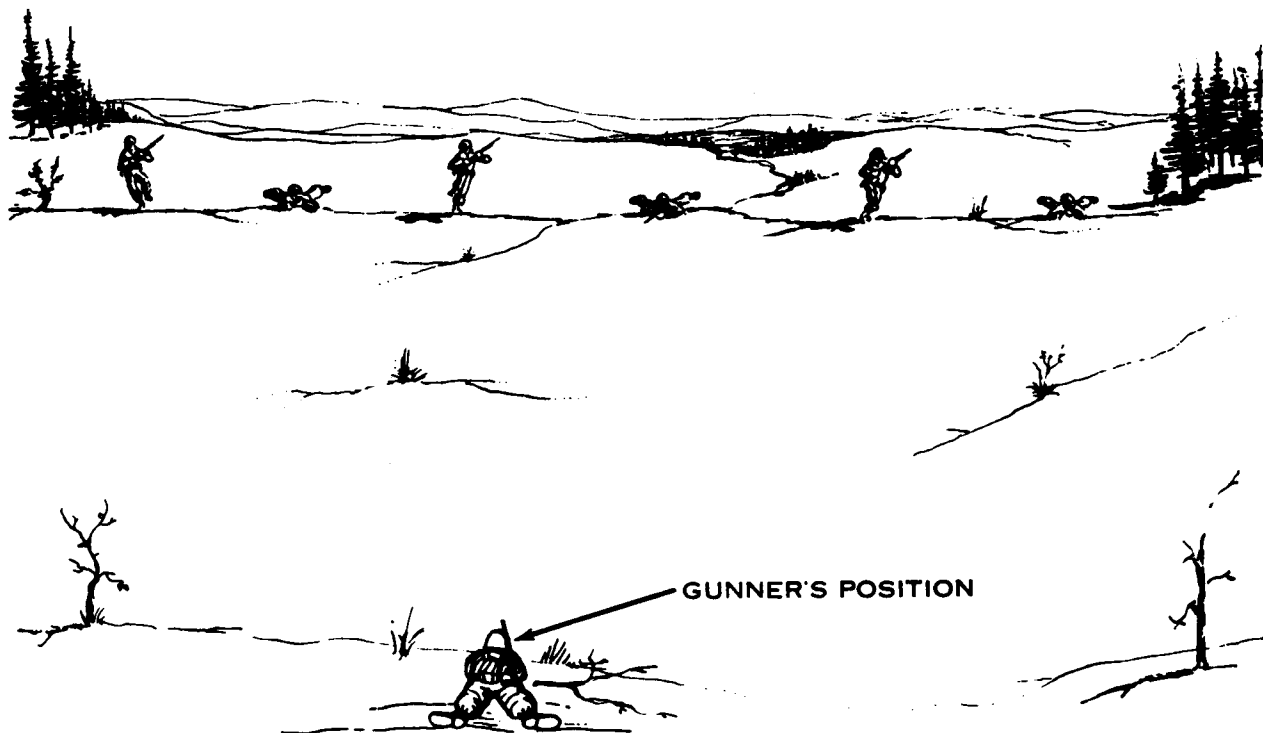


Figure 86. Linear target.

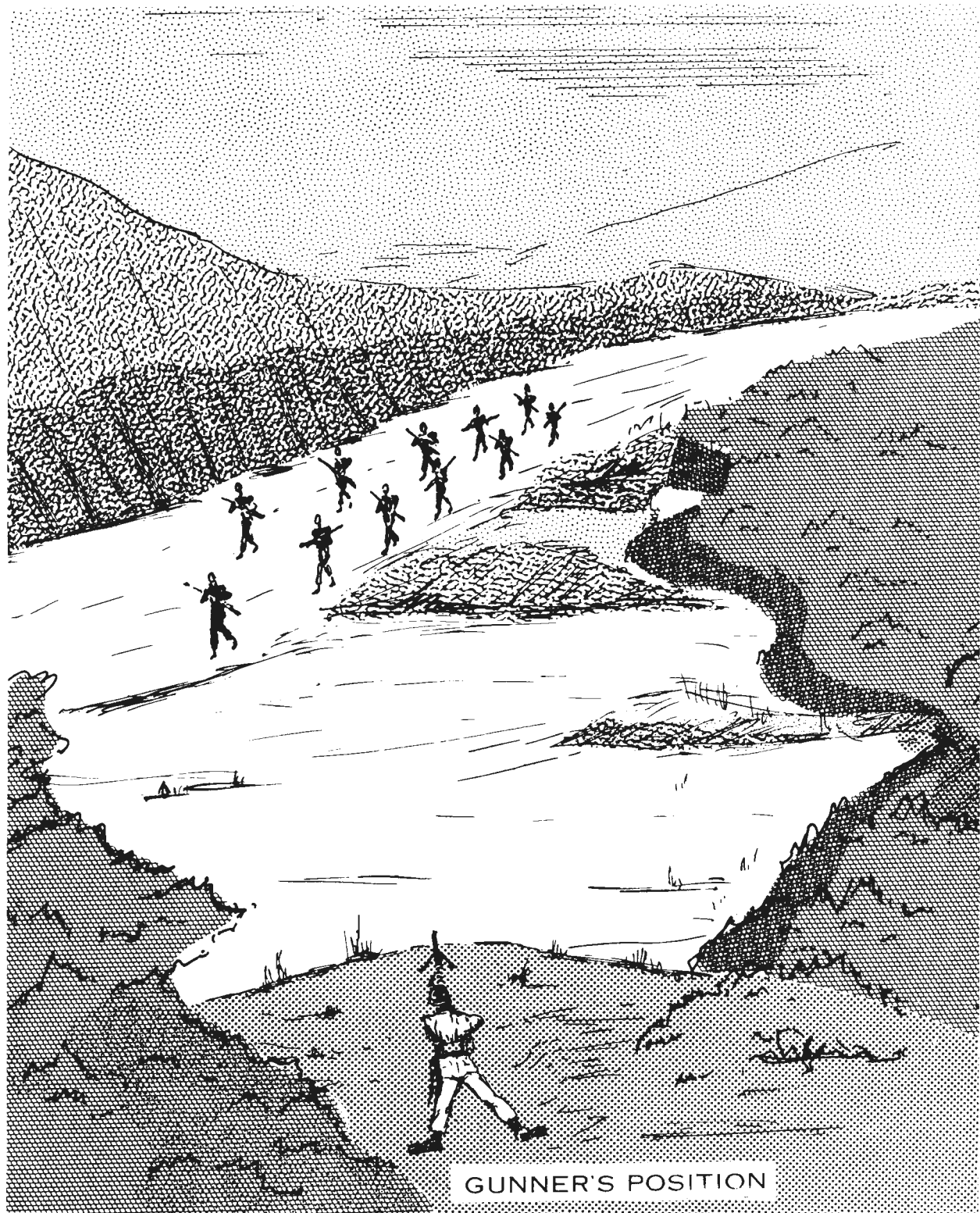


Figure 87. Linear target with depth.

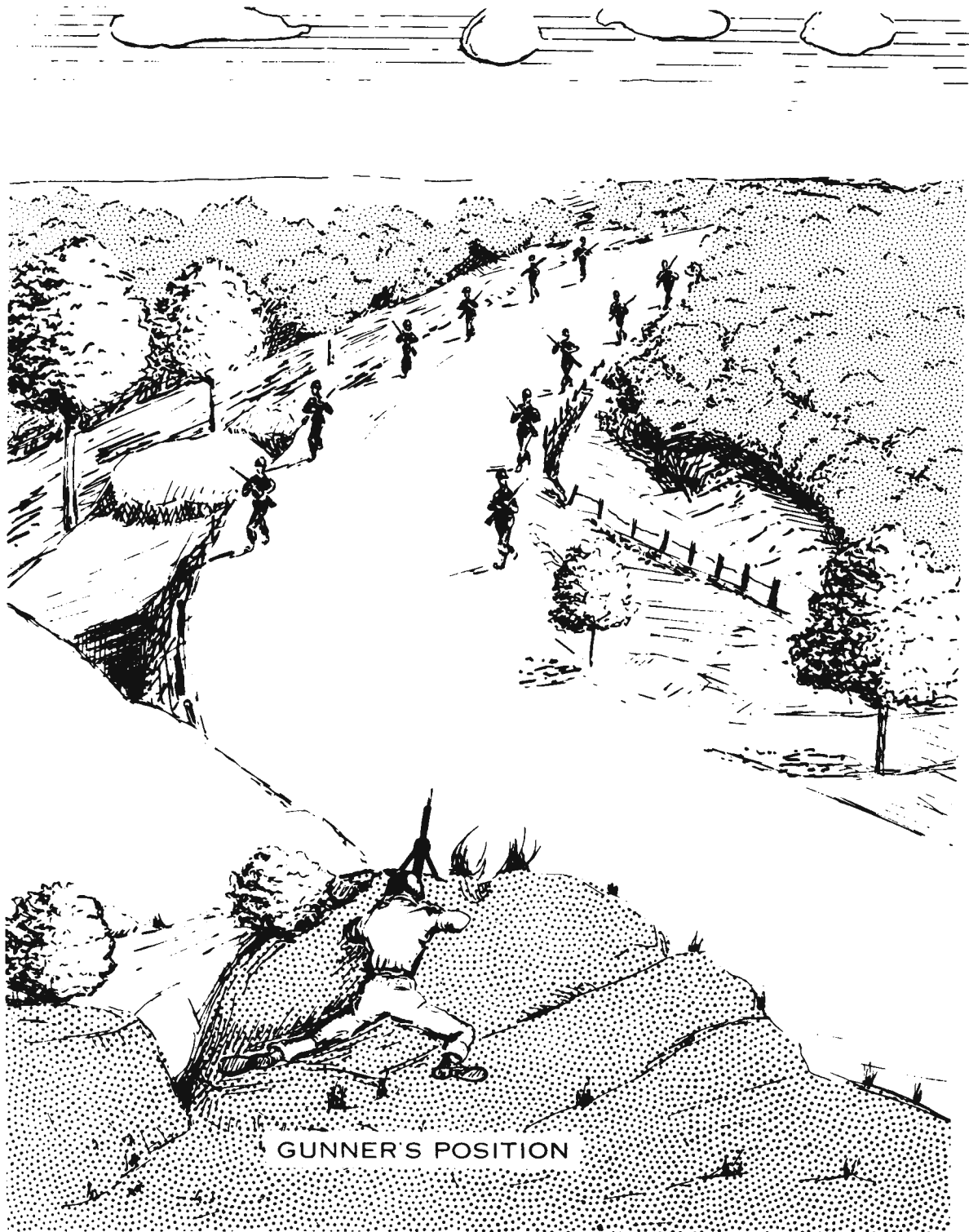


Figure 88. Deep target.

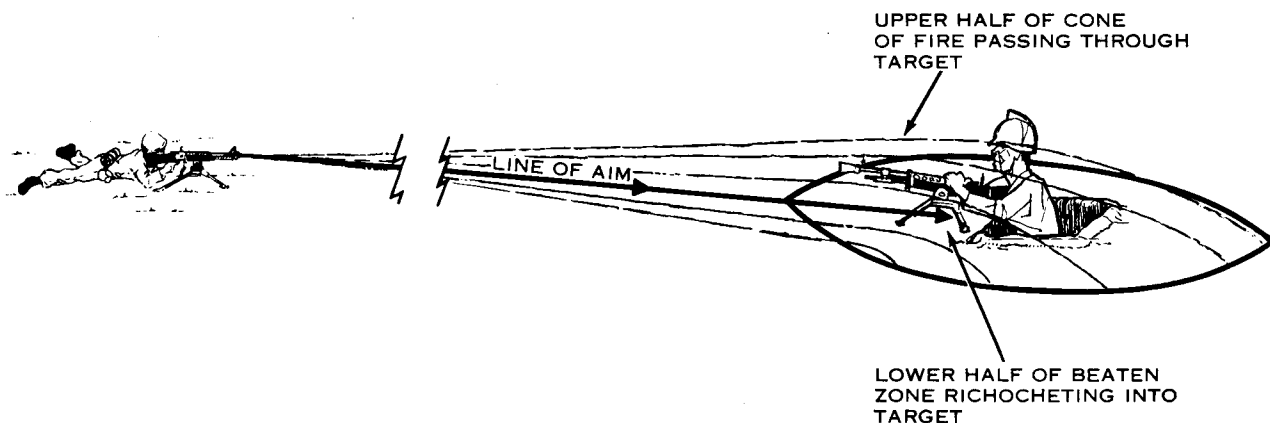


Figure 89. Placement of center of impact on target.

each burst of fire. When this is done, projectiles in the upper half of the cone of fire will hit the target, and projectiles in the lower half of the beaten zone may ricochet into the target (fig. 89).

- (b) Direction of manipulation of the gun after adjusting fire onto the point of initial aim. The gunner must move his beaten zones in a certain direction over the target. The direction depends on the type of target and whether the target is engaged with a pair of guns or a single gun. When engaging targets other than point targets with a pair of guns, the targets are divided so that fire is evenly distributed throughout the target area.

- (2) Fire delivered on point targets or a specific area of other target configurations is called concentrated fire.

b. Rates of Fire.

- (1) There are three rates of fire with the machinegun: sustained, rapid, and cyclic. These rates are established primarily as a guide for training and to indicate when a barrel change is desirable. In many instances firing will be in excess of the rapid and sustained rate or below the sustained rate. In training, the rate of fire should be announced to facilitate learning and to provide the gunners with a basis for judging the number of rounds being expended in

subsequent training or in combat.

- (a) Sustained fire is 100 rounds per minute in bursts of six to nine rounds at 4- to 5-second intervals. It is directed by announcing SUSTAINED. (A barrel change is recommended after firing the sustained rate for 10 minutes.)
- (b) Rapid fire is 200 rounds per minute in bursts of six to nine rounds at 2- to 3-second intervals. It is directed by announcing RAPID. (A barrel change is recommended after firing two minutes.)
- (c) The cyclic rate of fire represents the maximum amount of ammunition which can be expended by a weapon in one minute. The cyclic rate of fire with the M60 machinegun is approximately 550 rounds per minute. This rate is in effect when the trigger is held to the rear and ammunition is continuously fed into the weapon for any given period of time. (A barrel change is recommended after firing at any rate in excess of the rapid rate for one minute.)
- (2) The following techniques concerning the rate of fire should be followed for maximum effect.
 - (a) Ground targets are *initially* engaged using the rapid or higher rate (200 or more rounds per minute) in order to gain fire superiority. After fire superiority has been gained, the rate

of fire is reduced to a point that is sufficient to maintain fire superiority. This reduction in rate of fire is necessary to keep the barrel from

overheating and to conserve ammunition.

(b) Aerial targets are engaged using the cyclic rate.

Section V. APPLICATION OF FIRE (TARGET ENGAGEMENT—DIRECT LAY)

82. General

a. When machinegun fire is under direct control of a leader, he designates the midpoint and flanks or ends of a target unless these are obvious to the gun crew(s).

b. When a target other than a point target is engaged by two gunners, it is always divided. Each gunner applies his fire to that portion of the target corresponding to his position with relation to the other gun. Normally each gunner engages one half of the target; however, gunners must be prepared to engage the entire target if this becomes necessary. Gunners continue to fire on the target until it is neutralized or until receiving another signal from the leader.

c. In order that the weapons squad machinegunners remain constantly aware of the portion of a given target that they would engage, their positions are numbered. The gun position on the right is the number one position, and the gun position on the left is the number two position (fig. 80). It should be emphasized that the *positions* are numbered, not the guns or gunners.

d. To insure that gunners react quickly and properly when they detect a target or when a target is designated by the leader, standard methods of applying fire to the various types of targets are taught. These methods are the same for bipod, tripod, and vehicular mounted guns.

83. Point Targets

A point target is engaged with fixed fire. If it moves after the initial burst, the gun crew(s) keeps fire on the target by following its movement with the gun(s).

84. Linear Targets

Linear targets are engaged with traversing fire.

a. Two Guns.

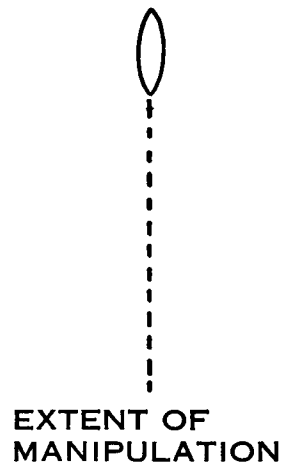
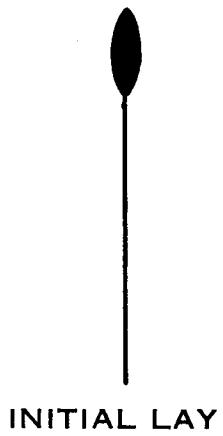
(1) *Normal division.* The target is divided at the midpoint; gun No. 1 firing on the right half, and gun No. 2 firing

on the left half. The point of initial lay and adjustment for both guns is on the midpoint of the target. After adjusting on the midpoint, gun No. 1 traverses right, firing a burst after each change in direction until reaching the right flank. Gun No. 2 traverses to the left flank in the same manner. Both gunners then reverse their direction of traverse and return to the midpoint (fig. 90).

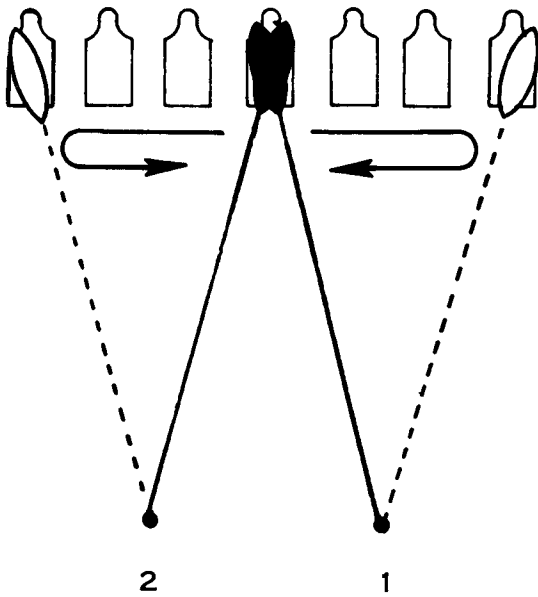
(2) *Special division.* If one portion of the target presents a greater threat than another portion, fire can be concentrated on that portion by dividing the target unevenly. The special division of the target is accomplished with subsequent fire commands after firing begins. The gunners initially lay on the midpoint regardless of the special division to be made, thus precluding confusion (fig. 91).

b. *One Gun.* A single gunner must engage the entire width of a linear target. The point of initial lay is on the midpoint or that portion of the target presenting the greatest threat. The gunner then manipulates in either direction to a flank and reverses his direction of manipulation to cover the rest of the target (fig. 90).

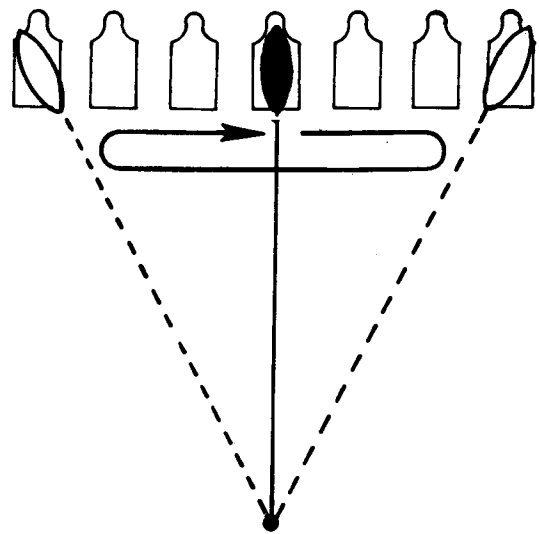
c. *Indistinct Linear Targets.* If a linear target is not easily identifiable by the gunners, the leader *may* designate the target by using a reference point. When the reference point method of designating an indistinct target is used, the leader determines the center mass of the target and announces the number of mils or fingers from the reference point that will cause each gunner to lay on the center mass. The reference point may be within or adjacent to the target; however, it should be on line with the target for maximum effect. After the command to fire has been given, the leader maintains and controls the fire on the target by using subsequent fire commands. Here is an example of a fire command



SYMBOLS

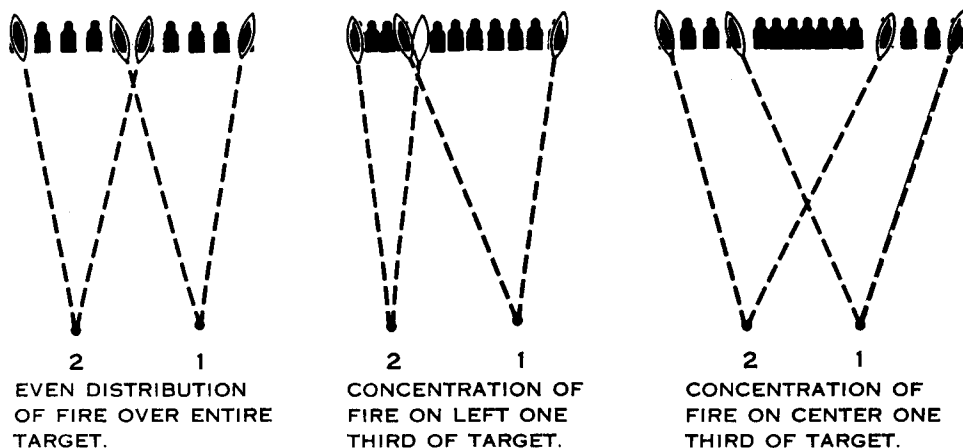


PAIR



SINGLE

Figure 90. Engagement of linear targets (distinct).



NOTE: 1—INITIAL LAY AND ADJUSTMENT FOR BOTH GUNS OF A PAIR IS ALWAYS ON THE MIDPOINT OF THE TARGET.

2—NORMAL DIVISION IS ALWAYS NO. 1 RIGHT HALF AND NO. 2 LEFT HALF FOR LINEAR TARGETS AND LINEAR TARGETS WITH DEPTH. (NO. 1 NEAR HALF AND NO. 2 FAR HALF FOR DEEP TARGETS.)

3—IF OTHER THAN NORMAL DIVISION IS REQUIRED. THE LEADER MUST USE SUBSEQUENT FIRE COMMANDS.

Figure 91. Special division of targets.

with the reference point outside of the target area (fig. 92):

FIRE MISSION
FRONT
REFERENCE: BUNKER, RIGHT FIVE,
CENTER MASS
TARGET: LINE OF TROOPS IN PRONE
SIX HUNDRED
TRAVERSE
AT MY COMMAND
FIRE

Here is an example of a fire command with the reference point within the target area (fig. 93):

FIRE MISSION
LEFT FRONT
REFERENCE: BURNED OUT TANK,
CENTER MASS
TARGET: LINE OF TROOPS IN PRONE
EXTENDING LEFT FIVE ZERO,
RIGHT FIVE ZERO
SEVEN HUNDRED
TRAVERSE
AT MY COMMAND
FIRE

85. Deep Targets

Deep targets are engaged with searching fire.

When range is announced, it is given to the midpoint of the target.

a. *Two Guns.* The point of initial lay for both guns is on the midpoint which is also the point of division. Since enflade fire (para. 69b(4)) is being delivered, it is not necessary to adjust on the midpoint of the target because the long beaten zone will compensate for any range errors. After the initial burst, gun No. 1 searches down to the near end of the target and gun No. 2 searches up to the far end. Both gunners then reverse their direction of search and return to the midpoint (fig. 94).

b. *One Gun.* A single gunner initially lays on the midpoint of a deep target unless another portion of the target is more critical. The gunner then searches down to the near end and back up to the far end (fig. 94).

c. *Indistinct Deep Targets.* The center mass of indistinct deep targets may be designated by using reference points in the same manner as for linear targets, except that the extent (depth) of the target is *always* given in meters. Here is an example of a fire command with the reference point within the target area.

FIRE MISSION
FRONT

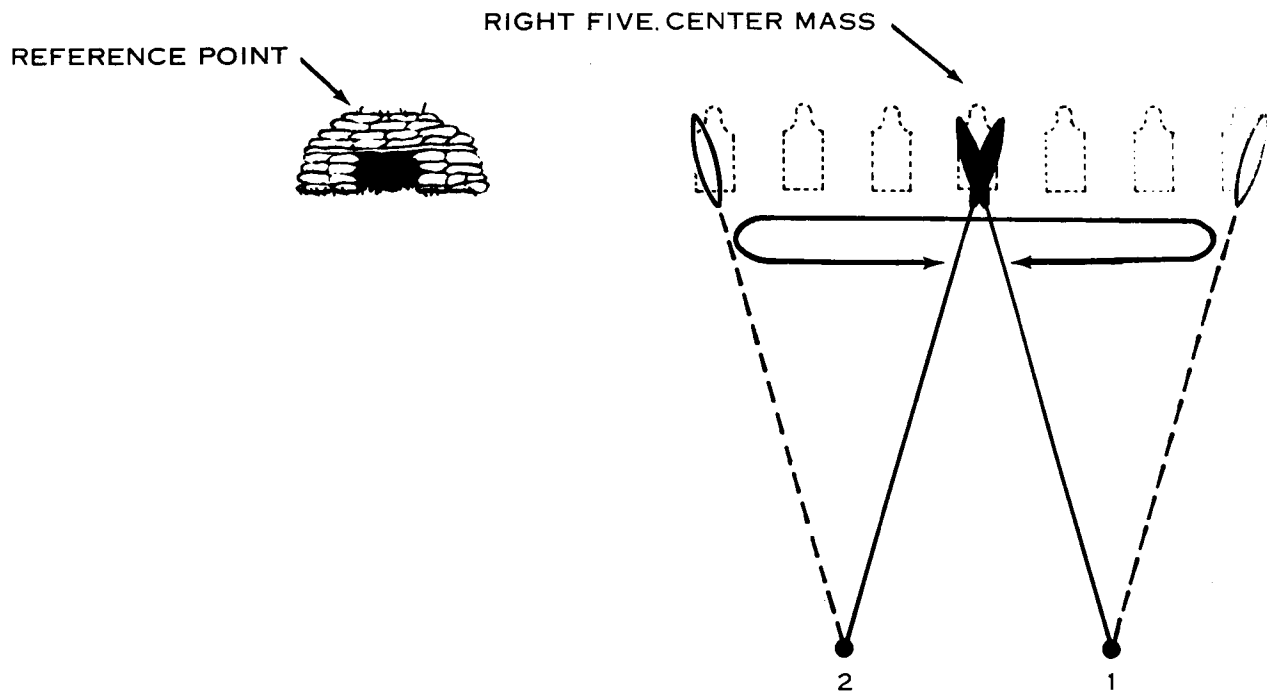


Figure 92. Engaging indistinct linear targets with a reference point outside the target area.

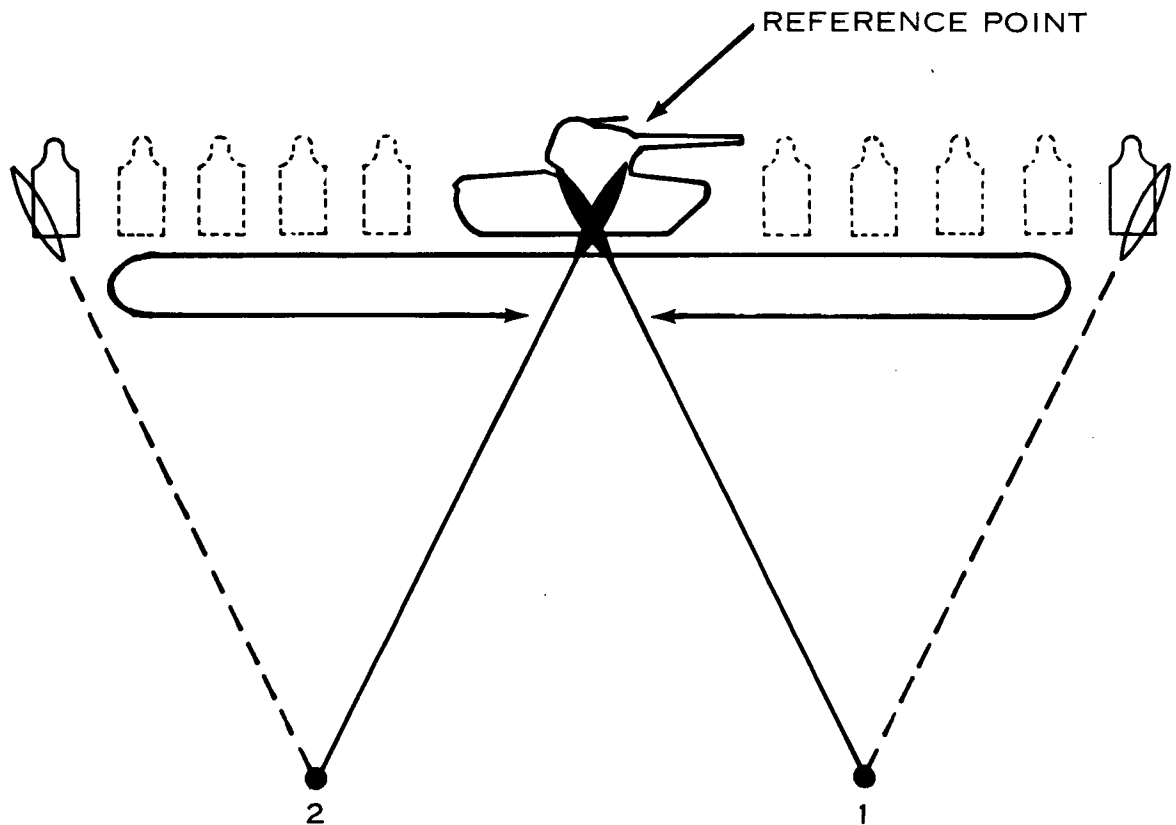


Figure 93. Engaging indistinct linear targets with a reference point within the target area.

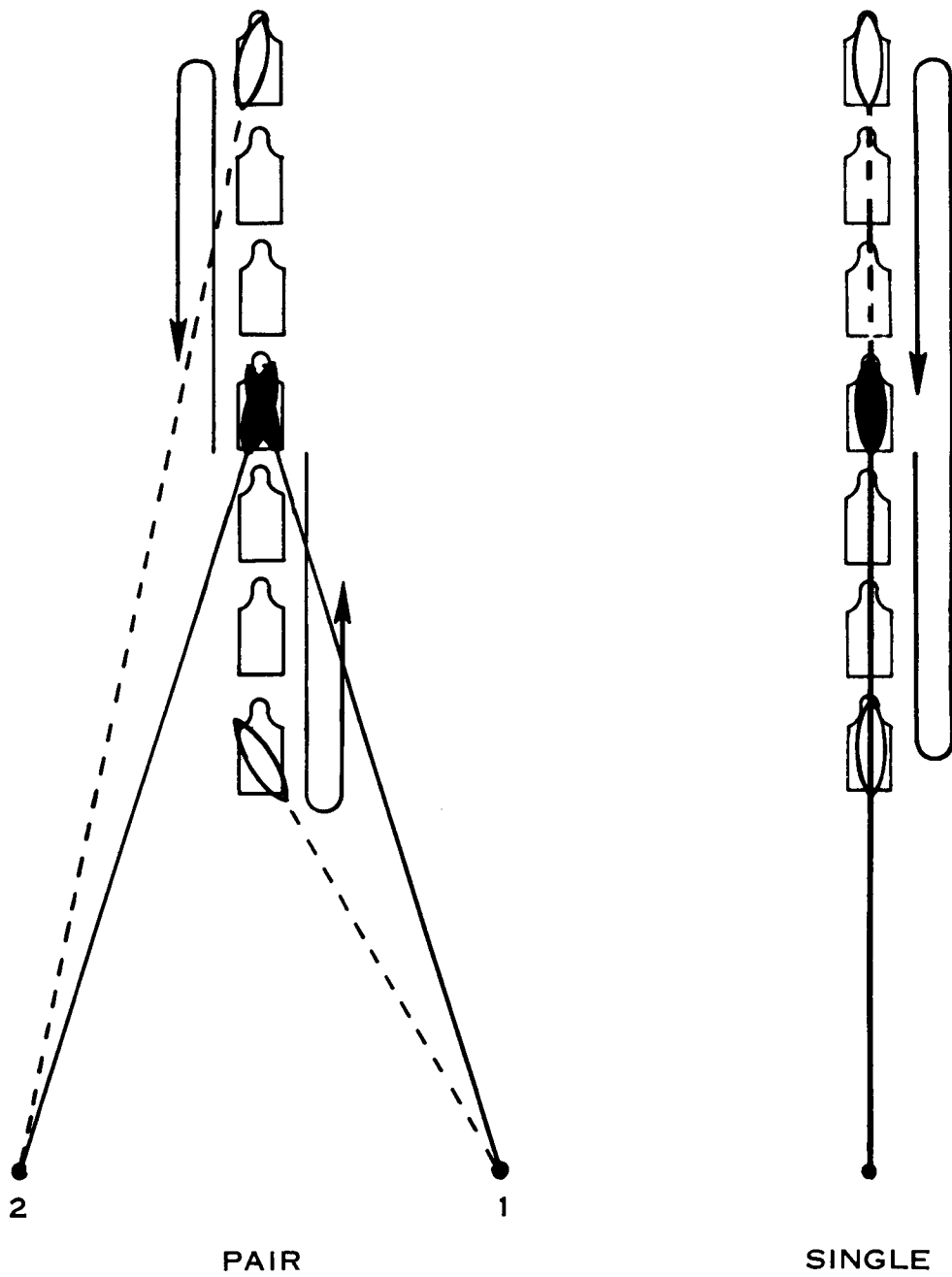


Figure 94. Engagement of deep targets.

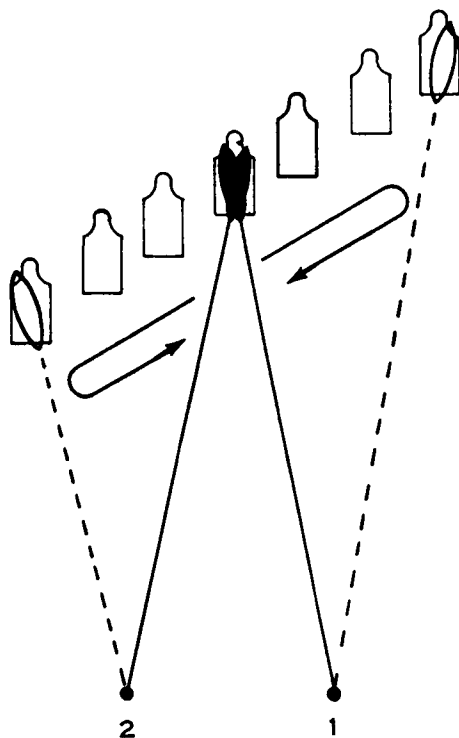
REFERENCE: BUNKER, CENTER
MASS
TARGET: COLUMN OF TROOPS EX-
TENDING SHORT 100 (METERS),
OVER 100 (METERS)
FIRE

Here is an example of a fire command with the reference point outside the target area.

FIRE MISSION
FRONT
REFERENCE: BUNKER, RIGHT FOUR,
CENTER MASS
TARGET: COLUMN OF TROOPS EX-
TENDING SHORT 100, OVER 100
NINE HUNDRED
SEARCH
AT MY COMMAND
FIRE

86. Linear Targets With Depth

Linear targets with depth are engaged with traversing and searching fire. When range is announced, it is given to the midpoint.



PAIR

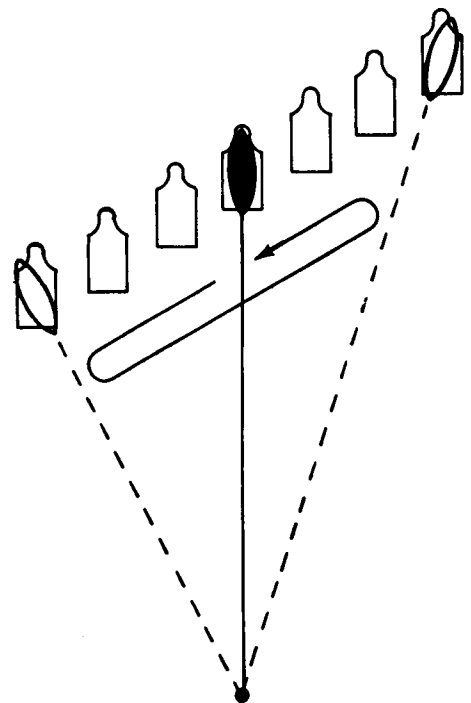
a. *Two Guns.* The method of division, the point of initial lay and adjustment, and the extent of manipulation for both guns is the same as that prescribed for linear targets. The gunners employ enough search between each burst to keep the center of impact on the base of the target (fig. 95).

b. *One Gun.* A single gunner initially lays and adjusts on the midpoint of a linear target with depth unless some other portion of the target presents a greater threat. The gunner then traverses and searches to the near flank, then back to the far flank (fig. 95).

c. *Indistinct Linear Targets with Depth.* The flanks and midpoint of an indistinct linear target with depth should be designated with machine-gun or rifle fire. The reference point method should not be used because a minimum of two reference points are required to show the angle of the target.

87. Area Targets

The leader designates an area target by indi-



SINGLE

Figure 95. Engagement of linear targets with depth.

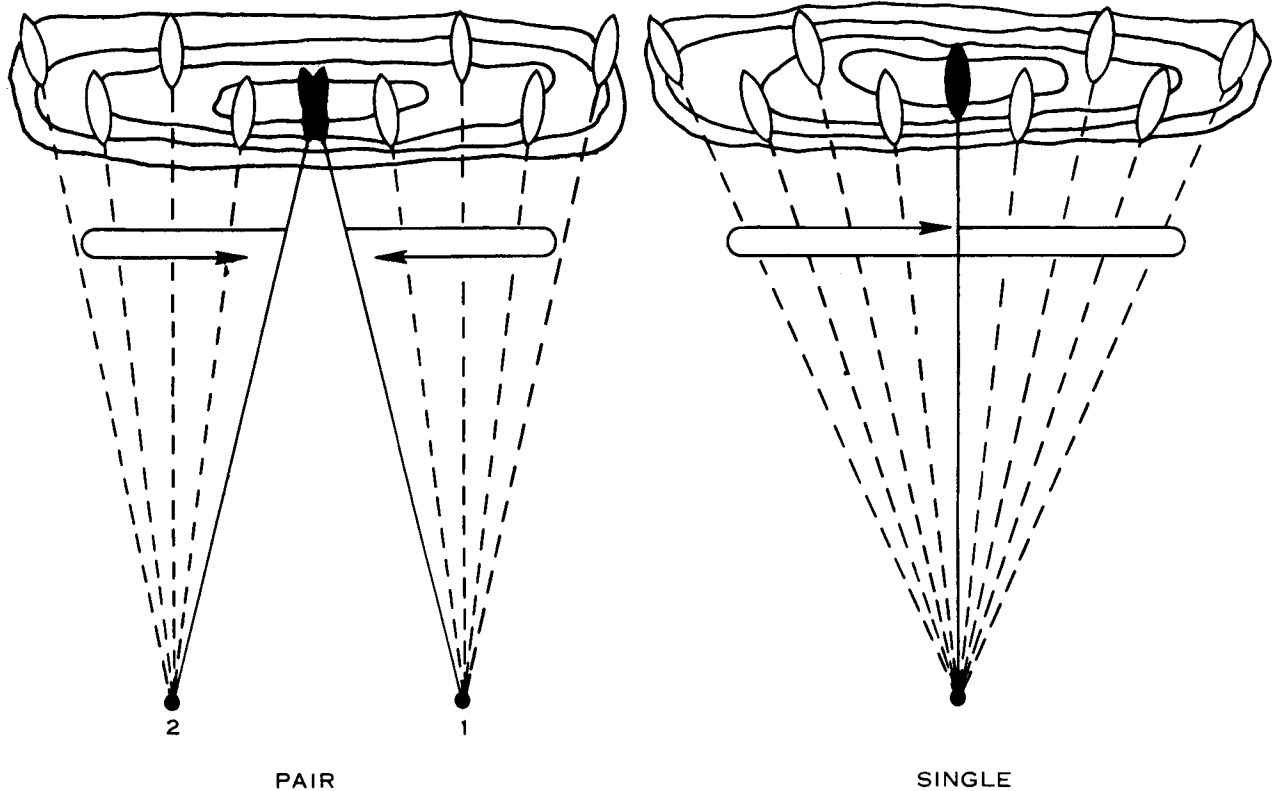


Figure 96. Engagement of area targets (objective).

cating to the gun crew(s) the width and depth of the target. Area targets are engaged with traversing and searching fire.

a. Two Guns.

- (1) The target is divided at the center of mass; gun No. 1 fires on the right half and gun No. 2 fires on the left half. The point of initial lay and adjustment for both guns is on the center of mass.
- (2) After adjusting fire on the center of mass of the area, fire is distributed by determining the size of the beaten zones and applying direction and elevation changes that cause the most effective coverage of the target area. Gun No. 1 traverses to the right, searches the necessary amount, and fires a burst. He continues traversing and searching up and down until the right flank of the area target has been reached. Gun No. 2 traverses and searches to the left flank in the same manner. Both gunners then reverse the direction of manipulation and return to the center of mass, firing a burst after each combined direction and elevation change

(fig. 96). Here is an example of a fire command to engage an area target.

FIRE MISSION
FRONT
REFERENCE: LONE PINE
TREE, CENTER MASS
TARGET: AREA, LEFT FIVE
ZERO, RIGHT FIVE ZERO
SUSTAINED
AT MY COMMAND
FIRE

b. One Gun. A single gunner engages an area target by laying and adjusting on the center mass, then traversing and searching to either flank. Upon reaching the flank, direction is reversed and the gun is traversed and searched in the opposite direction (fig. 96).

88. Aerial Targets

Aerial targets are engaged using the hip firing position, or free gun from the tripod and vehicular mounts. Solid tracer ammunition should be used whenever possible for ease of observation and adjustment of fire. To obtain hits on an aerial target, the gunner must aim in front of the target at a point that will cause the target

and the projectiles from the weapon to arrive at the point simultaneously (fig. 97). The gunner

must observe the tracer stream and adjust fire as necessary.

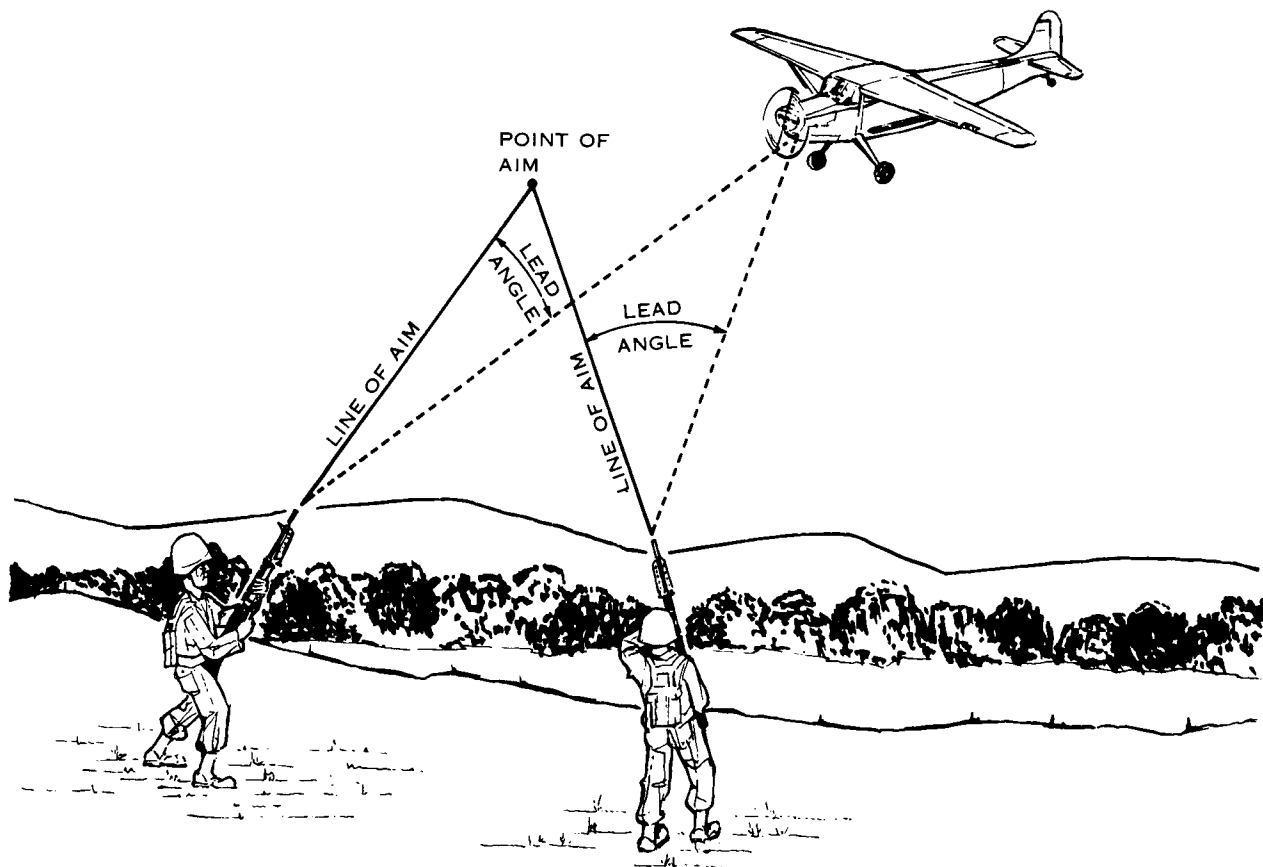


Figure 97. Engagement of aerial targets.

Section VI. ASSAULT FIRE

89. General

a. Machineguns need not always be limited to supporting fire roles in the attack. In many situations the leader can obtain maximum effect from the machineguns by placing them on line in the assault. The procedures described in this section are used when assaulting in a line such as during a night attack or during the final stages of a day assault when fire superiority has been gained.

b. To assault successfully, crew members must learn to—

- (1) Deliver fire effectively without alining the sights.
- (2) Move rapidly and maintain alinement in order to arrive on the objective in the shortest possible time.

(3) Reload rapidly to prevent lulls in the firing.

(4) Keep the fire down in the objective area.

(5) Distribute fire properly.

90. Firing Positions

There are three firing positions which may be used when firing the gun in the assault. Use of each of the positions at the proper time will enable gunners to place accurate fire on the enemy without alining the sights. With all assault firing positions the gunner adjusts his fire by observing the tracers and the impact of the projectiles in the target area. To provide support for the gun in the assault, a sling is attached to the weapon and placed over the gunner's shoulder. It



Figure 98. Hip firing position.

is primarily used to support the weapon when carried or fired in the underarm and hip positions.

a. *Hip Position* (fig. 98). The hip firing position is used when a heavy volume of fire is desired in the target area and rapid movement is not essential. The hip firing position provides good stability but is awkward to use while moving. Not less than nine rounds are fired in each burst. When firing from this position—

- (1) The bipod legs are down for instant use if needed.
- (2) The rear sight is down.
- (3) The left hand grasps the handguard of the forearm assembly.
- (4) The right hand is on the pistol grip.
- (5) The rear of the stock is held firmly against the forward portion of the right thigh.
- (6) The left foot is pointed in the direction of the target during firing.
- (7) The right foot is positioned to the rear to provide stability.
- (8) The gunner leans toward the target before and during firing.

b. *Shoulder Position* (fig. 99). The shoulder firing position is used when the gunner desires to hit specific points in the target area and rapid movement is not essential. He pauses momentarily and fires a burst after every two or three steps as the left foot strikes the ground (right handed firer). A maximum of six rounds is fired in each burst. This position provides the greatest accuracy. When firing from this position—

- (1) The rear sight and bipod legs are down. To aim, the gunner places the top of the front sight blade at the center base of the target.
- (2) The gunner's hands and feet are placed the same as when firing from the hip position.
- (3) The stock of the weapon is held firmly into the shoulder, and the gunner leans toward the target before and during firing.

c. *Underarm Position* (fig. 100). The underarm firing position is used when closing with the enemy and a heavy volume of fire and rapid movement are required. During periods of limited visibility this position is used during the entire assault. The gunner's movement is continuous and he fires a *short* burst each time his

left foot strikes the ground. A maximum of six rounds is fired in each burst. When firing from this position—

- (1) The rear sight and bipod legs are down.
- (2) The gunner's hands and feet are placed the same as when firing from the hip position.
- (3) The weapon is held firmly between the right arm and the right side of the chest. The gunner leans forward while firing.

91. Speed of Movement and Maintaining Alinement

The gun crews must move rapidly and maintain alinement with the other members of the assaulting element in order to reach the objective in mass. To accomplish this the following techniques are used.

a. The gunners move as rapidly as possible, consistent with their ability to fire accurately and maintain alinement.

b. The gun crew(s) maintains alinement by guiding on the designated base man, maintaining visual contact, and sensing the muzzle flashes and blasts to the flanks.

c. The gun crew(s) must not stop during the assault. Stopping disrupts alinement and slows movement.

92. Reloading

Gunners and assistant gunners must learn to reload rapidly to avoid lulls in the firing. This can be achieved by practice and by applying the following techniques.

a. *Prior to the Assault.*

- (1) The gunner inspects the extended bandoleer supporter for damage.
- (2) Assistant gunners remove the cardboard covers from the tops of the bandoleers, check the ammunition to insure it is clean and serviceable, and check the bandoleer loop for serviceability.

b. *During the Assault.*

- (1) Gunners use their assistant gunners to assist in reloading the weapon; however, if the assistant gunner is hit, the gunner must continue moving forward and reload as rapidly as possible. The sling will allow the gunner to use both hands to reload.



Figure 99. Shoulder firing position.



Figure 100. Underarm firing position.

- (2) The assistant gunner moves to the left of the gunner carrying a belt of 100 rounds of ammunition, which is attached to the end of the belt in the weapon before it is expended. If the gunner becomes a casualty, the assistant gunner must secure the gun and continue in the assault or move to the objective for the consolidation and reorganization.

93. Keeping the Fire Down

a. Gunners have a tendency to fire high in the assault. To overcome this they must be trained to make a bold depression of the muzzle when firing, and then adjust upward. It is easier

to adjust upward than downward, and by firing low, maximum effect is obtained from ricochets.

b. The use of tracer ammunition provides a means of adjusting fire. At night, solid tracer ammunition should be used. In addition to providing a means of adjusting fire, it aids in illuminating the objective area and has a demoralizing effect on the enemy.

94. Distributing Fire

To insure that fire is properly distributed over the objective area, gunners fire and adjust rapidly and continuously on as much of the objective area as possible without endangering friendly troops, giving priority to enemy automatic weapons.

Section VII. OVERHEAD FIRE

95. General

a. Overhead fire is delivered over the heads of friendly troops. During training it is used *only* when troop safety has been proven. The terrain and visibility *dictate* when overhead fire can be delivered safely.

b. Overhead fire *cannot* be safely delivered on a target at a range greater than 850 meters from the gun, and it is not delivered over level or uniformly sloping terrain.

96. Delivery of Overhead Fire

a. Overhead fire is delivered with guns on *tripod* because of the greater degree of stability

and accuracy and the limited capability of measuring vertical mil angles by using the elevating mechanism.

b. Ideally, overhead fire is delivered when a depression in the terrain exists between the gun position and the target. The depression should be such that the gunner's line of aim is well above the heads of friendly troops (fig. 101).

c. Control is normally accomplished by the weapons squad leader. He lifts or shifts the fire when the feet of the troops in the element being supported reach an imaginary line drawn parallel to the target where further fire would cause casualties to friendly troops. This imaginary line

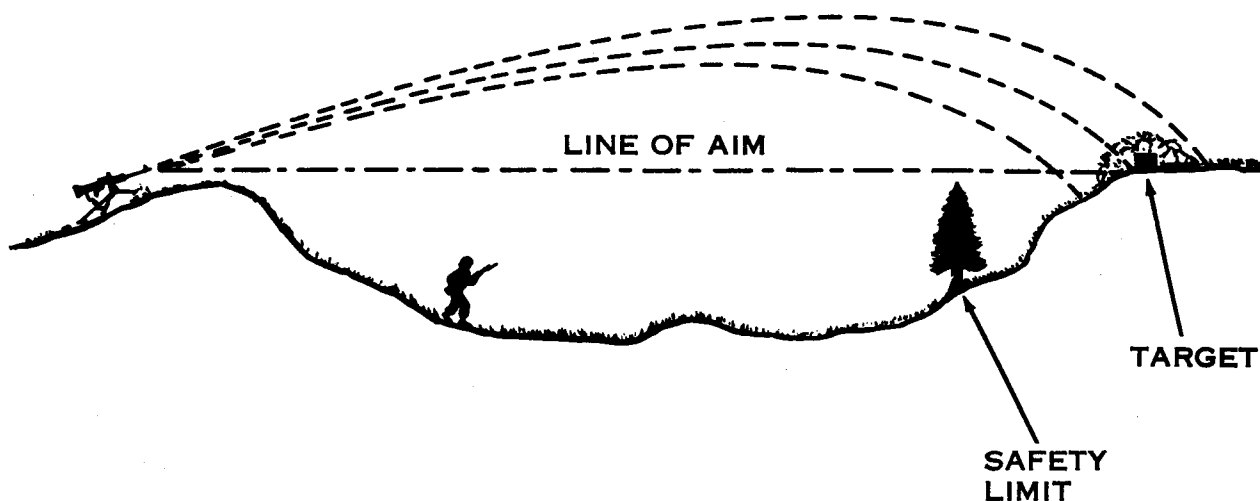


Figure 101. Delivering overhead fire.

is called the *safety limit* (fig. 101). In some instances the leader of the element being supported will direct lifting of fire at the proper time by prearranged signals which can be transmitted by radio, wire, or visual means.

97. Determining the Safety Limit

The *safety limit* can be determined by observation of the fire or by using the gunner's rule (b below).

a. To determine the *safety limit* by observation the leader uses binoculars to observe the fire with relation to advancing friendly troops.

b. A *safety limit* can be selected prior to firing the gun by using the gunner's rule. The accuracy and safety of this method depends on the weapon being *accurately* zeroed (para. 161) and the range to the target being *correctly* determined (para. 70). The gunner's rule is used only when the target is between 350 and 850 meters from the gun. To use the gunner's rule—

- (1) Determine the range to the target and set the range on the rear sight.
- (2) Lay the gun to hit the target.
- (3) Raise the rear sight slide to 1,100 meters.
- (4) Depress the muzzle of the weapon 10 mils by using the elevating handwheel (one click equals one mil).
- (5) Look through the rear sight and note the point where the new line of aim

strikes the ground. An imaginary line drawn through this point and parallel to the target is the *safety limit*.

- (6) Reset the range to the target on the rear sight, relay on the target, and prepare to fire.

98. Precautions for Overhead Fire

The following safety measures *must* be considered in delivering overhead fire.

- a. Firmly emplace the tripod mount.
- b. Use depression stops to prevent the muzzle of the gun from accidentally being lowered below the *safety limit*.
- c. Do not deliver overhead fire through trees.
- d. Inform commanders of friendly troops when fire is to be delivered over their heads.
- e. Insure that all members of the gun crew are aware of the *safety limit*.
- f. Do not deliver overhead fire if the range from the gun to the target is less than 350 meters or exceeds 850 meters.
- g. Do not use a barrel which has excessive muzzle blast or is otherwise determined to be badly worn.
- h. During training exercises—
 - (1) Do not lay machineguns so their fire will cross at any point over the heads of friendly troops.
 - (2) Consult AR 385-63 and local safety regulations concerning overhead fire.

Section VIII. POSITION DEFILADE

99. General

In order to achieve *maximum effectiveness*, the machinegun(s) must be employed using the technique of direct lay; however, at times it may be desirable to employ guns from position defilade. A machinegun is in position defilade when the gun and its crew are hidden from enemy ground observation by a land mass such as the crest of a hill. The position may be on the reverse side of the mask or the forward slope of the next high ground in the rear of the mask or in a small fold in the ground (fig. 102). The machinegun on bipod mount is not fired from position defilade due to the difficulties encountered in adjusting fire when the gunner cannot see the target.

a. Advantages.

- (1) The gun crew(s) has cover and concealment from aimed small arms fire.
- (2) The crew has some freedom of movement in the vicinity of the gun position.
- (3) Control and supply are facilitated.
- (4) The characteristic smoke and flash of the gun is less easily observed by the enemy.

b. Disadvantages.

- (1) Rapidly moving ground targets are not easily engaged because adjustment of fire must be made through an observer.
- (2) Targets close to the mask usually cannot be engaged.
- (3) It is difficult to obtain a final protective line.

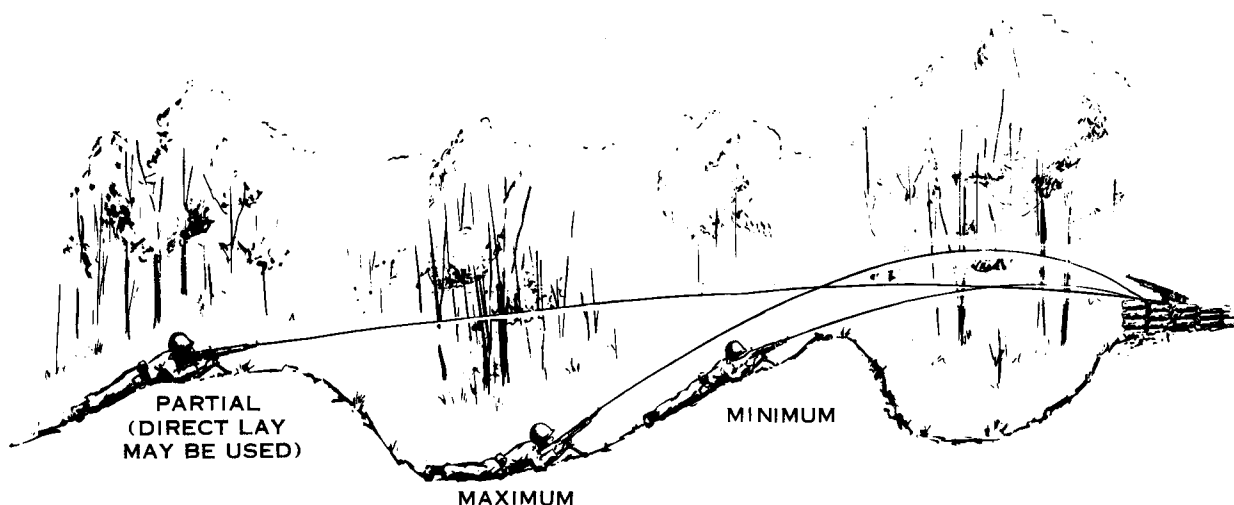


Figure 102. Types of position defilade.

100. Types of Position Defilade

a. Maximum Position Defilade. A gun is in maximum position defilade when it is at the lowest point on a slope from which it can engage the target (fig. 102). It has relatively good cover but lacks flexibility in engaging new targets.

b. Minimum Position Defilade. A gun is in minimum position defilade when it is at the highest point on a slope at which position defilade can be obtained (fig. 102).

c. Partial Defilade. A gun is in partial defilade when a mask provides the gun and crew with some protection from enemy direct fire, and the gunner is still able to engage the target by direct laying techniques (fig. 102).

101. Target Engagement

The essential elements in the engagement of a target from position defilade are mask clearance, direction, elevation, and adjustment of fire. If possible, a minimum mask clearance (minimum elevation) will be determined for the entire sector of fire. However, it may be necessary (due to the slope of the mask) to establish clearance for each individual target.

a. Establishing Mask Clearance.

- (1) If the mask is 300 meters or less from the gun position, place a 300-meter range setting on the rear sight, lay on the top of the mask, and add three mils (clicks) of elevation with the elevating handwheel.

- (2) If the mask is over 300 meters from the gun position, place the range setting to the mask on the rear sight, lay on top of the mask, and add three mils (clicks) of elevation.
- (3) The elevation reading(s) obtained using the methods outlined in (1) and (2) above, give the minimum elevation for the sector or target(s). The minimum elevation should be recorded.

b. Laying the Gun for Direction. The observer places himself to the rear of the gun on the gun-to-target line and in a position where he can see the gun and the target (fig. 103). He alines the gun for general direction by directing the gunner to shift the mount and/or gun until it is alined on the target. A prominent terrain feature or landmark visible to the gunner through his sights is selected as an aiming point. This aiming point should be at a greater range than the target and at a higher elevation. When laying the gun on the aiming point, the range setting on the rear sight must correspond to the range to the target.

- (1) If the aiming point is on the gun to target line, the gun is laid on the aiming point and is thereby alined for direction.
- (2) If the aiming point is not on the gun to target line, the horizontal distance in mils is determined using the best means available (binoculars) and announced to the gunner. This measured

distance is then laid off with the traversing handwheel.

c. Laying the Gun for Elevation. The observer measures the vertical distance from the aiming point to the base of the target using the best means available and directs the gunner to depress the muzzle of the gun the number of mils measured. The gun should now be laid to hit the target (fig. 103).

d. Control. Control of fire from position defilade is accomplished by an observer (who can

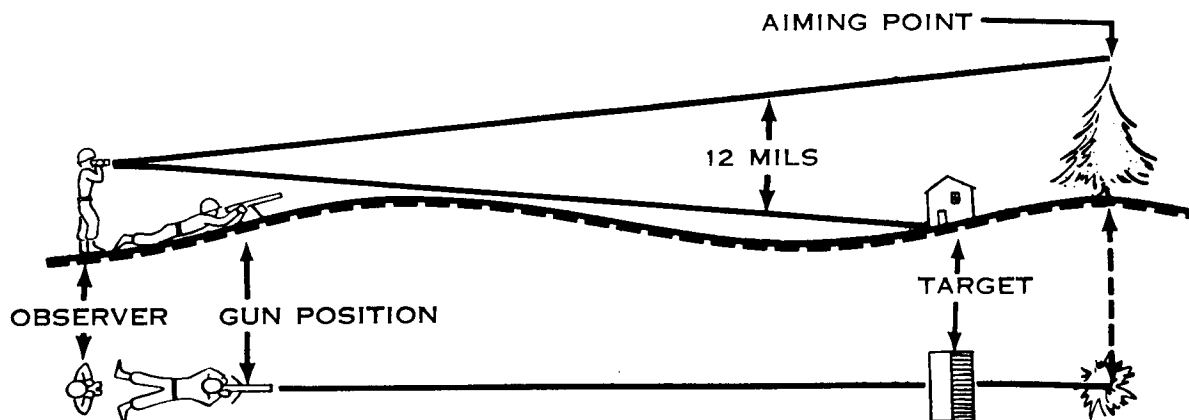
see the target) standing at or near the gun (fig. 103). An example of a fire command used to engage a target from position defilade is—

AS LAID (The gun has already been laid for direction and elevation.)

AT MY COMMAND

FIRE

Adjustment of fire is accomplished by the leader or a member of the machinegun crew acting as the observer.



1-AIMING POINT ON GUN TO TARGET LINE.

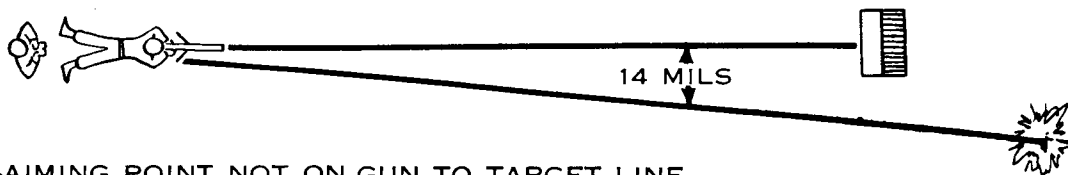
RANGE GUN-TARGET IS 1000 METERS

DIRECTION:

WITH REAR SIGHT SET AT 1000 METERS, LAY GUN ON AIMING POINT.

ELEVATION:

DEPRESS GUN 12 MILS.



2-AIMING POINT NOT ON GUN TO TARGET LINE.

RANGE GUN-TARGET IS 1000 METERS.

TARGET IS 14 MILS LEFT OF AIMING POINT.

DIRECTION:

WITH REAR SIGHT SET AT 1000 METERS, LAY GUN ON AIMING POINT.

TRAVERSE GUN LEFT 14 MILS.

ELEVATION:

DEPRESS GUN 12 MILS.

Figure 103. Firing from position defilade.

CHAPTER 8

TECHNIQUES OF FIRE DURING PERIODS OF LIMITED VISIBILITY

Section I. GENERAL

102. General

a. This chapter provides guidance in machinegun firing techniques during periods of limited visibility. Periods of limited visibility refer not only to periods of darkness, but also to periods during daytime operations when visibility is impaired by conditions such as smoke, fog, rain, or snow. This chapter also discusses terms frequently used in techniques of fire during periods of limited visibility.

b. Machinegunners, as well as other members of the rifle platoon, encounter several difficulties while defending during periods of limited visibility. These difficulties preclude the use of many of the daylight techniques of engaging targets.

- (1) During periods of limited visibility the machinegun sector cannot be observed in depth as during normal daylight periods. Most targets are difficult to detect, and in some instances it is difficult to detect targets at all.
- (2) In some instances visibility will be so limited that the leader cannot control the fires of his guns by selecting and directing fire on targets as he would do during periods of good visibility. Oral commands are not dependable, arm-and-hand signals cannot be seen, and personal contact with the gunners is difficult.
- (3) At night there is a tendency for the machinegunners to fire indiscriminately at noises and suspected enemy locations other than preplanned target areas.

c. In order to overcome the difficulties encountered during periods of limited visibility,

special techniques must be developed for engaging *visible* targets and in delivering preplanned fires by the use of range cards.

103. Terms

This paragraph defines and discusses terms frequently used in technique of fire during periods of limited visibility.

a. *Sector of Fire.* An area (to be covered by fire) assigned to an individual or unit. Machineguns are normally assigned two sectors of fire, a primary and a secondary (para. 120a).

b. *Final Protective Line.* A predetermined line along which grazing fire is placed to stop an enemy assault. This line is fixed as to direction; however, a few mils of search are employed while firing to compensate for irregularities in the terrain. *The final protective line can be delivered regardless of conditions of visibility.* The final protective line always corresponds to the inner limit of the primary sector which ideally is assigned close to the forward edge of the battle area. When terrain permits, final protective lines are assigned machineguns along the FEBA as a part of the final protective fires of the defending unit.

c. *Sector of Graze.* A wedge shaped area of terrain, formed by assigned sector limits, which affords continuous knee high grazing fire (one meter high maximum) from the muzzle of the weapon out to the first major break in the terrain (fig. 111). The sector of graze is fired using swinging traverse with the tripod mounted gun in the primary sector. It can be fired in the secondary sector in conjunction with field expedients by freeing the traversing and elevating mechanism, using the tripod mount as a pivot, or by using the bipod mounted gun (para.

109d). A sector of graze can be delivered regardless of the condition of visibility.

d. *Principal Direction of Fire.* A priority direction of fire which marks the center of a *specific principal area* assigned to a weapon. This area may extend from the gun position to the maximum effective range of the weapon and is, therefore, not fixed for elevation. *Visible targets* appearing in the principal direction of fire take priority over targets which may appear elsewhere in the sector. A principal direction of fire may be assigned to cover an area which provides good fields of fire, a likely avenue of foot approach, or to mutually support an adjacent unit.

- (1) *Principal direction of fire day.* A priority direction of fire which marks the center of a *specific principal area* as-

signed to a weapon to be covered during periods of good visibility.

- (2) *Principal direction of fire night.* A priority direction of fire which marks the center of a *specific principal area* assigned to a weapon to be covered during periods of limited visibility.

e. *Area of Graze.* An area, other than the sector of graze, within a sector of fire which is covered by grazing fire. Grazing fire need not be continuous from the muzzle of the weapon to the area over which grazing fire is desired (fig. 112). Areas of graze are normally areas of tactical significance such as likely routes or avenues of approach. A gunner uses traversing fire to cover areas of graze and employs a few mils of searching fire to compensate for irregularities in the terrain.

Section II. TECHNIQUES OF ENGAGING VISIBLE TARGETS DURING PERIODS OF LIMITED VISIBILITY

104. General

A gunner's ability to detect and identify targets during periods of limited visibility will vary depending upon the amount of natural and artificial illumination. Complete definition of these targets as to the exact size and flanks will in many cases be questionable.

105. Types of Targets

Normally two types of targets will appear in the machinegunner's sector of fire during periods of limited visibility:

a. Enemy personnel in platoon or squad size formations which will be linear, linear targets with depth, or deep targets.

b. Supporting automatic weapons and assaulting enemy personnel which will be point targets.

106. Fire Control

Since the leader cannot effectively direct the fires of his guns during periods of limited visibility as he does during good visibility, initiative is required of the gunners. When targets within their sectors become visible to gunners, they must engage these targets without command and continue to fire until these targets have been neutralized. Gun crews engage targets only when they can identify them unless

ordered to do otherwise. As an example, if one gunner detects a target and engages it, the other gunner(s) will observe the area in which fire is being placed and will add his fire only if he can identify the target or if he is ordered to place fire in the area.

107. Target Engagement

a. Solid tracer ammunition will enable a gunner to more effectively engage visible targets during periods of limited visibility and should be used when possible. Gunners must be trained to fire low initially, and adjust up when engaging targets during periods of limited visibility. This aids in overcoming the tendency to fire high during these conditions.

b. When engaging linear, linear targets with depth, and deep targets, no attempt is made to divide these targets (when two or more guns are engaging the same targets) as is done during periods of good visibility. During periods of limited visibility, the center and flanks of these targets will not be clearly defined; therefore, each gunner observes his tracers and covers what he believes to be the entire target. To effectively engage—

- (1) Linear targets, the gunner(s) lays on what he considers to be the center of

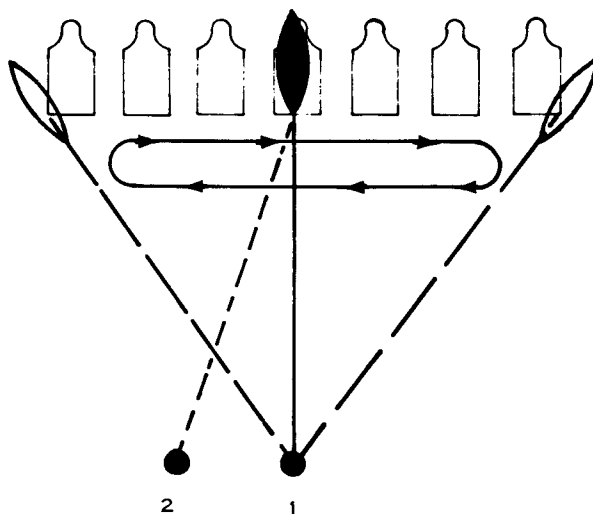
mass of the target. With the tripod mounted gun, he uses swinging traverse fire and maintains his beaten zone on the base of the target (fig. 104). With the bipod mounted gun, the gunner traverses rapidly back and forth across the target by selecting successive aiming points.

- (2) Linear targets with depth, the gunner(s) lays on what he considers to be the center of mass of the target, then traverses and searches it first, covering the side which is closest to his position. With the tripod mounted gun, swinging traverse fire combined with searching fire is used to cover the target (1, fig. 105). With the bipod mounted gun, the gunner selects successive aiming points, covering what is considered to be the entire target by observing his tracers.
- (3) Deep targets, the gunner(s) lays on what he considers to be the center of

mass of the target, then searches it. The direction of search is down to what is considered the near end, then up to what is considered the far end. With the tripod mounted gun, the target is searched by using the elevating handwheel. To facilitate rapid lateral adjustments, the traversing slide is left loose. While searching the target, the gunner traverses a few mils to either side of his line of search by applying shoulder pressure to the stock of the weapon (2, fig. 105). With the bipod mounted gun, the gunner covers the entire target by selecting successive aiming points and observing his tracers.

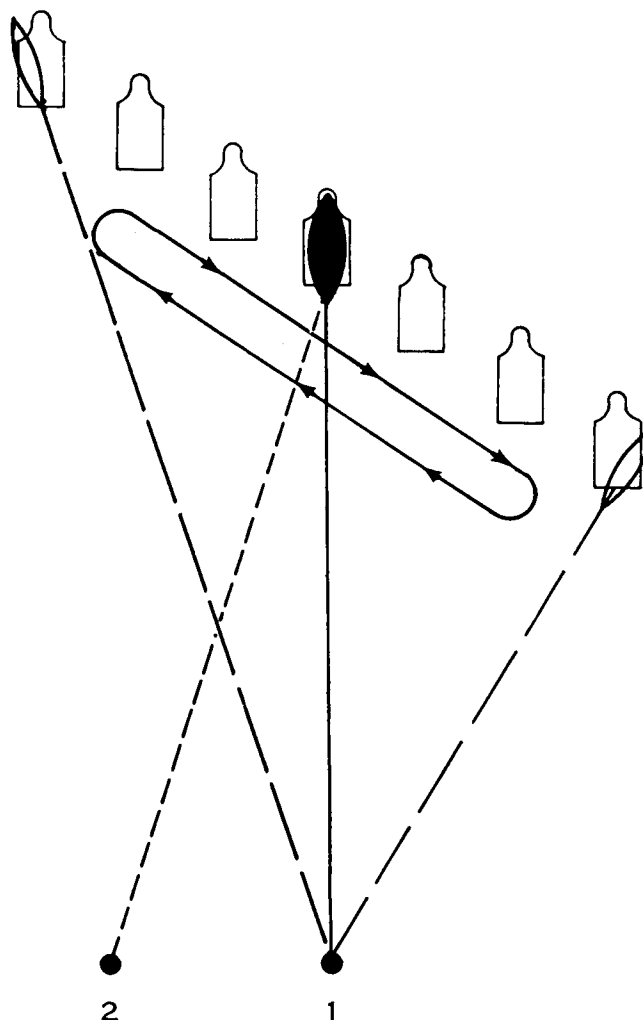
c. The types of point targets with which machinegunners will be concerned during periods of limited visibility, particularly at night, are enemy automatic weapons and assaulting enemy personnel.

(1) *Enemy automatic weapons.* Point



ONE OR BOTH GUNS INITIALLY LAY ON CENTER OF MASS,
THEN TRAVERSE WHAT IS CONSIDERED TO
BE THE ENTIRE TARGET. GUNNER(S) MAY
TRAVERSE IN "EITHER" DIRECTION.

Figure 104. Engagement of a linear target during periods of limited visibility.



ONE OR BOTH GUNS INITIALLY LAY ON THE CENTER OF MASS. TRAVERSE AND SEARCH DOWN AND THEN UP, COVERING WHAT IS CONSIDERED TO BE THE ENTIRE TARGET.

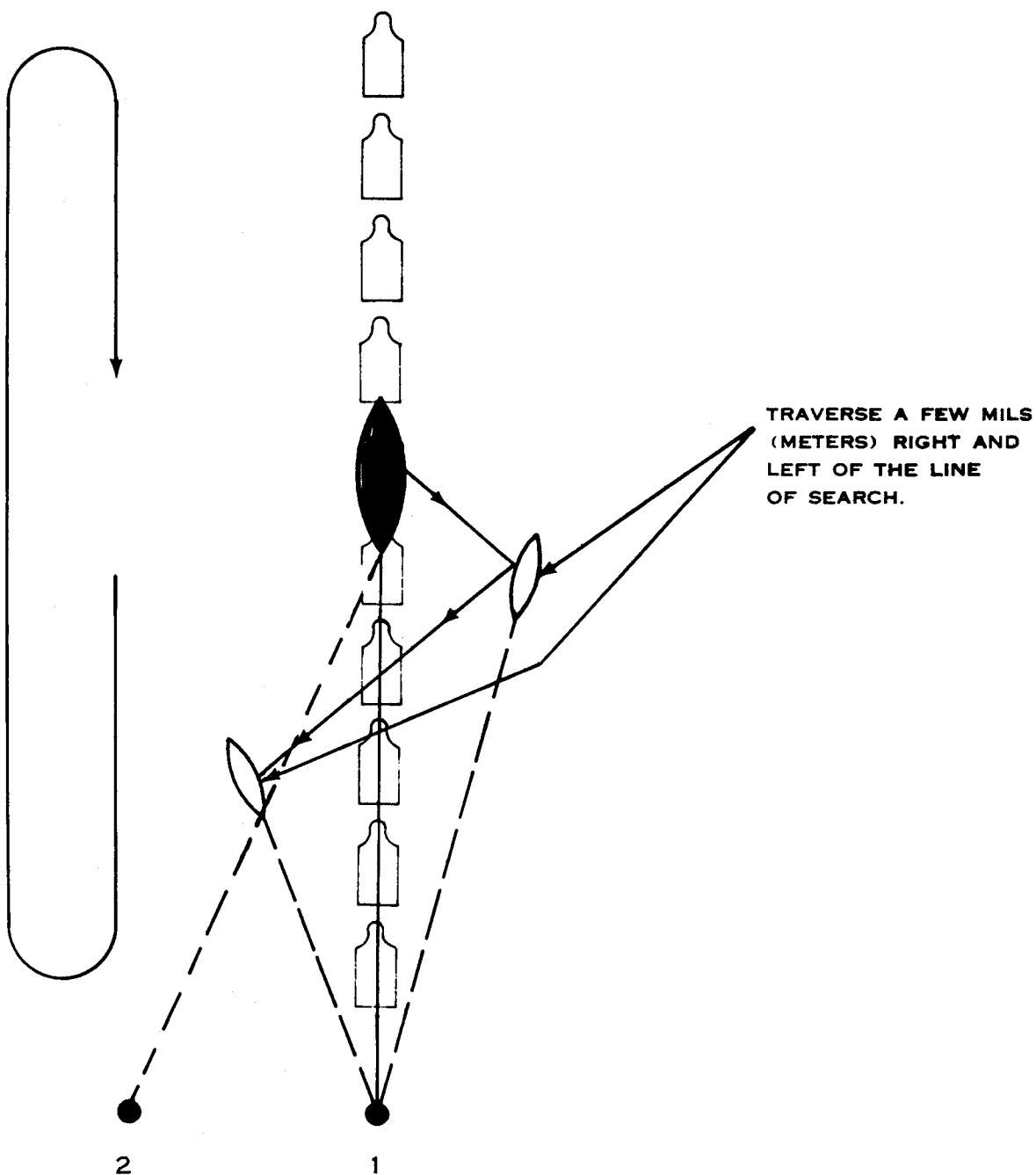
(1) Linear targets with depth

Figure 105. Engagement of target during periods of limited visibility.

targets such as automatic weapons may be identified during conditions of limited visibility by their muzzle flashes. To effectively engage these targets, field expedients are used to aid in alining the weapon sights on these targets (fig. 106). Fire should be delivered in a heavy volume and adjusted on these targets by observing the tracer stream.

(2) *Assaulting enemy personnel.* During

the final stage of an enemy assault, machineguns normally fire final protective fires; however, it may be necessary to engage individual enemy soldiers if they are observed in the proximity of the gun position. When engaging these types of targets with the tripod mounted gun, the type of fire employed is normally free gun, which allows rapid shifting of fire from one point to another.



ONE OR BOTH GUNS INITIALLY LAY ON THE CENTER OF MASS AND SEARCH WHAT IS CONSIDERED TO BE THE ENTIRE TARGET. THE INITIAL DIRECTION OF SEARCH IS DOWN.

(2) Deep target

Figure 105—Continued.

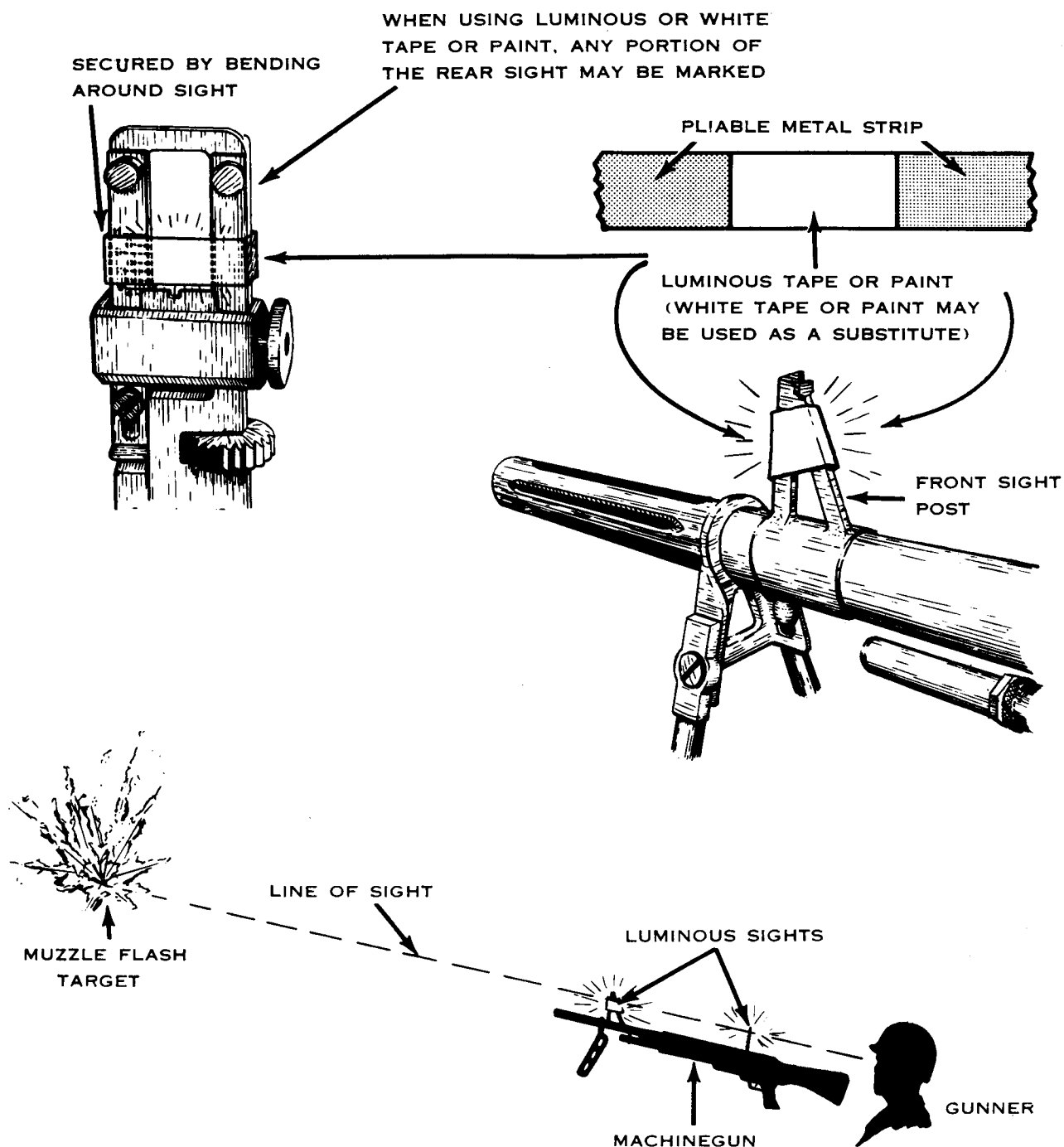


Figure 106. Field expedient night sight and sight picture for the M60 machinegun.

Section III. TECHNIQUES OF DELIVERING PREPLANNED FIRES

108. General

In addition to engaging appropriate visible targets, the machinegunner must be able to deliver preplanned fires during periods of limited visibility. These fires are used to cover target areas of tactical significance such as routes, avenues of approach, anticipated enemy supporting weapons positions, probable enemy assault positions, and to establish sectors of graze and final protective lines.

109. Obtaining Grazing Fire

For maximum effect in all preplanned target areas, grazing fire should be obtained when possible. Grazing fire must be obtained for final protective lines, sectors of graze, and areas of graze. Grazing fire may be obtained within a sector of fire over various types of terrain.

a. Obtaining the Maximum Extent of Grazing Fire Over Level or Uniformly Sloping Terrain (fig. 107). To obtain the maximum extent of grazing fire with the M60 machinegun, the gunner sets the rear sight at 600 meters, selects a point on the ground which he determines to be at a range of 600 meters, lays, fires, and adjusts on this point. At no time will the center of the cone of fire rise more than one meter above the ground.

b. Obtaining the Maximum Extent of Grazing Fire over Irregular Terrain (fig. 108). If the

gunner concludes that he cannot obtain 600 meters of grazing fire because of a major break in the ground at a range of less than 600 meters, he places the range to the break on his rear sight and lays, fires, and adjusts on the break. At no time will the center of the cone of fire rise more than one meter between the gun and point of lay of the weapon.

c. Determining the Extent of Grazing Fire on a Final Protective Line. The extent of grazing fire on the final protective line is determined using the techniques described in *a* and *b* above. Any intermediate breaks in the terrain along this line which cannot be covered by grazing fire from a gun firing along the line is considered as *deadspace* (fig. 109) and includes streams, ravines, and shell craters. The location and extent of deadspace may be determined in two ways.

(1) *Walking the final protective line.*

After the gun is laid for direction and elevation, a member of the gun crew walks the final protective line while the gunner looks through his sights. Anytime the individual's waist falls below the gunner's line of aim, deadspace exists.

(2) *Observing fire.* By observing the flight of tracer ammunition from behind or from the flank of the gun position, deadspace may be determined.

SET SIGHTS AT 600 METERS
LAY ON POINT 600 METERS
FROM GUN.

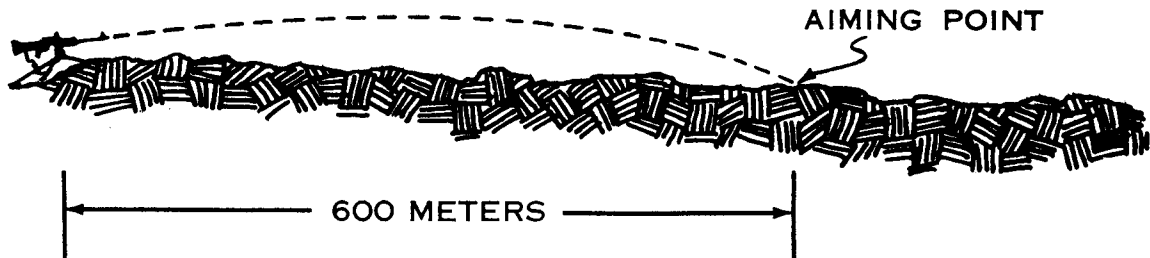


Figure 107. Obtaining the maximum extent of grazing fire over level or uniformly sloping terrain.

SET SIGHTS AT RANGE TO BREAK.
LAY ON BREAK.

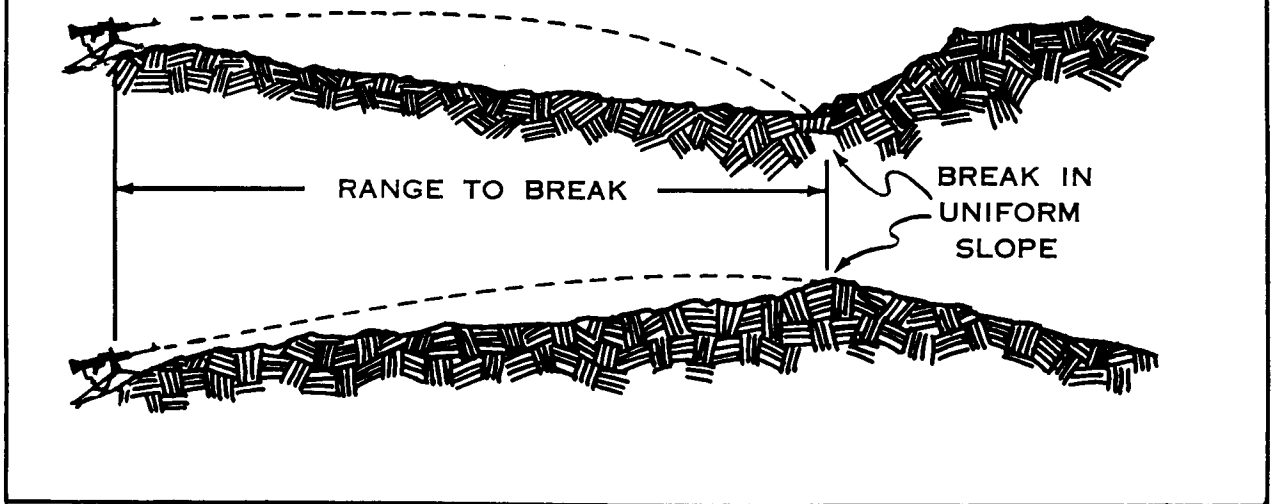


Figure 108. Obtaining the maximum extent of grazing fire over irregular terrain.

d. Determining the Amount of Grazing Fire in a Sector of Graze. A sector of graze exists over uniformly sloping or level terrain anytime the machinegun is fired at a target which can be engaged with a sight setting of 600 meters or less. The ranges to the extent of grazing fire in a sector of graze are determined by observation of the terrain and by observation of the tracer stream from behind the gun or from a flank of the gun. Normally the extent of grazing fire within this area will be much less than on a final protective line and will form an irregular pattern as shown in figure 110.

e. Determining the Amount of Grazing Fire in an Area of Graze. The same procedures used in *a* and *b* above are used in determining the

extent of grazing fire in an area of graze. The ranges to areas of grazing fire are determined by observing the flight of tracer ammunition from behind or from the flank of the gun position. The gunner determines the lateral extent of areas of graze by selecting and engaging successive aiming points in the area believed to afford grazing fire, using the same range setting as when determining the range to the extent of grazing fire (fig. 111).

110. Fire Control

Predetermined target areas are engaged on order from the squad leader or by SOP.

a. Final Protective Fires. The signal used in calling for final protective fires is normally pre-

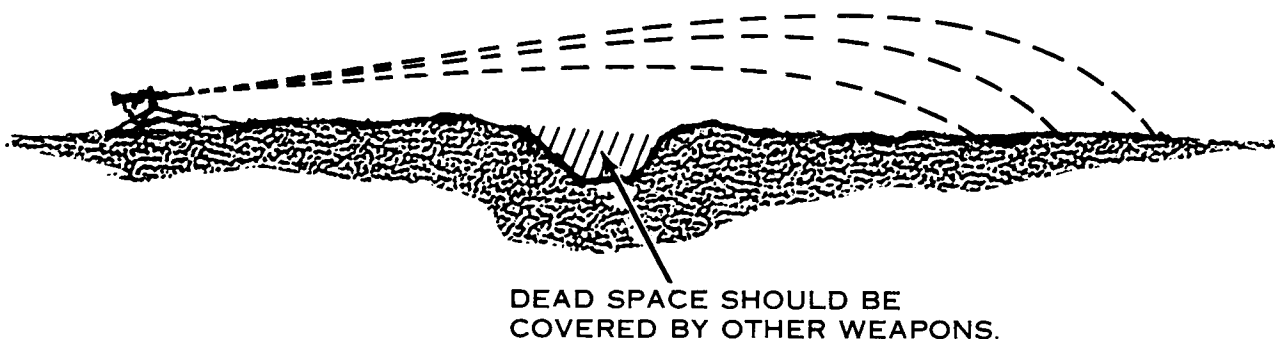


Figure 109. Deadspace.

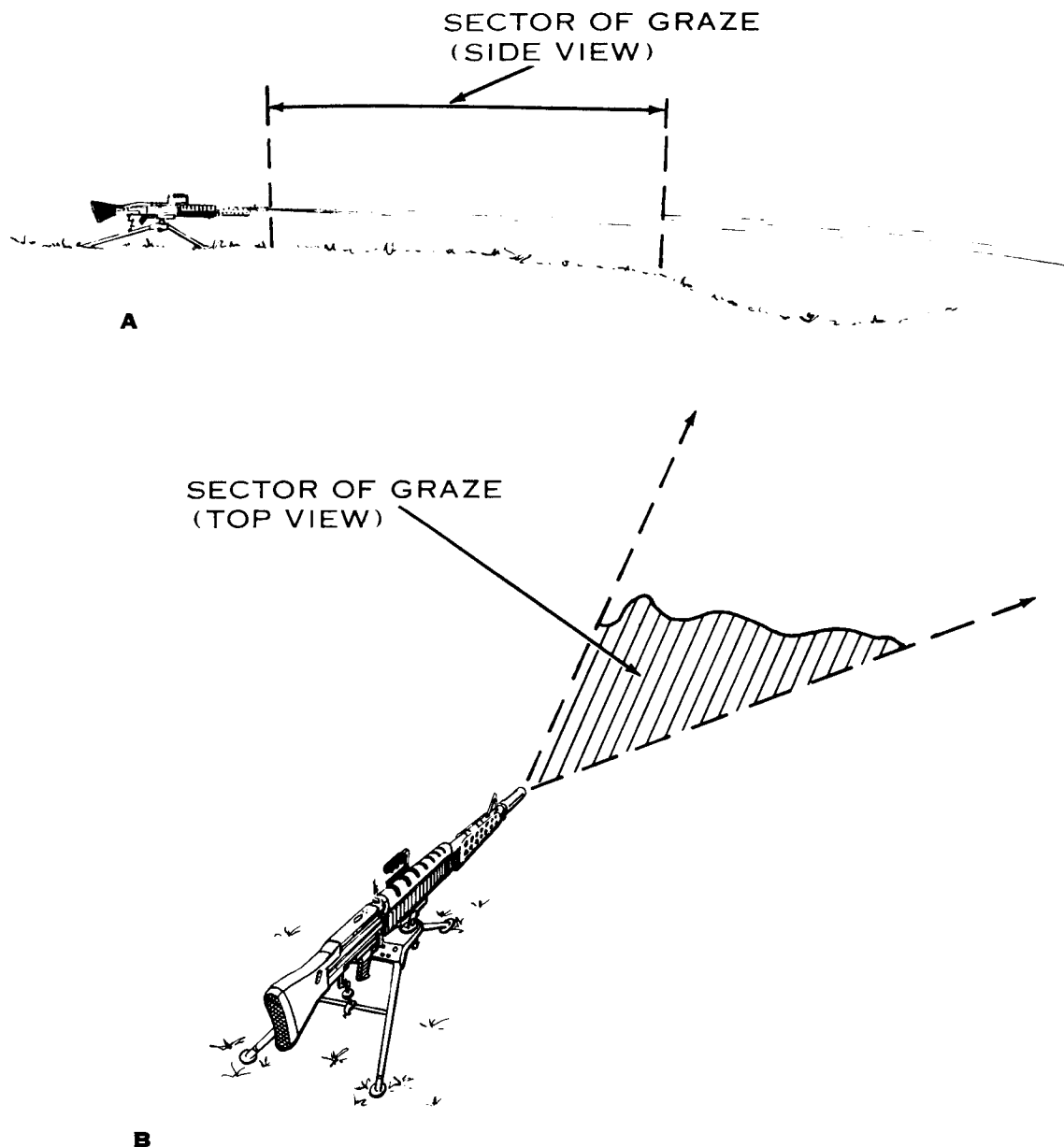


Figure 110. Determining a sector of graze.

scribed in the company operation order. The authority to call for these fires may be delegated to the platoon leader of a forward rifle platoon. Final protective fires are ceased on order or signal.

- (1) *Signals.* Arm – and – hand signals, voice commands, or pyrotechnic devices may be used in calling for these fires.
- (2) *Rates of fire.* When firing final protective fires, the rapid rate of fire is used unless it is obvious that a higher

rate is necessary to accomplish the mission.

b. Engaging other Preselected Target Areas. When engaging other preselected target areas, the rapid rate of fire is used until a command to cease fire is given.

111. Methods of Laying the Gun

The technique of laying the gun to engage preselected target areas during periods of limited visibility is effective only if the data are correct. These data are determined from the

lay of the gun on targets. If possible, the lay is verified by firing and adjusting on these selected targets. There are two methods of determining data necessary to engage selected targets during periods of limited visibility: readings taken from the traversing bar and traversing and elevating mechanism, and by the use of field expedients.

a. Traversing Bar and Traversing and Elevating Mechanism Method. Direction and elevation readings constitute the data necessary to engage preselected target areas during periods

of limited visibility. These readings are measured by and recorded from the traversing bar and traversing and elevating mechanism. All measurements are recorded in mils.

(1) *Preliminary steps before direction and elevation readings are obtained.*

(a) *Positioning the traversing mechanism.* Turn the traversing handwheel toward your body as far as it will go, then turn it *away* two complete revolutions. Check the traversing handwheel scale to insure

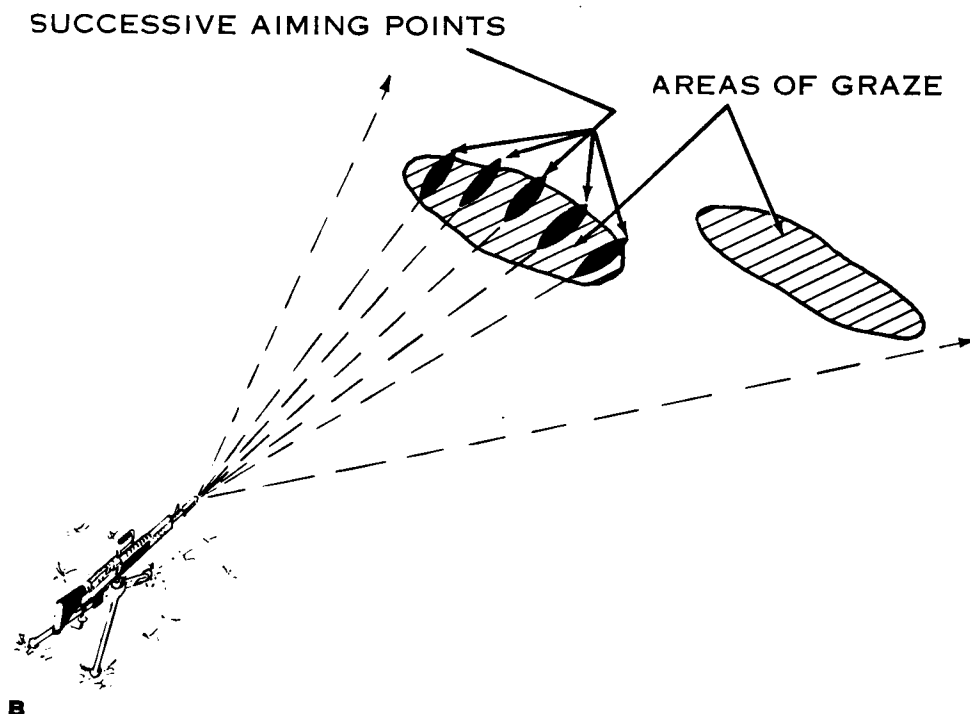
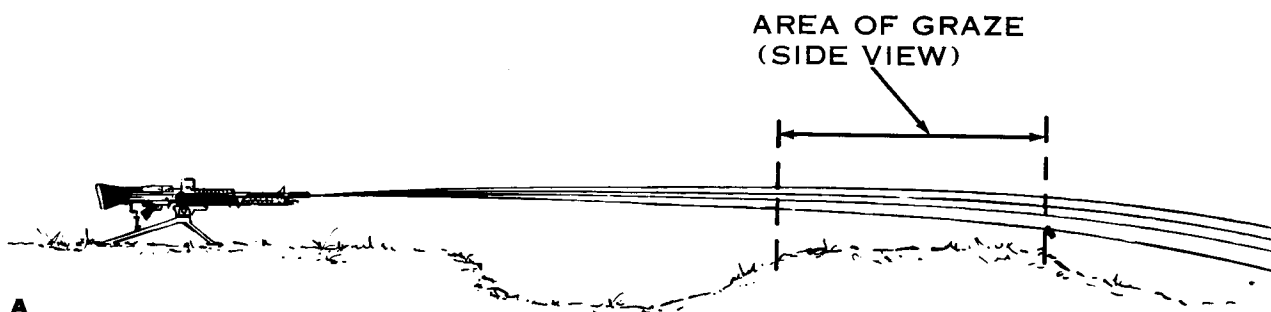


Figure 111. Determining areas of graze.

the same reading is lined up with the "0" index line before and after the two revolutions. The traversing mechanism can be positioned at night by turning the traversing handwheel toward your body as far as it will go, and then turning it away 50 clicks (two revolutions).

- (b) *Laying the gun for direction.* To lay the gun for direction when a final protective line has been assigned, lock the traversing slide on either the extreme left or right side of the traversing bar, depending on the side of the sector on which the final protective line has been assigned. Pick up the rear legs of the tripod and shift the tripod until the muzzle of the gun points along the final protective line. If a final protective line has *not* been assigned, the gun will be laid for direction on the center of the primary sector. In this case, lock the left edge of the traversing slide on the "0" graduation on the traversing bar. *The left edge of the traversing bar slide is always used as the index.* Pick up the rear legs of the tripod and shift the tripod until the muzzle of the gun is laid on the center of sector.
- (c) Once the gun is laid for direction, emplace the tripod firmly by digging the tripod shoes in or by placing sand bags on the tripod legs. This is done to insure greater stability and prevent accidental movement of the tripod.
- (2) *Direction readings.* Direction readings are obtained and recorded to all targets within the primary sector of fire with the exception of the final protective line. The final protective line needs no direction reading since the traversing slide is positioned to the extreme right or left of the traversing bar. To obtain direction readings to targets other than the final protective line—
 - (a) Loosen the traversing slide lock lever and slide the traversing bar slide along the traversing bar until

the gun is laid on the center of a point target and on either flank of a linear target.

- (b) Lock the traversing slide to the traversing bar and read the direction reading from the scale on the traversing bar (fig. 112). *If the left edge of the traversing slide does not fall exactly on a 5-mil graduation (tickmark), use the nearest 5-mil graduation as the direction reading.*
- (c) When the left edge of the traversing slide is on a graduation to the left of the "0" graduation on the traversing bar, the direction reading is recorded as RIGHT that number of mils. (The muzzle of the weapon moves to the right.) When the *left* side of the slide is to the *right* of the "0" graduation, the direction reading is recorded as LEFT that number of mils. (The muzzle of the weapon moves to the left.)
- (d) After having taken a direction reading of a linear target, the width of the target is measured in mils by traversing across the target using the traversing handwheel. The traversing mechanism *must* be repositioned before moving to another target.
- (3) *Elevation readings.*
 - (a) After obtaining the direction reading to a target, an elevation reading is obtained before moving to another target. To obtain this reading the gun is laid on the base of the target.
 - (b) The elevation reading is obtained from two scales. The first portion of the reading is taken from the engraved scale on the upper elevating screw plate. The second portion is taken from the engraved scale on the top of the elevating handwheel, using the indicator as the index (fig. 112). The two portions of the elevation reading are separated by a slash (/) when they are recorded.
 - (c) The engraved scale on the upper elevating screw plate is graduated

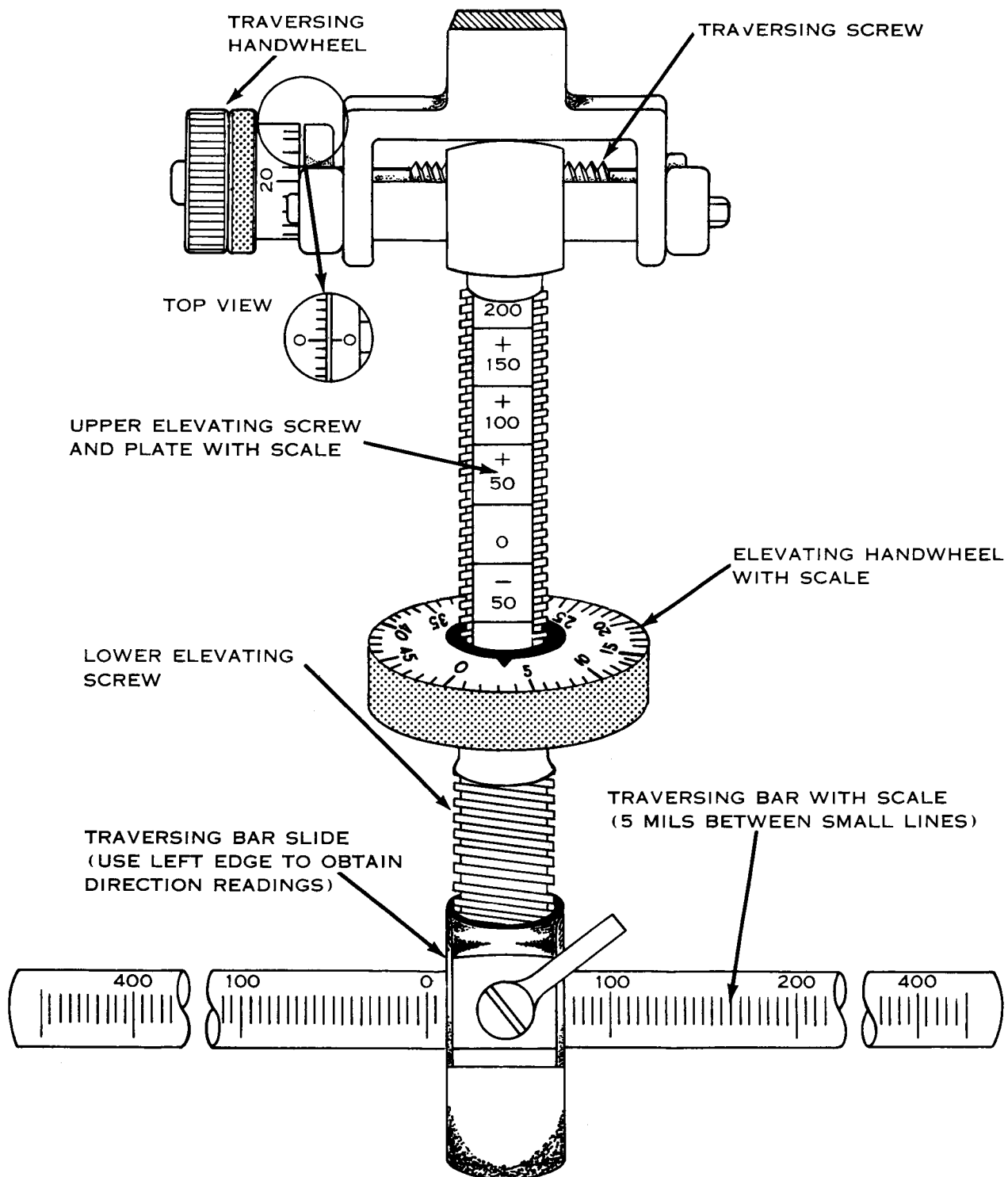


Figure 112. Traversing bar and traversing and elevating mechanism.

in 50-mil increments from MINUS 200 mils to PLUS 200 mils. There is an index line *below* each number and a PLUS or MINUS sign above each number, with the exception of the "0" (fig. 112). The zero reading has *no* sign. *In obtaining the elevation reading, the gunner should lower his head until his eyes are on line with the top of the elevating handwheel.* The first portion of the reading is the number and plus or minus sign *above* the first visible index line. As in figure 112, this would be a minus 50 reading.

- (d) The scale on the elevating handwheel is graduated in 1-mil increments for a total of 50 mils. Locate the graduation on line with the indicator (fig. 112). The entire reading is recorded as minus 50/3.
- (e) An elevation reading is valid on only one mechanism. If data are placed on another mechanism using the same mount and gun, the data *could be* inaccurate. The number of threads exposed on the lower elevating screw (fig. 112) must remain the same both when obtaining and using data. If the number of threads is increased or decreased after the data are recorded, accurate fire cannot be placed on the target. For example, when a gun is freed to

engage a secondary sector, should the base of the traversing and elevating mechanism rotate, the data are *only* correct if the gunner insures that the same number of exposed threads is replaced on the mechanism.

- (f) To replace the elevation reading of minus 50/3 on the traversing and elevating mechanism, manipulate the elevating handwheel until the horizontal line below —50 is visible at eye level, with the handwheel indicator on 3.
- (4) To insure a correct elevation reading to a target, the gunner should fire and adjust on this target.
- (5) Data may be obtained to targets without firing and adjusting as mentioned in the preceding paragraph. This is accomplished using the *dry-fire* method of laying the gun. In using this method, the range to the target is determined by eye; this range is placed on the rear sight and the gun is laid on the center base of the target. The direction and elevation readings are then taken. Range determination is critical because any discrepancy will cause an error in the elevation when the target is engaged. The dry-fire method of obtaining data is used only when firing is not possible or when the situation is such that firing

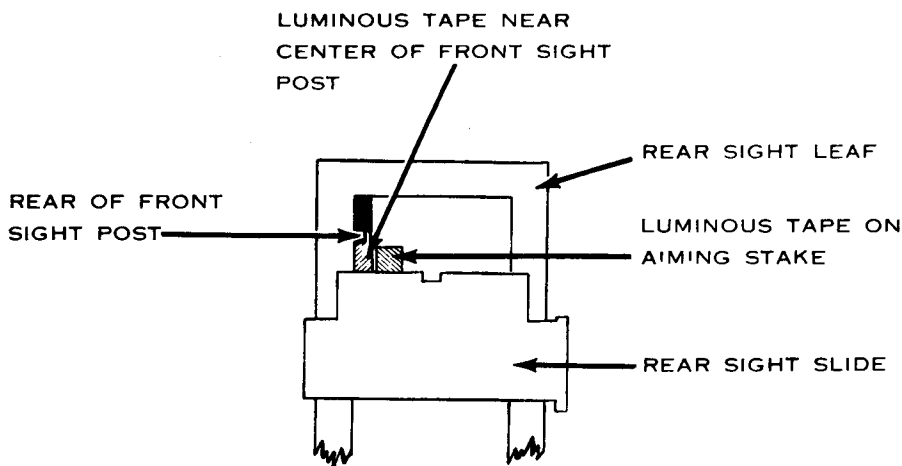


Figure 113. Aiming stake technique of engaging targets during periods of limited visibility.

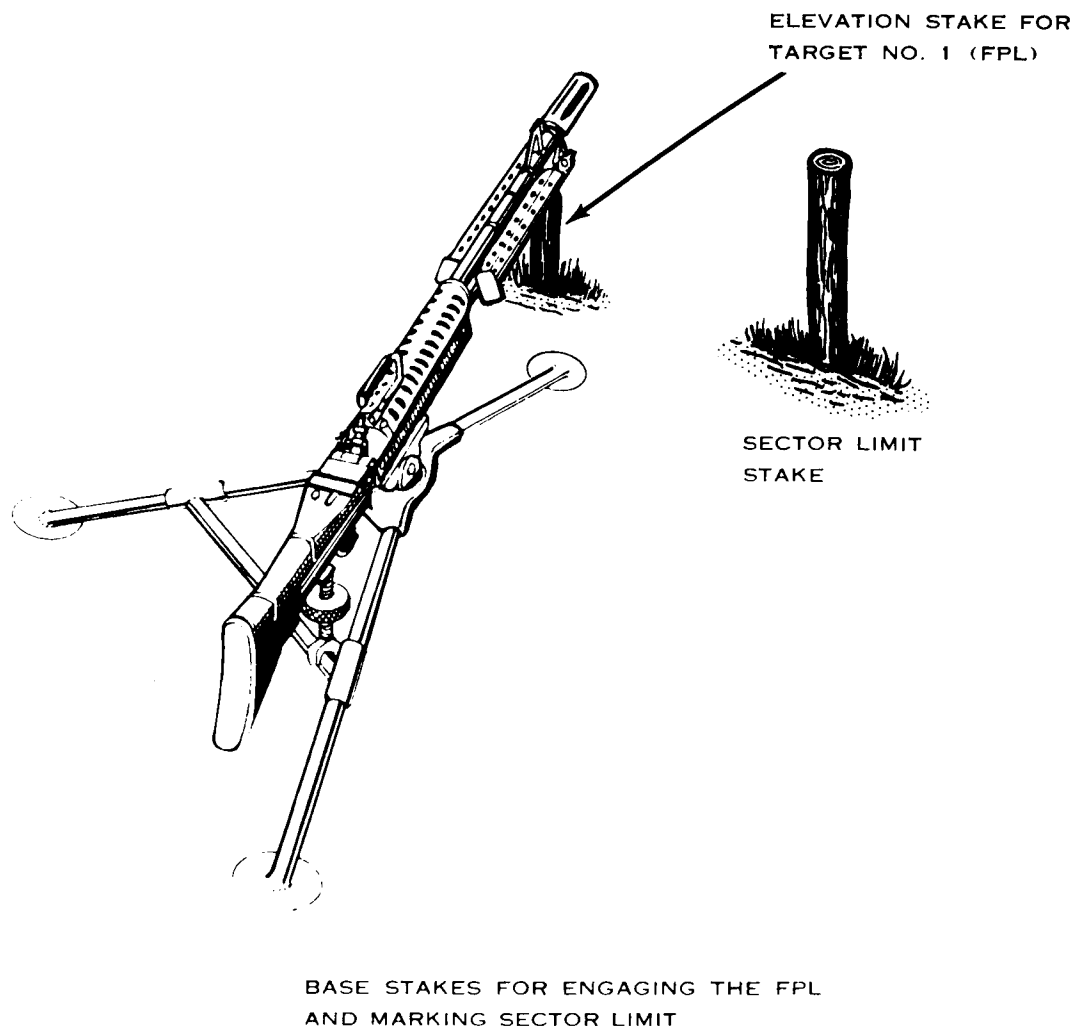


Figure 114. Base stake techniques of engaging preselected target areas.

would disclose the position of the gun.

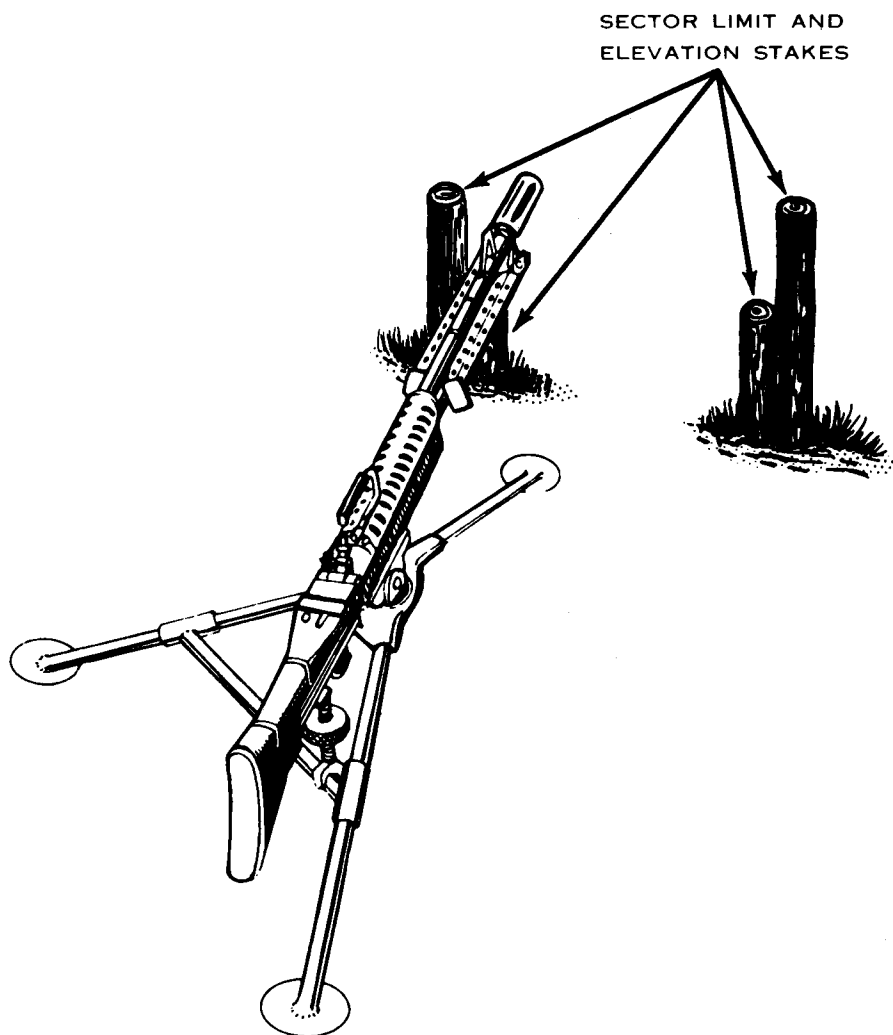
b. Laying the Machinegun by the Use of Field Expedients. Field expedients include the use of stakes and other devices to engage preselected target areas. Proper use of one or a combination of the field expedient techniques described in this paragraph will aid the gunner considerably in employing the machinegun in its predetermined fire role. These techniques may be used in conjunction with the traversing bar and traversing and elevating mechanism method. The field expedient method serves to *supplement* and enhance the employment of the gun in engaging preselected target areas. This method is not as effective as the traversing bar and traversing and elevating mechanism method and requires additional material. Field expedients serve as a primary means of engaging

preselected target areas in a secondary sector during periods of limited visibility, and they may be used as a primary means in the primary sector until time or conditions of visibility permit recording data from the traversing bar and traversing and elevating mechanism. If a gun crew is replaced for any reason, field expedients being employed must be explained to the relieving crew.

- (1) *The aiming stake technique.* The principal advantage of this technique is that no light is required at the gun position at night. This technique is not effective when visibility is so limited that aiming stakes cannot be observed. To employ this technique the gun is laid to hit a target area and the following procedure is used.

- (a) The rear sight slide is raised to its uppermost position in the rear sight leaf.
- (b) A strip of luminous tape or luminous paint is placed at least halfway up the rear of the front sight post.
- (c) An aiming stake, marked with a strip of luminous tape or paint, is taken one or two meters forward of the gun position.
- (d) The gunner moves his head slightly to the right causing the front sight post to appear in the left corner of the rectangle formed by the rear

sight slide and rear sight leaf. Under the gunner's direction the stake is alined and driven into the ground in such a way that the two pieces of luminous material are adjacent (alined for direction) and the top edges of both pieces of material are level (alined for elevation), presenting a sight picture such as the one depicted in figure 113. The gunner must maintain the correct position and grip throughout the procedure and, when engaging targets, must cause the front sight post to appear



BASE STAKES FOR ENGAGING TARGET
AREAS (OTHER THAN THE FPL) ON SECTOR LIMITS

Figure 114—Continued.

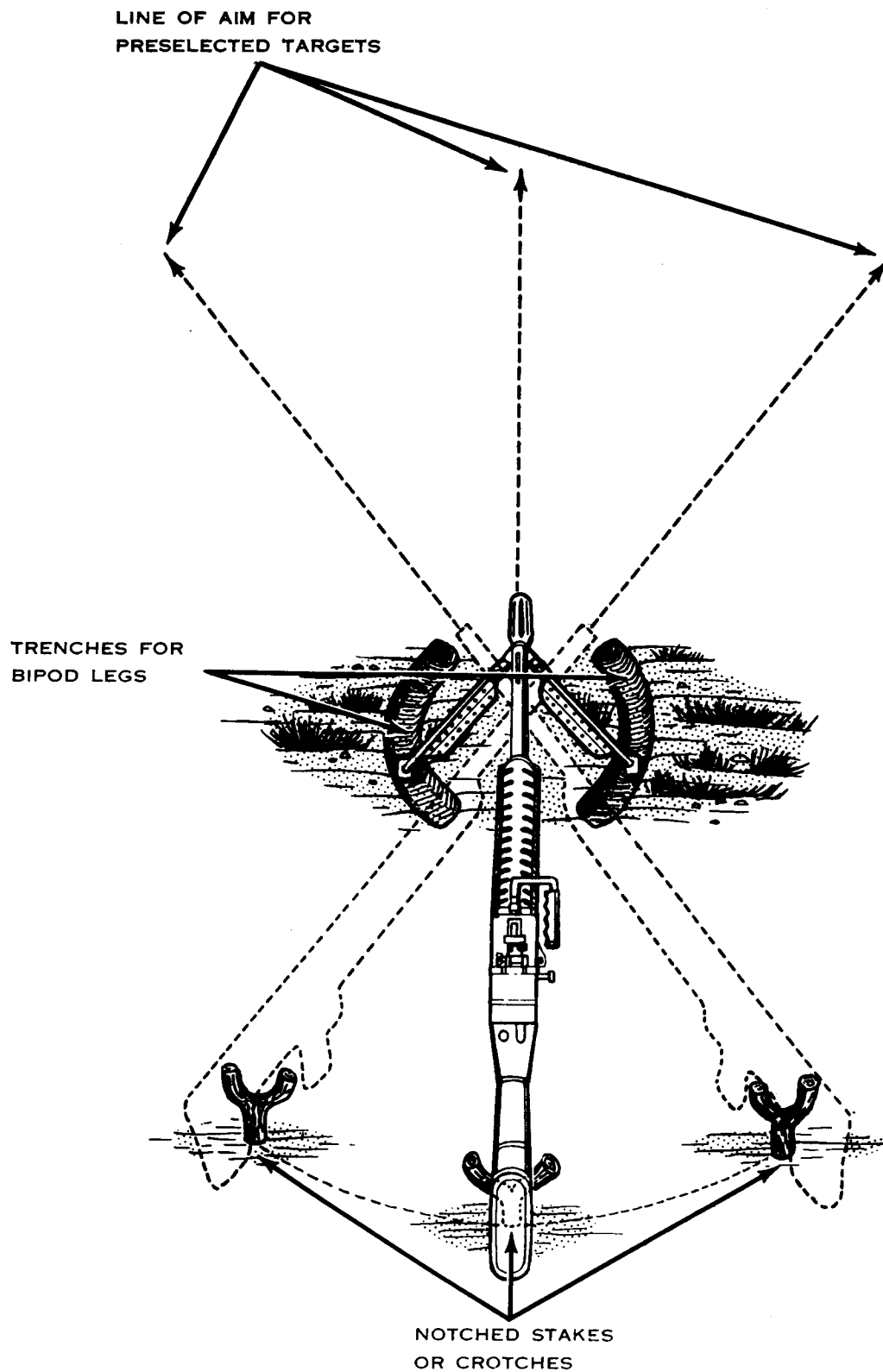
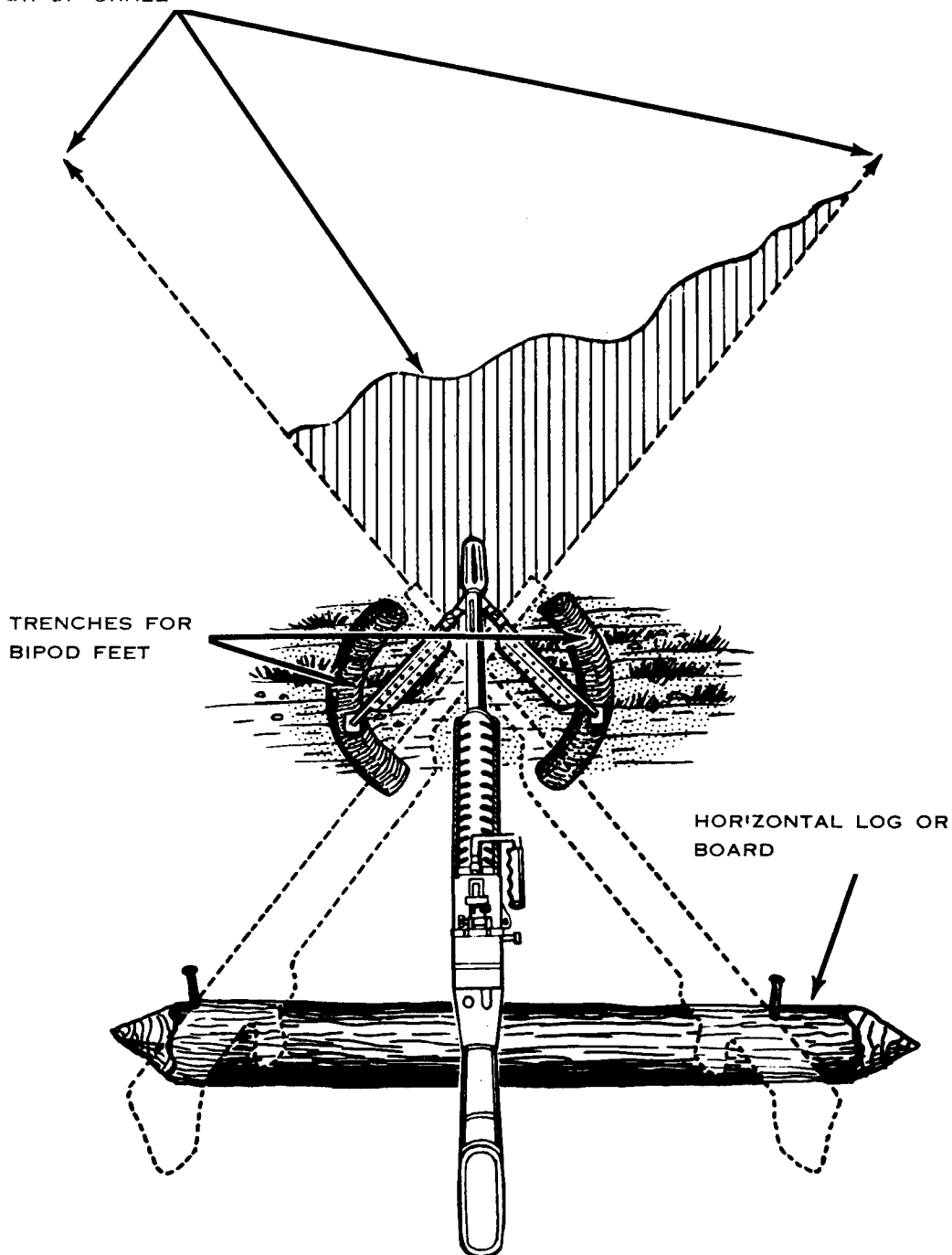


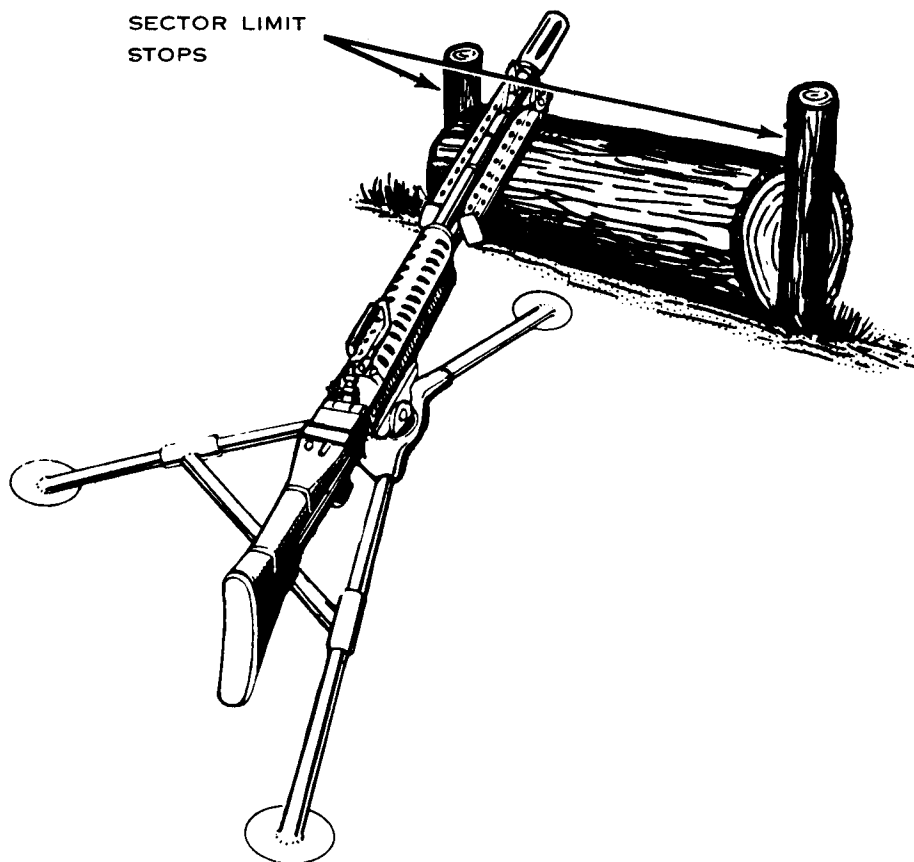
Figure 115. Notched stake or tree crotch technique of engaging preselected targets.

SECTOR LIMITS AND
SECTOR OF GRAZE



HORIZONTAL LOG OR BOARD USED WITH THE BIPOD
MOUNTED M60 MACHINEGUN

Figure 116. Horizontal log or board technique of engaging preselected areas.



HORIZONTAL LOG OR BOARD USED WITH THE TRIPOD MOUNTED M60 MACHINEGUN.

Figure 116—Continued.

in the *left* of the rear sight by again moving his head slightly to the right.

- (2) *The base stake technique.* This technique is used to define sector limits and may provide the lay for the final protective line or other preselected target areas which exist along a primary or secondary sector limit. The base stake method is effective in all conditions of visibility and requires a minimum of additional material. The following procedure is used to—
- (a) *Define a limit of sector.* Lay the gun for direction along one sector limit and emplace a stake along the outer edge of the folded bipod legs, taking up the “play,” since the legs rotate slightly on the barrel. The

same procedure is used for placing a stake along the opposite sector limit.

- (b) *Lay the gun to engage a final protective line.* Move the muzzle of the weapon to a limit of sector. Adjust for elevation by driving a stake into the ground so the top of the stake is under the gas cylinder extension, allowing a few mils of depression to facilitate covering irregularities in the terrain (fig. 114).
- (c) *Lay the gun to engage other target areas on a sector limit.* In a primary sector this is accomplished by using the procedure in (b) above, the only difference is that no depression is allowed for irregularities in the terrain. In a secondary

sector when the gun is mounted on tripod, and the traversing and elevating mechanism is removed, the procedure described in (a) above is used in addition to driving in an additional stake under the gas cylinder extension to fix the elevation (fig. 114).

- (3) *The notched stake or tree crotch technique* (fig. 115). The notched stake or tree crotch technique is used with the bipod mounted gun to engage preselected target areas within a sector or to define sector limits. This method is effective in all conditions of visibility and requires a minimum of additional material. To employ this method the following procedure is used.
 - (a) The stock of the weapon is placed in the rests of notched stakes or tree crotches and adjusted to hit desired targets or to define sector limits.
 - (b) Shallow trenches or grooves are dug for the bipod feet. These trenches or grooves act as a pivot point for the weapon, permitting rotation of the bipod feet as the stock is moved from one crotch or stake to another.
 - (c) The weapon is held and fired using the position and grip employed in bipod firing.

- (4) *The horizontal log or board technique* (fig. 116). This technique is used with the bipod or tripod mounted machine-gun to mark sector limits and provide sector of graze fire. The horizontal log or board technique is effective in all conditions of visibility. The following procedures are used with—

- (a) *The bipod mounted gun.* Place a log or board beneath the stock of the weapon in such a way that the stock can slide across it freely. Dig shallow trenches or grooves for the bipod feet to allow rotation of the feet as the stock is moved along the horizontal log or board. Adjust the bipod legs to the desired elevation. The sector limits may be marked by notching or placing stops on the horizontal log or board. Bipod firing position and grip are used.
- (b) *The tripod mounted gun.* Place a log or board beneath the barrel of the weapon. The log or board should be positioned in such a way that the barrel, when resting on the log, will be at the proper elevation to obtain sector of graze fire. The limits of sector are marked, when appropriate, as discussed in (a) above.

Section IV. RANGE CARDS

112. General

a. A range card is a record of firing data necessary to engage preselected target areas within a sector(s) of fire during periods of limited visibility. Such areas are suspected of being tactically significant during these periods. These areas include likely routes or avenues of approach, anticipated enemy supporting weapons positions, probable enemy assault positions, final protective lines, and sectors of graze. The range card may also be used as a reference to engage targets during periods of good visibility, and it also aids the platoon leader in preparing his fire plan.

b. Data to areas within the primary sector are of primary concern. The tripod mounted gun is habitually employed covering the primary

sector of fire. Preselected targets in the secondary sector are engaged during periods of limited visibility by the use of field expedients (para. 111).

c. A range card consists of two parts; a sketch of the sector(s) of fire containing drawings of targets, and a data section which lists data necessary to engage these targets during periods of limited visibility. The sketch is not drawn to scale, but the data referring to the areas are accurate.

113. Preparation of a Range Card

Range cards are prepared in duplicate; one copy stays at the gun position, and the other copy is sent to the platoon leader. Complete

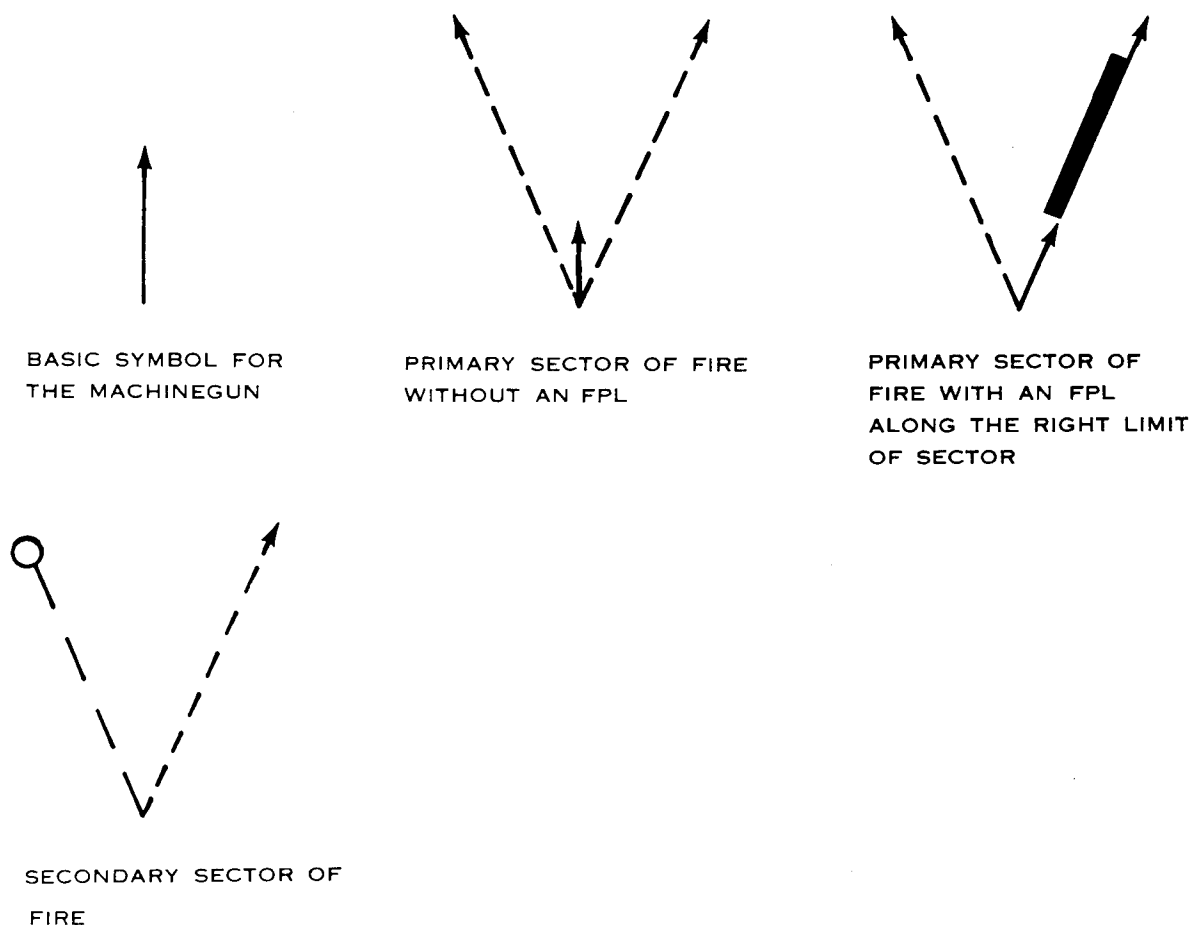


Figure 117. Military signs and symbols applicable to the M60 machinegun.

range cards are prepared for primary gun positions, and partially completed range cards are prepared for alternate and supplementary gun positions. The gunner, assisted as necessary by the assistant gunner and leader, is responsible for the preparation of the range card. Range cards are prepared immediately upon arrival in a position regardless of the anticipated length of stay. The range cards should be constantly revised during occupation of a position. Military symbols in figure 117 are used in preparing a range card. The following steps are accomplished in preparing a range card, but need not be accomplished in the order outlined.

a. Position the traversing mechanism (para. 111).

b. Position the weapon with the muzzle oriented on the final protective line. If a final protective line is not assigned, the muzzle should be oriented on the center of sector. Emplace the tripod as explained in paragraph 111.

c. Sketch in the basic symbol for the machinegun in the lower center portion of the card, oriented in the direction of the final protective line or center of sector, as appropriate (fig. 118).

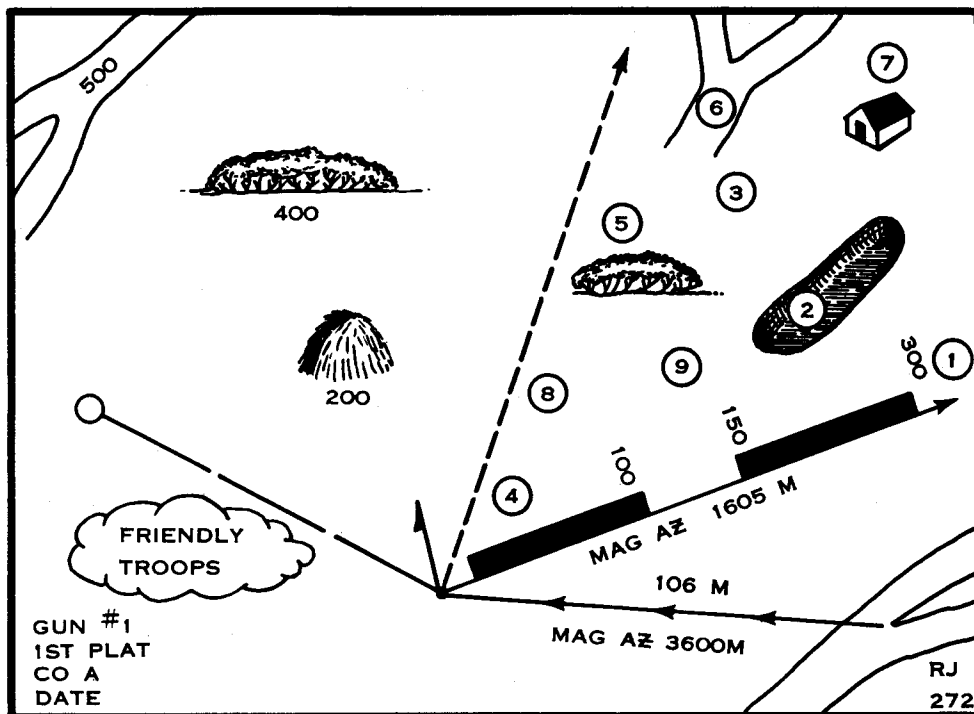
d. If a final protective line is assigned, draw in the final protective line using the procedure outlined in *i* below.

e. Draw in the limit(s) of the primary sector which does not contain a final protective line on the sketch. No data are recorded for this limit(s) of sector in the data section unless a target is located along this line (fig. 118).

f. Draw in the limit of the secondary sector which does not border the primary sector on the range card sketch.

g. Draw in and label friendly positions which are located forward of the forward edge of the battle area (FEBA) and in the vicinity of machinegun's sector of fire (fig. 118).

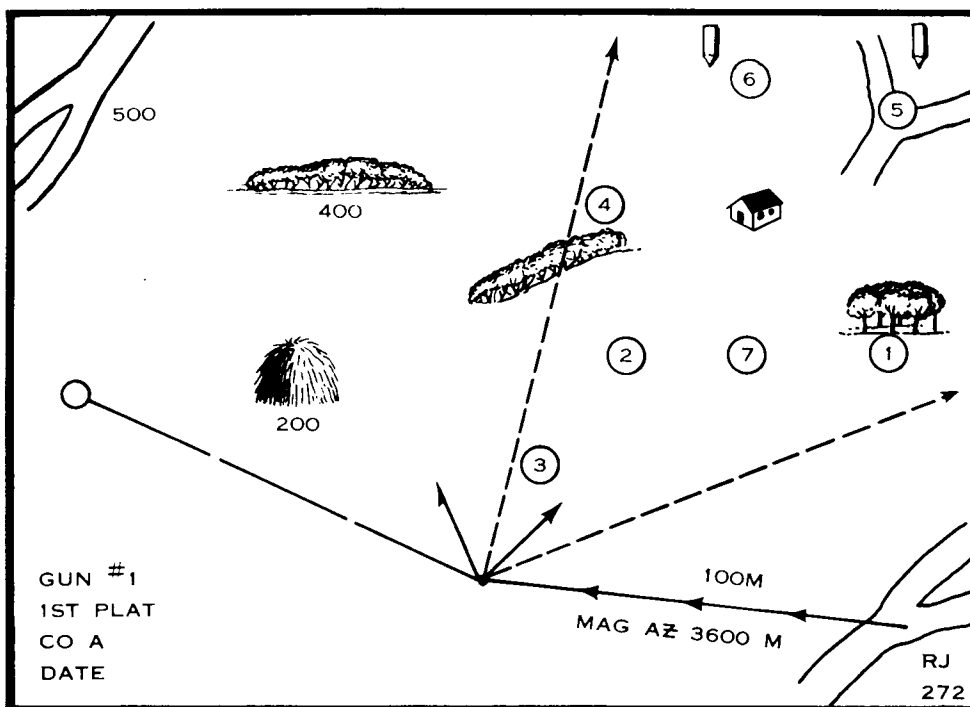
h. Draw a magnetic north arrow from the



DATA SECTION

NO.	DIRECTION	ELEVATION	RANGE	DESCRIPTION	REMARKS
1		+50 / 15	300	FPL	
2	R200			PDFD	
3	L100			PDFN	
4		-50 / 10		SG	
5	L305	+50 / 41	300	HEDGEROW	R25
6	L270	+100 / 10	600	RJ	+5
7	R165	+100 / 15	500	HOUSE	R3+2
8	L400	+50 / 8	200	AG	R100
9	R25	+50 / 43	200	AG	R50

Figure 118. Range card with a final protective line.



DATA SECTION

NO.	DIRECTION	ELEVATION	RANGE	DESCRIPTION	REMARKS
1	R20			PDFD	
2	L150			PDFN	
3		-100 / 25		SG	
4		+50 / 47	300	HEDGEROW	R30
5			600	RJ	AIMING STAKE
6			500	HOUSE	AIMING STAKE
7	R75	0 / 26	300	AG	R50

Figure 119. Range card without a final protective line.

base of the machinegun symbol pointing in the direction of magnetic north.

i. Orient the gun position with a prominent terrain feature recognizable on a map by obtaining the magnetic azimuth from the terrain feature to the gun position. Determine the distance in meters between these two points (fig. 118). Place arrow barbs along this line to indicate the direction in which the magnetic azimuth was taken. If a prominent terrain feature is not available, the gun position may be oriented by using an 8-digit grid coordinate.

j. As marginal data, record the gun number, unit designation, and date in one of the corners of the sketch. No higher unit designation than company is recorded on the sketch because of security reasons (fig. 118).

k. Obtain data to target areas.

- (1) When a final protective line is assigned, determine the maximum extent of grazing fire on this line, then draw a solid line in extension to the basic symbol for the machinegun. This line ends in an arrowhead. Sketch in a shaded blade on the inside of the final protective line to represent the extent of grazing fire. If deadspace exists on the final protective line, breaks are left in the shaded blade to represent it. Record the ranges to the near and far edges of the deadspace and to the maximum extent of graze along the final protective line. Determine the magnetic azimuth of the final protective line and record this azimuth along the final protective line. Record the elevation reading and other pertinent data under appropriate columns in the data section (fig. 118). The final protective line is referred to in the data section as "FPL."
- (2) Select the principal direction of fire day and principal direction of fire night and mark the center of these areas on the sketch with a number as discussed in (6) below. Obtain direction readings to this marked area and enter the data in appropriate columns of the data section.

- (3) If a sector of graze is obtainable, determine the elevation setting which gives the maximum extent of grazing fire between the muzzle of the weapon and the first major break in the terrain between the primary sector limits. Record this elevation reading in the data section (fig. 118). The sector of group is referred to in the data section as "SG."
- (4) After having laid the gun on other target areas in the primary sector, obtain direction and elevation readings for these areas and record the data in the data section (fig. 118).
- (5) An area of graze is treated as a target area, and is referred to in the data section as "AG."
- (6) Target areas in the primary sector are marked on the range card sketch by numbers inclosed in circles. The final protective line, when assigned, is labelled target number 1; the principal direction of fire day, target area number 2; and the principal direction of fire night, target area number 3. In the absence of a final protective line, principal direction of fire day becomes target number 1 and principal direction of fire night becomes number 2. The remaining targets are assigned subsequent numbers in order of their priority. The principal direction of fire day and the principal direction of fire night are referred to in the data section as "PDFD" and "PDFN" respectively.
- (7) When field expedients are used to engage targets, replicas of the field expedients are sketched above the drawing of the targets and the word "stake," with its number, is written in the data section (fig. 119).
- (8) Preselected targets in the secondary sector are sketched in on the range card, and ranges to these targets are not recorded below the sketches. Data to these targets are recorded in the data section (fig. 119).

CHAPTER 9

TACTICAL EMPLOYMENT OF THE M60 MACHINEGUN

Section I. INTRODUCTION

114. General

Before the machineguns of a rifle platoon can be effectively employed, the terms and techniques for applying fire during periods of good and limited visibility as discussed in chapters 7 and 8 must be understood. Because of the number and diversity of missions assigned the weapons squad in tactical operations and the resulting difficulty of direct control by the squad leader, individual initiative and actions are required of members of the machinegun crews.

115. Scope

This chapter amplifies the doctrine contained in FM 7-15 to assist the instructor, platoon leader, squad leader, and the individual member of gun crews in effectively employing the M60 machinegun. This chapter includes—

- a. Definitions and discussions of the terms frequently used in defensive and offensive operations as they apply to the M60 machinegun.
- b. Fundamentals of employing the M60 machineguns in offensive and defensive operations.

Section II. DEFINITIONS

116. General

This section defines and discusses terms frequently used in offensive and defensive operations. These terms must be commonly understood by all members of the rifle platoon prior to any discussion of tactical employment.

117. Defense Terms

a. *Primary Position.* That location on the ground which provides the best observation and fields of fire to accomplish the assigned mission.

b. *Alternate Position.* The next best position(s) from which the assigned mission (the same mission(s) assigned for the primary position) can be accomplished.

c. *Supplementary Position.* A position assigned for defending in a direction that cannot be covered from the primary position.

d. *Forward Edge of the Battle Area (FEBA).*

The FEBA is the line formed by the forward defensive positions (fig. 120).

e. *Frontage.* Space from side to side covered by a unit in combat.

f. *Combat Outpost Line (COPL).* The COPL is a line formed by the security echelon of a unit which denies the enemy close ground observation of the unit position (fig. 120).

g. *Outguard.* One of the elements of the unit deployed on the COPL. An outguard may vary in size from half a squad to a reinforced squad. Outguards are positioned on or near the topographical crest of terrain features in order to obtain maximum observation and long range fires. To insure that the combat outpost can provide early warning of the advance of the enemy, outguards are located where they can obtain overlapping sectors of observation. Adjacent outguards should be capable of mutual

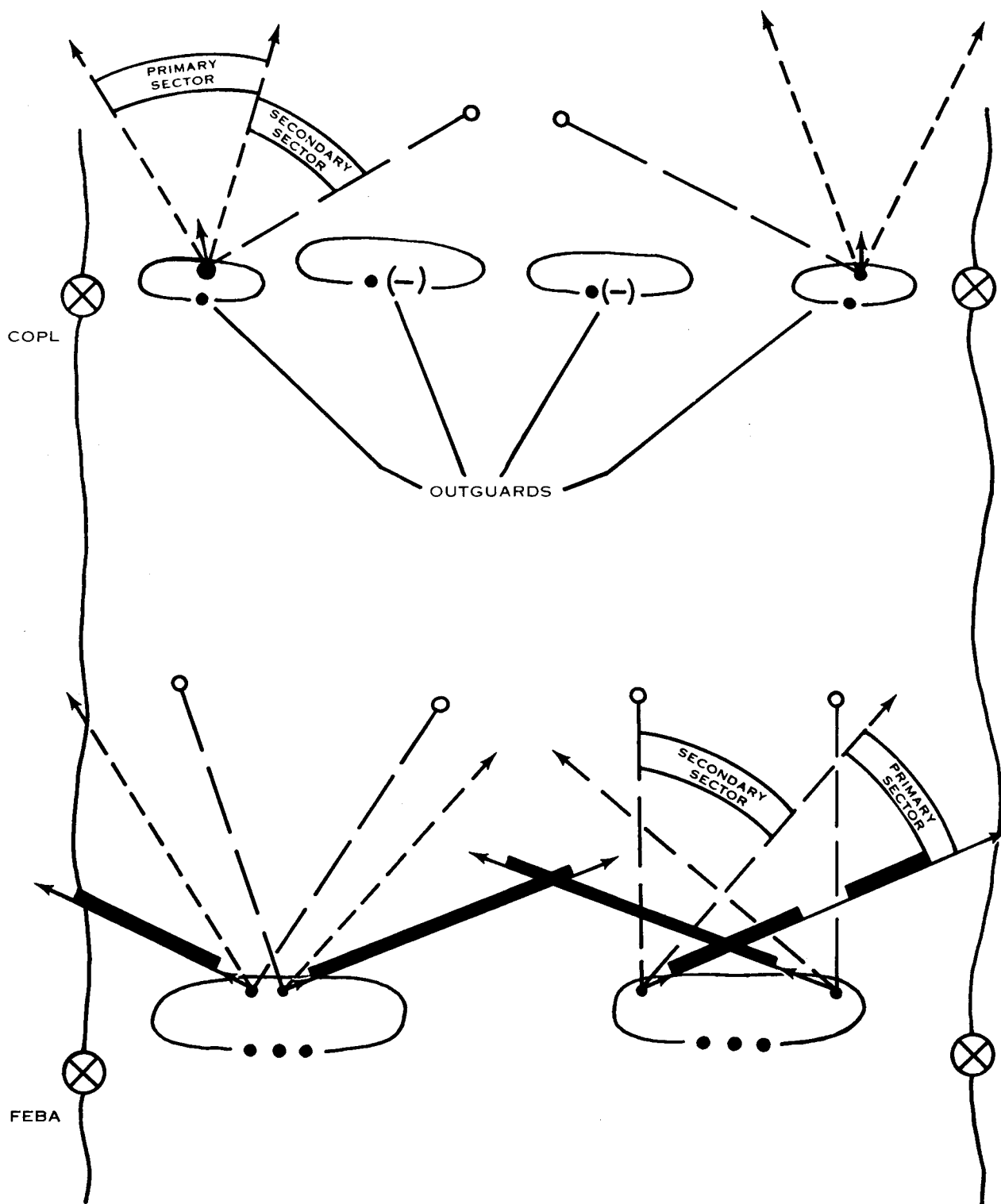


Figure 120. Partially completed company defense plan.

fire support and should be located within visual distance of one another (fig. 120).

h. Long-Range Fires. Fires employed against the enemy as soon as he comes within effective range.

i. Close Defensive Fires. Fires employed against the enemy that subject him to an increasingly heavier volume of fire as he approaches the battle area.

j. Final Protective Fires. Fires immediately in front of the battle area which are used to break up the enemy assault. During final protective fires machineguns fire their final protective lines.

118. Attack Terms

a. Fire and Maneuver. Fire and maneuver consists of an element(s) establishing a base

of fire to cover the movement of another element(s) while it maneuvers to close with and destroy or capture the enemy.

b. Fire and Movement. When the maneuver element(s) meets effective enemy opposition and can no longer advance under the cover of supporting fires, it employs fire and movement. Fire and movement consists of one element providing close fire support while another element advances toward the enemy. This procedure may be repeated as often as necessary until one or both of the attacking elements are in position to assault the enemy position. Depending upon the situation, it may be necessary to conduct the assault on the objective by the application of fire and movement from the time the assault starts until the objective is completely overrun.

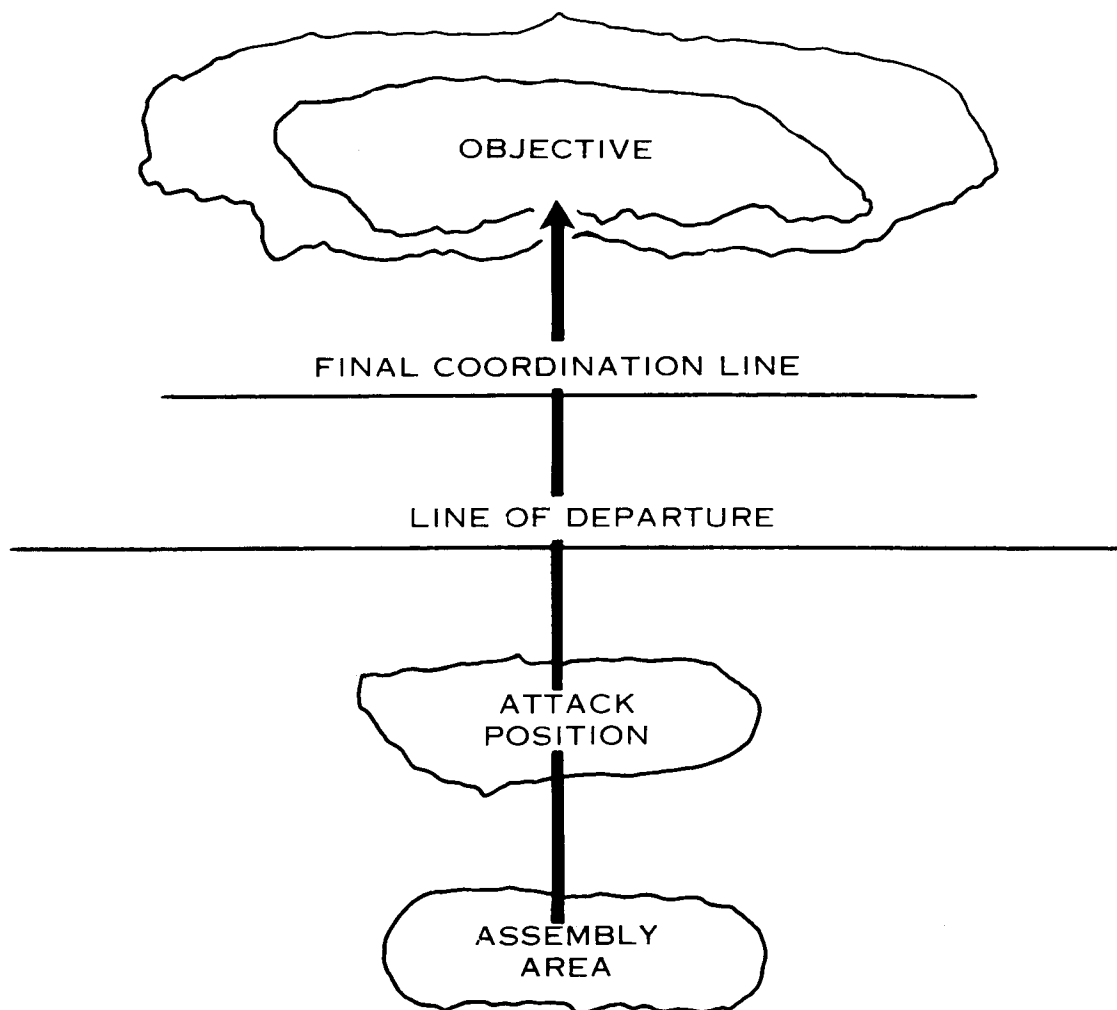


Figure 121. Control measures used during a daylight attack.

c. Displacement by Crews. Displacement of one (or more) machinegun crew(s) to a new position(s), the other crew(s) remaining in position firing, or prepared to fire, on a given target or area. Where necessary, the movement can be continued by bounds or echeloned bounds.

d. Assembly Area. The area in which a unit prepares for an offensive or defensive operation. Units are suitably dispersed, and while orders are issued, reconnaissances conducted, and resupply and maintenance accomplished, the command is disposed for defense and the security required by the situation maintained. Under these conditions, machineguns will often occupy firing positions. In an attack situation this area is usually company size and located within one hour's movement time of the line of departure (fig. 121),

e. Attack Position. This is the last concealed and covered position short of the line of departure where platoons deploy in the attack formation and make final coordination. The platoon will halt in the attack position only when final preparations cannot be completed in the assembly area or on the move, or when ordered by the company commander (fig. 121).

f. Line of Departure (LD). This is a line designated by the company commanders to coordinate the beginning of the attack and is usually an easily recognizable terrain feature, such as a stream or road, running perpendicular to the direction of attack (fig. 121).

g. Final Coordination Line. This is a line used to coordinate the lifting and shifting of supporting fires and the final deployment of the maneuver element in preparation for conducting an assault against an enemy position. It

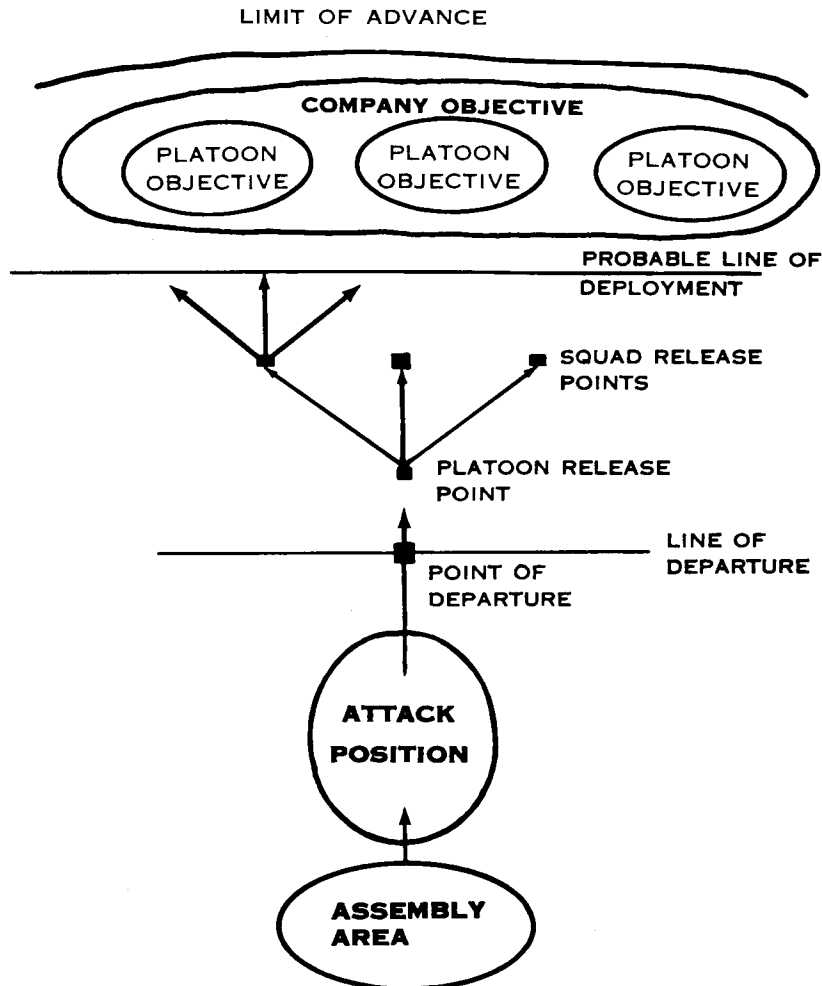


Figure 122. Control measures used during a night attack.

is located as close to the enemy position on the objective as attacking troops can move before becoming dangerously exposed to friendly supporting fire.

h. Objective. This is a designated locality or terrain feature to be captured or reached during the attack or during movement (fig. 121).

i. Reorganization on the Objective. Reorganizing the attacking unit as necessary by replacing casualties, reassigning men if necessary, ammunition resupply or redistribution as necessary, and performing any other actions necessary to prepare the unit for further action.

j. Consolidation on the Objective. Organizing and strengthening a newly captured posi-

tion to defend against an enemy counterattack.

k. Points of Departure. Specific locations at which designated units will cross the line of departure in a night attack (fig. 122).

l. Release Points (RP). A clearly defined point on the route where units are turned over to the control of their respective leaders (fig. 122).

m. Probable Line of Deployment. A line previously selected on the ground where attacking units deploy prior to beginning an assault during periods of limited visibility. It is located as close to the objective as possible without revealing the presence of the assaulting element (fig. 122).

Section III. EMPLOYMENT OF THE M60 MACHINEGUNS OF THE RIFLE PLATOON IN THE DEFENSE

119. General

a. This section provides guidance for the platoon leader, the weapons squad leader, and the machinegun crew in employing M60 machineguns in defensive operations. The provisions are applicable to the rifle platoon of the infantry, airborne infantry, and mechanized infantry battalions.

b. The mission of the platoon in the defense is to repel the enemy's assault by fire and close combat. Rifle platoon machineguns possess combat characteristics which are of major importance in the defense. Machineguns can—

- (1) Produce a heavy volume of direct fire.
- (2) Deliver grazing fire out to 600 meters.
- (3) Produce sustained fire for a prolonged period.
- (4) Effectively engage targets at ranges out to 1100 meters.
- (5) Deliver accurate predetermined fires based upon direction and elevation data.
- (6) Deliver overhead fire.

c. To exploit these characteristics, machineguns located along the forward edge of the battle area provide maximum fire support by participating in the delivery of long range fires, close defensive fires, and final protective fires.

120. Missions

Selection of a machinegun's primary position

is primarily dependent upon its planned principal mission(s). Principal missions for a machinegun, in addition to a sector of fire which is habitually assigned, are: a final protective line, a principal direction of fire day, and a principal direction of fire night.

a. Sectors of Fire. Machinegunners of the rifle platoon are assigned primary and secondary sectors of fire as appropriate. Within these sectors the gunner may be assigned a final protective line if terrain permits, a principal direction of fire day, and principal direction of fire night.

(1) *Primary sector.* When possible, the tripod mounted M60 machinegun is employed to cover the primary sector. The tripod mount permits accurate, controlled fire to the maximum effective range of the gun. Inherent in the mount is the important capability of selective prearranged fires, as well as reduction in the adverse effects of personnel fatigue. This mount has approximately 875 mils of controlled traverse. The primary sector is normally assigned to take advantage of the maximum extent of this controlled traverse and is located close to the units on the FEBA (fig. 120).

(2) *Secondary sector.* The secondary sector of fire may be as wide as the terrain and situation permit (fig. 120). Within the secondary sector of fire, a gunner

selects target areas of tactical significance. The gunner may engage these areas and other targets appearing in this sector, providing that no vital targets are visible in his principal direction of fire. Targets in the secondary sector are engaged using free gun, by removing the gun from its tripod mount and using the bipod mount, or by using field expedients as discussed in, paragraph 111.

b. Final Protective Lines. A well chosen final protective line constitutes the best use of machinegun fire during periods of limited visibility. Although 600 meters of effective grazing fire can be achieved against the average standing soldier over level or uniformly sloping terrain, grazing fire will seldom be obtained beyond 400 meters. Since terrain will normally restrict grazing fire to less than 400 meters, every attempt should be made to obtain knee high fire (one meter high maximum). Grazing fire obtained on a final protective line should be flanking enfilade.

c. Principal Direction of Fire Day and Principal Direction of Fire Night. A principal direction of fire day is assigned to be covered during periods of good visibility, and a principal direction of fire night is assigned to be covered during periods of limited visibility. *The gun is always laid on the principal direction of fire day during periods of good visibility and on the principal direction of fire night during periods of limited visibility, unless other targets are being engaged.* Visible targets appearing in the principal direction of fire day or principal direction of fire night take priority over targets appearing elsewhere in the sector.

121. Selection of Positions

a. In the defense, the machineguns of the rifle platoon may be employed singly or in pairs and assigned principal missions discussed in paragraph 120. The method of employment depends on the platoon frontage and the type of terrain in the platoon area. The advantages afforded by employing machineguns in pairs are relative ease of control and resupply. When the guns are employed in pairs, they are normally assigned different primary and secondary sectors (fig. 120).

b. Machineguns should be located to receive incidental protection from adjacent rifle squads.

c. Until the platoon is prepared to defend it-

self, machinegun fire across its position is vital. Where flanking fire from the selected primary position is feasible, the guns are emplaced in temporary positions adjacent to these positions. Many times temporary positions somewhat forward of the FEBA must be occupied to obtain effective fire. Such exposed positions should be promptly withdrawn once the defense is organized. Minimum personnel of the gun crews man these temporary positions to conserve personnel for concurrent work on the primary position(s).

d. In some situations a machinegun crew can exploit all of the characteristics of the weapon discussed in paragraph 119b from one position during periods of both good and limited visibility. In many instances, however, it will be necessary to select a minimum of two positions. A primary position is selected which takes advantage of these characteristics during periods of good visibility and periods of limited visibility caused by fog, rain, snow, or smoke. A secondary position is selected which gives the machinegun the desired capability during hours of darkness. Thus, when selecting machinegun defensive positions—

- (1) First, select the weapon's principal mission(s), considering the terrain, by assigning a primary and secondary sector, and a possible final protective line, principal direction of fire day, and principal direction of fire night. In order of priority, the following should be considered in regard to the terrain in selecting the weapon's principal mission(s).
 - (a) During periods of good visibility.
 1. Good fields of fire and observation over areas which will enable the machinegunner to deliver long range fires and close defensive fires.
 2. Grazing fire along a final protective line.
 3. Cover and concealment.
 - (b) During periods of limited visibility.
 1. Grazing fire along a final protective line.
 2. Good fields of fire, and observation when visibility permits, over areas which will enable the machinegunners to deliver close defensive fires.
 3. Capability of delivering long range preplanned fires.

4. Cover and concealment.

- (2) Decide whether each gun of the section should have the same or different principal missions.
- (3) Next, select the sector(s) of fire, considering the 875 mils of controlled traverse limitation of the tripod, the platoon defense area, and the desirability of a favorable location of the principal mission of each gun within its sector of fire.
- (4) Based upon the factors listed in (1), (2), and (3) above, locate the general area of each weapon's primary position considering local cover and rearward routes of communication available.
- (5) Decide whether a temporary position(s) must be occupied while the defense is being organized. If so, whether the platoon front can be covered with grazing fire from a single section position on one flank or whether separate temporary positions are required. Proximity to the primary position(s) is desirable, but the effectiveness of fire should not be sacrificed for it.

122. Preparation for the Defense

a. The machineguns of the weapons squad are a part of the platoon's organic fire support. The platoon leader assigns the missions and general firing positions for these weapons. He will assign alternate and supplementary positions as necessary.

b. The weapons squad leader normally accompanies the platoon leader on his reconnaissance to make recommendations concerning positions for the weapons squad.

c. Upon arrival of the platoon in the defense area and the completion of the platoon defense order, the weapons squad leader—

- (1) Makes any further detailed reconnaissance required for specific gun positions.
- (2) Issues his order to the gun crews from a location(s) which best enables him to point out specific areas within the platoon area.
- (3) Outlines the work priorities included

in the platoon order as they affect the gun crews.

- (4) Supervises execution of the order.
- (5) Coordinates essential details with adjacent rifle squads and other crew-served weapons whose fire missions require such coordination.

d. Guns are emplaced as directed by the leader for immediate assumption of their mission(s). The squad leader closely supervises the preparation of the positions.

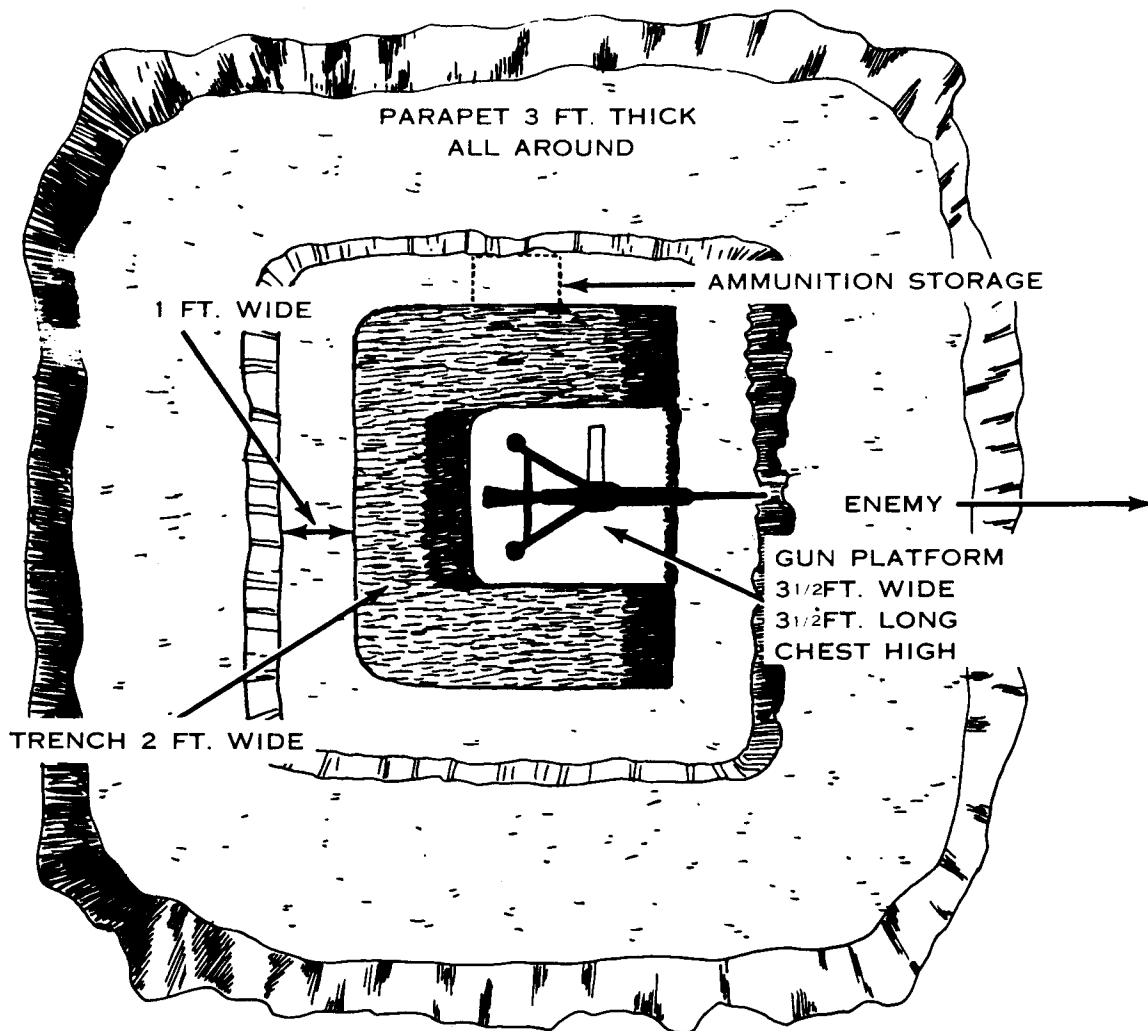
e. Range cards are prepared for gun positions immediately upon arrival of the gunners regardless of their anticipated length of stay (para. 112 and 113). In adjusting fire to confirm elevation data for range cards, gunners should use single rounds. Field expedients may be used to aid gunners in laying their weapons to cover areas of tactical significance (para. 111b).

f. Preparation and improvement of gun positions are continuous. As long as the area is occupied, improvements are made to strengthen the defensive posture of the guns. The following work is accomplished in the priority listed, if time permits.

- (1) Clear fields of fire and maintain camouflage and concealment concurrently with work.
- (2) Prepare a hasty position (emergency emplacement).
- (3) Prepare a horseshoe position for the gun with proper gun platform depth to insure maximum cover for the weapon, commensurate with the mission(s) (fig. 123).
- (4) Prepare other positions for crew members.
- (5) Minimize dust caused by the weapon's muzzle blast by dampening the ground or by placing wet sandbags forward of the muzzle.
- (6) Construct overhead protection.
- (7) Prepare a bunker.

123. Conduct of the Defense of the Forward Rifle Platoon During Periods of Good Visibility

a. The conduct of the defense of a forward rifle platoon begins when observation of the enemy is sufficient to permit delivery of effective fire from the organic weapons of the platoon or weapons which are attached.



PLAN

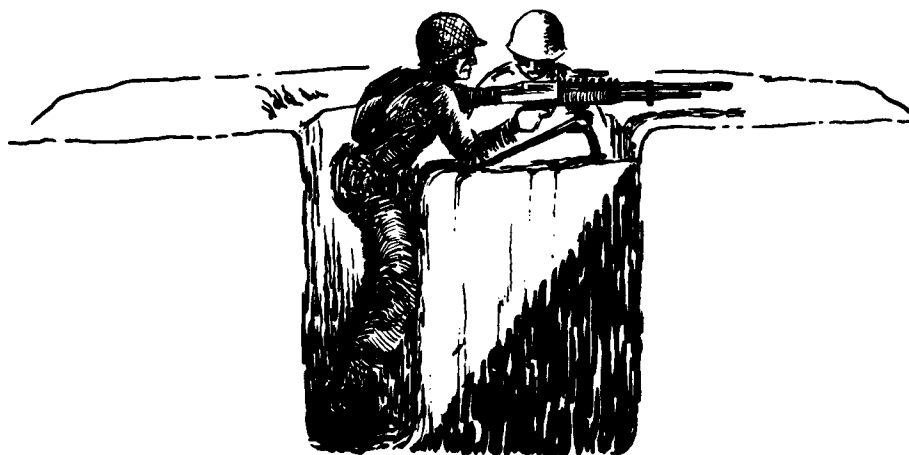


Figure 123. Horseshoe emplacement.

b. At ranges of 1,000 meters or less, the enemy is likely to be in formations or occupying areas which are considered desirable machinegun targets. As the enemy approaches the defensive positions, the machinegunners engage targets within their sectors of fire using techniques discussed in chapter 7. *Consideration should be given to conducting the long-range harassing fires from temporary positions to avoid giving away primary positions.* In the absence of targets in a gunner's principal direction of fire, he may engage lucrative targets anywhere within his primary and secondary sectors. As the enemy continues to approach the platoon area, he is brought under an increasing volume of machinegun fire.

c. As the effectiveness of the close defensive fires forces the enemy to present less lucrative targets and utilize cover, machinegunners decrease their volume of fire and engage only targets which pose threats to the platoon defensive area.

d. If the enemy continues to advance through the close defensive fires and starts his assault, the platoon leader calls for his final protective fires. When final protective fires are called for, the machinegunners will fire their final protective lines, if assigned. If final protective lines are not assigned, machinegunners fire their sectors of graze.

124. Conduct of the Defense of the Forward Rifle Platoon During Periods of Limited Visibility

The conduct of the defense during periods of limited visibility differs from that discussed in paragraph 123. The conduct of the defense during periods of limited visibility begins for the machinegunners of the rifle platoon when reports indicate that an attack is imminent or when the enemy can be observed.

a. Predetermined fires are used extensively to engage suspected enemy locations at long ranges and at midranges. When enemy locations are reported by listening posts or surveillance devices, these areas may be brought under fire by predetermined fire data as discussed in paragraphs 108 through 111.

b. Targets made visible by artificial illumination are engaged using techniques discussed in paragraphs 104 through 107. Firing techniques for engaging targets made visible by artificial

illumination differ from those used during periods of good visibility. When artificial illumination is used (organic or attached), the location of the bursting area of flares or areas of illumination by other illuminating devices should be controlled from the forward rifle platoon area. Well directed close-in illumination (600 meters or less) enables machinegunners to place effective fire on visible targets.

125. Reserve Platoon in the Defense

a. The reserve platoon is positioned in the rear of the forward platoon to provide depth to the company defensive area. The platoon is located on the best defensive terrain from which it can accomplish the mission(s) assigned. Within the scope of the missions which may be assigned, the reserve rifle platoon machinegunners are assigned primary, alternate, and supplementary positions. These gunners fire within their sectors from these positions on order from the platoon leaders.

b. Machinegunners in the reserve platoon are assigned the same type sectors of fire as are the gunners in the forward rifle platoons. Final protective lines are *not* assigned to machineguns in the reserve platoon. A principal direction of fire day and principal direction of fire night are assigned these weapons.

c. The several alternative and separate missions which may be assigned a reserve platoon complicate the problems of the machinegun crews. Standing operating procedures may create two or more reconnaissance groups to facilitate concurrent reconnaissance of several separate unit positions. Placing of ammunition on several potential positions, where possible, facilitates ammunition supply. Where long foot movement is involved, effort should be made to obtain transportation or additional ammunition carriers from the rifle squads.

d. The guns, when possible, are employed on the tripod mount for engagement of targets within the primary sector and fired free gun or from the bipod mount to engage targets within the secondary sector.

e. The machineguns of the reserve rifle platoon are normally employed singly because there is a greater area of responsibility, which, with guns employed in pairs, the platoon could not cover.

f. The preparation of the weapons squad of

the reserve platoon for the defense is otherwise the same as for the weapons squad of the forward rifle platoon.

126. Defense of the COPL

The mission of the COPL is to deny the enemy close ground observation of the battle area and provide early warning of his advance. Within its capabilities, it delays and disorganizes the enemy and deceives him as to the true location of the battle area. It avoids close combat when possible. The COPL is organized into outguards for most effective coverage.

a. Machinegunners on the COPL are assigned positions, normally with outguards, from which they can cover the greatest portion of the platoon frontage and take full advantage of their long-range fires.

b. The gunners on the COPL are assigned primary and secondary sectors of fire. These sectors are assigned in such a manner that they provide a maximum of mutual support for adjacent elements on the COPL. The machineguns are normally employed on tripod to achieve more accurate fires at the maximum effective range of the weapon and to facilitate employing the gun in its predetermined fire role during periods of limited visibility.

c. The primary sector should cover areas of tactical significance which allows for engagement of targets out to the maximum effective range of the M60. Final protective lines are not assigned machinegunners on the COPL; therefore, the primary sector limits need not be close to the defensive units. The guns are assigned principal directions of fire day, principal directions of fire night, and will be habitually laid on a principal direction of fire corresponding to the condition of visibility.

d. The secondary sectors of fire will cover as much of the frontage as possible and will be engaged using free gun or by removing the gun from its tripod mount and employing the gun on its bipod mount (fig. 120).

e. The machineguns on the COPL are controlled by the commanders of the outguards to which they are attached.

f. Preparation of machinegunners for the defense of the COPL is as detailed as time permits. In addition to normal preparation of positions, reconnaissance of withdrawal routes and pos-

sible delay positions is emphasized. In the difficult task of breaking contact without being too closely involved, the machinegunners may well be used to cover the withdrawal of the rest of the force. It is desirable, therefore, that motor transport be available for the gun crews, and that it be kept close behind the gun positions. Where the hostile advance habitually employs mechanized forces, withdrawal must be initiated early and withdrawal routes selected which provide cover and concealment.

127. Retrograde Operations

A retrograde operation is any organized movement of a unit to the rear or away from the enemy. It may be forced by the enemy or made voluntarily. Retrograde operations may be classified as a withdrawal, a delaying action, or a retirement. The rifle platoon usually executes retrograde operations as part of the company. Machineguns of the rifle platoon are disposed in all retrograde operations to take maximum advantage of long-range and close defensive fires depending on the condition of visibility.

a. *Withdrawal.* A withdrawal is an operation by which all or a part of a deployed force disengages from the enemy in order to position itself to initiate some other action. The two techniques of executing withdrawals are the *night or deception withdrawal technique* and *daylight or under pressure withdrawal technique*.

- (1) The night or deception withdrawal technique is used at night, during other periods of limited visibility, or in the absence of definite enemy pressure. When using night withdrawal techniques, a portion of the force is left on position to simulate normal activities while the remainder of the force withdraws to the rear. Normally one rifle squad and one-half of the crew-served weapons are left. The machinegun(s) left is the one with the best position to deliver close defensive and final protective fires to best protect the defensive position of the element left in contact. In some cases a machinegunner(s) left in contact may be required to move to occupy a position(s) which allows him to obtain close defensive and final protective fires. A machinegun(s) should be assigned a final pro-

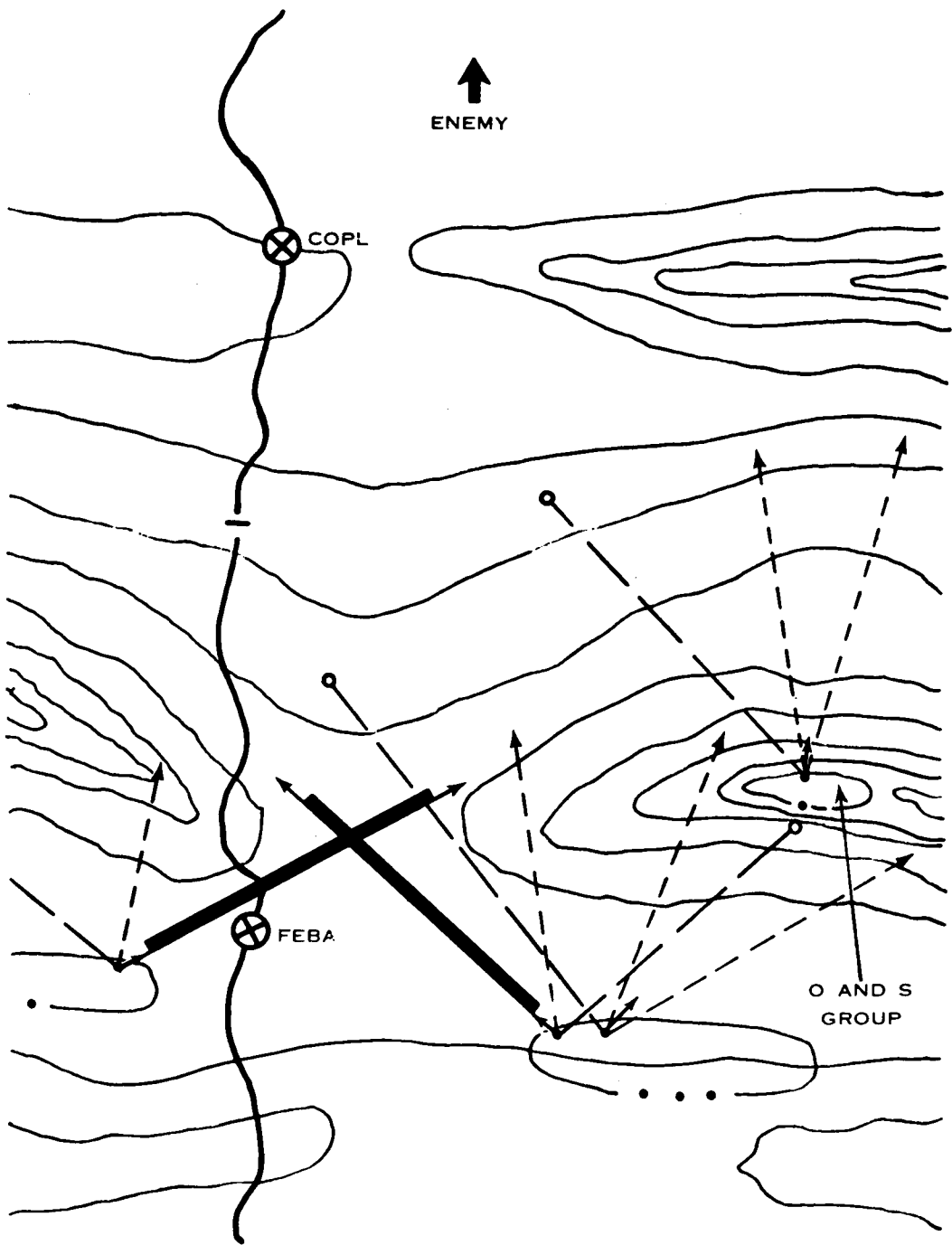


Figure 124. Reverse slope defense.

tective line, and a principal direction of fire night.

- (2) A daylight or under pressure withdrawal technique is used when a unit is forced by enemy action to execute a withdrawal. Units disengage from the enemy by fighting their way to the rear, with units positioned to the rear covering the withdrawal of the forward units. The rifle platoon may use either of three methods of withdrawing: withdrawal by thinning the lines, machineguns withdrawing last; withdrawal by squad maneuver (crew-served weapons attached to squads left in contact); or withdrawal by fire team maneuver, machine guns leapfrogging to the rear. In each situation, machinegunners should occupy positions which permit delivery of long range fire and close defensive fires. Machineguns should be assigned principal directions of fire. Final protective lines are not normally assigned.

b. Delaying Action. A delaying action is an operation in which a unit trades space for time and inflicts casualties on the enemy without becoming decisively engaged in combat. The underlying principal of a delaying action is to gain time without fighting a decisive engagement. Machineguns are assigned principal directions of fire. Gunners should occupy positions which permit delivery of fire on the enemy at the maximum effective range of the weapon. Final protective lines are not normally assigned unless the platoon may have to defend a position accepting close combat to accomplish its mission.

128. Special Defensive Operations

This paragraph provides the necessary guidance for the *machineguns of the rifle platoon* in conducting special defensive operations.

a. Reverse Slope Defense (fig. 124). A reverse slope defense is organized on that portion of a terrain feature which is masked by a crest from

enemy direct fire and ground observation. Control of the crest by either fire or physical occupation is necessary. Selection of positions and conduct of the reverse slope defense are the same as in the regular defense. Special considerations are—

- (1) Machineguns are located to place grazing enfilade fire on the enemy if possible when he arrives at the crest, and on the forward slope of adjacent terrain features (fig. 124).
- (2) Final protective lines and principal directions of fire are employed as in a forward slope defense. Machineguns may occupy temporary forward positions with the observation and security groups initially, and withdraw early.
- (3) Machineguns located along the FEBA hold their fire until the enemy crosses the crest. As the enemy advances over the crest of the hill, all available fires are brought on him.

b. Perimeter Defense. The organization, preparation, and conduct of a perimeter defense is the same as that discussed in paragraphs 119–123 with one exception—machineguns are *normally* employed singly.

c. Defense of a Riverline (fig. 125). Machineguns are positioned to cover dangerous crossing sites and avenues of approach to them. The terrain along a river usually offers excellent fields of fire and permits grazing enfilade fire to be delivered along the front. Final protective lines should be established to give grazing fire *on the river or the far bank*.

d. Relief in Place. In order to insure the effective delivery of preplanned fires during and immediately after a relief which is conducted during periods of limited visibility, incoming and outgoing crews must exchange tripod mounts. Tripod mounts (complete with traversing and elevating mechanisms), field expedients for delivering preplanned fires, and range cards are left in position by the outgoing crews.

Section IV. EMPLOYMENT OF THE M60 MACHINEGUNS OF THE RIFLE PLATOON IN THE ATTACK

129. General

This section provides guidance for the platoon leader, weapons squad leader, and machinegun

crew members in employing the M60 machinegun in the attack. The provisions are applicable to the machineguns of the rifle platoons of the

infantry, airborne infantry, and mechanized infantry battalions.

130. Missions and Fundamentals of Employment

a. The mission of the rifle platoon in the attack is to close with and destroy or capture the enemy.

The rifle platoon normally attacks as part of a coordinated company action as described in FM 7-11. It maneuvers under cover of both organic and nonorganic fire support to assault the enemy. The platoon may also be employed as a semi-independent force in which the platoon leader has more freedom of action.

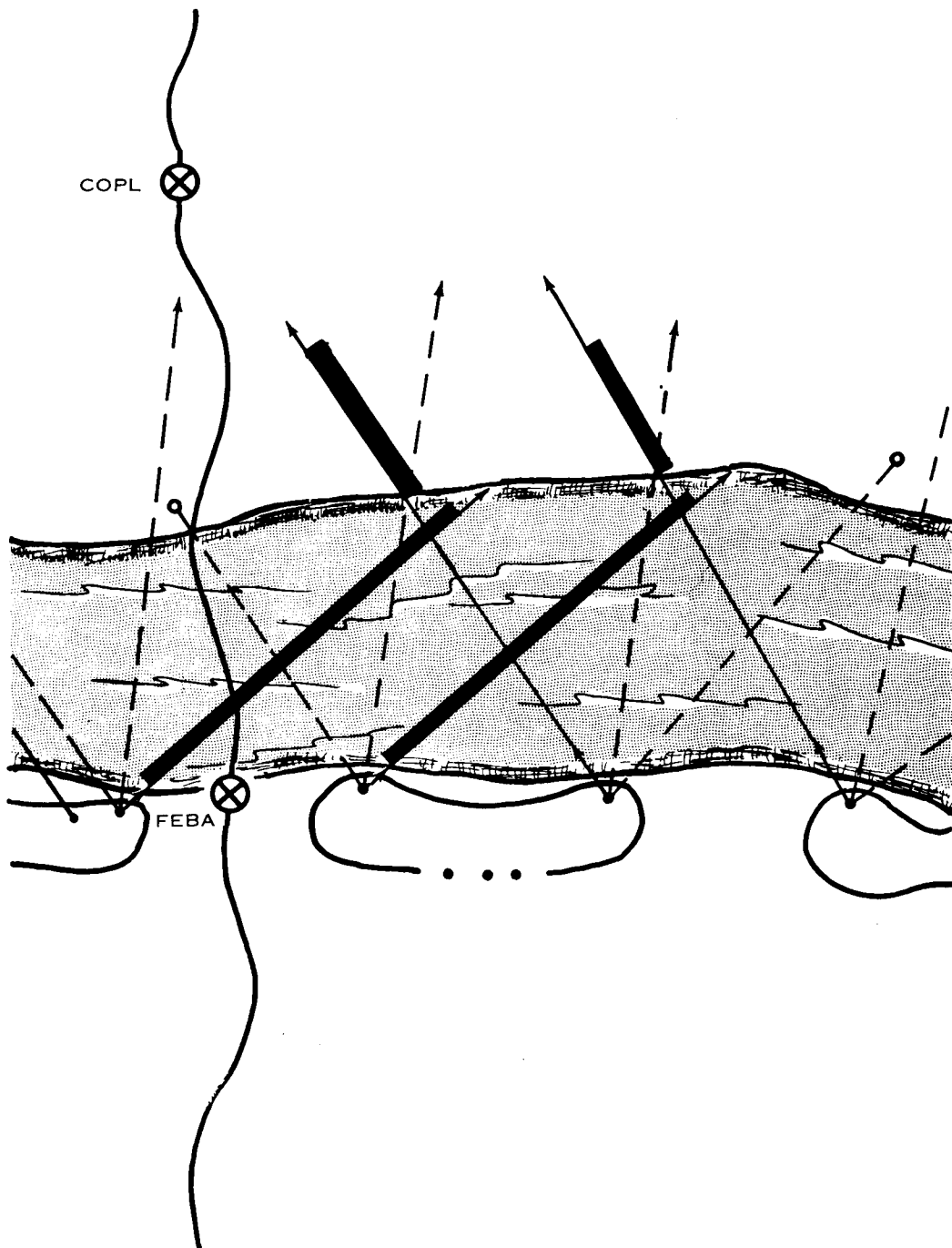


Figure 125. Defense of a riverline.

b. In an attack the mission of the machinegunner is to assist the advance of the rifleman with supporting fire, including close-up fire support during the assault. To accomplish these missions, machineguns should be employed as far forward as possible, consistent with their ability to provide close-in supporting fire over the route(s) to the objective and to deliver effective fire on the main objective.

c. The following considerations govern the employment of the machineguns of the rifle platoon in the attack.

- (1) The distance from the LD to the objective.
- (2) Observation and fields of fire from the LD over the route(s) to the platoon objective.
- (3) The availability of firing positions forward of the LD which provide good observation and fields of fire over the route(s) and the objective.
- (4) The availability of fire support from other sources.

d. If the LD is in the proximity of the initial objective (close enough to safely deliver overhead fire; see para. 95 through 98) and good firing positions are available, the guns may occupy positions on or in the vicinity of the LD. Where the LD is not too distant from the objective or when suitable firing positions do not exist, the machineguns should accompany the maneuvering element across the LD. Selected positions are occupied forward of the LD from which effective supporting fire can be delivered. Displacement by crews may be used effectively to insure continuous fire support during the attack.

e. During the assault, machineguns should be in position to best assist the advance of the rifle squads. They should be employed as far forward as possible, consistent with their ability to provide an accurate heavy volume of fire during the assault. One or more machinegun crews may accompany the assaulting element to aid in gaining and maintaining fire superiority, or may support the assault by fire from a position behind the final coordination line.

131. Preparation for the Attack

a. The machinegunners of the rifle platoon prepare for the attack in their assigned portion of the platoon assembly area. The guns are em-

placed and the crews are constantly prepared to defend their portion of the assembly area. Upon receipt of the platoon warning order, the squad leader issues a warning order to the squad members. This is a brief fragmentary order containing time of attack and details such as drawing special equipment, ammunition, rations, and turning in unneeded equipment.

b. The weapons squad leader normally accompanies the platoon leader forward to receive the order from the company commander. Upon receipt of the platoon attack order, the weapons squad leader accomplishes the troop leading procedures as covered in paragraph 122.

c. During his reconnaissance, the weapons squad leader selects firing positions for weapons, including primary and alternate positions according to the platoon leader's instruction. He pays particular attention to targets, routes to weapons positions, routes for displacement, and routes the platoon will take to the objective. Based on the above, he plans the actions of his gun crews from the time they cross the LD through consolidation on the objective.

d. Time permitting, the squad leader issues his order in the assembly area using an improvised terrain model or sketch to orient his men. Often the time will be so limited that the squad leader must issue his order while moving forward from the assembly area or while in the attack position. The squad leader's order should include the following:

- (1) Mission.
- (2) Tactical details.
 - (a) Information of the enemy, the mission of the platoon, and the location and mission of adjacent units.
 - (b) Plan of attack to include formations to be used, routes, plans for seizing key terrain features, displacements, deployment on the final coordination line, and consolidation.
 - (c) Prearranged signals to be used during the attack, and the location of himself and the platoon leader.
- (3) Administrative details to include information on supply, ammunition, and location of the aid station.

132. Conduct of the Daylight Attack

Initially, the machineguns may support by fire from the vicinity of the LD; accompany the

maneuvering element, supporting by fire from positions forward of the LD or joining in the assault; or by separating the guns, do both.

a. Fire Support Element. Gun crews, which are part of the platoon support element, employ the following procedures to support the attack.

- (1) The machineguns set up, under the control of the weapons squad leader, in positions which offer observation, good fields of fire, cover, and concealment.
- (2) The squad leader specifies the method and rate of fire to be used in engaging targets. Sufficient fire is placed on targets to neutralize them, but consideration is given to conserving ammunition for other targets which may appear during the attack.
- (3) The squad leader anticipates the masking of fire and displaces the weapons by crews. In the absence of a leader, the gunners are responsible for displacement. When the fires of the machineguns are masked by the assaulting element, they are moved forward immediately to join in the assault or to take part in consolidation.
- (4) Overhead fire (para. 95-98) may be delivered to aid in supporting the attack. The terrain and visibility dictate when overhead fire can be delivered and the distance overhead fire can be safely delivered by machineguns.

b. Maneuver Element. When the gun crews accompany the maneuver element, the following procedures are employed.

- (1) Gun crews take positions, with or protecting the formation, which afford best opportunity for prompt delivery of fire should resistance be encountered en route to the objective. When the terrain is rugged and favors such action, the gun(s) may advance by bounds from position to position. Where flat terrain affords no favorable gun position, the crew(s) moves in rear and toward the flank(s) of the rifle elements prepared for prompt action. In such cases, a new potential position should be selected by the gun crew leader as each previously selected potential position is passed. Where overhead fire support is impracticable,

position(s) on the flanks of the rifle elements favors fire support by delaying masking of fire by the advance.

- (2) During the assault, machinegun fire support may be delivered from well-forward, fixed positions of the type discussed in the preceding paragraph, or the gunners may move the assault element using the techniques of assault fire described in paragraphs 89 through 94.

133. Consolidation and Reorganization

a. Immediately after seizing the objective, the machinegunners move to preselected positions or to positions which offer good fields of fire to repel a possible counterattack. The machineguns constitute the defensive framework of the platoon and have priority of positions. The machinegunners are assigned defensive missions and begin preparing for the defense as outlined in paragraph 122.

b. Reorganization is a continuing process; however, it is given special emphasis upon seizure of the objective. After seizure of the objective, key men who have become casualties are replaced, and ammunition is redistributed.

134. Conduct of the Night Attack

a. Night attacks are a part of normal operations and become more frequent when firepower makes daylight operations more hazardous. During some periods of limited visibility (fog, smoke, rain, snow, or at night when artificial illumination is used), some or all of the techniques used during period of good visibility may apply. This paragraph deals primarily with a night attack by stealth.

b. Night combat is generally characterized by—

- (1) A decrease in the ability to place aimed fire on the enemy.
- (2) An increase in the importance of close combat, volume of fire, and the fires of certain weapons laid on targets during daylight.
- (3) Difficulty of movement.
- (4) Difficulty in maintaining control, direction, and contact.

Despite these difficulties, the night attack gives the attacker a psychological advantage in magnifying the defender's doubts, fears, and apprehension of the unknown.

c. The conduct of the attack by stealth requires that the attacking elements reach the probable line of deployment without being discovered. If the attack is discovered prior to this, the unit commander may call for illumination and planned supporting fires. If he does call for illumination the attack then continues using the tactics and techniques for a daylight attack.

d. The attacking units move from the assembly area in a column formation. The machinegunners are located in the platoon formation where they can best deploy into the assault formation or separate themselves from the assaulting element if their mission is to support by fire.

e. In the fire support role machineguns support the night attack by fire; they deliver prearranged fires from positions where firing information was obtained during periods of good visibility.

f. Machineguns in the assault.

(1) When the machineguns are a part of the assault element, they move forward in the platoon formation from the probable line of deployment on order. When the attack is discovered, assault fires are initiated. Scattered fire by small elements of enemy must not be taken as loss of surprise and should not be the signal to start the assault fires. The importance of developing a great volume of fire during the assault cannot be overemphasized. It is at this time that fire superiority must be established and maintained. Machinegunners apply techniques of assault fire as described in paragraphs 89 through 94. The assault is conducted aggressively with troops shouting and creating as much noise as possible. The assault continues to the military crest on the far side of the object. Gunners do not move forward of the limit of advance. Solid tracer ammunition is used by the machinegunners to increase accuracy of fire observation and to demoralize the enemy.

(2) When the objective has been seized, the plans for reorganization and consolidation are carried out as described in paragraph 133.

135. Special Offensive Operations

This paragraph provides the necessary guidance for the employment of machineguns of the rifle platoon in conducting special offensive operations.

a. Attack of a Built-Up Area.

(1) A built-up area is any grouping of buildings such as villages, towns, cities, or factories. After seizing terrain features which dominate approaches to a built-up area, the platoon's next task is to seize enough buildings for a lodgement on the edge of the town. This lodgement reduces or eliminates the defender's ground observation and ability to place direct fire on the approaches to the built-up area.

(2) The machineguns of the rifle platoon are employed initially to provide covering fire for the rifle squad during its attack to seize a platoon foothold in the area. Once a foothold is secured, the machineguns are quickly moved into the built-up area and kept well forward in the platoon where they can provide supporting fire for the platoon's attack. Machinegunners are prepared to deliver grazing fire down streets, alleys, and other open areas. These fires destroy any enemy driven into the open and prevent them from using streets, alleys, and open areas as routes for supply, reinforcement, or maneuver. After seizure of the built-up area, consolidation and reorganization are effected as discussed in paragraph 133.

b. Attack of a Fortified Area. The machineguns of the rifle platoon are employed as a part of the fire support element or as a part of the maneuver element.

(1) *Fire support element.* As a part of the fire support element of the platoon, a machinegun(s) neutralizes the fires of the bunker under attack, enemy forces in open emplacements around the bunker, and locations suspected of containing enemy who can hinder the advance of the maneuver element. As the fires of the machinegun(s) become masked by the maneuver element, the machinegunner(s) shifts his fires and

continues to place fire on known and suspected enemy locations.

- (2) *Maneuver element.* As a part of the maneuver element, a machinegunner(s) assists in the assault in neutralizing the enemy position by firepower.

c. River Crossing Operations. A river crossing operation is used to rapidly move an attacking force across a river obstacle so it may continue the attack to seize the assigned objective(s). There are two types of river crossings: hasty and deliberate. The type of crossing made will depend on factors such as strength of the defenses, size of the river and its current, and the available crossing means. During the conduct of either type river crossing, machineguns of the platoon should make the crossing in separate vehicles.

- (1) *Hasty crossing.* A hasty crossing is conducted without extensive preparation and is executed to take advantage of discovered enemy weaknesses in order to maintain momentum and achieve surprise. A single rifle platoon may execute a hasty crossing. During

the crossing one or both of the weapons squad machinegunners may be left on the near bank to provide covering fire for the rifle squads. If covering fires from other sources is sufficient, both guns may cross with the rifle squads.

- (2) *Deliberate crossing.* A deliberate crossing requires detailed planning and preparation at all levels of command. It may be conducted to resume the offensive, as a result of an unsuccessful hasty crossing, or when a hasty crossing is undesirable because of the difficulty of the obstacle or the strength of enemy defenses. During a deliberate crossing, covering fires are normally provided by weapons other than those organic to the rifle platoon. The platoon normally crosses in squads as a part of a higher unit. Machine guns of the rifle platoon make the crossing with rifle squads to which they are attached. The guns remain assigned to these squads until the platoon consolidates and reorganizes on the objective.

CHAPTER 10

MACHINEGUN MARKSMANSHIP TRAINING

Section I. INTRODUCTION

136. General

Machinegun marksmanship training includes training on both the basic (10-meter) and transition ranges. During this training a gunner is taught the fundamentals of machinegun marksmanship with the bipod and tripod mounted machinegun. This training is conducted in three phases: bipod instructional firing on the basic (10-meter) range, tripod instructional and record firing on the basic (10-meter) range, and instructional and record firing on the transition range.

137. Organization for Training

- a. The conduct of training as outlined in this

chapter is predicated upon a unit of 200 to 250 men, as would normally be the case in advanced individual training. Where groups of other sizes are involved, the training must be modified accordingly.

b. A standard basic (10-meter) range can accommodate a unit of approximately 200-250 men at a time; therefore, concurrent training is not required. However, a standard transition range (ten lanes) cannot accommodate a unit of this size at one time, and the use of concurrent training is recommended to effectively utilize allotted training time.

Section II. BASIC MARKSMANSHIP TRAINING, BIPOD MOUNTED GUN, BASIC (10-METER) RANGE

138. General

During basic marksmanship training with the bipod mounted gun, the objectives and fundamentals of machinegun marksmanship are taught and applied during live fire exercises. This instruction is also designed to familiarize the gunner with the characteristics, noise, and recoil of the weapon during firing.

a. The objectives of machinegun marksmanship are—

- (1) Obtaining an accurate initial burst.
- (2) Traversing and searching the gun.
- (3) Observation and adjustment of fire.
- (4) Operating with speed.

b. In addition to the objectives and fundamentals, the following subjects are covered in this section.

- (1) Fire commands used on the basic range.

- (2) Basic marksmanship target.
- (3) Analyzing and scoring the target.
- (4) Range facilities.
- (5) Conduct of instruction.
- (6) Organization for firing and conduct of firing exercises.

139. Obtaining An Accurate Initial Burst

Optimum effectiveness of machinegun fire is obtained with an accurate initial burst. To obtain an accurate initial burst, the fundamentals of position and grip, sight alinement and sight picture, trigger manipulation, and zeroing must be properly applied.

a. *Position and Grip* (fig. 126).

- (1) The gunner assumes a prone position behind the gun and raises the rear sight.
- (2) He places the hinged shoulder rest on



Figure 126. Prone position.

his right shoulder. An imaginary line drawn through the gun should bisect his right shoulder and his right buttock (fig. 127).

- (3) His legs are spread a comfortable distance apart and his heels are down, if possible.
- (4) His right hand grasps the pistol grip, index finger resting lightly on the trigger.
- (5) His left hand is placed on the cover.
- (6) With both hands, he exerts a firm, steady pressure down and to the rear while both aiming and firing the gun.
- (7) His cheek rests lightly against the cover or against his left hand.
- (8) His shoulders are level and his elbows are an equal distance from the receiver of the gun.
- (9) Left handed firing with the M60 machinegun is discouraged because the ejection pattern of some weapons is almost directly to the rear. In addition, a gunner firing the tripod mounted gun makes all manipulations with the left hand (para. 152).

b. Sight Alinement and Sight Picture.

- (1) *Sight alinement.* To obtain correct sight alinement, the gunner centers the front sight blade in the aperture of the rear sight slide with the top of the front sight blade even with the top of the sight slide (fig. 128).
- (2) *Sight picture.* To obtain correct sight picture, the gunner centers the target over the front sight blade so that it appears to rest on top of the front sight blade and on top of the rear sight slide (fig. 129).

c. Trigger Manipulation. When firing the M60 machinegun, the trigger is not squeezed as with other small arms. It is pulled straight to the rear and then released. This aids the gunner in controlling the number of rounds in each burst and prevents excessive wear to the sear and sear notch. To time himself in firing a 6-round burst, the gunner pulls the trigger straight to the rear and says, "Fire a burst of six," and then releases the trigger.

d. Zeroing. This is adjusting the rear sight until the strike of the projectiles coincide with the point of aim at a given range, and then adjusting the range plate to reflect that range. Zeroing the machinegun on the basic range is accomplished through the following step-by-step procedure.

- (1) *Step 1—set sights.* To establish a common starting point when zeroing on the basic range, a range setting of 500 meters should always be used. The gunner sets this range and alines the windage index by placing zero windage on the rear sight.
- (2) *Step 2—fire three rounds.* Upon receiving the command to fire, the gunner fires three rounds (one round at a time) to establish a shot group. He takes the same sight alinement and sight picture each time he fires. No adjustments on the rear sight are made until he has fired three rounds. The shot group should be small enough to determine exactly where the center of the group is in relation to the aiming pasteur.
- (3) *Step 3—correct for deflection.* If the center of the shot group is to the left or right of the point of aim, the gunner



Figure 127. Prone position.

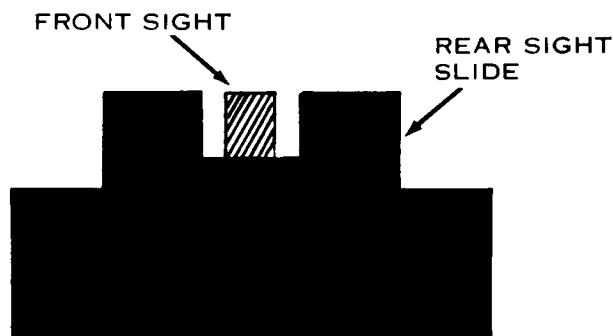


Figure 128. Sight alinement.

must correct for deflection. To correct for deflection the gunner turns the windage knob, causing the rear sight to move in the direction of the desired change. Since the distance to the target is 1000 centimeters (10 meters), a 1-click or 1-mil adjustment moves the point of aim one centimeter. For example: if the gunner notes that the center of the shot group is two centimeters (two aiming pasters) to the right of the aiming point, he turns the windage knob two clicks, moving the rear sight in the direction of the aiming paster (to the left).

- (4) *Step 4—correct for elevation.* If the center of the shot group is above or below the black aiming paster, the gunner must correct for elevation. To correct for elevation, the gunner turns the elevation knob, causing the rear sight slide to move in the direction of the desired change. A 1-click adjustment on the elevation knob equals a $\frac{1}{4}$ -mil change, or four clicks equal a 1-mil change. Since the distance to the target is 1000 centimeters (10 meters), a 4-click (1-mil) adjustment moves the point of aim one centimeter.
- (5) *Step 5—confirm.* After making corrections for deflection and elevation, the gunner fires a confirming round. If he misses his point of aim, he treats this hit as the center of a three-round shot group, makes further adjustments as necessary, and fires another round. He continues this procedure until he hits the point of aim.
- (6) *Step 6—adjust the range plate and*

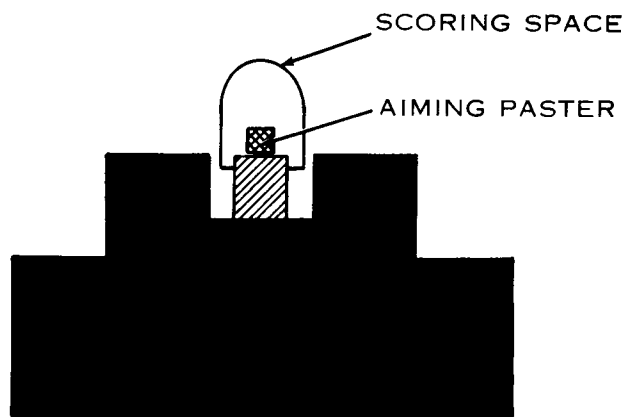


Figure 129. Correct sight alinement and correct sight picture.

record deflection. The gunner loosens the range plate screw and moves the adjustable range plate up or down until the 500-meter graduation coincides with the top left edge of the rear sight slide. He then tightens the range plate screw and records the deflection for future reference.

140. Traversing and Searching the Gun

Machinegun targets may have width and depth which requires the gunner to move the gun in order to distribute fire throughout the target area.

a. Traversing. This is moving the muzzle of the weapon to the left or right to distribute fire laterally. With the bipod mounted gun, this is accomplished by selecting successive aiming points in the target area. The gunner makes minor changes in direction by shifting his shoulders slightly to the right or left. To make major

changes in direction, the gunner moves his elbows and realines his body to remain directly behind the gun.

b. Searching. This is moving the muzzle of the weapon up or down to distribute fire in depth and is accomplished by selecting successive aiming points in the target area. To make changes in elevation, the gunner moves his elbows closer together or farther apart.

141. Observation and Adjustment of Fire

Gunners must be taught to observe and rapidly adjust their fire.

a. Observation of Fire. Machinegun fire is observed by noting the strike of the projectiles in the target area, by observing tracers in their flight, or, in the case of the 10-meter range, by noting the holes made in the target.

b. Adjustment of Fire. When firing the bipod mounted gun, fire is adjusted by changing the gunner's body position as outlined in paragraph 140.

142. Operating With Speed

Gunners must be capable of delivering effective fire onto a given target with speed. Initially, however, emphasis must be placed upon attaining proficiency in the first three objectives. Speed will come as a byproduct while becoming skilled in the first three objectives.

143. Fire Commands (Ch. 7)

The standardized fire command is used as a means of control during marksmanship training. The fire command as it applies to the basic range must be explained to the gunner. The elements are given (as appropriate) before each firing exercise. The gunner takes the appropriate action as indicated and repeats each element as it is announced.

a. Alert. The alert is given as FIRE MISSION. Upon receipt of the alert, the gunner loads his weapon and places the safety on FIRE.

b. Direction. Since all targets appear to the gunner's front, the direction is given as FRONT.

c. Description. Since the gunner aims at black aiming pasters, description is announced as PASTER NUMBER (pasters 1-8 as appropriate), at which time the gunner lays on the announced paster.

d. Range. A range setting of 500 meters on

the rear sight is always used on the basic range. This is announced as FIVE HUNDRED, at which time the gunner must insure that his rear sight reflects the correct range setting.

e. Method of Fire. Manipulation is announced as FIXED, TRAVERSE, SEARCH, and TRAVERSE AND SEARCH. All firing on the basic range with the bipod mounted gun is at point targets, so the method of fire is announced as FIXED. The gunner fires either single rounds or bursts of six at a rate slower than the sustained rate; therefore, the rate of fire element is omitted.

f. Command to Open Fire. To facilitate control, this is announced as AT MY COMMAND. When the gunner is ready, he announces UP to the assistant gunner who extends his right arm and hand in the READY signal. When all gunners are ready to fire, the command FIRE is given.

144. Basic Machinegun Marksmanship Target

The basic machinegun marksmanship target (fig. 130) is used for all firing on the basic range. An explanation of the target, to include the size of the aiming pasters and scoring spaces, will aid the gunners in zeroing their weapons and facilitate control during the firing exercises.

a. The target consists of four sections lettered A, B, C, and D respectively, each of which consists of scoring spaces for eight fixed fire exercises (scoring spaces 1, 2, 3, 4, 5, 6, 7, and 8) and two traversing and searching exercises (scoring spaces 6 through 5 and 7 through 8).

b. Each scoring space is four centimeters wide and five centimeters high.

c. The black aiming paster within each numbered scoring space is one centimeter wide by one centimeter high.

145. Analyzing and Scoring the Target

Targets are analyzed and scored to determine the fundamentals in which gunners need more training and to determine their degree of proficiency.

a. Analyzing. During bipod firing, a target is best analyzed by considering the fundamentals of position and grip and sight alinement and sight picture.

(1) Large shot groups are usually due to incorrect position and grip.

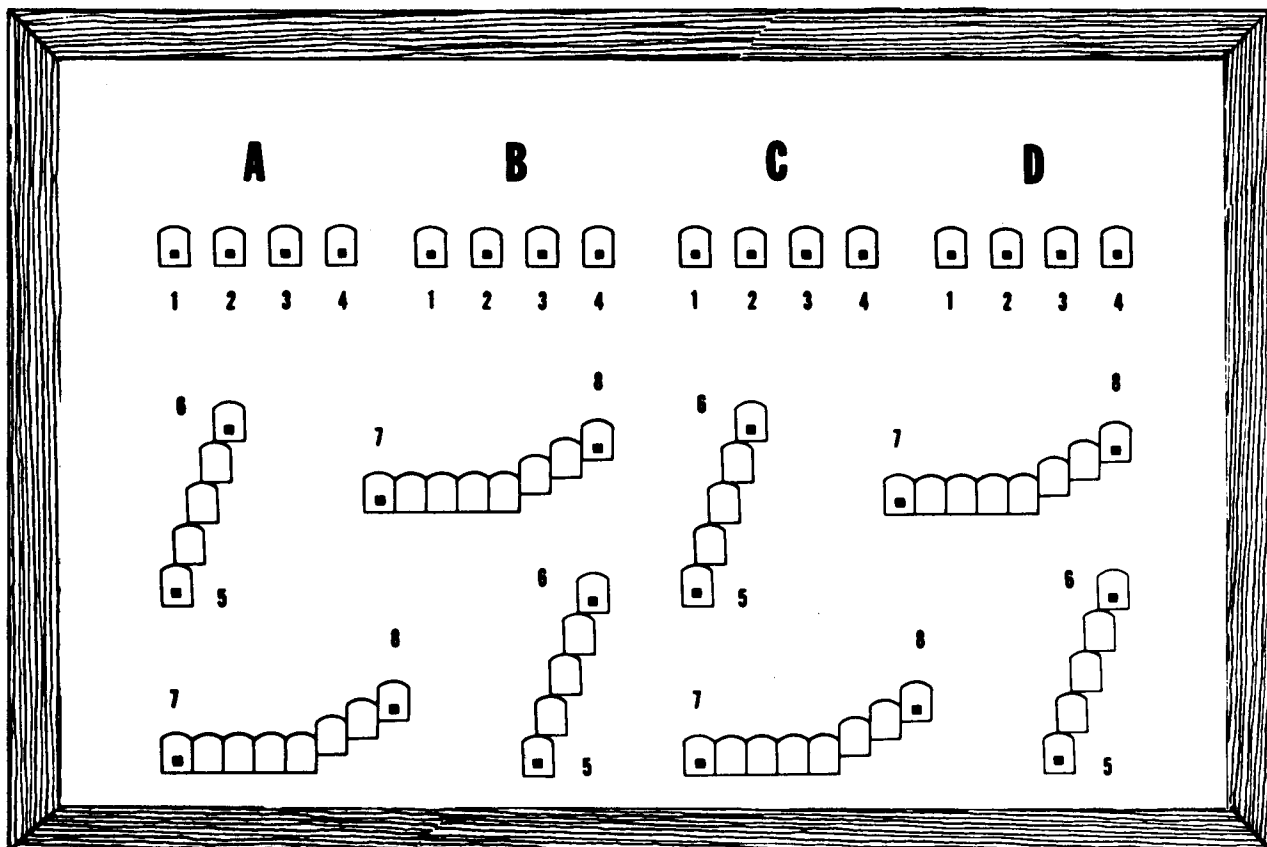


Figure 130. Basic machinegun marksmanship target (FSN 6920-078-5128).

- (2) Tight (small) shot groups, which are outside of the scoring space, are usually due to incorrect sight alignment or sight picture.

b. Scoring. Bipod firing (app. II, table I) is scored for instructional purposes only and may be scored by the gunner. Pastors 1 and 2 are used for zeroing and not scored.

- (1) One point is given for each hit (not to exceed six) in each scoring space. Holes touching the boundary of a scoring space are considered hits.
- (2) A bonus of two points is given for each scoring space hit, regardless of the number of rounds within the space.
- (3) Since six scoring spaces are engaged with 36 rounds, the total possible score for table I is 48 points. A score of 26 is satisfactory.

146. Range Facility

A standard basic range should consist of the following (fig. 131) :

a. Firing Line.

- (1) The firing line is of sufficient length to properly emplace 100 guns or more, allowing approximately three meters between guns. To facilitate control, each gun position should be numbered.
- (2) Brass deflectors (fig. 150) are placed between each gun to protect students from the ejected brass from adjacent guns.

b. Targets. The target line is ten meters in front of the firing line. The machinegun marksmanship target is a paper target (fig. 130) pasted onto target cloth which is stretched over a wooden frame. One target is set up for each gun position and is numbered to correspond with the numbered gun position. The dimensions of the target are shown in figure 146.

c. Instructional Site. A bleacher with the required seating capacity located to the immediate rear of the firing line is desirable.

d. Control Tower. To control the firing line,

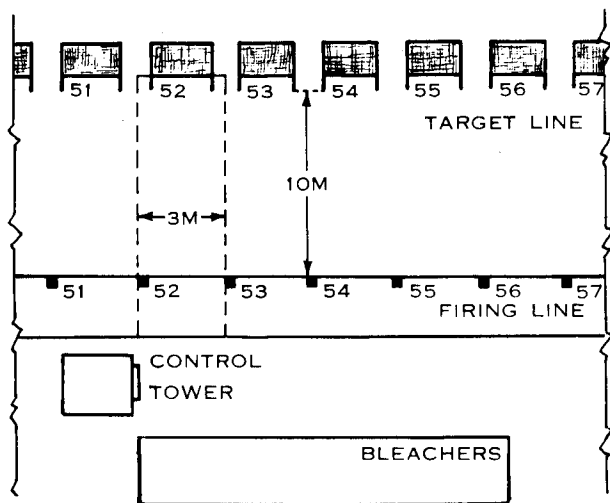


Figure 131. Layout of basic range.

a control tower is centrally located to the immediate rear of the firing line.

147. Conduct of Instruction

Initially the entire unit is assembled and presented instruction on the objectives and fundamentals (para. 138–142), fire commands used on the basic range (para. 143), basic machine-gun marksmanship target (para. 144), analyzing and scoring the target (para. 145), and the following:

a. Course of Fire. Bipod firing on the basic range consists of firing 42 rounds as outlined in appendix II, table I.

- (1) The gunner is first allotted six rounds with which to zero. He zeros, as outlined in paragraph 139d, by firing three rounds at paster 1 and his confirming rounds at paster 2.
- (2) The gunner then fires six spacings of six rounds each at pasters 3, 4, 5, 6, 7, and 8. He attempts to fire a 6-round burst into each of the scoring spaces. A fire command is given for zeroing and for the firing of each of the spacings of six rounds.

b. Prefiring Checks. Before any weapon is fired, all of the prefiring checks are performed as outlined in paragraphs 54–57. This procedure is explained and demonstrated.

c. Procedures for Clearing the Gun. The correct procedure for clearing the M60 machine-gun as outlined in paragraph 38 must be explained and demonstrated to the gunners.

d. Safety Precautions. Additional safety precautions are covered in appendix V.

e. Assistant Gunner's Duties. Throughout bipod firing, the assistant gunner lies beside the gunner (to his left). His duties include—

- (1) Assisting the gunner during prefiring checks.
- (2) Checking the gunners position and grip.
- (3) Assisting the gunner in loading.
- (4) Extending his right arm and hand in the READY signal when he receives an UP from the gunner.
- (5) Assisting the gunner in zeroing.
- (6) Pointing out errors to the gunner, such as failing to repeat the elements of the fire commands, firing an incorrect exercise, and failing to properly clear the weapon.

148. Organization for Firing and Conduct of Firing Exercises

a. Organization. To conduct firing, the unit is organized into five equal groups. Each group is divided into two firing orders. One order becomes gunners, and the other order becomes assistant gunners.

b. Conduct of Firing.

- (1) The gunners and assistant gunners at each gun position set up their guns and perform prefiring checks.
- (2) The gunner is required to assume the correct gunner's position and to aim at paster 1. The assistant gunner checks his position and has him explain what sight alinement and sight picture he has taken.
- (3) The gunner is then given fire commands to require him to place range settings on the rear sight. This is done to insure proficiency in moving the rear sight slide and obtaining accurate sight settings. The assistant gunner checks the manner in which the gunner sets his sight, checks the range settings for correctness, and points out any errors.
- (4) A fire command is then issued requiring the first order to zero their guns.
- (5) At the completion of zeroing, individual fire commands are issued to require the gunners to engage each of the six

remaining numbered scoring spaces. Sufficient time is allowed between burst to permit gunners to observe their firing from the firing line.

- (6) After the first order has fired table I, the second order fires the course in the same manner.
- (7) After both orders have fired, the weapons are cleared.

- (8) After the weapons have been cleared, both orders move to the target line where they analyze and score their targets as outlined in paragraph 145.
- (9) Following this, the targets are analyzed, and the firing is critiqued by qualified personnel.

Section III. BASIC MARKSMANSHIP TRAINING, TRIPOD MOUNTED GUN, BASIC (10-METER) RANGE

149. General

Basic marksmanship training with the tripod mounted gun is a continuation of basic marksmanship training with bipod mounted gun. The same four objectives which applied to the bipod mounted gun also apply here; however, the techniques used in attaining these objectives differ in some instances. Therefore, the gunner is taught these techniques as they apply to the tripod mounted gun. He then applies these techniques during manipulation and dry fire exercises and practice and record firing on the basic (10-meter) range.

150. Mounting and Emplacing the Gun

To assist in delivering accurate fire, the gun must be properly mounted and emplaced.

a. Mounting the Gun.

- (1) Place the mount on the ground with the pintle lock lever ten meters from the target and the front leg pointing toward the center of the target.
- (2) Place the gun on the mount, (para. 31a).
- (3) Center the traversing mechanism and expose one and a half inch of threads on the elevating screw above and below the elevating handwheel.
- (4) Attach the traversing and elevating mechanism to the gun and clamp the left edge of the traversing slide on the zero graduation on the traversing bar.

b. Emplacing the Gun.

- (1) The gunner alines the gun and the mount for direction by shifting the rear legs of the tripod until the gun is pointing to the approximate center of the target.

- (2) The gunner then loosens the dirt around and under the tripod feet and firmly emplaces the tripod shoes in the ground.
- (3) If the traversing bar is not level, he removes the dirt from under one or both of the rear shoes to level it. He also insures that only the tripod feet, and not the legs, are in contact with the ground, and that dirt is removed from under the traversing bar to insure that the slide can be moved freely across the bar.

151. Obtaining an Accurate Initial Burst

To obtain an accurate initial burst with the tripod mounted gun, the fundamentals of position and grip, sight alinement and sight picture, trigger manipulation, and zeroing must be properly applied.

a. Position and grip (fig. 132).

- (1) The gunner assumes a prone position behind the gun so that a straight line drawn through the weapon would bisect his right shoulder and his right buttock (fig. 127).
- (2) His legs are spread a comfortable distance apart, and his heels are down, if possible.
- (3) He grasps the pistol grip with his right hand, index finger resting lightly on the trigger.
- (4) With his left hand, palm down, he grasps the elevating handwheel and exerts a firm downward pressure with both hands, both while aiming and firing the gun.



Figure 132. Prone position.

- (5) His cheek rests lightly (if at all) against the cover.
- (6) His elbows are inside the tripod legs, but not touching the tripod.
- (7) The gunner has his shoulder lightly against the stock of the gun. He does not apply any pressure, because this could push the gun out of alinement while firing.

b. Sight alinement, sight picture, trigger manipulation, and zeroing are the same as outlined for the bipod mounted gun in paragraphs 138 through 148.

152. Traversing and Searching the Gun

Machinegun targets may have width and depth which require the gunner to move the gun by manipulating the handwheels in order to distribute fire throughout the target area.

a. Changes. All manipulations are made with the left hand. Changes in direction are made first and then changes in elevation. The three manipulations are traverse, search, and traverse and search.

b. Traversing. To make changes in direction, the following fundamentals are applied.

- (1) To move the muzzle of the gun to the right, the gunner puts his left hand on the traversing handwheel, thumb up, and pushes his thumb away from himself (PUSH RIGHT).
- (2) To move the muzzle of the gun to the left, the gunner pulls his thumb toward himself (PULL LEFT).

c. Searching. To make changes in elevation, the following fundamentals are applied.

- (1) To move the muzzle of the gun up

(search up), the gunner grasps the elevating handwheel with his left hand and pushes his thumb away from himself (PUSH ADD).

- (2) To move the muzzle of the gun down (search down), he pulls his thumb toward himself (PULL DROP).

153. Observation and Adjustment of Fire

Gunners must be taught to observe and rapidly adjust their fire.

a. Observation of fire is the same as outlined in paragraph 141.

b. To adjust fire when firing the tripod mounted gun, the gunner makes adjustments by manipulating the traversing and elevating handwheels. A 1-click adjustment on either wheel equals a 1-mil change, and will move the strike of the projectile 1 centimeter (the width or height of the black aiming paster) on the 10-meter range.

154. Operating With Speed

Gunners must be capable of delivering effective fire onto a given target with speed. During the initial training of a gunner, however, emphasis must be placed on the first three objectives before he is required to operate with speed. Speed will come as a byproduct while attaining skill in the first three objectives. The only timed exercises are record practice firing and record firing.

155. Analyzing and Scoring the Target and Maintaining the Scorecard

Targets are analyzed to determine the objectives and fundamentals in which the gunner

needs more training. The targets are scored to determine the degree of proficiency of the gunner, and a score card is maintained as a record of his performance.

a. Analyzing the Target.

- (1) *Large shot groups.* This is usually due to—

- (a) Incorrect position and grip.
- (b) Improper emplacement of the gun.

- (2) *A tight (small) initial shot group outside the first scoring space.* This is usually due to incorrect sight alinement or sight picture.
- (3) *Second or subsequent bursts outside the scoring spaces.* This is caused by a failure to properly traverse or search the gun.
- (4) *Tight shot groups fired continuously either high, low, right, or left of each scoring space.* This indicates a failure to properly observe and adjust fire.
- (5) *Failure to complete a firing exercise in the time prescribed.* This indicates a need for more training in the first three objectives.

b. Scoring the Target (fig. 130). During all firing except record firing, the gunner may score his target. Only exercise 7-8 and 6-5 are scored.

- (1) One point is given for each hit, not to exceed six in each scoring space. Holes touching the boundary of a scoring space are considered hits but can be counted in only one scoring space.
- (2) A bonus of two points is given for each scoring space engaged, regardless of the number of hits within the space.
- (3) When firing exercise 7-8, eight scoring spaces are engaged with 48 rounds. The possible score is 64 points. When firing exercise 6-5, five scoring spaces are engaged with 30 rounds. The possible score is 40 points.
- (4) The total possible score for exercise 7-8 and 6-5 is 104 points. A minimum score of 65 points is required for the gunner to qualify on the basic range (para. 163).

c. Maintaining the Scorecard (fig. 135).

- (1) A scorecard is issued to each gunner. All scores are entered by authorized personnel and are made in ink or in-

delible pencil. No erasures are allowed.

- (2) Alterations may be made only by the unit commander or an officer acting as scorer, and they must be authenticated.
- (3) All scorecards are checked and signed by an officer.

156. Record Firing Procedures

This firing should take place on a day subsequent to practice firing. It will be necessary for gunners to emplace and zero their guns. Before record firing is conducted, all personnel (gunners and instructors) must be familiar with the time and ammunition allowances, procedures followed in the event of a stoppage, and penalties imposed.

a. Time and Ammunition Allowances (app. II, table IV).

- (1) The gunner is allotted six rounds to zero.
- (2) He is then given individual fire commands and fires four spacings of six rounds at pasters 1, 2, 3, and 4 for practice in firing 6-round bursts.
- (3) He is then allotted 50 seconds to fire 48 rounds at exercise 7-8 on command, and 40 seconds and 30 rounds to fire exercise 6-5 on command.

b. Stoppages.

- (1) If a stoppage occurs, the gunner must apply immediate action. If the stoppage is reduced, he continues to fire the course. To complete firing of the exercise the gunner is allotted an additional 15 seconds for each application of immediate action.
- (2) If a stoppage occurs which cannot be reduced by applying immediate action, the gunner raises his hand and announces TIME.
- (3) Upon hearing a gunner announce TIME, the assistant instructor notes the time, insures that a legitimate stoppage exists, and assists the gunner in reducing it. He then instructs the gunner to complete firing, allowing him additional 15 seconds for each application of immediate action.
- (4) If the cause of a stoppage is due to an error on the part of the gunner, addi-

tional time is not permitted. The gunner then receives the score he obtained before the stoppage occurred.

- (5) If it should be necessary to replace the entire weapon, the gunner is given six rounds to zero the new weapon and he may then refire the exercise.
- (6) Gunners who could not complete firing in the time allotted due to malfunctions and applying immediate action, finish the exercise in an alibi run after all other gunners complete firing.

c. Penalties.

- (1) A penalty of five points is deducted from the score of any gunner who fails to stop firing at the command or signal to cease fire.
- (2) One additional point is deducted for each round in excess of three fired after the command CEASE FIRE was given.
- (3) If a gunner fires at the wrong target or exercise, he loses the points for those rounds. The gunner whose target was fired upon by another gunner, is permitted to refire the exercise.

157. Preparatory Training

a. Instruction.

- (1) Prior to conducting live fire exercises, the entire unit is assembled in the bleachers, and instruction is presented on mounting and emplacing the gun (para. 150), position and grip (para. 151a), and traversing and searching (para. 152).
- (2) Manipulation and dry fire (spotter) exercises are also demonstrated. They are designed to give the gunner practice in traversing and searching the gun and in observation and adjustment of fire.
- (3) Sight alinement, sight picture, trigger manipulation, zeroing, fire commands, and the basic marksmanship target are reviewed as outlined in section II.

b. Manipulation Exercises and Dry Fire (Spotter) Exercises (app. IV; fig. 147). The unit is organized into five groups, and each group is divided into two orders. One order is designated as gunners, and the other is designated as assistant gunners.

(1) *Manipulation exercises.*

- (a) Upon command the gunner assumes his position behind the gun. The assistant gunner moves to a position approximately ten steps to the gunner's front and slowly moves his hand right, left, up, and down requiring the gunner to follow these movements with the gun by manipulating the traversing and elevating handwheels.
- (b) After the gunner reaches the degree of proficiency required, the assistant gunner becomes the gunner and the exercises are repeated in the same manner.

(2) *Dry fire (spotter) exercise.*

- (a) The gunner assumes his position behind the gun. The assistant gunner assumes the assistant gunner's position, which is to the gunner's left.
- (b) The gunner is given a fire command at which time he lays on the announced paster and gives an UP to the assistant gunner when he is ready to fire.

(c) The assistant gunner performs the following actions—

1. Checks the gunner's sight setting and, after satisfying himself that the setting is correct, announces SIGHT SETTING CORRECT.
2. Checks to see that the gunner is laid on the correct exercise, makes corrections if necessary, and then announces EXERCISE CORRECT.
3. Checks the gunner's position and grip, makes corrections if necessary, and then announces POSITION AND GRIP CORRECT.
4. The assistant gunner then changes the lay of the gun for direction by moving the traversing handwheel not less than five nor more than ten clicks (mils). If the gunner is dry firing exercise 7-8, he lays the gun off to the left; and when dry firing exercise 6-5, he lays it off to the right. This is to require the gunner to traverse in the direction

- of paster 6 or paster 7, as appropriate, and to take out some slack from the traversing mechanism.
5. The assistant gunner then picks up a spotter, goes to the target line, and assumes his position behind the target.
 6. Upon the command FIRE, the exercise is conducted as follows. (Based on firing exercise 7-8.)
 - (a) The gunner relays and aims paster 7 and announces AIM.
 - (b) While he simulates firing a 6-round burst, he announces FIRE A BURST OF SIX. The assistant gunner then places the spotter in the center of paster 7.
 - (c) The gunner then raises his head to observe his fire and announces LOOK.
 - (d) When the gunner observes the spotter in the center of paster 7, he must traverse to the right four clicks (four mils) to engage the next scoring space. While he does this, he announces RIGHT FOUR.
 - (e) He then simulates firing another 6-round burst and announces FIRE A BURST OF SIX.
 - (f) The assistant gunner places the spotter in the center of the next scoring space, and the exercise is continued in this manner until they reach the elbow of exercise 7-8. Then the gunner traverses to the right in 4-mil increments, searches up in 2-mil increments and announces LOOK, RIGHT FOUR, ADD TWO throughout the remainder of the exercise.
 7. Additional training.
 - (a) To provide additional training, the spotter is sometimes placed outside a given scoring space. This requires the gunner to observe and make varying adjustments based upon

his observation. When the gunner sees that he has missed a scoring space with a 6-round burst, he relays back on the scoring space he missed and splits his next 6-round burst. He fires a 3-round burst at the space he missed and a 3-round burst at the next scoring space. This is done to insure complete target coverage. The gunner announces his adjustments aloud. For example: RIGHT SIX, ADD FIVE, FIRE A BURST OF THREE.

- (b) After conducting one exercise (7-8 and 6-5), the gunner and assistant gunner change over and go through the exercise in the same manner.

158. Conduct of Firing

Live fire exercises provide the gunner an opportunity to apply the fundamentals of marksmanship. During practice firing, the assistant gunner performs the same duties as he performed during the dry fire exercises (para. 157b (2) (c)), except that he does not move forward of the firing line. During record practice firing and record firing, the assistant gunner performs no checks, but he assists in controlling the firing (para. 158b (2) (e)).

a. Instruction. The entire unit is assembled in the bleachers and instruction is presented on the courses of fire (app. II, tables II, III, and IV), scoring and analyzing the target (para. 155), record firing procedures (para. 156), and the safety regulations (app. V, para. 2 and 3).

b. Courses of Fire. The unit is organized into five groups and each group is divided into two orders. One order is designated as gunners, and the other order is designated as assistant gunners.

- (1) *Practice firing* (app. II, table II). Each gunner is issued six single rounds, four spacings of six rounds, one belt of 48 rounds, and one belt of 30 rounds.
 - (a) The gunner and assistant gunner at each gun position set up their guns

- and perform the prefiring checks (para. 54-57).
- (b) The gunner zeroes as outlined in paragraph 139d.
 - (c) Fire commands are given, requiring the gunners to fire four spacings of six rounds each at pasters 1, 2, 3, and 4 to give him additional practice in firing 6-round bursts.
 - (d) The gunner is then given a command to fire the 18-round belt at exercises 7-8, attempting to place a 6-round burst in each of the eight scoring spaces.
 - (e) The gunner is then given a command to fire the 30-round belt at exercise 6-5, attempting to place a 6-round burst in each of the five scoring spaces.
 - (f) The gun is cleared (para. 38), and the gunner moves to the target line to score and analyze his target. While the gunners are scoring and analyzing their targets, assistant instructors critique each gunner individually.
 - (g) After the scoring, analysis, and critique of the first order, the gunner and assistant gunner change over and the second order fires the exercises in the same manner.
- (2) *Record practice firing* (app. II, table III). This is a timed exercise designed to emphasize the necessity for operating with speed and to familiarize the gunner with record firing procedures.
- (a) This firing immediately follows practice firing.
 - (b) Exercises 7-8 and 6-5 are fired. The gunner is allotted 50 seconds to fire exercise 7-8 and 40 seconds to fire exercise 6-5.
 - (c) During this firing the assistant gunner performs no checks.
 - (d) Before each exercise is fired, instructor personnel lay the guns off for direction (to the left of paster 7 when firing 7-8, and to the right of paster 6 when firing 6-5).
 - (e) The assistant gunner must be directed to observe the control tower or other control elements such as flagmen, in order to cause the gunner to cease fire on command. He taps the gunner on the back when he receives the cease fire signal.
 - (f) Upon completion of firing both exercises, the targets are analyzed and scored.
- (3) *Record firing* (app. II, table IV). This firing is conducted on a day subsequent to practice firing (para. 158b (1)).
- (a) The unit is organized into five groups, and each group is divided into two orders.
 - (b) The gunners and assistant gunners emplace their guns and perform the prefiring checks.
 - (c) The first order zeroes the guns.
 - (d) After zeroing is completed, the left half of each group fires for record, and the right half of each group dry fires the course.
 - (e) Then the right half of each group fires for record, and the left half of each group dry fires the course.
 - (f) After the first order has fired, the gunners and assistants change over and the second order fires for record.
 - (g) Upon completion of all firing, weapons are cleared, *instructor personnel* score the targets, record the scores (para. 155b), and conduct a final critique.

Section IV. TRANSITION FIRING

159. General

a. Bipod firing on the basic (10-meter) marksmanship range teaches the gunner the basic fundamentals of firing the bipod mounted gun. Later, when the gunner moves to the

transition range, he is taught to engage targets at long ranges with the bipod mounted gun.

b. Transition firing provides the gunner the necessary experience to progress from basic (10-meter) range firing to field firing. It is

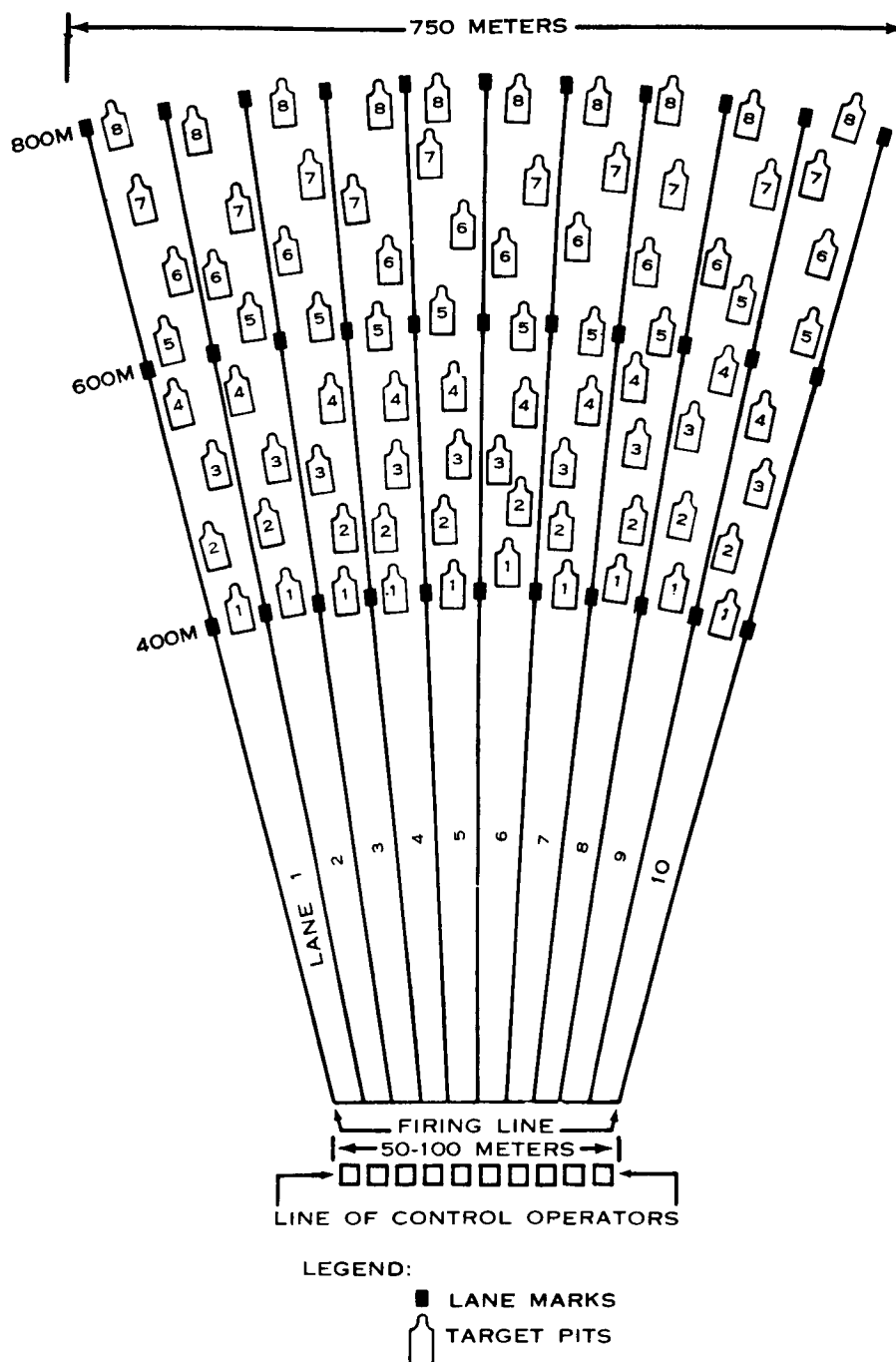


Figure 133. Transition range.

also the final phase of a gunner's qualification. A standard transition range (10 lanes) can accommodate approximately 75 personnel; therefore, concurrent training must be conducted when larger groups are involved.

c. During transition ring the individual receives training in the fundamentals of long-range target engagement to include characteris-

tics of fire, field zeroing, range determination, the alternate aiming point method of fire adjustment.

160. Range Facility

A standard transition range facility should consist of the firing range and concurrent training areas.

a. Transition Range. A standard firing range consists of 10 lanes (fig. 133). The gunner fires twice on the transition range—once for practice and once for record. This firing is conducted on two different lanes; therefore, a minimum of two lanes is required regardless of the size of the unit.

- (1) *Firing lanes.* Each firing lane of a transition range should be five to ten meters wide at the firing line and 75 meters wide at the greatest range of 800 meters.
- (2) *Targets and their locations.* Either eight single "E" silhouette targets or eight double "E" silhouette targets must be used in each lane (double "E" silhouettes if possible). The target closest to the firing line is target number 1 and is located at a range of 400 meters. The target farthest from the firing line is target number 8 and is located at a range of 800 meters. The remaining six targets are located at various ranges between targets number 1 and 8. Any two of these targets, as they appear to a gunner from the firing line, must be at least five mils apart in width or 150 meters apart in depth. This spacing of the targets will require the gunner to make a major change in either direction or elevation when engaging any two successive targets.
- (3) *Target devices.* Electrical target devices (M30 or M31A1) are desirable; however, targets which are raised and lowered manually by pit personnel may be used. The disadvantage of the latter system is that at least 80 personnel are required to operate the pits on a standard (10-lane) range; also, communications must be established between each pit within a given lane and the target control operator for that lane.
- (4) *Target control points.* Regardless of whether the targets are operated electrically or manually, each lane must have a control point approximately 10 meters behind the firing line to control raising and lowering the targets and to facilitate scoring. It is desirable

that this control point be in the form of a small wooden booth (approximately 4 feet by 4 feet by 6 feet), particularly if the range is electrically operated. The booth will also serve to house the electrical controls or the communications equipment during firing.

- (5) *Instructional site.* A bleacher with the required seating capacity located to the immediate rear of the firing line is desirable.
- (6) *Control tower.* To control the firing line, an elevated platform or control tower centrally located to the immediate rear of the firing line is desirable.

b. Concurrent Training Areas. Three concurrent training areas located 200 to 500 meters from the firing line are necessary. Each of these areas must be of sufficient size to seat approximately 75 individuals.

161. Field Zeroing

Gunners must be taught how to zero the weapon at long ranges.

a. During field zeroing, a target between 300 and 700 meters should be selected. The reasons for this are that range graduations on the rear sight of the M60 machinegun begin at 300 meters, making it impossible to place a lesser range setting on the sight, and at ranges greater than 700 meters the gunner will experience great difficulty in determining (with sufficient accuracy) where the center of the beaten zone is falling in relation to the target.

b. After determining the range to the target on which he is going to zero, the gunner places this range on the rear sight and aligns the windage index (windage zero). The 500-meter target on the transition range is recommended because of the ease of determining deflection adjustments at that range.

c. The gunner fires a 6- to 9-round burst at the target and notes where the burst hits.

d. The gunner then makes any necessary corrections for deflection. One click or one mil on the windage knob moves the line of aim one meter at a thousand meters. He applies the necessary corrections for deflection by moving the rear sight the necessary number of clicks in the direction of the target. For example, if the gunner is zeroing at a range of 500 meters and

the center of the beaten zone is two meters to the right of the target, he will move the rear sight four clicks (mils) in the opposite direction (to the left).

e. The gunner estimates how high or low he thinks the center of the beaten zone is hitting in relation to the target and makes elevation changes accordingly. It is extremely difficult to determine how high or low the beaten zone is in relation to the target, especially over uneven terrain or at greater ranges. New gunners will have to rely on trial and error until they gain sufficient experience to make accurate estimates.

f. After correcting for deflection and elevation, the gunner fires a confirming burst. If his adjustments were correct, the gunner then adjusts the range plate (para. 139d(6)).

g. If the gunner does not hit the target with the confirming burst, he repeats the same procedures treating each subsequent burst as if it were the initial burst.

162. Adjusted Aiming Point Method of Fire Adjustment

a. All machinegunners strive for an accurate initial burst. However, an accurate initial burst may not always be obtained. Therefore, gunners must have a means of rapidly and accurately adjusting their fire onto the target without going through the time consuming process of making sight adjustments. This is known as the *adjusted aiming point method of fire adjustment*.

b. If the gunner misses the target with his initial burst, he must select a new aiming point on the ground the same distance from the target as the center of impact of the initial burst but in the opposite direction, and fire a second burst (fig. 134).

163. Qualification Scores (Basic and Transition Firing)

a. The score which a gunner receives on the basic (10-meter) range is computed as discussed in paragraph 145. It is recorded on the same scorecard (DA Form 85, Machinegun Marksmanship) which is used to record the score on the transition range (fig. 135). In order to qualify, a minimum score of 65 points must be achieved on the basic (10-meter) range.

b. Transition firing is the second phase of a

gunner's qualification. In order to qualify on the transition range, the gunners must engage all eight targets within the prescribed time limit. Also, if double "E" silhouette targets are used, he must hit a minimum of five. No minimum score is required if single "E" silhouettes are used. Scoring on the transition range is accomplished as discussed in paragraph 165c.

c. If a gunner qualifies on the basic and transition ranges, his overall machinegun qualification is computed as follows:

- (1) Add the basic (10-meter) score to the transition score in order to obtain the aggregate score.
- (2) Determine the qualification (expert, first class gunner, second class gunner) based on the following:

Qualifications	Points
Expert	155-184
First class	140-154
Second class	115-139
Unqualified	Below 115

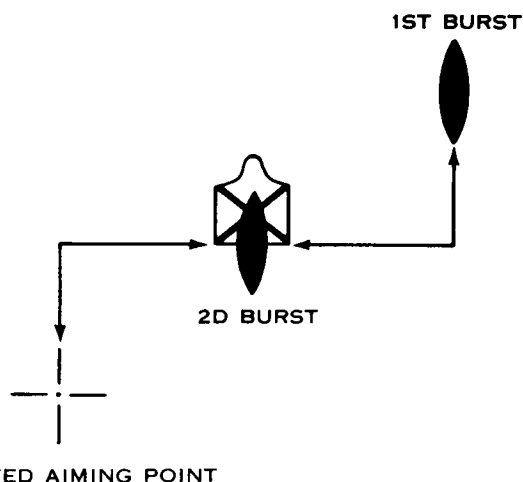


Figure 134. Adjusted aiming point.

164. Organization for Training and Conduct of Instruction

a. The entire unit is assembled in one bleacher and presented instruction on the following fundamentals:

- (1) *Target detection.* A review of target detection techniques should be conducted (FM 23-71).
- (2) *Position and grip.* Position and grip with the bipod mounted machinegun as outlined in paragraph 139a, must be reviewed.

MACHINE GUN MARKSMANSHIP (FM 23-67)		SCORE CARD COURSE M60 CAL. 30 Q/F* A/B/FAM**			
LAST NAME- FIRST NAME- MIDDLE INITIAL TRAMMELL, JOHNNY C.					
SERVICE NUMBER 05 315 294					
ORDER		TARGET			
BASIC RANGE					
PRACTICE	BONUS	EXERCISE			TOTAL SCORE
		1-2-3-4	5-6	7-8	
1 ST	26		23	39	88
2 D					
3 D					
4 TH					
5 TH					
6 TH					
RECORD	26	28	44	98	
SIGNATURES (Record)					
SCORER <i>Sgt S. Viselli</i>		FIRER <i>Johnny C. Trammell</i>			
ORDER	1	TRANSITION		LANE 5	
TARGET	PRACTICE			RECORD	
	1 ST	2 D	3 D		
1	●			●	
2	○			●	
3	○			●	
4	●			●	
5	●			●	
6	○			●	
7	○			○	
8	●			●	
NO TARGETS ENGAGED	8			8	
SCORE TARGETS HIT X10	40			70	
SIGNATURES (Record)					
SCORER <i>Sgt. Paul Hudson</i>		FIRER <i>Johnny C. Trammell</i>			
QUALIFICATION EXPERT		AGGREGATE SCORE 168			
DATE 14 FEB 64		CERTIFIED CORRECT <i>Peter W. Hecht Jr</i>			

DA FORM 85
1 SEP 62

PREVIOUS EDITIONS OF THIS
FORM ARE OBSOLETE.

SCORING	
BASIC RANGE	
BONUS- 2 POINTS FOR EACH SCORING SPACE HIT.	
EXERCISE- 1 POINT WILL BE SCORED PER HIT TO A MAXIMUM OF 6 POINTS PER SCORING SPACE.	
FIXED EXERCISE- NOT SCORED.	
TRANSITION	
TARGET ENGAGED ○	TARGET HIT ●
10 POINTS WILL BE SCORED FOR EACH TARGET HIT.	
NO SCORE IS ALLOWED UNLESS ALL TARGETS HAVE BEEN ENGAGED WITHIN THE PRESCRIBED TIME LIMIT.	
* M60 - QUALIFICATION OR FAMILIARIZATION.	
** CAL. 30 - A/B/FAM	

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Figure 135. Scorecard.

- (3) *Characteristics of fire.* This instruction should include trajectory, cone of fire, beaten zone, and center of impact, as outlined in paragraph 68.
- (4) *Field zeroing.* The gunner must now be taught to zero the weapon at long ranges (para. 161).
- (5) *Range determination.* Gunners must be taught the importance of range determination and how to determine range by eye (para. 70).
- (6) *Adjusted aiming point method of fire adjustment.* This method should be thoroughly explained and demonstrated (para. 162).

b. At the completion of the instruction the entire unit is divided into equal groups. One group stays on the firing line and the others go to concurrent training stations.

- (1) *Concurrent training.* The county, fair system of movement through concurrent training stations is recommended (fig. 136). Subjects covered in concurrent training stations should be

limited to subjects relating to machinegunnery. The following are recommended subjects.

- (a) General disassembly and assembly of the M60 machinegun.
- (b) Detailed disassembly and assembly of the M60 machinegun.
- (c) Cycle of functioning of the M60 machinegun to include stoppages and immediate action.
- (d) Direction and elevation readings. This instruction should include obtaining direction and elevation readings using the traversing bar and transversing and elevating mechanism method. This prepares the individual for subsequent range card instruction.
- (e) Technique of fire rudiments. This period of instruction should include a review of the characteristics of fire; an explanation of maximum ordinate; an explanation of classes of fire with respect to the ground,

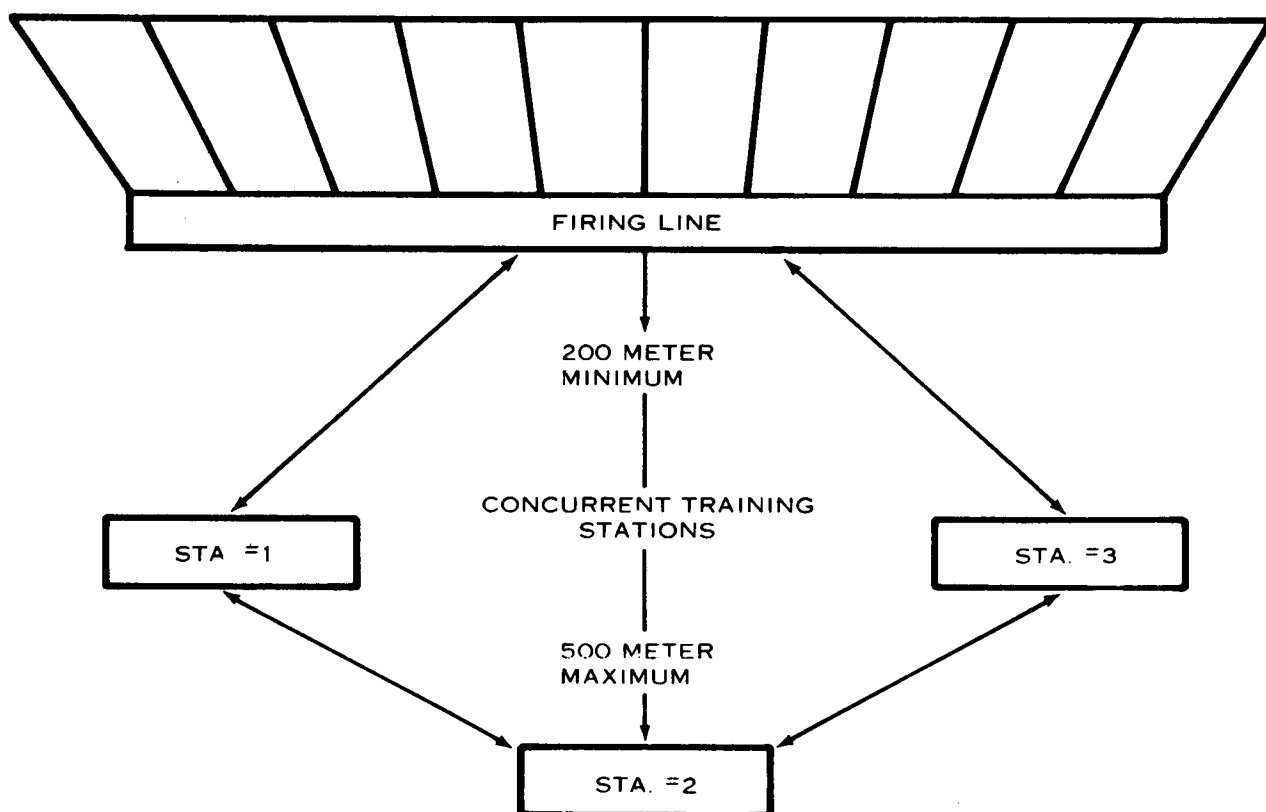


Figure 136. Machinegun transition range organization.

target, and gun; fire control; and a review of application of fire (ch. 7).

(2) *Firing line.*

(a) Two gun positions are established in each lane and a 3-man crew consisting of a gunner, assistant gunner, and ammunition bearer is assigned to each gun. Each lane is controlled by a noncommissioned officer (NCO).

(b) Target control operators. One target control operator is assigned to each lane and is responsible to raise and lower targets (as necessary) if the targets are electrically operated, or he is responsible for telephonically instructing pit personnel (when to raise and lower targets) if the targets are manually operated. He is also responsible for indicating on each gunner's scorecard the targets which he hit. He makes entries in accordance with the instructions contained on the reverse side of the scorecard (DA Form 85).

(c) Safety regulations (app. V, para. 2 and 4).

c. A detailed list of the personnel, equipment, and training aids recommended to conduct transition instruction and concurrent training is contained in appendix IV, paragraph 2c.

165. Conduct of Firing

Gunners are required to fire the transition course (app. II, table V) twice, once for practice and once for record.

a. *Rules.* As each group reports to the firing line, the following rules are explained to them. These rules are predicated upon a transition course utilizing *double "E" silhouette targets*. If *single "E" silhouette targets* are used, gunners should be allotted 180 rounds and a maximum of three bursts per target to compensate for the greater difficulty they will experience in engaging them. Also, when using single "E" silhouettes, no minimum score is required in order to qualify in this phase of a gunner's qualification.

(1) Each gunner is allotted 120 rounds and four minutes to engage the eight targets in his lane. He may fire a maximum of two bursts (any number of

rounds is considered a burst) at each target, but he fires the second burst only if he fails to hit the target with his first burst.

(2) Gunners will not fire on the same lane for record as they fired for practice.

(3) The assistant gunner may assist the gunner in locating the targets as they appear but may not assist the gunner in determining the ranges to them or in adjusting his fire.

(4) Target number 1 (400 meters) is raised prior to the command to commence firing and is always the first target engaged.

(5) Target number 8 (800 meters) must be the second, third, or fourth target which is raised.

(6) The remaining six targets are raised in any sequence, but target operators must have at least three different sequences for raising targets so the individual will not know which target to expect next.

(7) If a stoppage occurs, the gunner must apply immediate action; and if the stoppage is reduced, continue to fire the course. The gunner may be allotted an additional 15 seconds for each application of immediate action. If a stoppage occurs which cannot be reduced by immediate action the gunner announces **TIME** and, with the assistance of the lane NCO, reduces the stoppages. When the gunner announces **TIME**, the lane NCO notes how many targets the gunner has not engaged, and after the stoppage has been reduced, insures that the gunner is allotted 30 seconds to engage each of the remaining targets.

(8) In order to qualify, the gunner must engage all eight targets within the prescribed time limit.

(9) A minimum score of 50 points (five hits) is required in order to receive a qualification.

b. *Recommended Method of Firing the Course.*

(1) Each gunner zeroes his weapon prior to firing the course.

(2) Within each lane one gunner fires while the other gunner dry fires.

Both gunners follow the same procedure. THEY DETERMINE THE RANGE TO EACH TARGET AS IT APPEARS, PLACE THIS SETTING ON THEIR REAR SIGHT, ASSUME PROPER POSITION AND GRIP, OBTAIN CORRECT SIGHT ALIGNMENT AND SIGHT PICTURE, AND FIRE 6- TO 9-ROUND BURSTS (DRY FIRE GUN SIMULATES).

- (3) If the gunner fails to hit the target with his initial burst, he must utilize the adjusted aiming point method of fire adjustment to attempt to hit the target with his next burst.

c. Scoring Procedures.

- (1) A gunner is credited with ten points for each target which he hits and receives no credit for unexpended ammunition.
- (2) The scoring is done by the target control operator in each lane and is recorded in the place provided on the same scorecard (DA Form 85) which was used to record the gunner's score on the basic (10-meter) range.
- (3) All entries on the scorecard are made as shown in figure 135.

CHAPTER 11

COURSES OF FIRE: FIELD TARGET FIRING

Section I. INTRODUCTION

166. General

After firing on the basic and transition ranges, gunners need practice in applying all of the fundamentals they have learned and the experience of engaging targets that depict enemy formations the gunner would be likely to engage on a battlefield during periods of good or limited visibility. Field target firing courses will provide this experience. This training is conducted on day defensive, predetermined fire, and assault firing field target ranges.

167. Organization

a. The paragraphs on organization for training in sections II, III, and IV of this chapter suggest methods for conducting field firing exercises for a 200- to 250-man unit. Commanders

may modify the outlined procedures to fit the facilities, the time available, and the number of gunners to undergo training. Training prescribed in section V is conducted during unit training at the discretion of the unit commander and includes instruction for personnel assigned to machinegun crews only.

b. Maximum use is made of available training time by conducting field target firing exercises and training in related subjects concurrently. On the *day defensive field firing range* the unit is assembled, receives instruction, and is organized into groups which rotate through concurrent training ranges or stations until completion of training. Following this the entire unit is assembled and organized for a continuation of the training on the *predetermined fire range*.

Section II. DAY DEFENSIVE FIELD FIRING COURSE

168. Training Facilities

a. *General Characteristics.* Figure 137 shows a schematic diagram and the dimensions of a daylight defensive field firing range.

- (1) A tower or elevated platform from which the officer-in-charge (OIC) can observe each lane is desirable.
- (2) Seating facilities must be available to seat the entire unit for instruction.
- (3) The range is set up with lanes 10 to 20 meters wide at the firing line and 100 to 200 meters wide at the end of the lane. The lanes should be at least 1100 meters deep so targets can be placed at the maximum effective range of the guns.

- (4) Terrain should be irregular so gunners have the opportunity to fire into various types of ground.
- (5) Each lane should have seating facilities for the gunners not firing, and the rear area of the range should include facilities for concurrent training (fig. 137).

b. *Targets.* "E" type silhouettes are arranged to represent the enemy in linear, deep, and linear with depth formations. This is accomplished by placing 10 to 12 silhouettes five to 10 meters apart for each type of target. Earth bunkers may be constructed and salvage vehicles may be placed down range to depict enemy point targets. One of each of the vari-

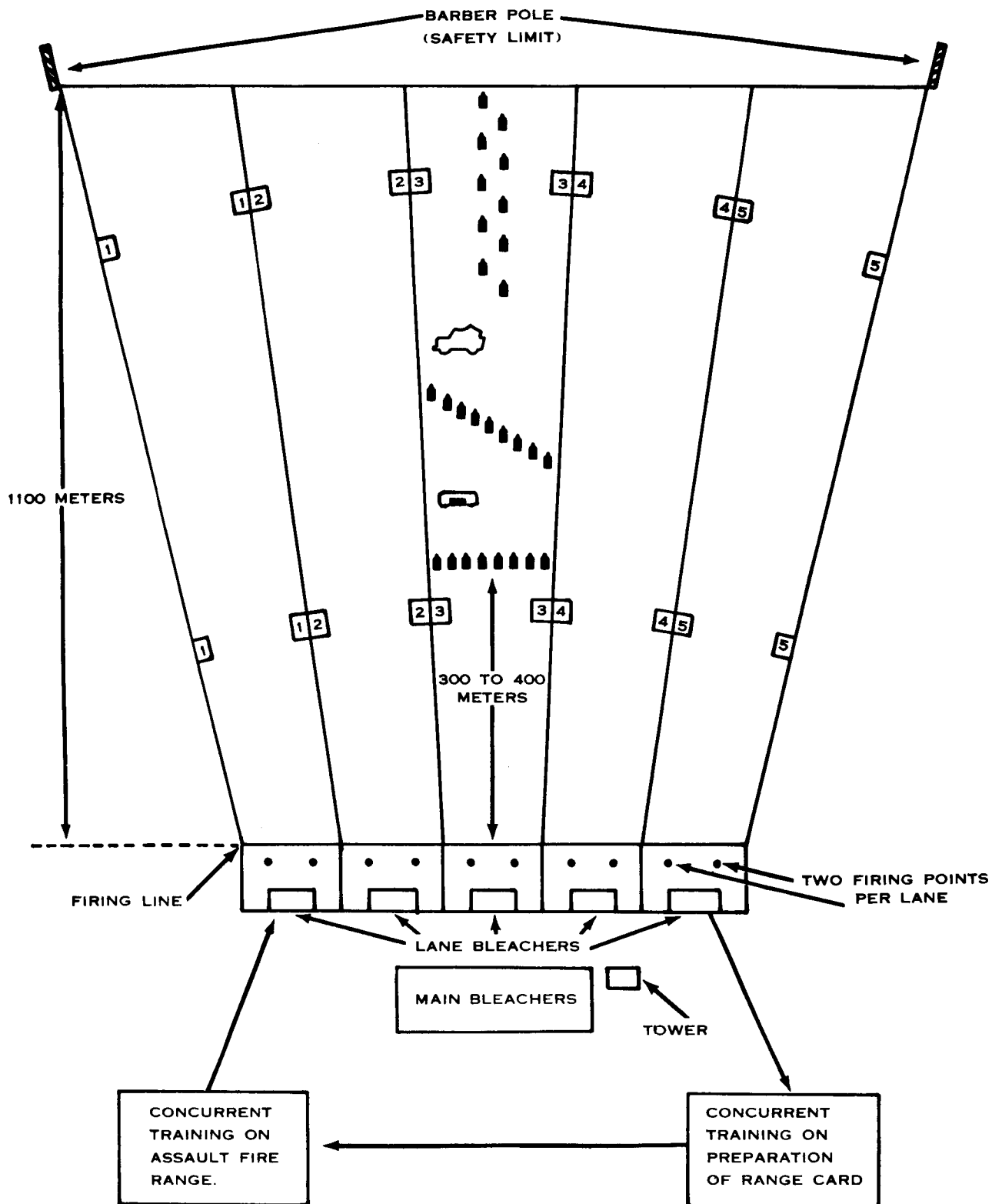


Figure 137. Daylight defensive field firing range.

ous types of targets should be constructed in each lane.

169. Organization for Training

a. The unit is assembled in one bleacher and presented instruction covering—

- (1) The location of machineguns in infantry units and the duties of the weapons squad leader and members of the machinegun crew.
- (2) Direct laying to include a review of characteristics of fire, classes of fire with respect to the ground, target and gun, and methods of fire control (ch. 7).
- (3) A review and demonstration of the engagement of distinct and indistinct linear, deep, and linear targets with depth with guns in pairs and single guns (ch. 7).

b. At the end of the instruction, the unit is organized into three equal groups. Two of the groups move to concurrent training stations as discussed in paragraph 167b and receive instruction on the preparation and use of a range card and assault firing.

c. The third group remains at the firing line and is organized into equal groups. The number of groups will depend on the number of firing lanes available. Ideally five lanes are used. A lane NCO is placed in charge of each group.

d. Upon arriving at the lane the gunners are given a brief orientation by the lane NCO concerning the targets to be engaged, safety limits for firing, and the method of rotation for firing. The lane NCO assigns each man a number to facilitate control. On each lane there is a critique chart (app. IV, fig. 162), and four M60 machineguns. Two guns are tripod mounted and two are bipod mounted. The lane NCO uses his own discretion as to which pair of guns will be assigned to the various gunners. He should, however, insure that gunners firing as pairs are using the same type mount.

170. Conduct of Firing

The gunners zero their weapons and engage targets using the technique of direct lay. During the engagement of targets, some of the individuals will be called upon to act as squad leaders applying the various methods of fire

control. Each gunner fires 200 rounds as prescribed in appendix II, table VI. Gunners should engage targets firing as a single gunner before engaging targets firing as one of a pair. To insure that firing is conducted in a safe and orderly manner, it will be conducted according to the safety instructions in appendix V, paragraph 2. A recommended method of conducting firing is as follows:

a. The lane NCO designates two gunners and two assistant gunners. The crews move to the guns and load a 20-round belt.

b. The lane NCO instructs the gunners to prepare to zero their weapons. When the gunners indicate they are ready to zero, the lane NCO announces UP to the OIC.

c. When all lanes are ready to fire, the OIC announces GIVE ME AN UP WHEN YOU HAVE ZEROED AND ARE READY TO ENGAGE THE FIRST TARGET. YOU ARE CLEAR TO FIRE.

d. When the gunners have zeroed their weapons, the lane NCO directs them to load a 100-round belt of ammunition. He also selects another individual to act as squad leader.

e. The squad leader takes a position to the rear of the two gun crews. He issues a fire command requiring one of the crews to engage either a linear, deep, or linear target with depth. The fire command is issued *only* up to the command to fire. The lane NCO then signals the OIC that his lane is ready to fire by announcing UP.

f. When all lanes are ready to fire, the OIC announces GIVE ME AN UP WHEN YOU ARE READY TO ENGAGE YOUR NEXT TARGET. YOU ARE CLEAR TO FIRE.

g. The squad leader announces FIRE, observes the fire, and issues subsequent fire commands if they are needed to place effective fire on the target.

h. When the gun crew has fired 100 rounds, the lane NCO conducts a critique. Special attention should be given to initial fire commands, accuracy of the initial bursts, direction and extent of manipulation, rate of fire, and the squad leader's control of fire. At the end of the critique, the squad leader issues a second fire command, and the second crew engages a target as described in e, f, and g above.

i. When the second gunner has fired 100 rounds, the lane NCO conducts a critique and

instructs each gunner to load an 80-round belt.

j. The squad leader issues a third fire command requiring both gunners to engage either a linear, deep, or linear target with depth as described in *e*, *f*, and *g* above. The gunners fire as a pair.

k. After they have engaged the target and have been critiqued, the gunners and squad leader return to their seats.

1. The procedure in *a* through *j* above is repeated until all gunners have fired. The assistant gunners are always the next men to act as gunners.

Section III. PREDETERMINED FIRING COURSE

171. General

After firing on the day defensive range which included concurrent training in preparation of range cards, the unit is moved to the predetermined fire field firing range. The instruction presented on this range is conducted in two phases, one during good visibility and the other during limited visibility.

a. The daylight phase consists of a review on the preparation and use of range cards, which was covered concurrently during previous training. Following this review they receive practical work in the preparation of a range card by obtaining data to assigned targets.

b. The night phase is presented after darkness on the same day that the daylight phase is conducted. In the night phase the fundamentals reviewed during the daylight phase are applied. The gunners reapply the data they obtained to their assigned targets, then engage those targets.

172. Training Facilities

a. General Characteristics. Figure 138 shows a schematic diagram and the dimensions of a predetermined fire field firing range.

- (1) A tower or elevated platform from which the OIC can observe firing is desirable.
- (2) Seating facilities must be available to seat the entire unit for a conference and demonstration.
- (3) The range should be constructed on a flat, open piece of terrain which allows one man to control the firing of all weapons.
- (4) A firing line consisting of 100 points is desirable, allowing at least two meters per point. Brass deflectors (fig. 150) between points reduce the possibility of individuals being hit by expended casings from adjacent points.

b. Target Area. In figure 138 everything in front of the firing line out to the range limits is considered target area.

- (1) The target area should be at least 500 meters deep and 440 meters wide at the end of the area. It should contain at least three targets which will permit engagement from either flank of the firing line and cause gunners to record data to the left and right of the zero graduation on the traversing bar. The center target should be a linear target that requires about 20 mils of traverse (approximately 10 meters wide).
- (2) Hard objects such as salvage vehicles or dirt-filled gasoline drums may be positioned to represent targets. Earth mounds may also represent targets. The construction of targets in this manner assists the gunner in determining the effectiveness of his fire by enabling him to see his tracers or hear his projectiles hit the target.
- (3) The lateral firing limits of the target area must be marked with safety fan poles. Red lights must be attached for night firing.

c. Allowable Difference. In lieu of a range designed specifically for predetermined fire instruction, the day defensive range may be used if the terrain between the firing line and targets at 500 meters is such that final protective lines and sectors of graze can be obtained.

173. Organization for Training

a. The entire unit is seated in the bleachers and presented a review and demonstration on the preparation and use of a range card in predetermined fire and an orientation on the range procedures.

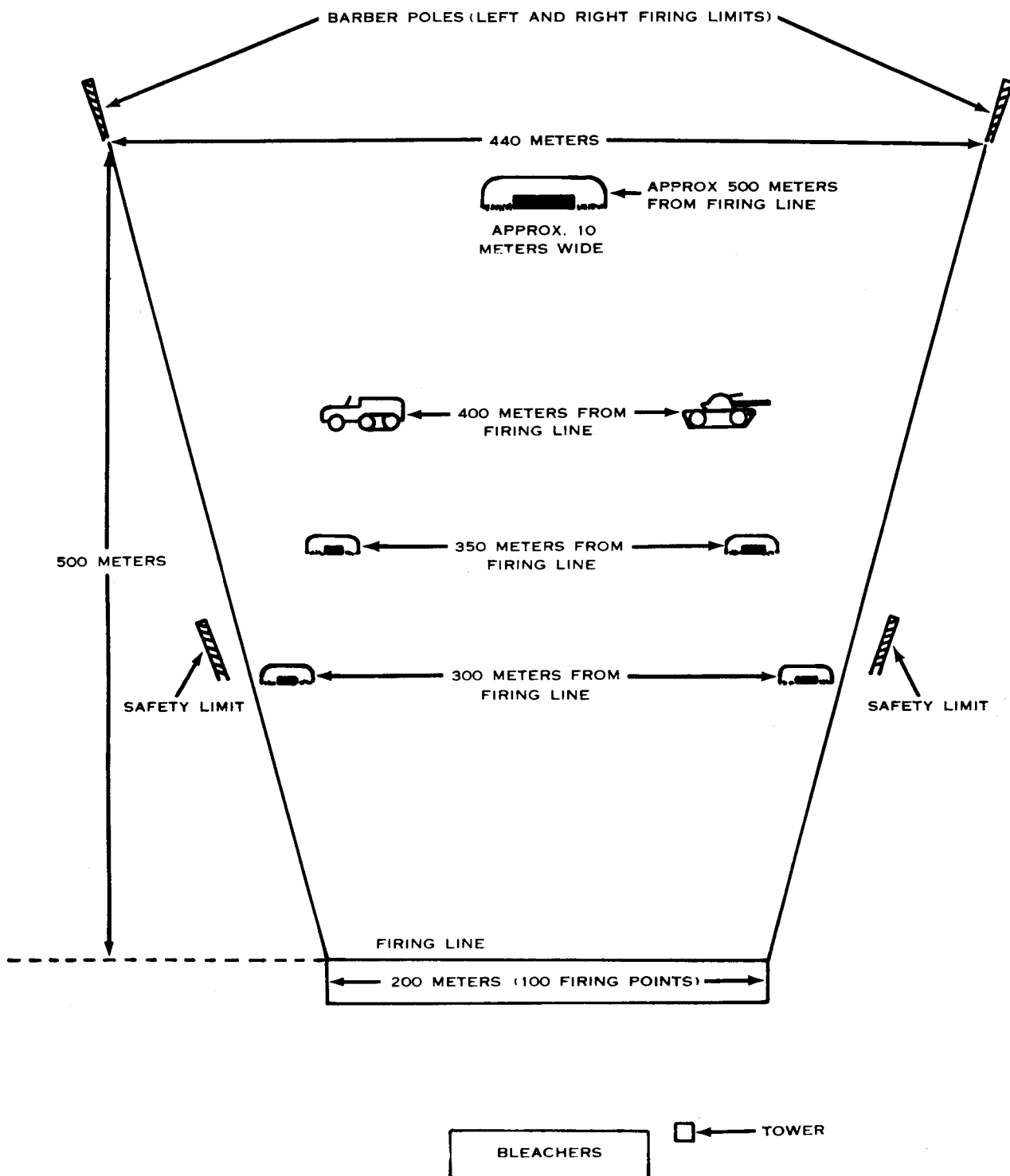


Figure 138. Predetermined fire field firing range.

b. Upon completion of the instruction, the unit is organized into five equal groups. Ideally a group of NCO and a minimum of three assistant instructors are assigned to each group to assist and supervise.

c. The group NCO organizes his group into gunners and assistant gunners, and a crew is assigned to each gun.

174. Conduct of Firing

Each gun crew fires 200 rounds as indicated in appendix II, table VIII. Safety procedures as outlined in appendix V, paragraphs 2 and 6 must be followed. The firing is conducted in two separate exercises as follows:

a. Day Firing.

- (1) Each crew is issued 80 rounds of ammunition (four 20-round belts) and instructed by the group NCO to load a 20-round belt for zeroing.
- (2) When all the gunners of a group indicate that they are ready to zero their weapons, the group NCO announces UP to the OIC.
- (3) When all groups are ready to fire, the OIC announces GIVE ME A CLEAR AND CHECK WHEN YOU HAVE OBTAINED DATA TO ALL TARGETS. YOU ARE CLEAR TO FIRE.
- (4) When the gunners have zeroed, the group NCO instructs them to obtain data to the final protective lines by firing 20 rounds.
- (5) After data to the final protective line has been obtained and recorded, the assistant gunner becomes the gunner and obtains data to a point and a linear target by firing 20 rounds at each target.
- (6) The group NCO then instructs the crews to obtain data to a point target by using the dry fire method (para. 111a(5)).
- (7) After all data to targets have been obtained and recorded, the group NCO clears and checks the weapons of his group and announces GROUP CLEARED AND CHECKED to the OIC.

b. Night Firing. Each crew is issued 120 rounds of ammunition (two 20- and two 40-round belts). They then reapply data obtained

during the day and engage their targets. If at any time during firing it becomes obvious that a large error in data has been made by the gunner, he should be stopped and directed to check his data and gun settings. A recommended method of conducting firing is as follows:

- (1) The group NCO instructs each gunner to load a 20-round belt and apply the data that was obtained by dry firing on a point target.
- (2) When all the gunners under the control of a group NCO indicate that they are ready to fire, the group NCO announces UP to the OIC.
- (3) When all groups are ready to fire, the OIC announces GIVE ME A CLEAR AND CHECK WHEN YOU HAVE ENGAGED ALL TARGETS. YOU ARE CLEAR TO FIRE.
- (4) The group NCO instructs one gun crew at a time to engage the point target.
- (5) When all point targets have been engaged, the group NCO instructs gunners to load a 40-round belt and instructs one gun crew at a time to engage the linear target.
- (6) After the gunners engage the linear target, they become the assistant gunners, and the assistant gunners become the gunners.
- (7) The gunners apply data and engage the second point target with 20 rounds and the final protective line with 40 rounds using the same procedure outlined in (4) and (5) above.
- (8) The group NCO and assistant conduct a critique as each crew fires its exercise. The critique should cover the following: the importance of maintaining the correct position and grip while laying on and engaging targets, accuracy in obtaining and recording data, accuracy in reapplying data, and adjustment of fire.
- (9) After all targets have been engaged and all crews have been critiqued, the group NCO clears and checks the weapons of his group and announces GROUP CLEARED AND CHECKED to the OIC.

Section IV. ASSAULT FIRING COURSE.

175. General

a. The assault firing course is designed for instructional firing with the M60 machinegun from the hip, shoulder, and underarm firing positions. Firing the course will increase the gunner's confidence in the gun and in his ability to place accurate fire on targets while assaulting in an assault line.

b. This training is normally conducted concurrently with the day defensive fire (direct lay) in order to make maximum use of available training time.

176. Training Facilities

a. *General Characteristics.* Figure 139 shows a schematic diagram and the dimensions of an assault firing range. This range may be superimposed on a night defensive range by using portable lane markers.

- (1) A tower or elevated platform from which the OIC can observe each lane is desirable.
- (2) Seating facilities must be available to seat the entire group for instruction.
- (3) The range should be constructed on level or uniformly sloping terrain for best control and safety. The range is set up in firing lanes 20 meters wide and 100 meters deep.
- (4) There are two control lines in each lane. The first control line is 30 meters from the firing line, and the second is 60 meters from the firing line. There must be a marked path in each lane. *Gunners must not get off the path while firing.*

b. *Targets.* Five "E" type silhouette targets are placed in a staggered line at the end of each lane.

177. Organization for Training

a. The unit is assembled in the bleachers and presented instruction on the assault firing techniques described in paragraph 89 through 94 with a demonstration of the assault firing positions, a demonstration firing of the course, and a demonstration of the actions to be taken if a weapon malfunctions.

b. Upon completion of the instruction, the unit is organized into equal groups. The number

of groups depends on the lanes available. Ideally 10 lanes are used. A lane NCO is placed in charge of each group.

c. The lane NCOs organize their groups into firing orders by assigning numbers. Gunners not firing remain on the ready line.

178. Conduct of Firing

Each gunner fires 150 rounds as indicated in appendix II, table VII. The ammunition is issued in two bandoleers, 50 rounds in one bandoleer and 100 rounds in the other. To insure safety and control, the procedures outlined in appendix V, paragraphs 2 and 5, must be followed. A method of conducting firing is as follows:

a. The OIC instructs the first order to move to the firing line, load a 50-round bandoleer, and assume the hip firing position. When all lanes are ready, the lane NCOs report LANE UP in sequence beginning with lane one.

b. Upon receiving an UP from every lane, the OIC announces GIVE ME AN UP WHEN YOU HAVE FIRED YOUR 50 ROUNDS, AND RE-LOADED WITH YOUR 100-ROUND BANDO-LEER. YOU ARE CLEAR TO FIRE.

c. When gunners have fired 50 rounds for familiarization from the firing line using each of the *three assault firing positions*, the lane NCOs instruct them to place their weapons on the ground, load the 100 round bandoleer, and then assume the ready position (underarm). When this has been accomplished, the lane NCOs report UP in sequence.

d. When all lane NCOs have indicated that they are ready, the OIC announces MOVE OUT. The gunners and lane NCOs start moving forward. The gunners fire approximately 36 rounds in 6-round bursts from the *shoulder position*, pausing momentarily after every three or four steps. Upon reaching the first control line, all gunners and lane NCOs halt and wait for the command from the OIC to MOVE OUT.

e. When the OIC sees that all gunners are on line at the first control line, he announces MOVE OUT. The gunners and lane NCOs start moving forward. The gunners fire approximately 64 rounds in 6-round bursts from the *underarm position*. A burst is fired each time the left foot strikes the ground. Gunners continue to move and fire in this manner until the second control line is reached. There the gunners halt but con-

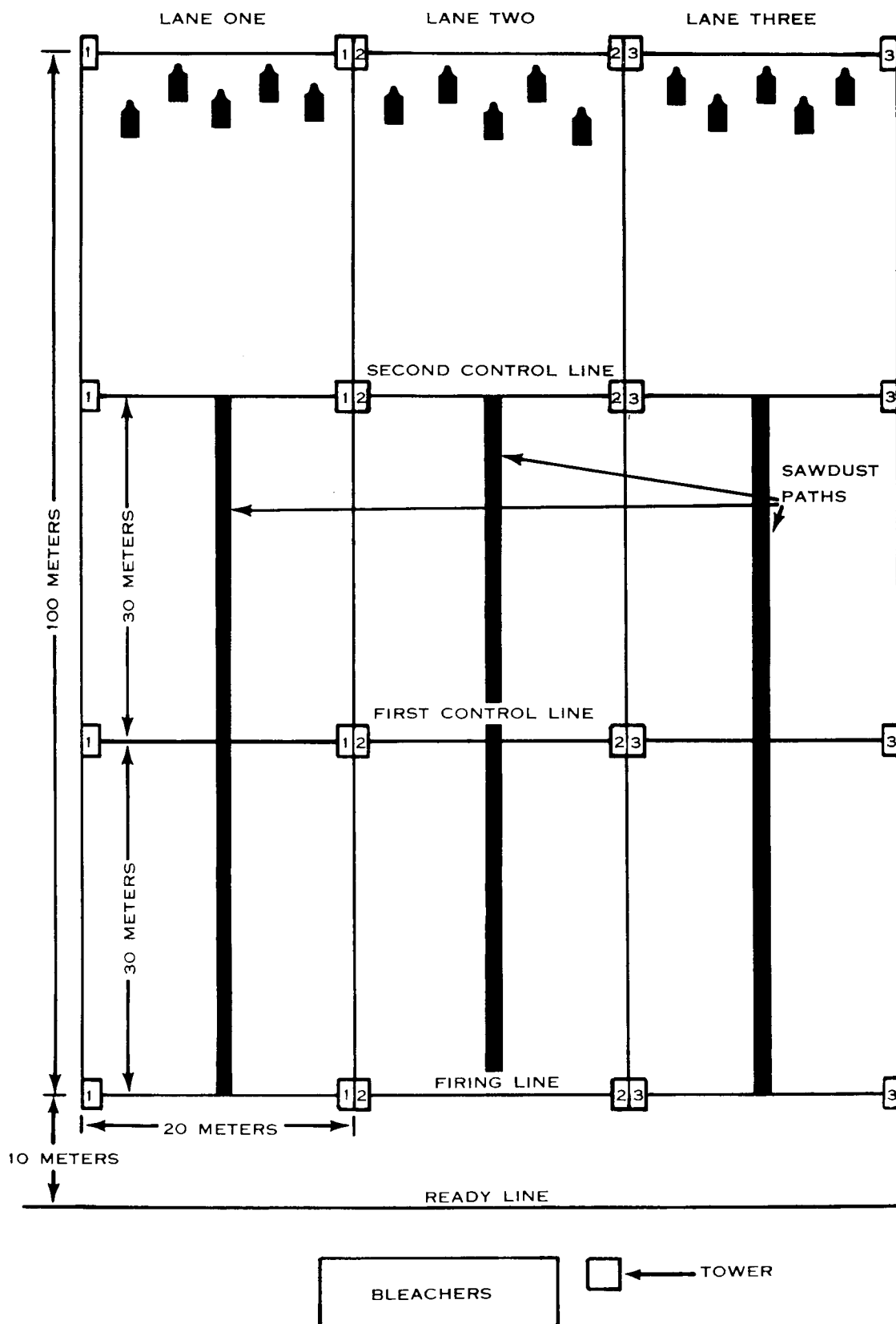


Figure 139. Assault firing range.

tinue to fire any remaining ammunition at their targets until told to cease fire. The weapons are then placed on the ground to be cleared by the lane NCO.

f. The lane NCOs clear the weapons and report **CLEARED AND CHECKED** in sequence to the OIC. The OIC then announces **ALL LANES ARE CLEARED. RETURN TO THE FIRING LINE.**

g. During firing, the lane NCOs note any mistakes the gunners make. On-the-spot corrections are made if possible. If immediate corrections are not possible, the mistakes are brought to the gunner's attention at the end of their firing.

Some of the most common mistakes are that gunners—

- (1) Fail to fire when their left foot strikes the ground. This results in a poor firing position.
- (2) Move too slowly or experience difficulty in maintaining alignment.
- (3) Fail to make bold depressions of the muzzles of their weapons to get fire down into the target.

h. Gunners return to the ready line, and lane NCOs return to the firing line. The remaining orders are fired in the same manner prescribed in *a* through *f* above.

Section V. NIGHT DEFENSIVE FIELD FIRING COURSE WITH ARTIFICIAL ILLUMINATION

179. General

a. The training outlined in this section is conducted at night and is designed to enable commanders to provide advanced training for unit machinegun crews. It is part of the proficiency course outlined in appendix III. This training is not connected with concurrent training on any other range described in this manual.

b. This training provides gun crews an opportunity to apply the techniques described in chapter 8 and gives them the experience of engaging targets during periods of limited visibility using artificial illumination.

180. Training Facilities and Organization for Training

a. To conduct this training the day defensive field firing range shown in figure 137 is used; however, target arrays should be placed at ranges from 300 to 600 meters only. Prior to conducting night firing, red lights must be attached to the poles which mark the safety limits of the firing area.

b. Illumination may be provided by organic means such as mortar parachute flares or searchlights, or it may be provided by field expedients such as trip flares and burning gasoline. If mortars are to be used for delivery of parachute flares, consult AR 385-63 and local

safety regulations to select an approved mortar firing position.

c. A method of organizing and conducting training is as follows.

- (1) The unit is assembled in one bleacher and presented instruction covering the techniques of engaging visible targets during periods of artificial illumination (ch. 8).
- (2) At the end of the instruction, the unit is organized into equal groups and moved to firing lanes as described in paragraphs 169*c* and *d*.

181. Conduct of Firing

a. The method of rotation for firing, lane NCO critiques, and control of fire by the OIC is the same as described in paragraph 170*e* through *l*, except that squad leaders are not used to control fire. The gunners fire *after* the OIC announces **YOU ARE CLEAR TO FIRE** and a target has been detected.

b. Each gunner fires 100 rounds as prescribed in appendix II, table X. Gunners fire only one exercise. The exercise is fired with the gunner acting as a single gunner or as one gunner of a pair. The choice is left to the discretion of the lane NCO.

c. Safety procedures as outlined in appendix V, paragraphs 2 and 6, must be followed.

APPENDIX I

REFERENCES

AR 320-5	Dictionary of United States Army Terms.
AR 320-50	Authorized Abbreviations and Brevity Codes.
AR 370-5	Qualification and Familiarization.
AR 385-63	Regulations for Firing Ammunition for Training, Target Practice, and Combat.
FM 5-15	Field Fortifications.
FM 7-11	Rifle Company, Infantry, Airborne Infantry, and Mechanized Infantry.
FM 7-15	Infantry, Airborne Infantry, and Mechanized Infantry, Rifle Platoons and Squads.
FM 7-20	Infantry, Airborne Infantry, and Mechanized Infantry Battalions.
FM 21-5	Military Training.
FM 21-6	Techniques of Military Instruction.
FM 21-30	Military Symbols.
FM 21-40	Small Unit Procedures in Chemical, Biological, and Radiological (CBR) Operations.
FM 21-60	Visual Signals.
FM 23-12	Technique of Fire of the Rifle Squad and Tactical Application.
FM 23-71	Rifle Marksmanship.
FM 31-70	Basic Cold Weather Manual.
TM 3-220	Chemical, Biological, and Radiological (CBR) Decontamination.
TM 9-207	Operation and Maintenance of Army Materiel in Extreme Cold Weather, 0° to —65°.
TM 9-1005-224-12	Operators and Organizational Maintenance Manual; Machinegun, 7.62mm, M60, w/e, and Mount, Tripod, Machinegun, M122.
TM 9-1005-224-20P	Organizational Maintenance Repair Parts and Special Tool Lists.
TM 9-1005-224-34	Field Maintenance Manual.
TM 9-1005-224-34P	Field Maintenance Repair Parts and Special Tool Lists.
TM 9-1903	Care, Handling, Preservation, and Destruction of Ammunition.
TM 10-1101	Petroleum-Handling Operations.
TA 23-100	Ammunition, Rockets, and Missiles for Training.
GTA 7-15	Technique of Fire, M60 Machinegun.
GTA 9-632	Cycle of Functioning, M60 Machinegun.
DA Pam 108-1	Index of Army Motion Pictures, Film Strips, Slides, Tapes, and Phono-Recordings.
DA Pam 310-5	Military Publications: Index of Graphic Training Aids and Devices.

APPENDIX II

AMMUNITION

1. General

a. This appendix describes the ammunition to be used for the 7.62-mm machinegun, M60, and provides a recapitulation of ammunition requirements for the firing courses outlined in this manual.

b. Ammunition is issued as a complete round consisting of the projectile, the cartridge case, the propellant powder, and the primer.

c. Ammunition is issued in a disintegrating metallic split linked belt (fig. 140). The members of machinegun crews must be able to recognize the types of ammunition available and know how to care for them.

2. Ammunition Data

a. *Classification.* Based upon the type of projectile, ammunition authorized for the M60 is classified as follows:

- (1) Ball cartridge—for use against light

material targets and personnel, and during training.

- (2) Armor-piercing cartridge* — for use against lightly armored targets where armor-piercing effects are desired.
- (3) Armor-piercing incendiary* — for desired armor-piercing effects combined with fire producing (incendiary) effects.
- (4) Tracer cartridge—for observation of fire, incendiary effects, signaling, and for use during training.
- (5) Dummy cartridge — for use during training.
- (6) Blank cartridge—for use during training when simulated live fire is desired.

b. *Identification.*

- (1) The type, caliber, model, and ammunition lot number, including the symbol

*Not authorized for training purposes.

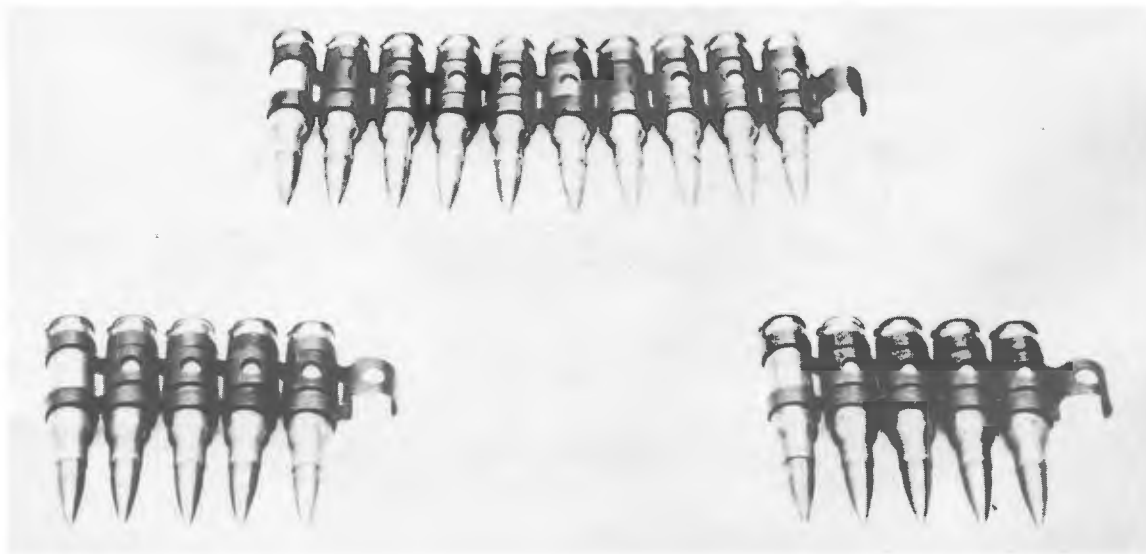


Figure 140. 7.62-mm ammunition in metallic belt.

of the manufacturer, are necessary for complete identification of small arms ammunition. The 7.62-mm NATO cartridge is completely identifiable by its appearance, the painting of the

projectile tips, the stamping of the manufacturer's initials and year of manufacture on the base of the cartridge case, and the markings on the packing containers.

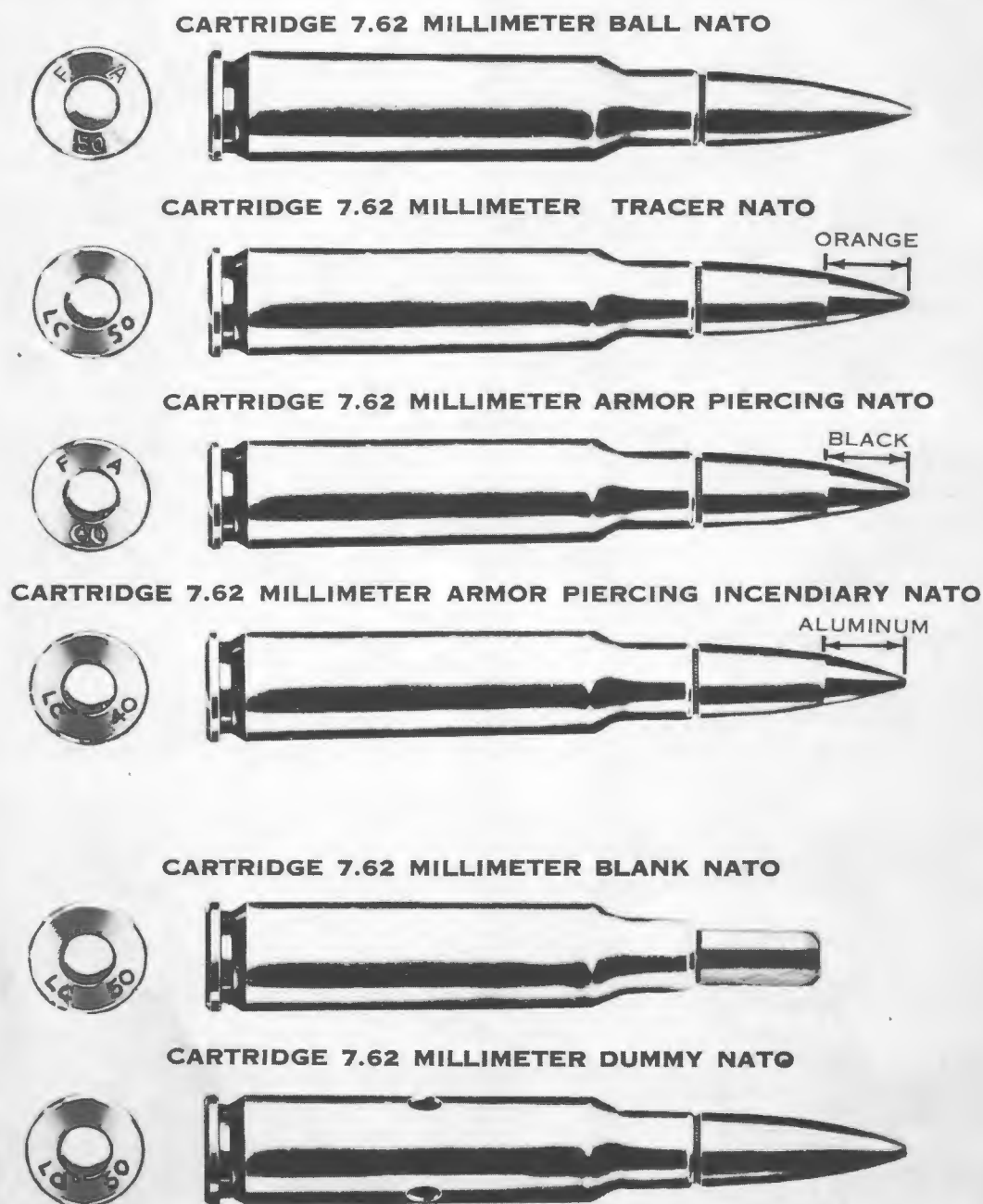


Figure 141. Cartridges for machinegun, 7.62-mm, M60.



Figure 142. 7.62-mm ammunition in bandoleer.

- (2) When removed from their original packing containers, the cartridges may be identified by physical characteristics as follows (fig. 141) :

<i>Types</i>	<i>Distinguishing Characteristics</i>
Ball	Gilding metal jacket on projectile (no markings).
Armor-piercing* ..	Tip of projectile is painted black for a distance of approximately 0.8 cm.
Armor-piercing incendiary*	Tip of projectile is painted aluminum for a distance of approximately 0.8 cm.
Tracer	Tip of projectile is painted orange for a distance of approximately 0.8 cm.
Dummy	Corrugated or three holes in body of cartridge case. (No markings on projectile.)
Blank	Gilding metal jacket on narrow nose. (Metal jacket extends from the base of the cartridge to the end of the projectile.)

*Not authorized for training purposes.

c. Storage. Ammunition should be stored under cover. If it is necessary to leave ammunition in the open, keep it at least 6 inches (15 cm) from the ground and covered with a double thickness of tarpaulin. Place the cover so it gives maximum protection to the ammunition and allows free circulation of air. Dig suitable trenches to prevent water from flowing under the ammunition.

d. Care, Handling, and Preservation.

- (1) Ammunition containers should not be opened until the ammunition is to be used. Ammunition removed from the airtight containers, particularly in damp climates, is likely to corrode.
- (2) Protect ammunition from mud, dirt,

and water. If the ammunition gets wet or dirty, wipe it off prior to use. Wipe off light corrosion as soon as it is discovered. Heavily corroded cartridges, or cartridges which have dented cases or loose projectiles, should not be fired.

- (3) Do not expose ammunition to the direct rays of the sun. If the powder is hot, excessive pressure may be developed when the gun is fired.
- (4) Do not oil or grease ammunition. If it is oiled, dust and other abrasives will collect on it and damage the operating parts of the gun.

e. Ammunition Packaging. Ammunition is packaged in a metal box containing two bandoleers. Each bandoleer contains 100 rounds and weighs approximately seven pounds (3.18 kg) (fig. 142). Ammunition in the bandoleers may be hooked together and fired from the container, or the bandoleers may be removed for firing.

f. Detailed Ammunition Information. Complete data on 7.62-mm ammunition for use in the M60 machinegun is published in TM 9-1005-224-12.

3. Ammunition Requirements for Machinegun Training

This paragraph provides a recapitulation of ammunition requirements for machinegun training. Ammunition listed below is not to be considered as a mandatory requirement of the conduct of training, but is furnished as a guide to be used in conjunction with established allowances in TA 23-100. Unit commanders are responsible for insuring that ammunition expended does not exceed current authorized allowance in TA 23-100.

Table I. Basic (10-Meter) Marksmanship—Bipod Firing

Time	Rounds per individual	Target	Type ammo	Type fire
No limit.	6	Basic machinegun pasters 1 and 2	Ball	Zeroing (single rounds)
No limit.	6	Basic machinegun paster 3	Ball	Fixed—one burst
No limit.	6	Basic machinegun paster 4	Ball	Fixed—one burst
No limit.	6	Basic machinegun paster 5	Ball	Fixed—one burst
No limit.	6	Basic machinegun paster 6	Ball	Fixed—one burst
No limit.	6	Basic machinegun paster 7	Ball	Fixed—one burst
No limit.	6	Basic machinegun paster 8	Ball	Fixed—one burst
Total.	42			

Table II. Basic (10-Meter) Marksmanship—Tripod Firing, Practice

Time	Rounds per individual	Target	Type ammo	Type fire
No limit.....	6	Basic machinegun pasters 1 and 2	Ball	Zeroing (single rounds)
No limit.....	24	Basic machinegun pasters 1, 2, 3, and 4	Ball	Fixed (four bursts of six rounds each)
No limit.....	48	Basic machinegun exercise 7 to 8	Ball	Traverse and search (6-round bursts each scoring space)
No limit.....	30	Basic machinegun exercise 6 to 5	Ball	Traverse and search (6-round bursts each scoring space)
Total.....	108			

Table III. Basic (10-Meter) Marksmanship—Tripod Firing, Record Practice

Time (sec.)	Rounds per individual	Target	Type ammo	Type fire
50	48	Basic machinegun exercise 7 to 8	Ball	Traverse and search (6-round bursts at each scoring space)
40	30	Basic machinegun exercise 6 to 5	Ball	Traverse and search (6-round bursts at each scoring space)
Total.....	78			

Table IV. Basic (10-Meter) Marksmanship—Tripod Firing, Record

Time	Rounds per individual	Target	Type ammo	Type fire
No limit.....	6	Basic machinegun pasters 1 and 2	Ball	Zeroing (single rounds)
No limit.....	24	Basic machinegun pasters 1, 2, 3, and 4	Ball	Fixed (four bursts of six rounds each)
50	48	Basic machinegun exercise 7 to 8	Ball	Traverse and search (6-round bursts at each scoring space)
40	30	Basic machinegun exercise 6 to 5	Ball	Traverse and search (6-round bursts at each scoring space)
Total.....	108			

Table V. Basic Marksmanship Firing—Transition Range, Practice or Record

Range	Time (min.)	Rounds per individual	Target	Type ammo	Type fire
400–700 meters.....	No limit	18	One double “E” silhouette between 400 and 700 meters	4–1	Zeroing (two to three 6- to 9-round bursts)
400–800 meters.....	4	120	Eight double “E” silhouettes	4–1	Fixed (a maximum of two bursts allowed at each target)
Total.....		276 (138 practice, 138 record)			

Note: If single “E” silhouette targets are used, the gunner should be allocated 180 rounds of 4–1 ammunition and a maximum of three bursts at each target for both practice and record firing.

Table VI. Day Defensive Field Firing

Range	Time	Total rounds per individual	Target	Type ammo	Type fire
300-700 meters.....	No limit	20	"E" type silhouette	4-1	Zeroing (three 6- to 9-round bursts)
300-1100 meters.....	No limit	100	Linear, deep, or linear with depth	4-1	6- to 9-round bursts — single gun
300-1100 meters.....	No limit	80	Linear, deep, or linear with depth	4-1	6- to 9-round bursts — guns employed in pairs
Total.....		200			

Table VII. Assault Firing

Time	Total rounds per individual	Target	Type ammo	Type fire
No limit.....	50	"E" type silhouette	4-1	Three 9-round bursts from hip and two 6-round bursts from underarm and shoulder positions
No limit.....	36	"E" type silhouette	4-1	Six 6-round bursts fired while moving, using the shoulder position
No limit.....	64	"E" type silhouette	4-1	Ten to eleven 6-round bursts fired moving, using the underarm position
Total.....	150			

Table VIII. Predetermined Firing (Range Cards)

Time	Total rounds per two-man crew	Target	Type ammo	Type fire
<i>a. Day Firing.</i>				
No limit.....	20	Point	Tracer	Zero — three 6- to 9-round bursts
No limit.....	20	Final protective line	Tracer	Obtain direction and elevation readings to final protective line
No limit.....	20	Point	Tracer	Obtain direction and elevation readings to point target
No limit.....	20	Linear	Tracer	Obtain direction and elevation readings to engage linear target
No limit.....		Point		Obtain direction and elevation readings by use of the "dry fire" method
<i>b. Night Firing.</i>				
No limit.....	20	Point (dry fire)	Tracer	Predetermined data
No limit.....	40	Linear	Tracer	Predetermined data
No limit.....	20	Point	Tracer	Predetermined data
No limit.....	40	Final protective line	Tracer	Predetermined data
Total.....	100 per individual (200 rounds per 2-man crew)			

Table IX. Recapitulation of Ammunition for Tables I-VIII

Table	Total rounds per individual	Type of ammunition
I	42	Ball
II	108	Ball
III	78	Ball
IV	108	Ball
V	276 (138 practice, 138 record)	4-1
VI	200	4-1
VII	150	4-1
VIII	100 (200 per 2-man crew)	Tracer
TOTAL	1062	

Table X. Proficiency Field Course

Range	Period	Total rounds per individual	Type ammo	Type fire
Basic (10-meter)	I	108	Ball	Table IV
Transition	II	138	4-1	Table V
Day defensive field firing....	III	200	4-1	Table VI
Assault firing	IV	150	4-1	Table VII
Predetermined fire	V	100	Tracer	Table VIII
		(200 per 2-man crew)		
Day defensive field firing....	VI	100	Tracer	Engagement of point, linear, linear with depth, and deep targets during darkness using artificial illumination
Total		796		

APPENDIX III

PROFICIENCY EXAMINATION AND PROFICIENCY FIELD COURSE

1. General

This appendix provides a guide for administering the proficiency examination to gunners and also provides a guide to unit commanders in the field for setting up a proficiency field course to maintain machinegunners' proficiency.

2. Proficiency Examination

a. The examination is a practical nonfiring exercise given during the last four hours of the machinegun block of instruction. It does not have to be conducted on a range, but may be held indoors if available facilities will permit.

b. To organize for training the entire unit is assembled in one area and receives an initial orientation as follows:

DURING THE NEXT FOUR HOURS YOU WILL TAKE PART IN A PERFORMANCE-TYPE EXAMINATION DESIGNED TO TEST YOUR KNOWLEDGE OF THE M60 MACHINEGUN. STAY WITH YOUR ASSIGNED GROUP DURING THE ENTIRE EXAMINATION. INITIALLY, EACH GROUP WILL BE ASSIGNED TO A SPECIFIC STATION. AT EACH STATION AN ASSISTANT INSTRUCTOR WILL READ A STATEMENT EXPLAINING EXACTLY WHAT TASK OR TASKS YOU ARE TO PERFORM. AFTER BEGINNING WORK, IF YOU DO NOT KNOW A STEP OR STEPS, ASK THE ASSISTANT INSTRUCTOR FOR HELP. HE WILL TELL YOU HOW TO PERFORM THE STEP, DEDUCT THE NECESSARY POINTS FROM YOUR GRADE, AND YOU MAY CONTINUE WORK. SEVENTY PER CENT IS THE REQUIRED PASSING SCORE.

c. The unit should be organized into six equal groups which rotate from station to station until all individuals have been tested. Sufficient assistant instructors should be assigned to each station

in order to grade and critique each gunner's performance. Up to 10 points can be awarded at each station. Out of the possible score of 60, 42 points (70%) is required in order to pass the examination. Graders should give partial credit as appropriate. For ease in marking, scoresheets are given to each grader and collected immediately after the completion of the test.

d. The recommended time breakdown is as follows:

- (1) 15 minutes, orientation, instructions, breakdown, and movement.
- (2) 30 minutes each—six stations.
- (3) 10 minutes each—two breaks.
- (4) 5 minutes each — five movement periods.
- (5) 240 minutes—total time.

e. For a detailed list of personnel and equipment necessary to conduct this proficiency examination, see appendix IV.

f. The six subjects and stations recommended for the proficiency examinations are as follows:

- (1) STATION 1: GENERAL DIS-ASSEMBLY AND ASSEMBLY.
 - (a) This station consists of approximately 11 setups. Each setup consists of the following: one tripod mounted M60 with cover raised, bolt forward, and safety on the FIRE position. This is placed on a mat to keep the parts free of dirt.
 - (b) The following statement should be read at this station. DURING THIS PERIOD YOU WILL BE ORGANIZED INTO THREE GROUPS AND REQUIRED TO DISASSEMBLE AND ASSEMBLE THE M60 MACHINEGUN. EACH GROUP WILL BE ORGANIZED WITH ONE INDIVIDUAL GUN AND

ONE GRADER PER TWO GUNS. EACH GROUP WILL BE ALLOWED EIGHT MINUTES TO COMPLETE GENERAL DISASSEMBLY AND ASSEMBLY. IF YOU HAVE ANY TROUBLE, RAISE YOUR HAND, AND THE GRADER WILL ASSIST YOU. THE TWO GROUPS NOT BEING TESTED WILL REMAIN TO THE REAR OF THE STATION WITH THEIR BACKS TOWARD THE WORKING AREA UNTIL THEY ARE CALLED.

- (c) The following scoresheet should be used in grading individual performance.

STATION 1
GENERAL DISASSEMBLY AND ASSEMBLY

Checklist	Point value	Names
1. Raise hinged shoulder rest and remove stock. Press in on buffer, remove buffer yoke, allow drive spring to expand, and remove buffer.	1	
2. Remove drive spring and guide and separate the parts.	1	
3. Pull operating group to rear, remove bolt and operating rod, and allow bolt to rotate. Do not separate bolt from operating rod.	1	
4. Remove leaf spring, remove trigger housing pin, and remove trigger housing assembly.	1	
5. Raise barrel lock lever and remove barrel group.	1	
6. Replace barrel group and lower barrel lock lever. Replace trigger housing assembly, insert trigger housing pin, and replace leaf spring.	1	
7. Replace operating rod and bolt into receiver.	1	
8. Replace drive spring and guide, pull trigger, and push forward on drive spring guide.	1	

STATION 1—(Continued)

Checklist	Point value	Names
9. Insert buffer plunger in drive spring guide, push forward on buffer, and replace buffer yoke.	1	
10. Replace stock, pull bolt to rear, close cover, and pull trigger.	1	
Total score	10	

- (d) At the completion of testing for each group, each grader should assemble the individuals he graded and give them a thorough critique (6 minutes).

(2) STATION 2: DETAILED DISASSEMBLY AND ASSEMBLY.

- (a) This station consists of approximately 11 setups. Each setup consists of the following: an assembled trigger housing group and an assembled operating group. Mats should be provided to avoid losing small parts and getting dirt into the weapon.

- (b) The following statement should be read at this station. DURING THIS PERIOD YOU WILL BE ORGANIZED INTO THREE GROUPS AND BE REQUIRED TO PERFORM DETAILED DISASSEMBLY AND ASSEMBLY OF THE TRIGGER HOUSING AND OPERATING GROUPS. EACH GROUP WILL BE ORGANIZED WITH ONE INDIVIDUAL PER GUN AND ONE GRADER PER TWO GUNS. EACH GROUP WILL BE ALLOWED EIGHT MINUTES TO COMPLETE THE TASK. IF YOU HAVE ANY TROUBLE, RAISE YOUR HAND, AND THE GRADER WILL ASSIST YOU. THE TWO GROUPS NOT BEING TESTED WILL REMAIN TO THE REAR OF THE STATION WITH THEIR BACKS TOWARD THE WORK AREA UNTIL THEY ARE CALLED.

- (c) The following scoresheet should be used in grading individual performance.

STATION 2
DETAILED DISASSEMBLY AND ASSEMBLY

Checklist	Point value	Names
<i>Trigger Housing Assembly</i>		
1. Remove sear pin, sear, sear plunger, and sear spring.	1	
2. Remove trigger pin and trigger.	1	
3. Replace trigger and trigger pin.	1	
4. Replace sear spring, sear plunger, sear, and sear pin.	1	
<i>Operating Group</i>		
5. Separate operating rod and bolt.	1	
6. Remove bolt plug pin, bolt plug, and cam roller assembly.	1	
7. Remove firing pin spring, firing pin bearing, and firing pin.	1	
8. Replace firing pin, firing pin bearing, and firing pin spring.	1	
9. Replace cam roller assembly, bolt plug, and bolt plug pin.	1	
10. Join bolt and operating rod.	1	
Total score	10	

(d) At the completion of testing for each group, each grader should assemble the individuals he graded and give them a thorough critique (6 minutes).

(3) STATION 3: PLACING CORRECT READINGS ON THE TRAVERSING AND ELEVATING MECHANISM.

(a) This station consists of approximately 11 setups. Each setup consists of the following: one tripod mounted machinegun complete with pintle and platform group, and traversing and elevating mechanism.

(b) For the first direction reading, the grader should insure that the traversing slide will be an even 5-mil graduation on the traversing bar and require the individual to place 1 to 4 mils on the traversing handwheel; i.e., L242. This will require that he

recenter the traversing mechanism before he can place the next direction reading on it correctly. The second direction reading should be in the opposite direction; i.e., R240. The second elevation reading should also be a major change; i.e., +50/32 to -50/17.

(c) The following statement should be read at this station. DURING THIS PERIOD YOU WILL BE ORGANIZED INTO THREE GROUPS AND BE REQUIRED TO PLACE TWO SETS OF READINGS ON THE TRIPOD MOUNTED M60. A GRADER WILL CHECK YOUR FIRST SET OF READINGS BEFORE YOU PLACE THE SECOND SET ON THE GUN. YOU WILL BE ALLOCATED AN 8-MINUTE WORK PERIOD AT THIS STATION. IF YOU HAVE ANY TROUBLE, RAISE YOUR HAND, AND THE GRADER WILL ASSIST YOU. THE TWO GROUPS NOT BEING TESTED WILL REMAIN TO THE REAR OF THE STATION WITH THEIR BACKS TOWARD THE WORK AREA UNTIL THEY ARE CALLED.

(d) The following scoresheet should be used in grading individual performance.

STATION 3
PLACING CORRECT READINGS ON TRAVERSING AND ELEVATING MECHANISM

Checklist	Point value	Names
<i>First Set of Readings</i>		
1. Correct direction reading.	2	
2. Correct elevation reading.	2	
3. Recenter traversing handwheel.	2	
<i>Second Set of Readings</i>		
4. Correct direction reading.	2	
5. Correct elevation reading.	2	
Total score	10	

(e) At the completion of testing for each group, each grader should assemble the individuals he graded and give them a thorough critique (6 minutes).

(4) STATION 4: IMMEDIATE ACTION.

- (a) This station consists of approximately six setups. Each setup should consist of the following: a bipod mounted M60 with bolt forward, cover closed, safety on FIRE position, and a cleaning rod.
- (b) The grader should ask the individual to perform immediate action as he would if a round were in the chamber and would not fire, and if the barrel was not hot enough to cause a cookoff.
- (c) The following statement should be read at this station. DURING THIS PERIOD YOU WILL BE ORGANIZED INTO FIVE GROUPS AND REQUIRED TO GO THROUGH THE STEPS OF IMMEDIATE ACTION WITH THE M60 MACHINEGUN. YOU WILL BE ALLOWED FIVE MINUTES. IF YOU HAVE ANY TROUBLE, RAISE YOUR HAND, AND A GRADER WILL ASSIST YOU. THE GROUPS NOT BEING TESTED WILL REMAIN TO THE REAR OF THE STATION WITH THEIR BACKS TOWARD THE WORK AREA UNTIL THEY ARE CALLED.
- (d) The following scoresheets should be used in grading individual performance.

**STATION 4
IMMEDIATE ACTION**

Checklist	Point value	Names
1. Fully cock the gun.	1	
2. Place the safety on SAFE.	2	
3. Raise the cover and check feed-tray for links and ammunition.	1	
4. Inspect chamber.	1	
5. Close the cover, place safety on FIRE, and attempt to fire.	1	
6. Remove the round.	2	
7. Reload, relay, and continue to fire.	2	
Total score	10	

- (e) At the completion of testing for each group, each grader should assemble

the individuals he graded and give them a thorough critique (5 minutes).

(5) STATION 5: LONG-RANGE ZEROING.

- (a) This station consists of approximately six setups. Each setup consists of a bipod mounted machinegun and screwdriver or combination tool.
- (b) Each grader should tell the individual the range (500 meters) to the target and have him simulate the firing of a 6- to 9-round burst. The grader will then tell the individual what corrections for deflection and elevation (in meters) are needed to hit the target. The gunner will then be graded on his actions.
- (c) The following statement should be read at this station. DURING THIS PERIOD YOU WILL BE ORGANIZED INTO FIVE GROUPS AND REQUIRED TO GO THROUGH STEPS OF ZEROING AT LONG RANGE. YOU WILL BE ALLOWED FIVE MINUTES TO EXPLAIN AND PERFORM YOUR ACTIONS TO THE GRADER. IF YOU HAVE ANY PROBLEM, ASK YOUR GRADER. THE GROUPS NOT BEING TESTED WILL REMAIN TO THE REAR OF THE STATION WITH THEIR BACKS TOWARD THE WORK AREA UNTIL THE ARE CALLED.
- (d) The following scoresheet should be used in grading individual performance.

**STATION 5
LONG-RANGE ZEROING**

Checklist	Point value	Names
1. Place original range setting of 500 meters and zero windage on rear sight.	2	
2. Make corrections for deflection.	2	
3. Make corrections for elevation.	2	
4. Simulate firing second burst and hitting target.	2	
5. Adjust range plate to reset 500 meters.	2	
Total score	10	

- (e) At the completion of testing for each group, each grader should assemble the individuals he graded and give them a thorough critique (5 minutes).

(6) STATION 6: ENGAGEMENT OF A LINEAR AND A DEEP TARGET.

- (a) This station consists of approximately six setups. Each setup should have a punchboard type training aid (app. IV, fig. 161) or a blackboard and chalk.
- (b) The individual is required to show his point of initial lay, direction of manipulation, and extent of manipulation for a linear (single gun) and a deep target (guns employed in pairs). The individual is also asked what rate of fire he would use if the rate were not stated in the fire command to engage these targets.
- (c) The following statement should be read at this station. DURING THIS PERIOD YOU WILL BE ORGANIZED INTO FIVE GROUPS AND REQUIRED TO EXPLAIN HOW TO ENGAGE DIFFERENT TARGETS WITH THE MACHINEGUN EMPLOYED SINGLY AND IN PAIRS. YOU WILL BE ALLOWED FIVE MINUTES FOR SIMULATED ENGAGEMENT OF TWO TYPES OF TARGETS. IF YOU HAVE ANY QUESTIONS, ASK YOUR GRADER. THE GROUPS NOT BEING TESTED WILL REMAIN TO THE REAR OF THE STATION WITH THEIR BACKS TOWARD THE WORK AREA UNTIL THEY ARE CALLED.
- (d) The following scoresheet should be used in grading individual performance.

**STATION 6
ENGAGEMENT OF A LINEAR AND A
DEEP TARGET**

Checklist	Point value	Names
1. Linear (single gun):		
Initial lay.	2	
Proper manipulation.	2	

STATION 6—(Continued)

Checklist	Point value	Names
2. Deep (gun employed in pairs):		
Initial lay.	2	
Proper manipulation.	2	
3. Use of rapid rate of fire.	2	
Total score	10	

- (e) At the completion of testing for each group, each grader should assemble the individuals he graded and give them a thorough critique (5 minutes).

3. Proficiency Field Course

This is a suggested course designed to maintain the proficiency of machinegunners. It consists of six periods of instruction (19 hours) which review important aspects of machinegunnery. It is conducted during unit training at the discretion of the unit commander.

a. Period I.

- (1) Subject: Basic (10-meter) Tripod Instructional Firing.
- (2) Time allocation: 3 hours.
 - (a) Review: 40 minutes.
 - (b) Practical work: 140 minutes.
- (3) Scope: Review and practical exercises covering emplacing, sighting and aiming, position and grip, zeroing, manipulation, loading and unloading, immediate action, and instructional firing with the tripod mounted M60 machinegun (ch. 10).
- (4) Training facility: Basic (10-meter) range (ch. 10).
- (5) Ammunition allocation: See appendix II, table X.

b. Period II.

- (1) Subject: Transition Instructional Firing.
- (2) Time allocation: 3 hours.
 - (a) Review: 40 minutes.
 - (b) Practical work: 140 minutes.
- (3) Scope: Review and practical exercise covering engagement of long-range, point targets, crew training, and instructional firing (ch. 10).
- (4) Training facility: Transition range (ch. 10).
- (5) Ammunition allocation: See appendix II, table X.

c. Period III.

- (1) Subject: Day Defensive Field Firing (direct lay).
- (2) Time allocation: 3 hours.
 - (a) Review: 40 minutes.
 - (b) Practical work: 140 minutes.
- (3) Scope: Review and practical exercise covering characteristics of fire, fire control, and engagement of field type targets (ch. 11).
- (4) Training facility: Day defensive range (ch. 11).
- (5) Ammunition allocation: See appendix II, table X.

d. Period IV.

- (1) Subject: Assault Fire.
- (2) Time allocation: 2 hours.
 - (a) Review: 40 minutes.
 - (b) Practical work: 80 minutes.
- (3) Scope: Review and practical exercise covering assault firing techniques (ch. 11).
- (4) Training facility: Assault firing range (ch. 11).
- (5) Ammunition allocation: See appendix II, table X.

e. Period V.

- (1) Subject: Predetermining Fire Role.
- (2) Time allocation: 4 hours.
 - (a) Review: 60 minutes.

(b) Practical work: 180 minutes.

- (3) Scope: Review and practical exercise covering sectors of fire, final protective lines, sectors of graze, principal directions of fire, direction and elevation readings, preparation of a range card, night firing methods, and firing to include preparation (during daylight) and use (during darkness) of a range card (ch. 8).
- (4) Training facility: Predetermined fire range (ch. 8).
- (5) Ammunition allocation: See appendix II, table X.

f. Period VI.

- (1) Subject: Technique of Fire During Periods of Limited Visibility (Darkness) Using Artificial Illumination.
- (2) Time allocation: 4 hours.
 - (a) Review: 60 minutes.
 - (b) Practical work: 180 minutes.
- (3) Scope: Review and practical exercise covering the techniques involved in placing effective fire on targets during periods of darkness using artificial illumination.
- (4) Training facility: Day defensive range (ch. 11).
- (5) Ammunition allocation: See appendix II, table X.

APPENDIX IV

TRAINING MANAGEMENT, TRAINING AIDS, AND DEVICES

1. General

This appendix is designed to aid the instructor in conducting the training outlined in this manual (marksmanship, field target firing, proficiency examination, and field proficiency course). The recommended personnel, equipment, training aids, and devices listed in this appendix are based upon a unit of 200–250 men and optimum conditions. (If necessary, training can be conducted with less.) As the size of the unit varies, compensation in the amounts of required personnel and equipment should be made accordingly.

2. Conduct of Training

When an officer in charge is required for a problem, he may be the principal instructor or alternate principal instructor. The OIC principal instructor, or alternate principal instructor may perform the duties of safety officer during periods of good visibility. Chartmen and demonstrators may be used as lane NCOs, group leaders, assistant group leaders, or assistant instructors if the type of instruction permits.

a. Mechanical Training.

(1) Personnel.

One OIC.
One principal instructor.
One alternate principal instructor.
One assistant instructor per ten individuals.

(2) Equipment.

One public address system.
One complete tripod mounted machine-gun per two individuals.

(3) Training aids and devices.

One M60 rack per gun (fig. 143).
One nomenclature board per gun (fig. 144).

One T7 bandoleer per gun (fig. 142).
One spacing of dummy ammunition per gun (fig. 145).

b. Marksmanship Instruction (Basic Range).

(1) Personnel.

One OIC.
One principal instructor.
One alternate principal instructor.
One noncommissioned officer in charge.
One group instructor per 40–50 individuals.
One assistant instructor per 10 individuals.
Two demonstrators (one gunner and one assistant gunner).
One chartman.

(2) Equipment.

One public address system.
Six machineguns per 10 individuals (one gun is used as a reserve for each five guns on line).
One cleaning rod per two guns.
One screwdriver per two guns.
Three machinegun marksmanship targets per firing position (fig. 146) (one target for bipod firing, one target for tripod practice and record practice, and one target for record firing).
Two pairs of binoculars.
Twelve stopwatches (two in the control tower and two per group instructor).
One scorecard per individual — DA Form 85 (fig. 135).
One spotter device per firing position (fig. 147).
(3) Training aids and devices.
Fire command chart (fig. 148).

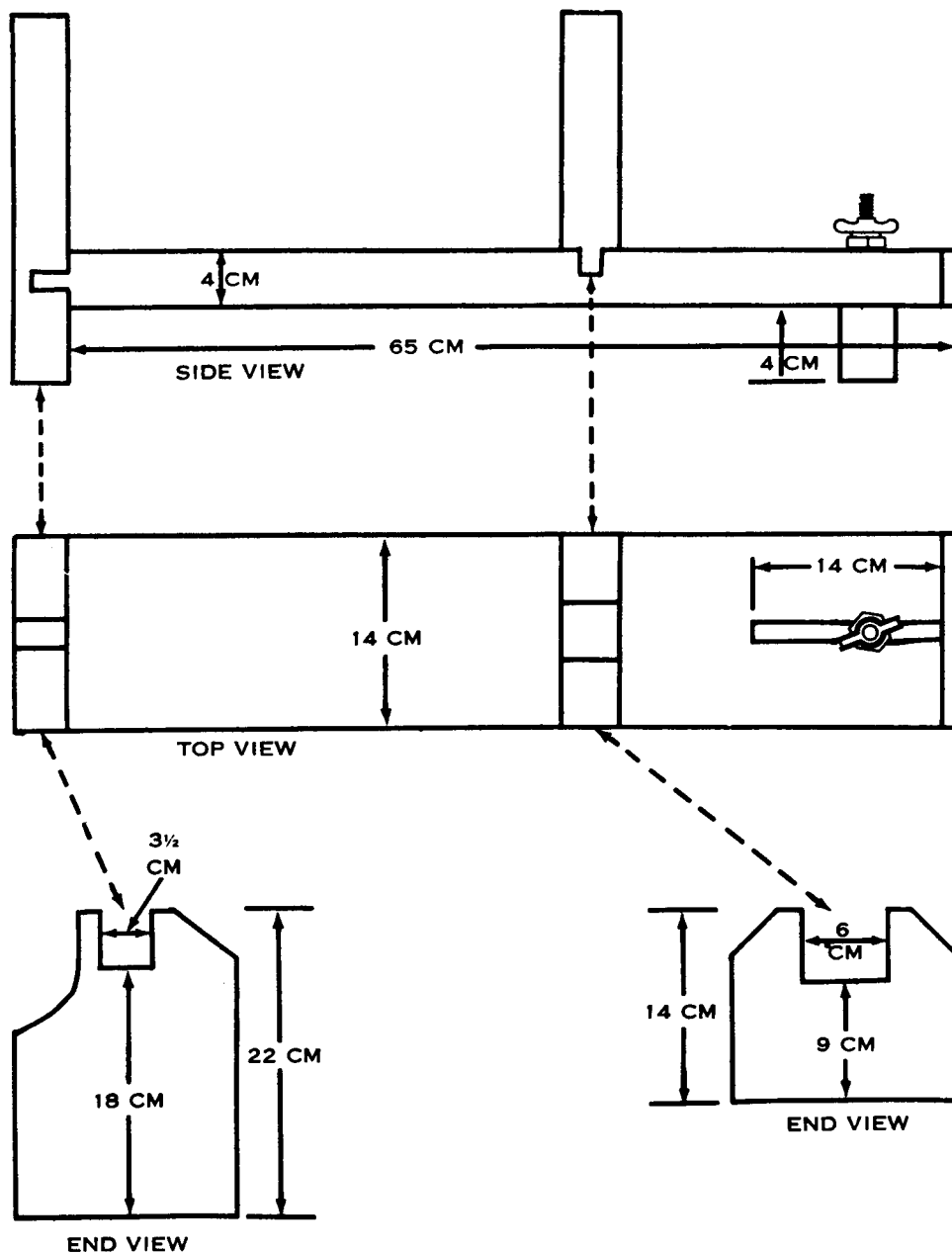


Figure 143. Rack for mounting M60.

Zeroing chart (fig. 149).

One brass deflector per gun position (fig. 150).

c. *Marksmanship Instruction (Transition Range).*

(1) *Personnel.*

(a) *Firing line.*

One OIC.

One principal instructor.

One alternate principal instructor.

One noncommissioned officer in charge.

One lane NCO per lane.

One target control operator per lane.

Eight pit personnel per lane (if electrical target devices are not available).

Six demonstrators (two 3-man gun crews).

One chartman.

- (b) General disassembly and assembly concurrent training station (para. 2a(1) above).
- (c) Direction and elevation readings concurrent training station.
One principal instructor.
One alternate principal instructor.
One assistant instructor.
One demonstrator.
- (d) Detailed disassembly and assembly concurrent training station (para. 2a(1) above).
- (e) Technique of fire rudiments concurrent training station.
One principal instructor.
One alternate principal instructor.
One chartman.

- (f) Cycle of functioning concurrent training station.
One principal instructor.
One alternate principal instructor.
One chartman.
- (2) *Equipment.*
 - (a) Firing line.
One public address system.
Three machineguns per lane.
One cleaning rod per lane.
One screwdriver per lane.
Twelve pairs of binoculars (one per target control operator and two for the control tower).
Two stopwatches.
One scorecard per individual—DA Form 85 (the same scorecard is

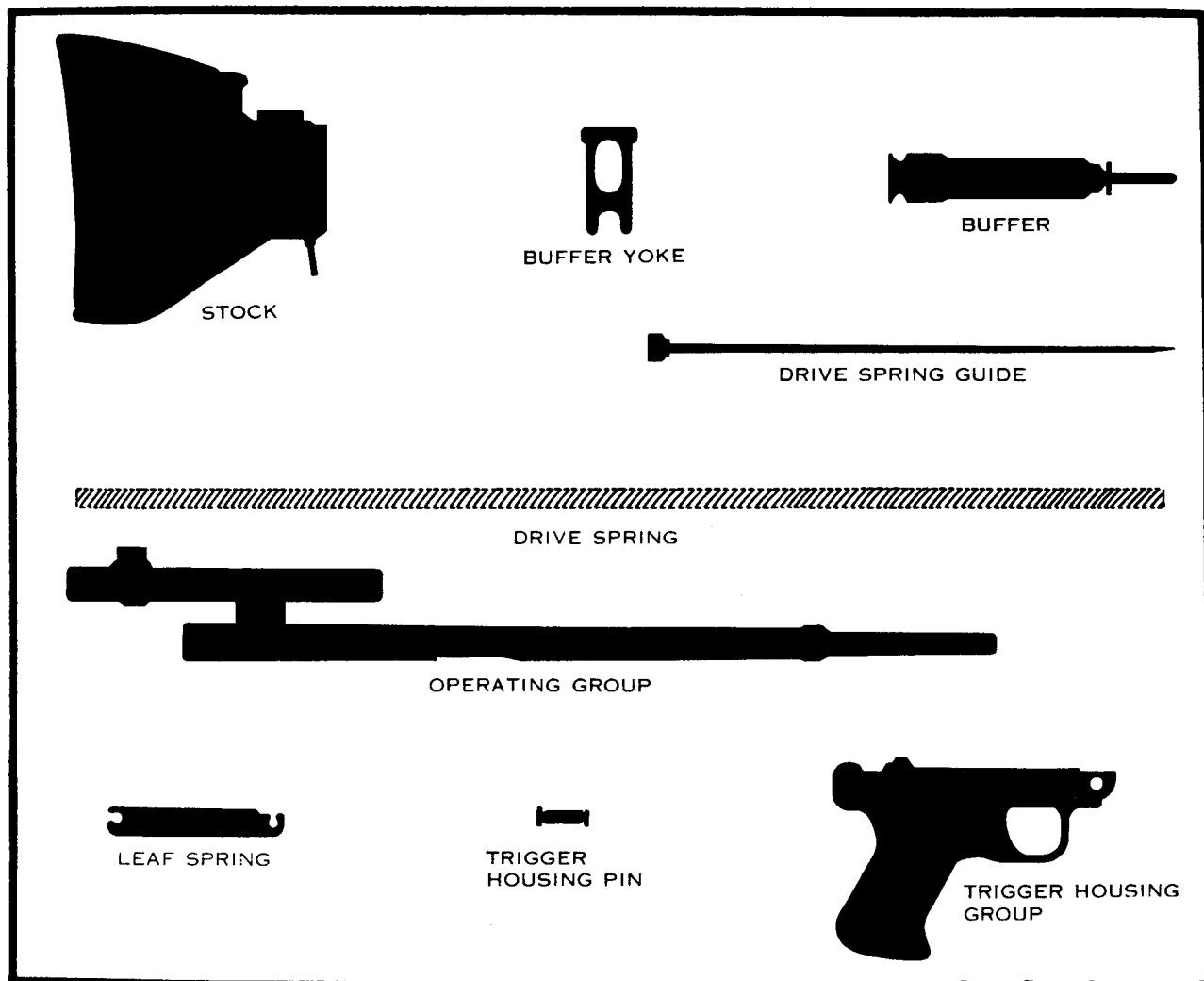


Figure 144. Nomenclature board.

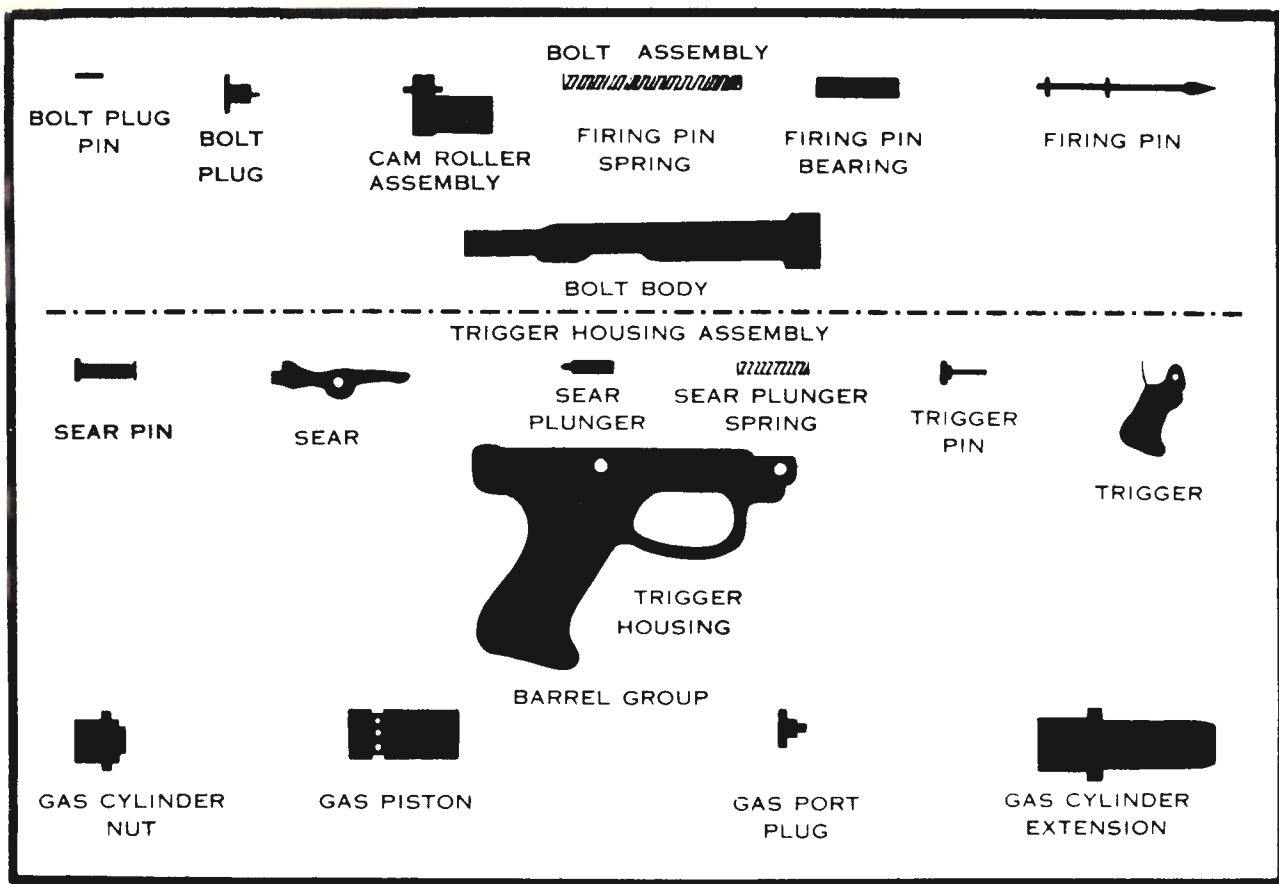


Figure 144—Continued.

- used on the transition range as was used on the basic range).
- (b) General disassembly and assembly concurrent training station (para. 2a(2) above).
- (c) Direction and elevation readings concurrent training station.
 - One public address system.
 - One complete tripod mounted machinegun.
 - One traversing and elevating mechanism per individual.
- (d) Detailed disassembly and assembly concurrent training station (para. 2a(2) above).
- (e) Technique of fire rudiments concurrent training station.
 - One public address system.
- (f) Cycle of functioning concurrent training station.
 - One public address system.
 - One tripod mounted machinegun.

(3) *Training aids and devices.*

- (a) Firing line.
 - Adjusted aiming point chart (fig. 151).
 - Cone of fire chart (fig. 152).
 - Beaten zone chart (fig. 153).
 - Mil relationship chart (fig. 154).
 - One brass deflector per two guns (fig. 150).
- (b) General disassembly and assembly concurrent training station (para. 2a(3) above).
- (c) Direction and elevation readings concurrent training station.
 - Landscape target (fig. 155).
 - Blackboard used to record direction and elevation readings (fig. 156).
- (d) Detailed disassembly and assembly concurrent training station (para. 2a(3) above).
- (e) Technique of fire rudiments concurrent training station. GTA 7-15.

Maximum ordinate chart (fig. 157).
Plunging and grazing fire chart (fig. 158).

Classes of fire with respect to the target chart (fig. 159).

Classes of fire with respect to the gun chart (fig. 160).

Punchboard training aid (fig. 161).

Lane NCO's critique chart (fig. 162).

(f) Cycle of functioning concurrent training station.

CTA 9-632.

Basic functioning chart (fig. 163).

d. Field Firing Course.

(1) *Personnel.*

(a) Day defensive course (direct lay).

One OIC.

One principal instructor.

One alternate principal instructor.

One noncommissioned officer in charge.

One lane NCO per 40-50 individuals.

One assistant lane NCO per 20-25 individuals.

Five demonstrators (two 2-man gun crews and one leader).

One chartman.

(b) Assault fire course.

One OIC.

One principal instructor.

One alternate principal instructor.

Two lane NCOs per lane.

(c) Predetermined fire course.

One OIC.

One safety officer (during hours of darkness only).

One principal instructor.

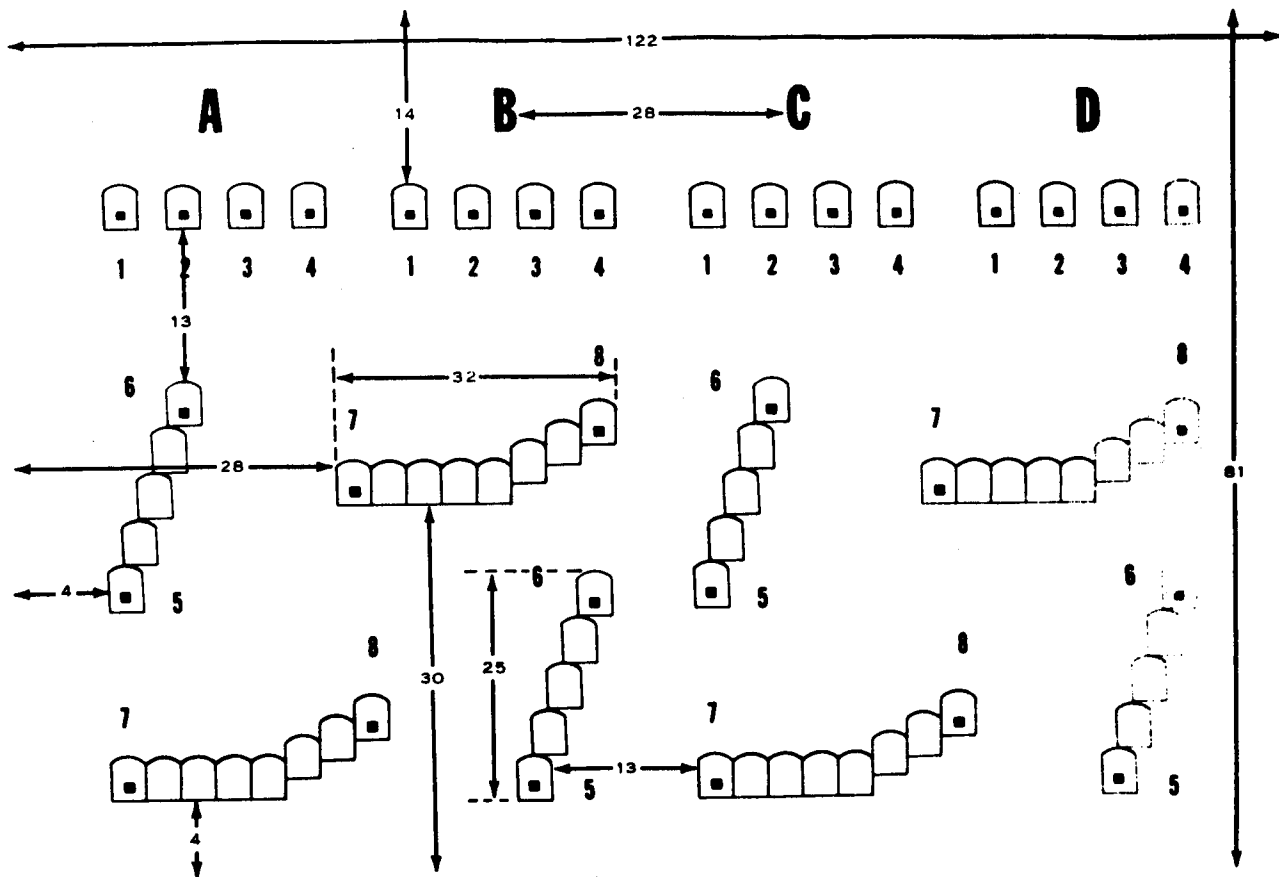
One alternate principal instructor.

One noncommissioned officer in charge.

One group NCO per 40-50 individuals.



Figure 145. Dummy ammunition spacing.



ALL MEASUREMENTS IN CENTIMETERS
 Figure 146. Basic machinegun marksmanship targets.

- One assistant group NCO per 20–25 individuals.
- Three demonstrators (gunner, assistant gunner, and leader).
- Two chartmen.
- (d) Technique of fire during periods of limited visibility (darkness) using artificial illumination.
- One OIC.
- One safety officer (during hours of darkness only).
- One principal instructor.
- One alternate principal instructor.
- One noncommissioned officer in charge.
- One lane NCO per 40–50 individuals.
- One assistant lane NCO per 20–25 individuals.
- Five demonstrators (two 2-man crews and one leader).

(2) *Equipment.*

- (a) Day defensive course (direct lay).
 - One public address system.
 - Five machineguns per lane (two tripod mounted and three bipod mounted).
 - Two cleaning rods per lane.
 - Two screwdrivers per lane.
 - Two pairs of binoculars.
- (b) Assault fire course.
 - One public address system.
 - Three bipod mounted machineguns with sling per lane.
 - One cleaning rod per lane.
 - Two pairs of binoculars.
- (c) Predetermined fire course.
 - One public address system.
 - Thirty machineguns per 40–50-man group (one gun per two individuals plus spares).

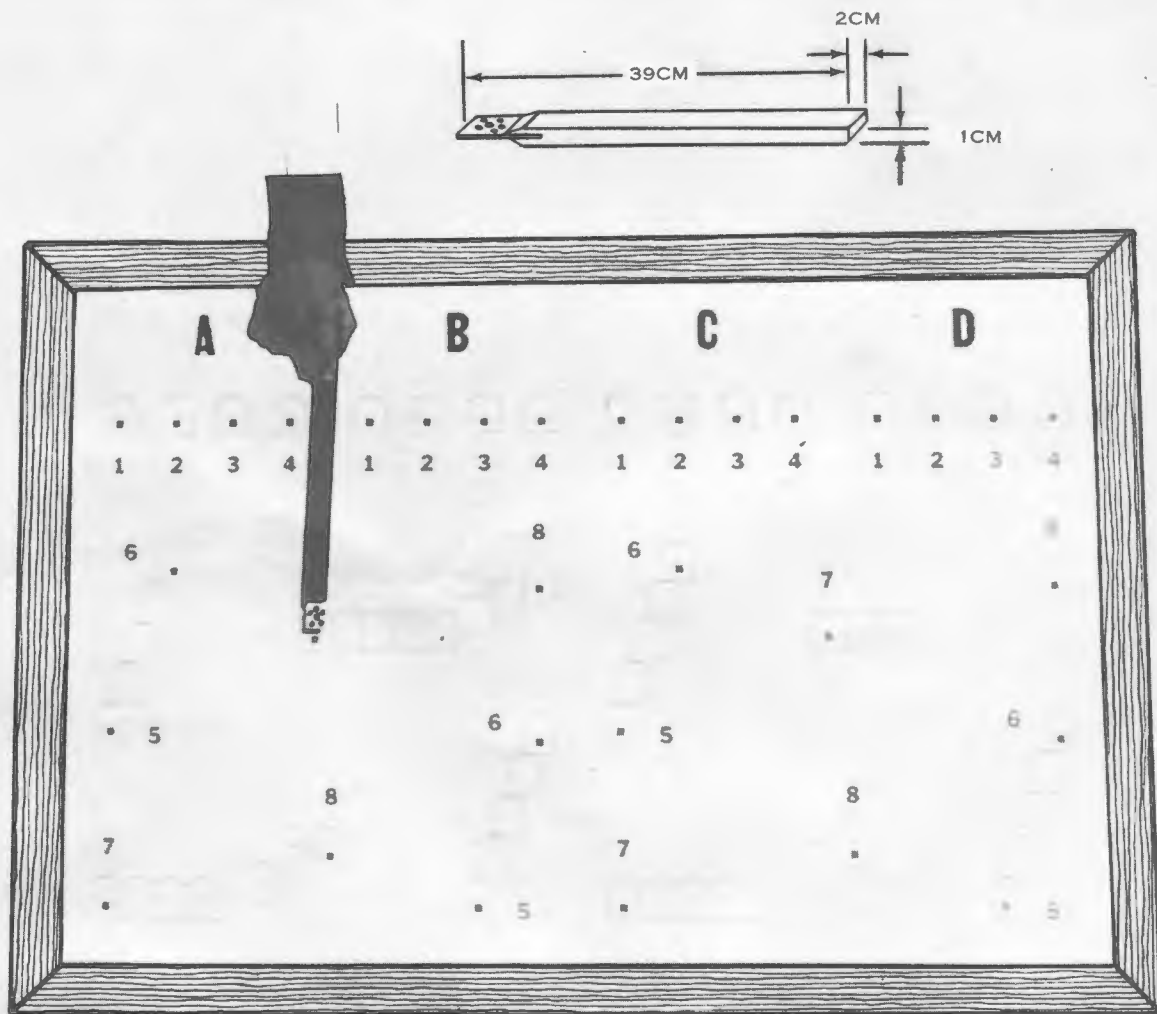


Figure 147. Spotter device.

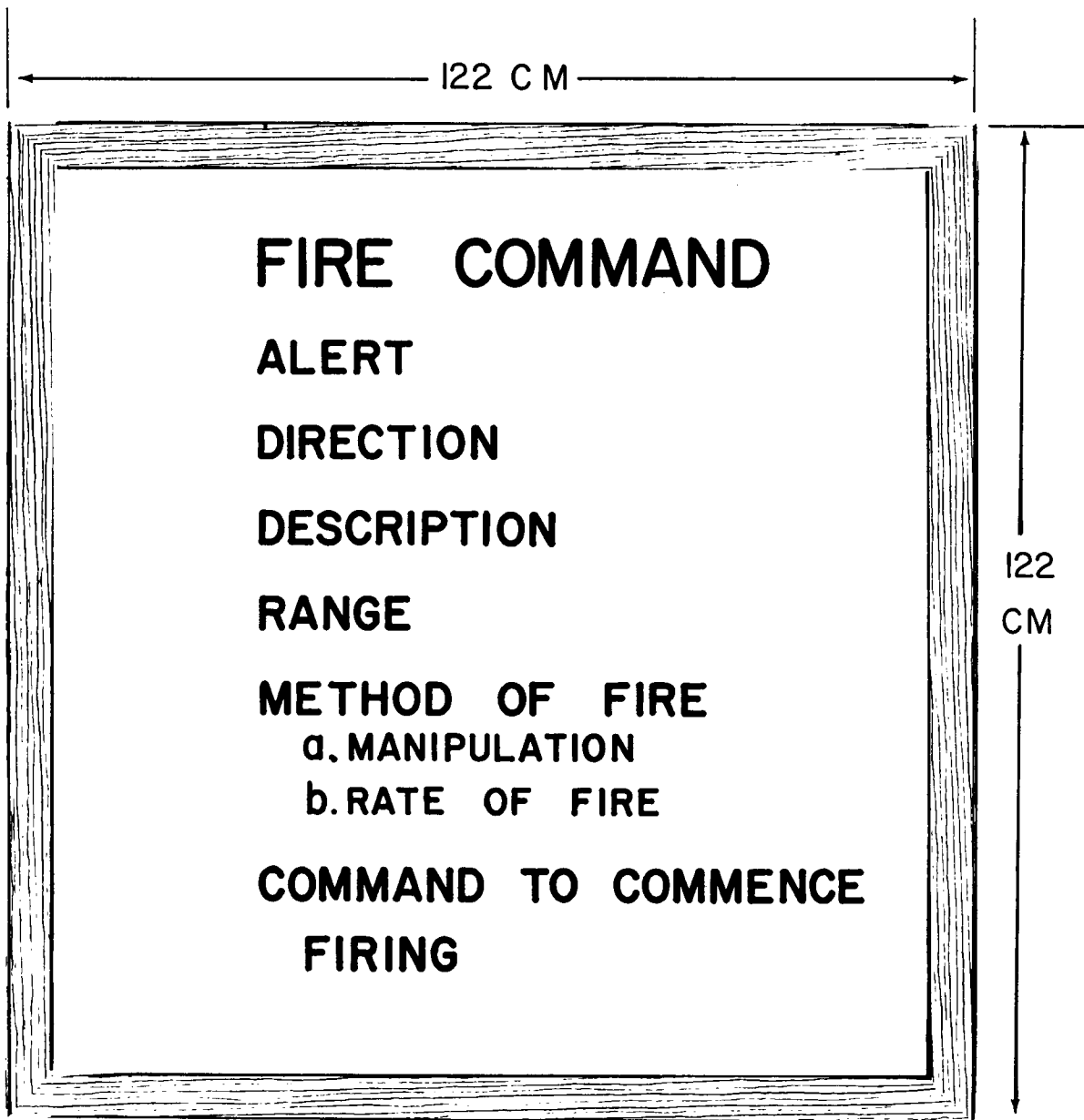


Figure 148. Fire command chart.

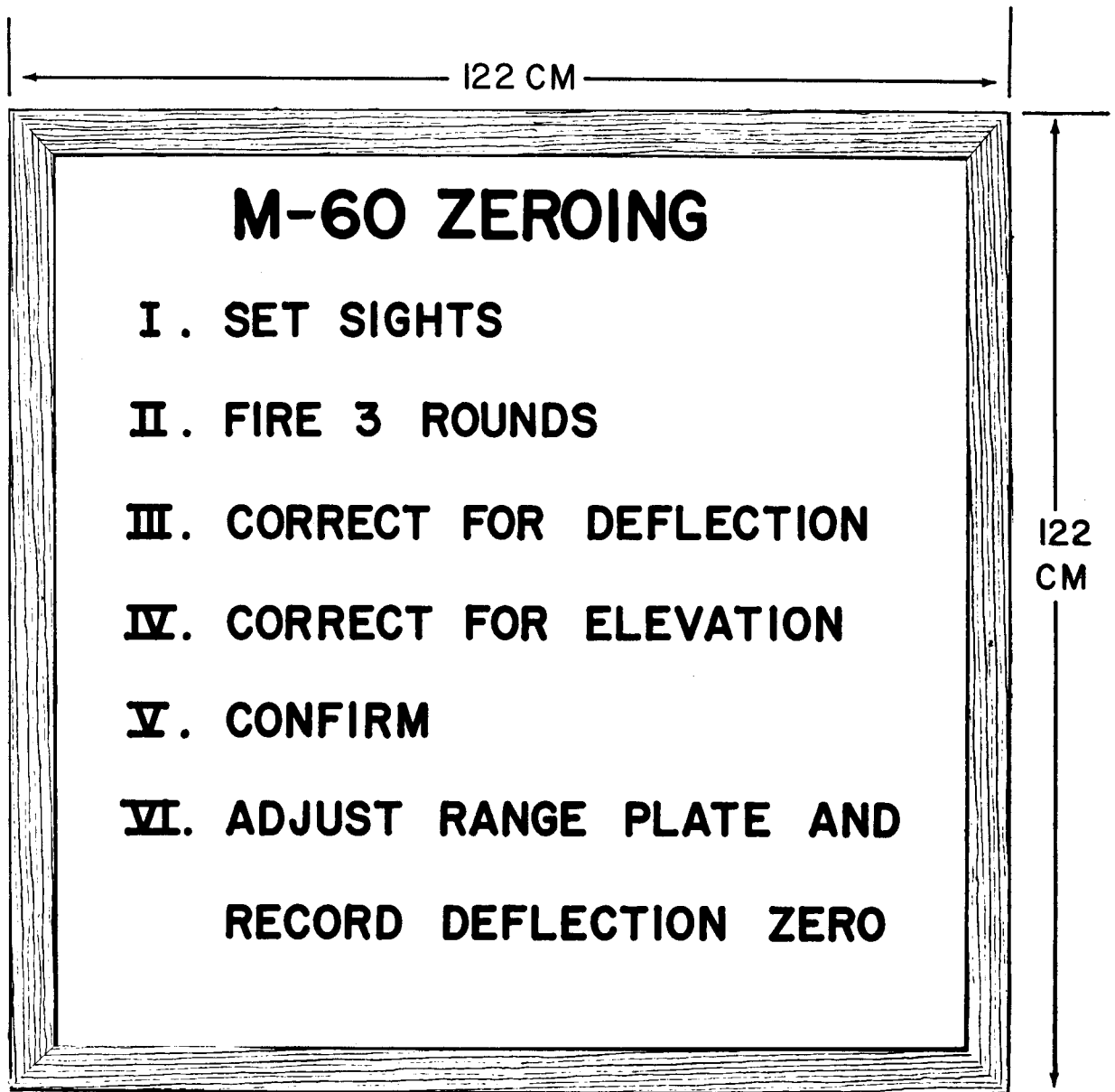


Figure 149. Basic (10-meter) range zeroing chart.

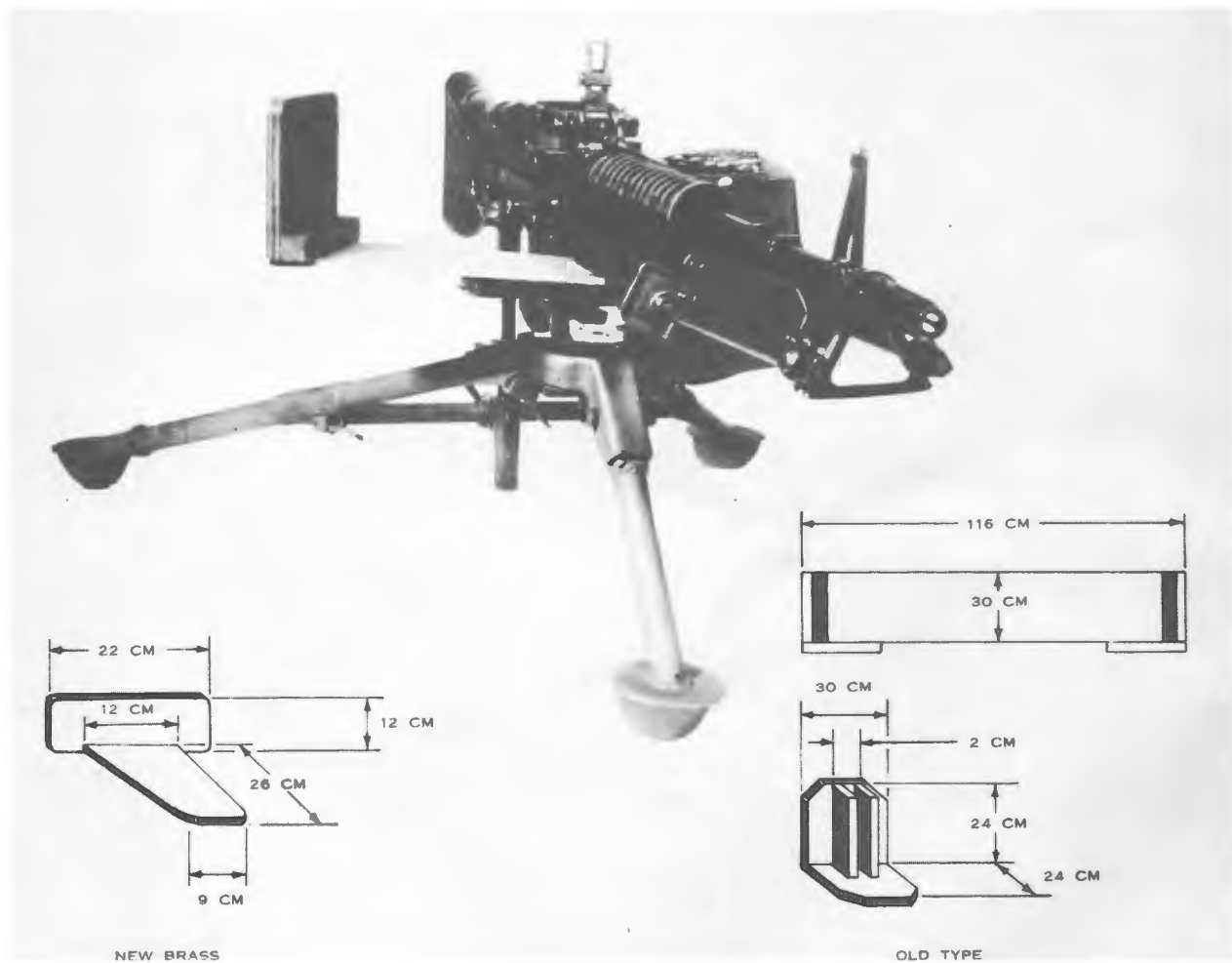


Figure 150. Brass deflectors.

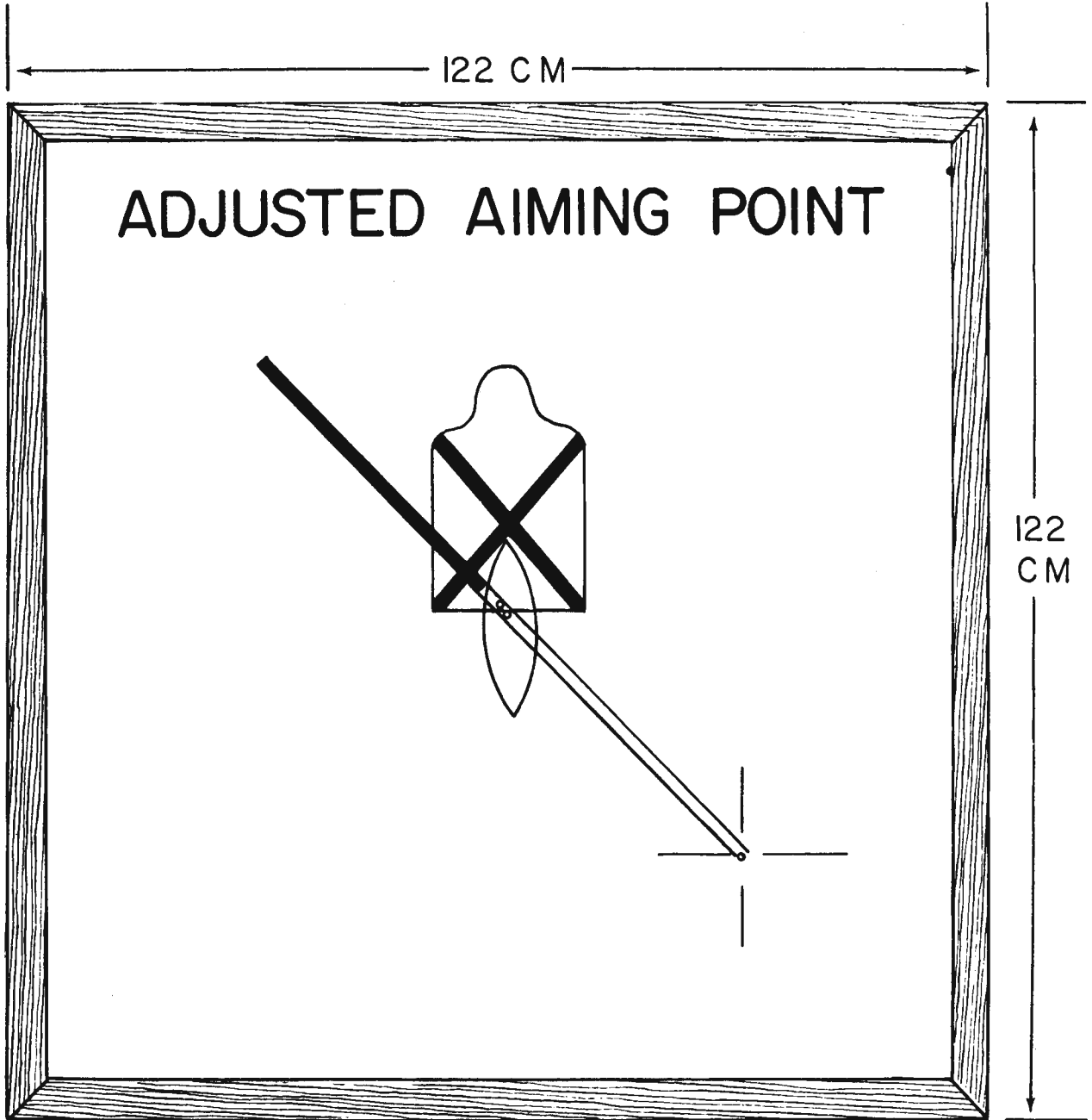


Figure 151. Adjusted aiming point chart.

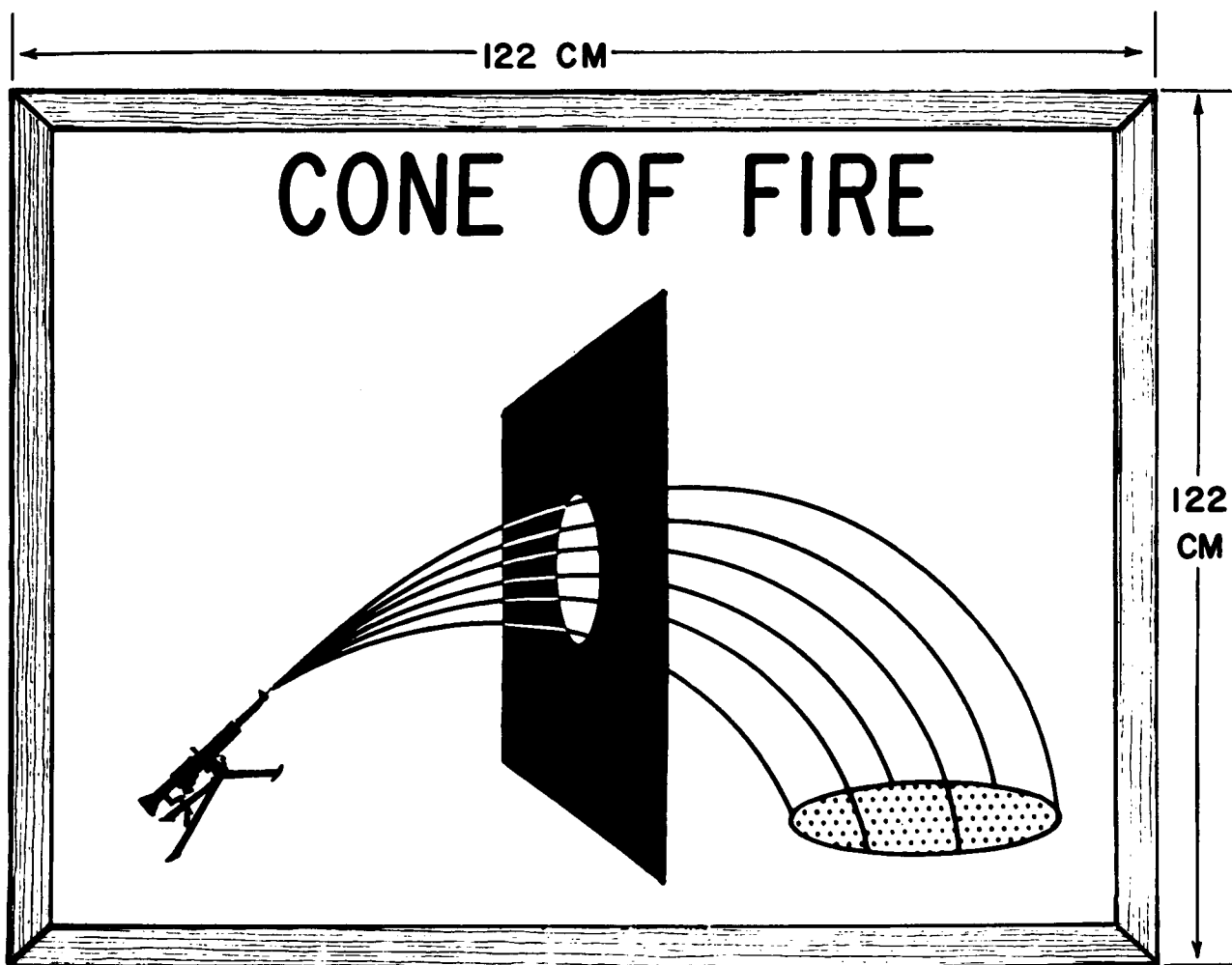


Figure 152. Cone of fire chart.

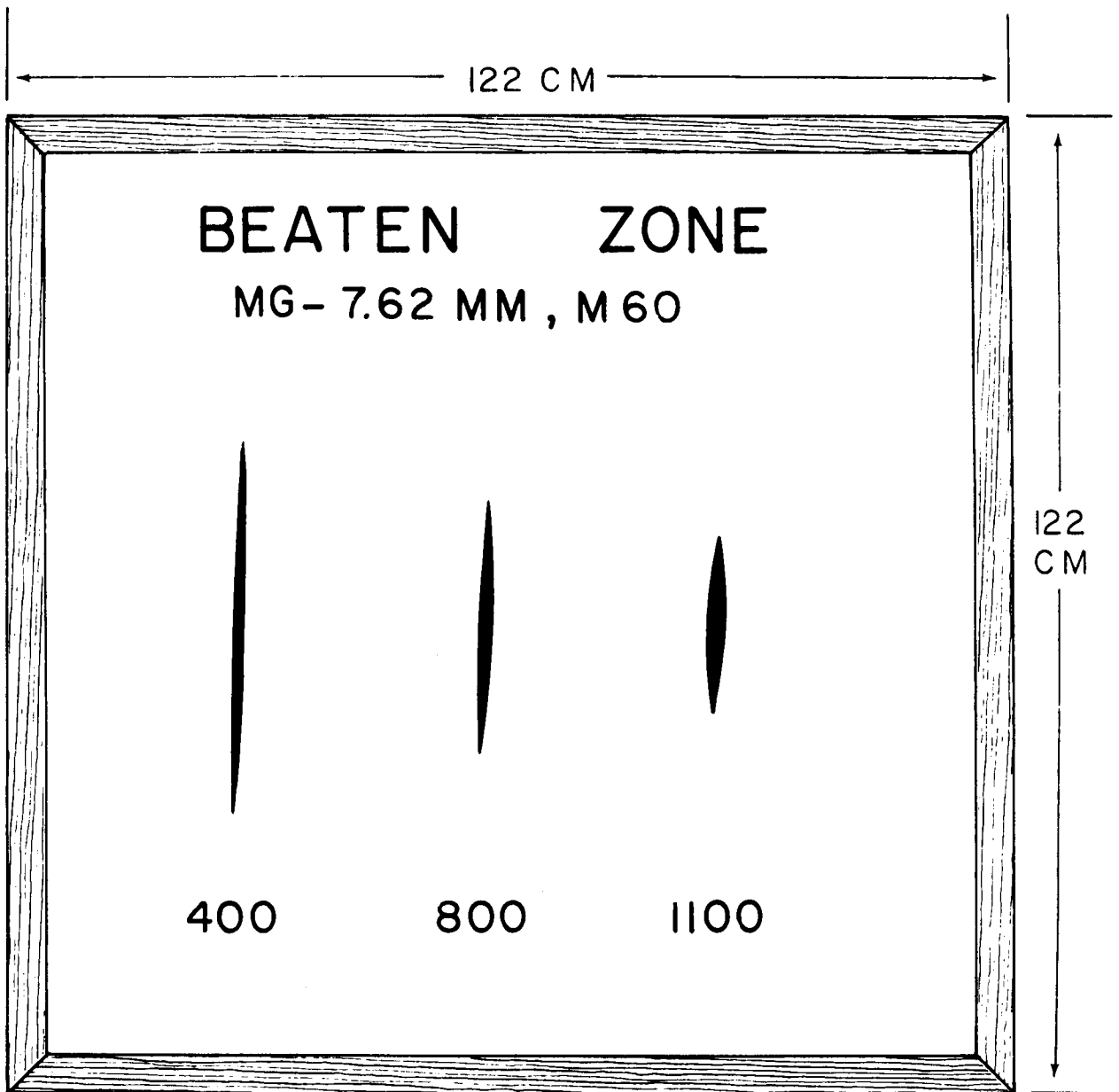


Figure 153. Beaten zone chart.

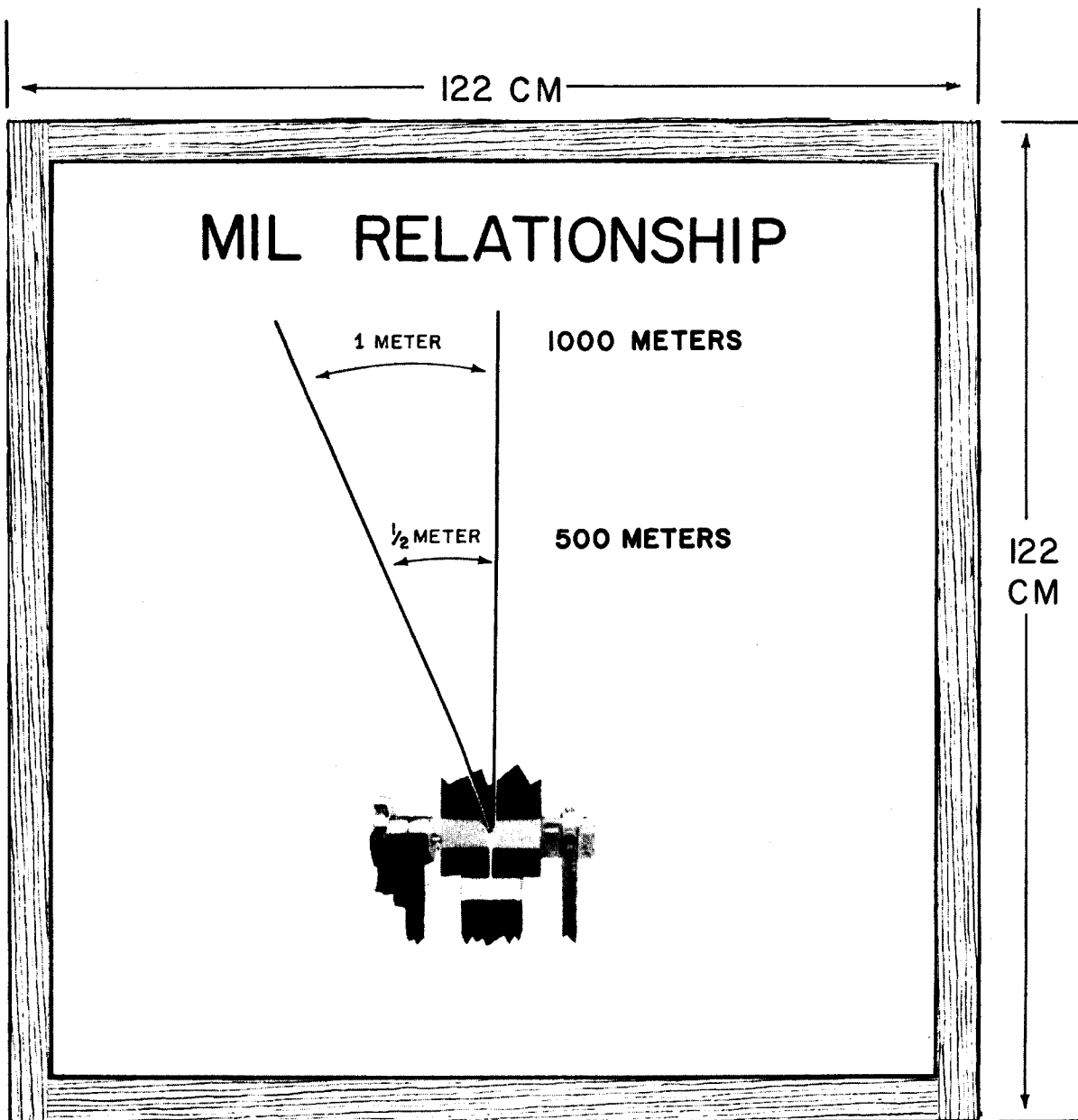


Figure 154. Mil relationship chart.

- Two cleaning rods per group.
- Two pairs of binoculars.
- One flashlight per gun position, group, and assistant group instructor.
- (d) Technique of fire during periods of limited visibility (darkness) using artificial illumination.
- One public address system.
- Five machineguns per lane (two tripod mounted and three bipod mounted).
- Two cleaning rods per lane.
- Two screwdrivers per lane.
- Two flashlights per lane.
- (3) *Training aids and devices.*
 - (a) Day defensive course (direct lay) (para. 2c (3) (e) above).
 - (b) Assault fire course.
 - None.

- (c) Predetermined fire course.
- Military symbols — sectors of fire chart (fig. 164).
- Grazing fire chart (fig. 165).
- Range card blackboard (fig. 166).
- Sight picture, aiming stake method chart (fig. 167).
- (d) Technique of fire during periods of limited visibility (darkness) using artificial illumination.
- None.

e. Proficiency Examination.

- (1) *Personnel.*
 - One OIC.
 - One noncommissioned officer in charge.
 - Six station instructors.
 - Forty-one assistant station instructors.
- (2) *Equipment.*
 - Fifty-five machineguns (23 bipod mounted and 22 tripod mounted).

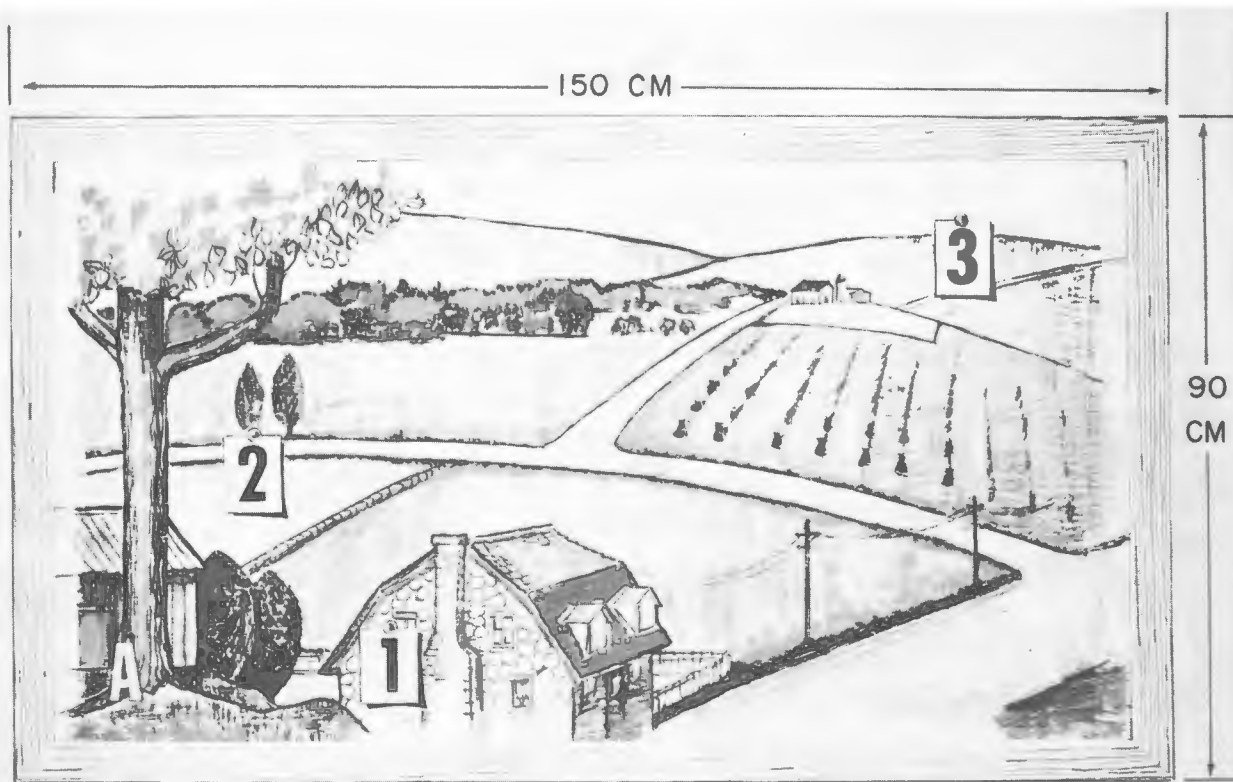


Figure 155. Landscape target.

Twenty-two mats (shelter half or poncho may be used).

Six cleaning rods.

Six screwdrivers.

(3) *Training aids and devices.*

Six punchboard training aids (fig. 161).

f. Proficiency Field Course. The personnel, equipment, training aids, and devices required to conduct this training are the same as those listed in paragraph 2b, c, and d, above (app. III).

122 CM			122 CM
RANGE	DIRECTION	ELEVATION	
TGT 1			
TGT 2			
TGT 3			

Figure 156. Direction and elevation readings blackboard.

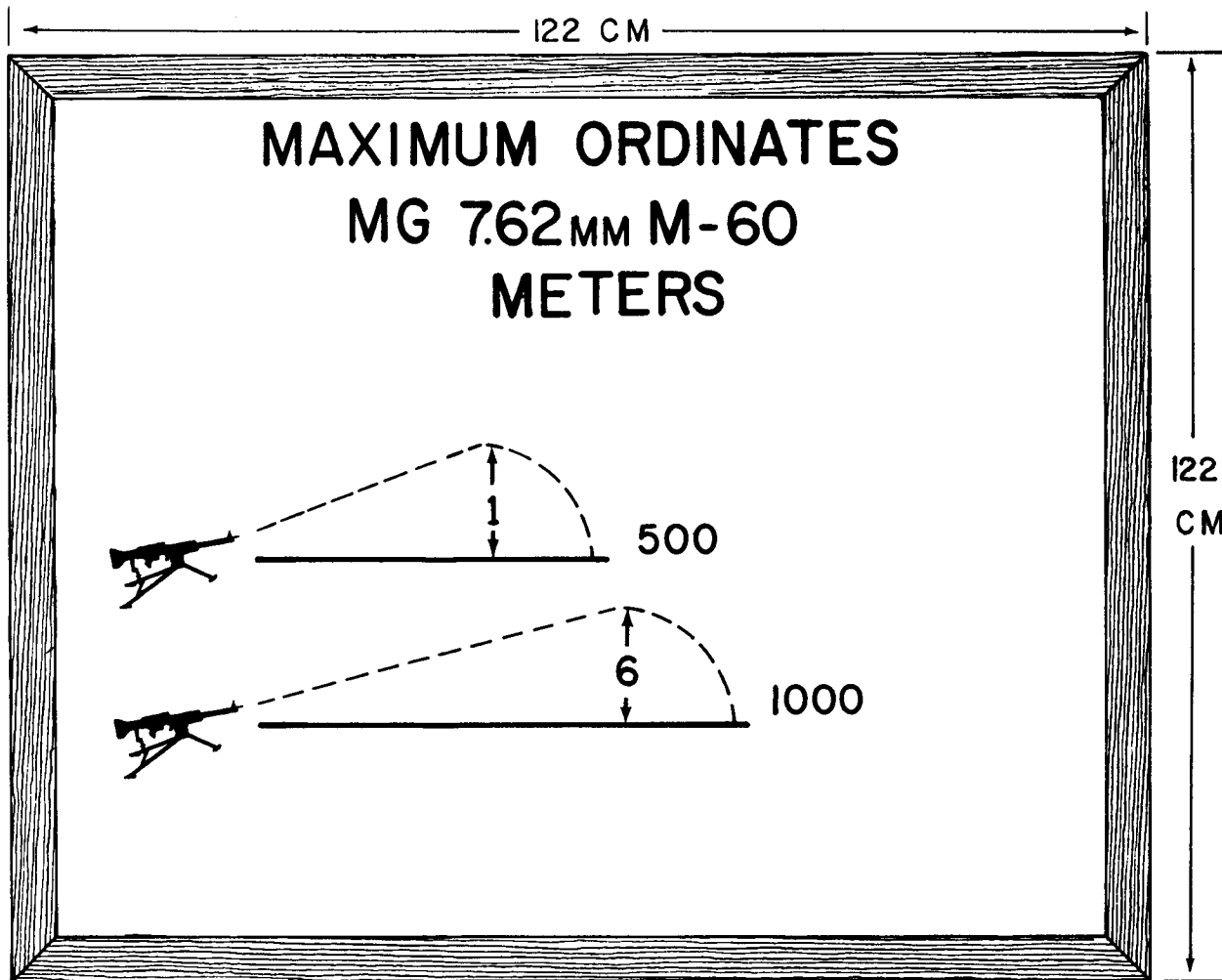


Figure 157. Maximum ordinate chart.

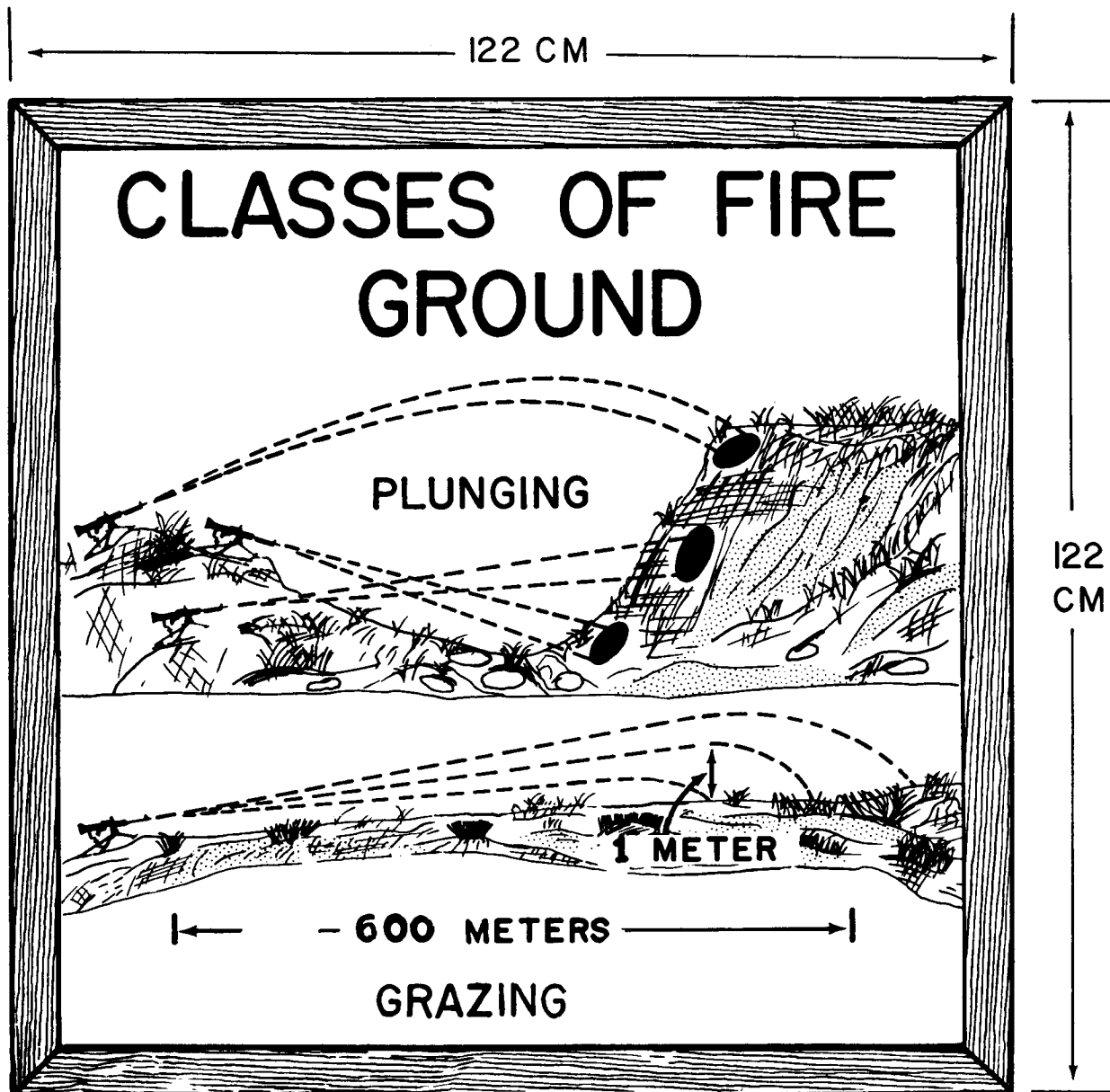


Figure 158. Plunging and grazing fire chart.

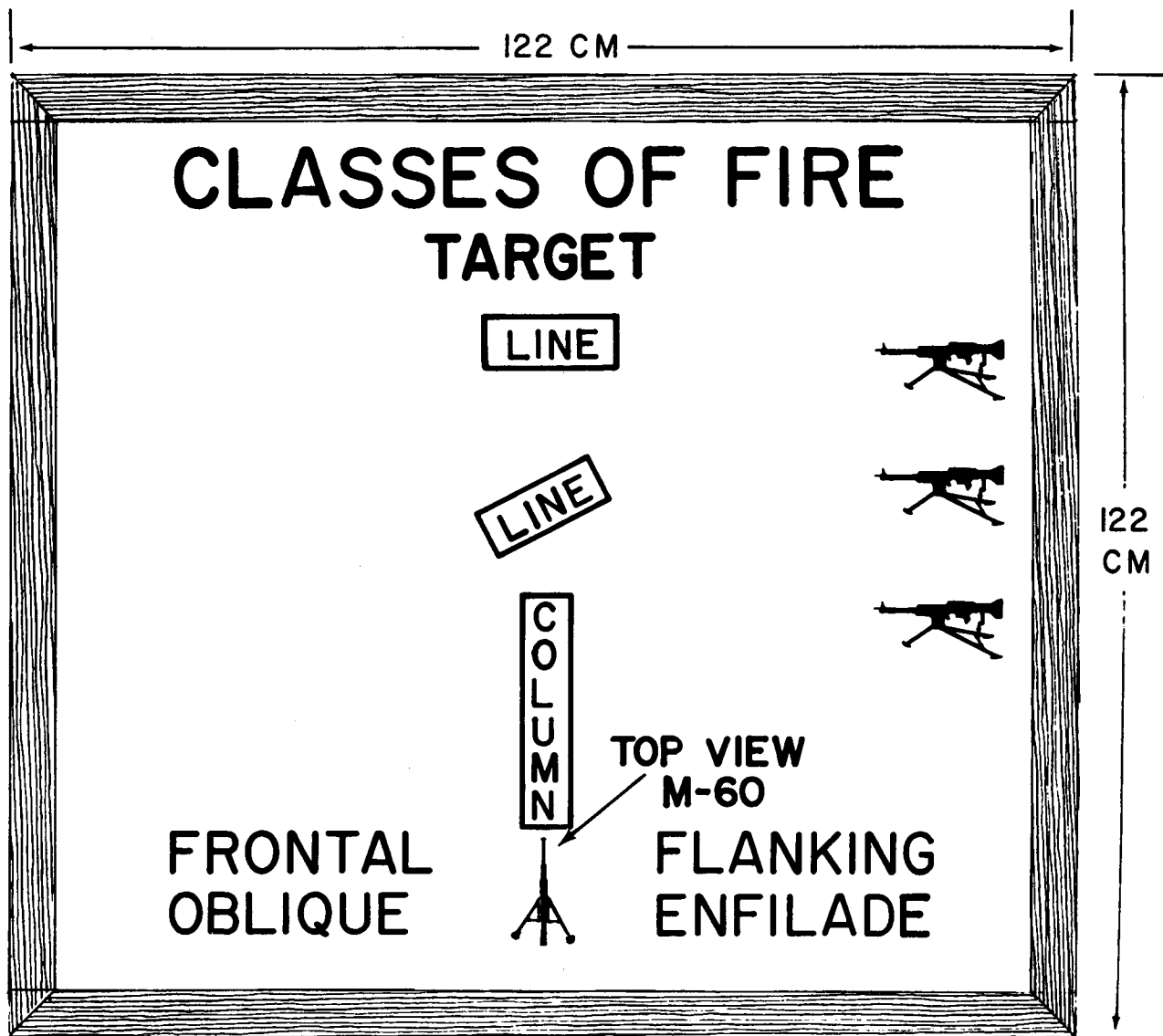


Figure 159. Classes of fire with respect to the target chart.

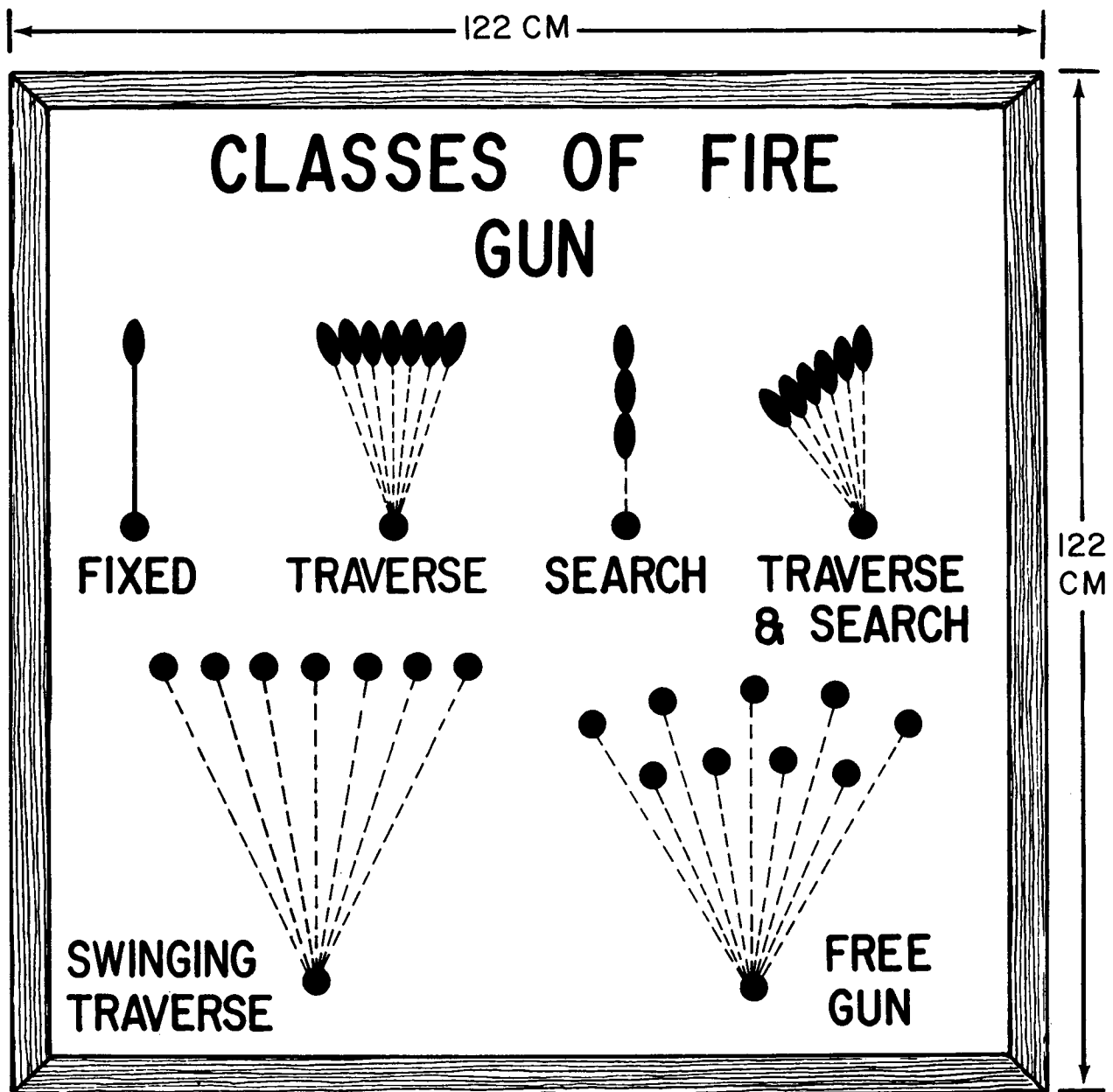


Figure 160. Classes of fire with respect to the gun chart.

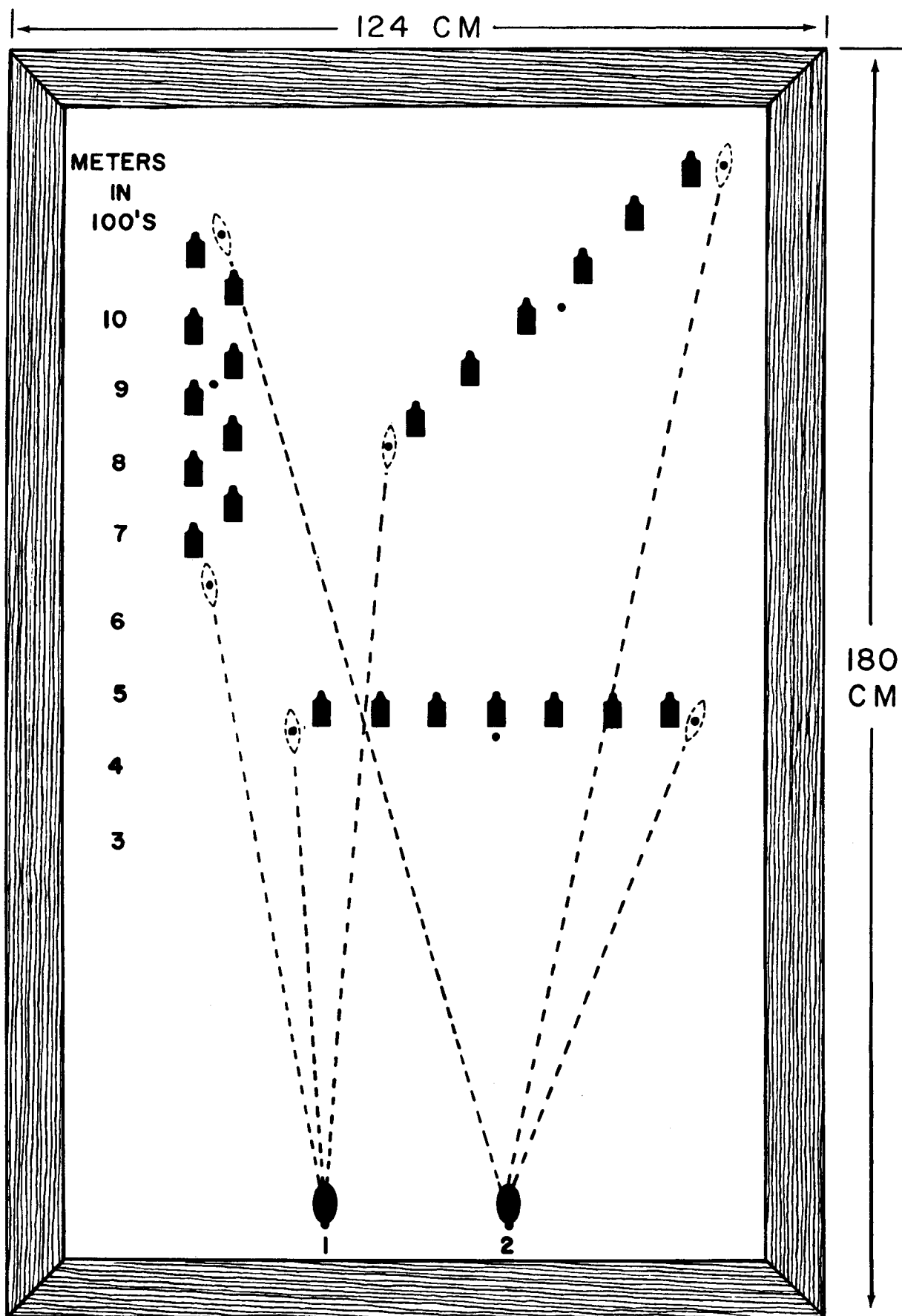


Figure 161. Punchboard for target engagement.

FIRE COMMANDS

_____ ALERT

_____ DIRECTION

_____ DESCRIPTION

_____ RANGE

_____ METHOD OF FIRE

 _____ A. MANIPULATION

 _____ B. RATE OF FIRE

_____ COMMAND TO OPEN FIRE

CRITIQUE

INITIAL LAY

DIRECTION AND

EXTENT OF MANIPULATION

RATE OF FIRE

CONTROL OF FIRE

NO.2. NO.1.

Figure 162. Lane NCO's critique chart.

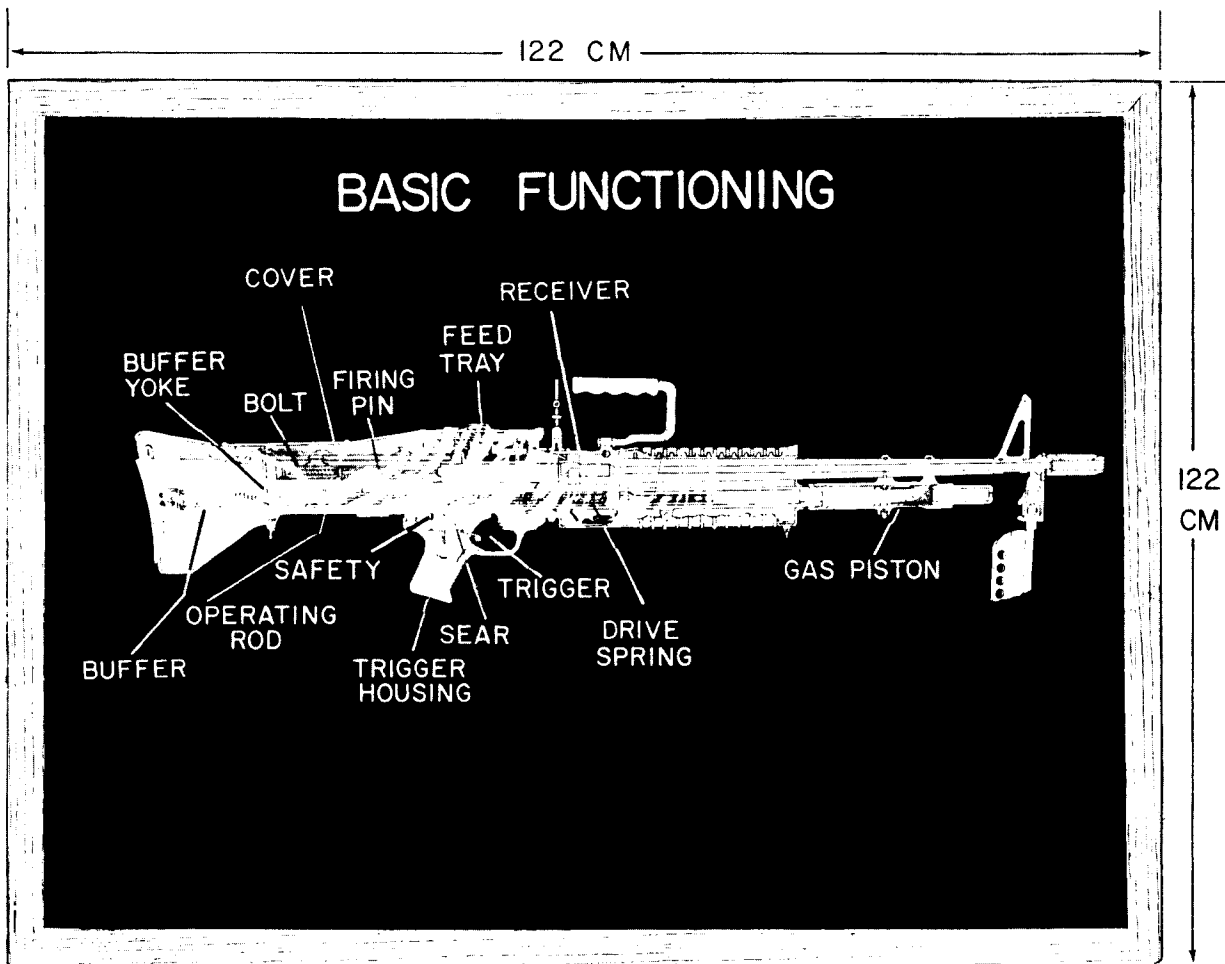


Figure 163. Basic functioning chart.

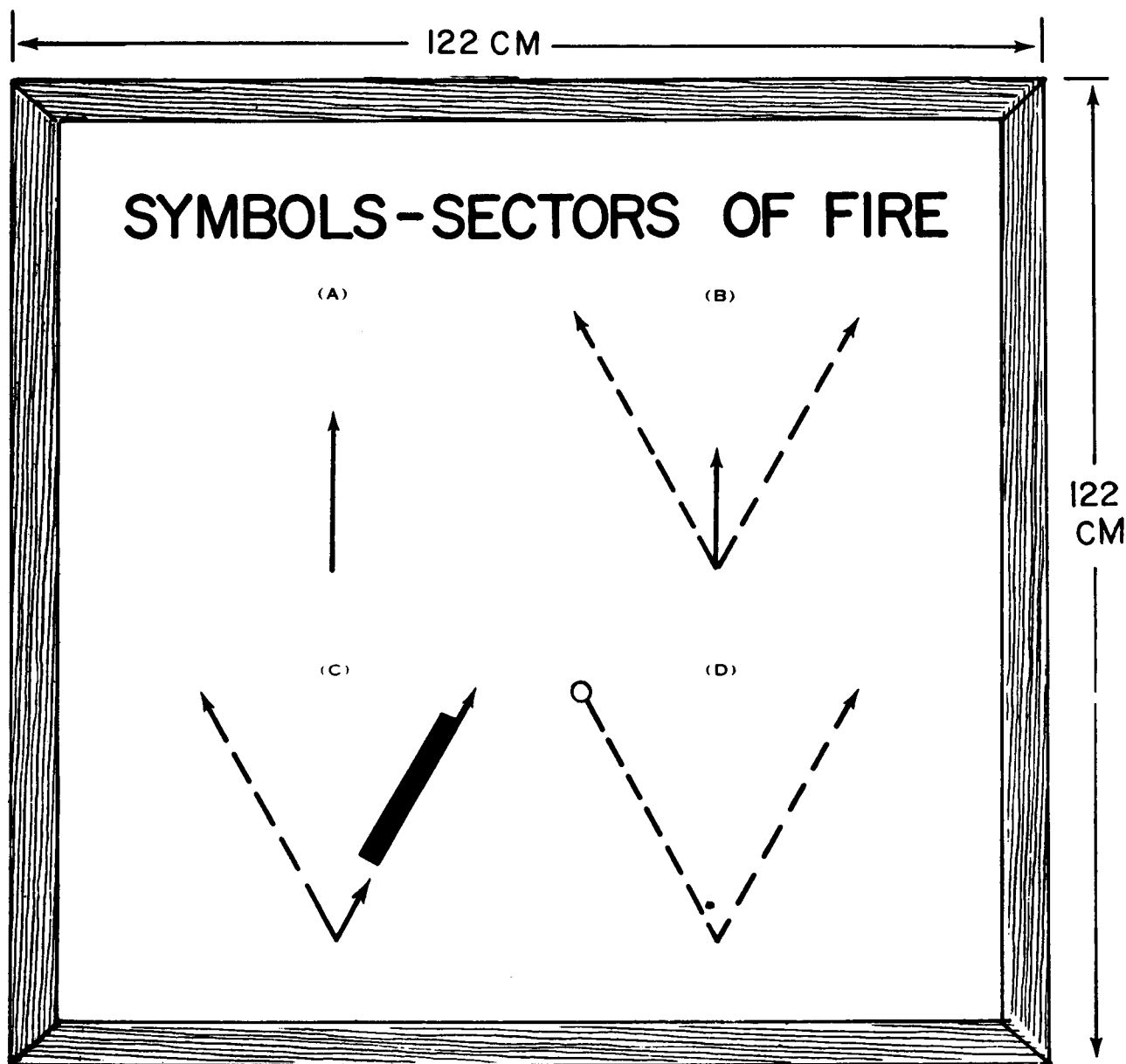


Figure 164. Military symbols—sectors of fire chart.

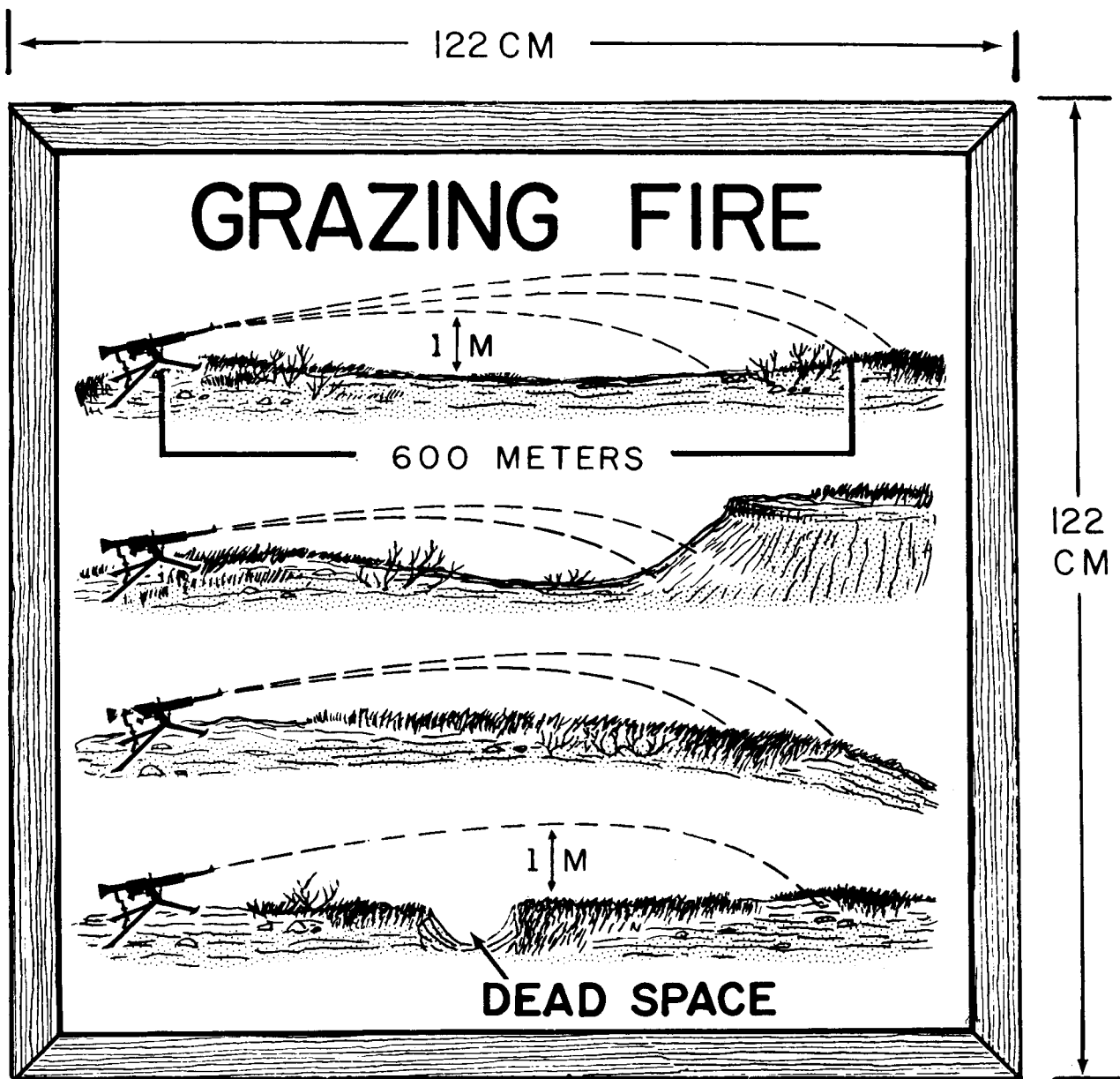


Figure 165. Grazing fire chart.

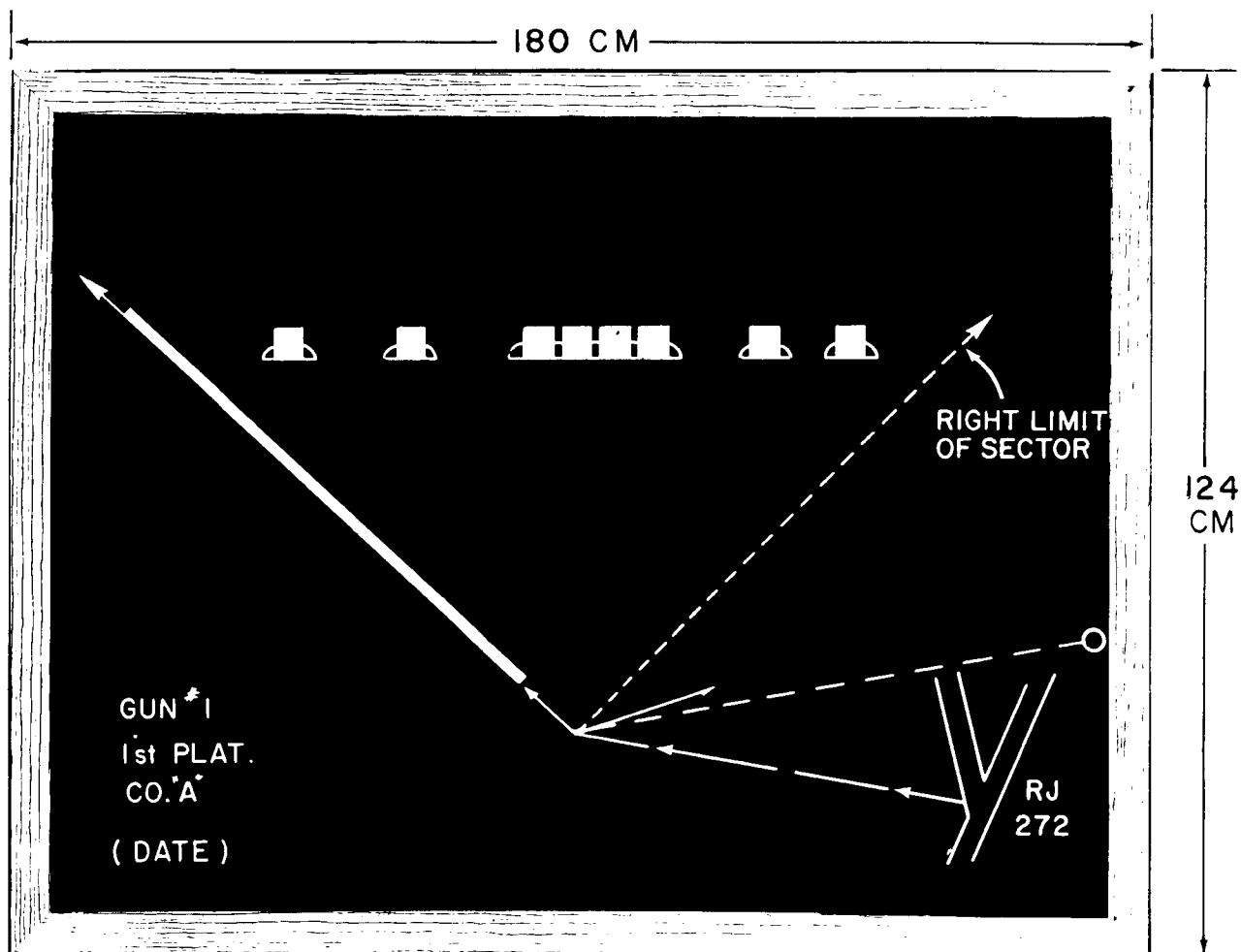


Figure 166. Range card blackboard.

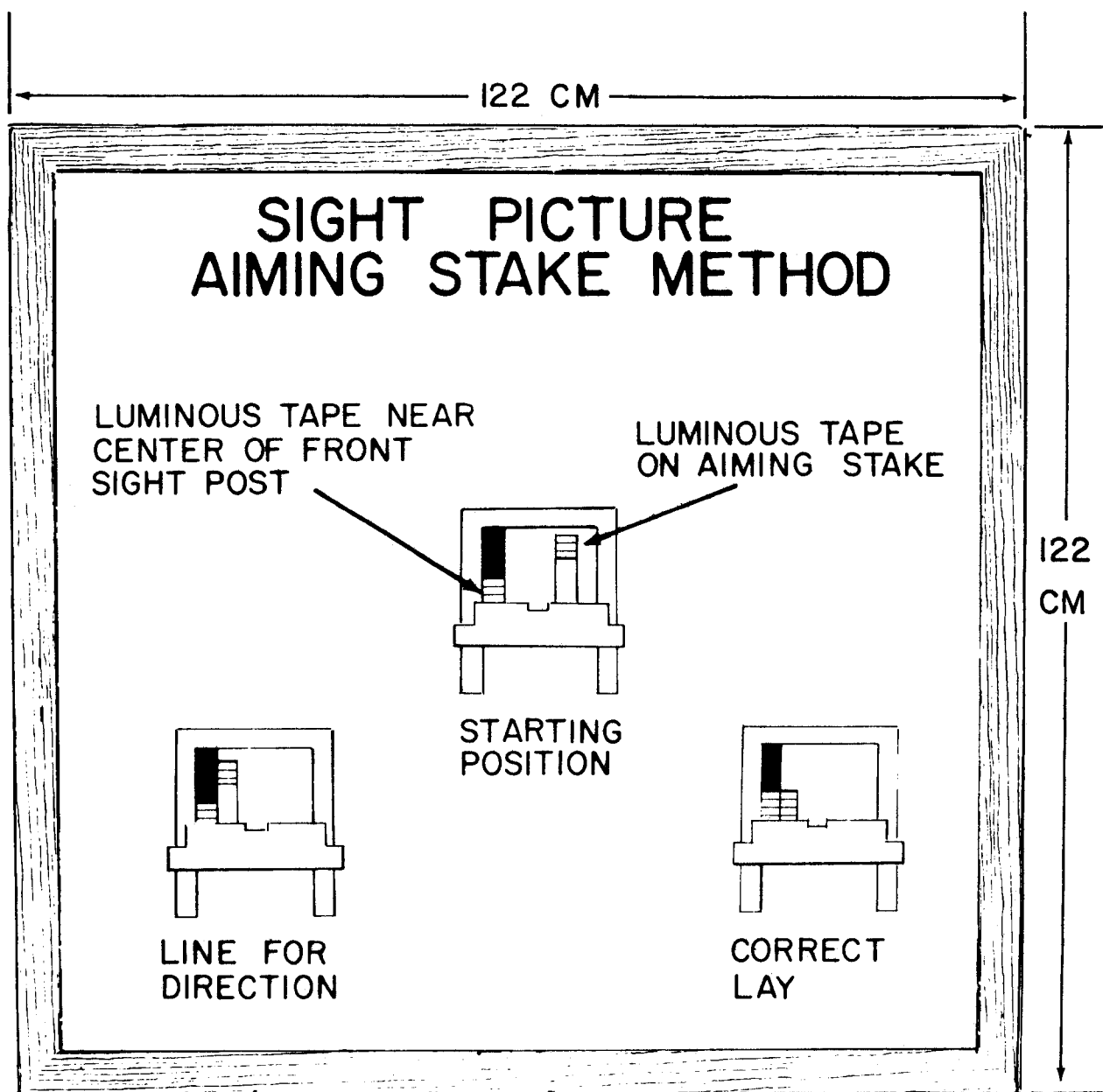


Figure 167. Sight picture, aiming stake method chart.

APPENDIX V

SAFETY

1. General

This appendix covers the safety precautions used to insure safe conditions on the ranges described in this manual. These safety precautions will assist the instructor in meeting the safety requirements for conduct of the training. They are intended as a guide only (checklist) and must be used in conjunction with Army and local regulations.

2. General Safety Precautions

The following safety precautions are recommended for all live firing prescribed in this manual.

- a.* Establish range clearance with range control.
- b.* Insure that a complete first aid box is on the range.
- c.* No firing will be conducted until the area has been sealed off by prescribed roadblocks, barriers, and necessary range guards.
- d.* Prior to firing, the OIC will insure that qualified medical personnel are located on the range or in a nearby area where they can be contacted quickly.
- e.* A check of the down range area prior to firing will be made to insure all personnel and equipment are clear of the area.
- f.* A red streamer will be displayed at the entrance of, or from a prominent location on, the range during all firing.
- g.* Firing limits will be indicated by red and white striped poles visible to all firers.
- h.* Prior to firing, all individuals will be shown the firing limits of the range and will be required to keep fires within them.
- i.* Prior to firing, all weapons will be checked by an officer or noncommissioned officer to insure that they are operational.
- j.* Ammunition will be drawn and issued only on command of the OIC. When two or more lots of ammunition are used for firing, it will be the responsibility of the OIC to insure that the lots are separated and properly identified so that positive identification can be made by lot numbers in case of an accident or malfunctions.
- k.* All ammunition must be protected from the direct rays of the sun.
- l.* No smoking is permitted near any ammunition, explosives, or flammables (TM 9-1903 and TM 10-1101).
- m.* All M60 machineguns will be kept in a prescribed area with bolt forward and safety on the SAFE position when not in use.
- n.* All individuals on the firing line will wear steel helmets.
- o.* Weapons will be loaded only on command of the OIC.
- p.* Weapons are always treated as if they are loaded and, therefore, will not be pointed at anyone.
- q.* Should an unsafe condition be noted while firing, the individual noting the unsafe act will immediately call CEASE FIRE and firing will not resume until directed by the OIC.
- r.* For the procedures involved in handling a runaway gun, see paragraph 41b.
- s.* Before the firing line is clear and anyone is allowed forward of it, all machineguns will be cleared. The procedure for clearing the machinegun is as follows:
 - (1) The gunner pulls the cocking handle to the rear, places the safety on the SAFE position, and pushes the cocking handle forward.
 - (2) He then raises the cover and inspects the chamber; if it is clear, he declares CHAMBER CLEAR.

- (3) At this time an assistant instructor runs a cleaning rod through the barrel until he sees the end of it in the chamber.
- (4) The assistant instructor then inspects the feedtray and receiver for rounds or links.
- (5) If the weapon is clear, the cover is closed, safety placed on the FIRE position, and the trigger pulled. After the bolt has gone forward, the safety is placed on the SAFE position and the procedure is complete.

t. No one will move forward of the firing line except on command from the OIC.

u. At the completion of all firings, weapons will be inspected by safety personnel to insure they are clear, and a check will be conducted to determine if any brass, links, or unexpended ammunition is in the possession of personnel.

v. Caution must be taken to insure that assistant gunners are not permitted to have their heads forward of the front sling swivel during firing. This is necessary in order to prevent the muzzle blast of the weapon from injuring the assistant gunner.

3. Basic (10-Meter) Firing

It is imperative that all personnel on this range are aware of the danger involved in moving forward of the firing line in order to analyze and score their targets. All weapons on the firing line must be cleared and this reported to the OIC. He will then declare the firing line cleared and tell the individuals to move to their targets. No weapon will be loaded until all assistant instructors have reported that all of their crews have returned to the firing line.

4. Transition Firing

If pit personnel are utilized on the transition range, the following special safety regulations must be adhered to:

a. Communication between each pit and the firing line must be established and maintained throughout firing.

b. Personnel will remain in the pits at all times unless directed otherwise by the OIC.

c. When personnel are down range and not in their pits, a red flag, clearly visible from the firing line, will be displayed in the vicinity of that pit.

d. If a red flag appears down range during firing, the command CEASE FIRE will be given immediately, and all weapons will be cleared.

5. Assault Firing

The following safety regulations apply to assault firing.

a. No one will move onto or forward of the firing line until ordered to do so by the OIC.

b. Gunners are restricted to firing in their own lanes. All lanes must be clearly marked.

c. Each gunner will be accompanied by a lane NCO. If any of the following conditions occur, the lane NCO will instruct the gunner to lock his weapon, keep it pointed down range, and continue moving through the course.

(1) The gunner gets too far ahead or behind the other gunners on line.

(2) The gunner moves out of the marked path in his lane.

(3) The gunner shoots wildly.

(4) The gunner stops for any reason at any point other than the first or second control lines.

d. If the gunner falls or stumbles, the lane NCO will secure the weapon, lock it, point it in the air down range, and direct the gunner to continue moving through the course.

e. If a weapon fails to fire, the gunner will continue to move. Immediate action is applied only at the firing line or the first or second control line. To apply immediate action, the weapon will be placed on the ground.

f. The lane NCO halts the gunner at the first and second control lines. At the first control line the gunner moves forward only on command from the OIC. At the second control line the weapons are cleared and unexpended ammunition is collected. Lane NCOs report in sequence to the OIC when their points are cleared.

g. A whistle is used as an emergency signal. If the whistle is blown any time during the conduct of an exercise, all gunners will halt, lock and point their weapons in the air, and wait for orders from the OIC.

6. Firing During the Hours of Darkness

When firing during darkness, the following special precautions apply.

a. A check of the down range area prior to firing will be made to insure all personnel and equipment are clear of the area. This will be

accomplished by asking twice over a public address system **IS THERE ANYONE DOWN RANGE?** Pause each time long enough to permit a response.

b. A blinking red light must be used in addition to the red streamer. It should be displayed

at the entrance to the range or at some other prominent location.

c. Firing limits must be marked by two red lights mounted on the striped poles. They must be visible to all firers.

d. No one will move from position until told to do so by the OIC.

APPENDIX VI

BLANK FIRING ATTACHMENT M13

1. General

The M13 blank firing attachment is designed for use on the M60 machinegun where live firing effects are desired, but live firing is not practical. With correct attachment and proper care, the M60 can effectively fire blank ammunition.

2. Attachment of the Blank Firing Attachment

In order to achieve optimum performance, the blank firing attachment must be adjusted to fit

the particular gun to which it is attached. The blank firing attachment is fitted so that the orifice tube fits inside the flash suppressor, against the muzzle, and flush with the forward end of the flash suppressor (figs. 168 and 169). When properly adjusted, the fit will be snug, thus preventing the escape of gas during firing. The blank firing attachment is manufactured with the distance at which the orifice tube is screwed into the orifice tube socket fixed by "pegging" the orifice tube socket. This fixed distance, set in the orifice tube socket, does not always provide the

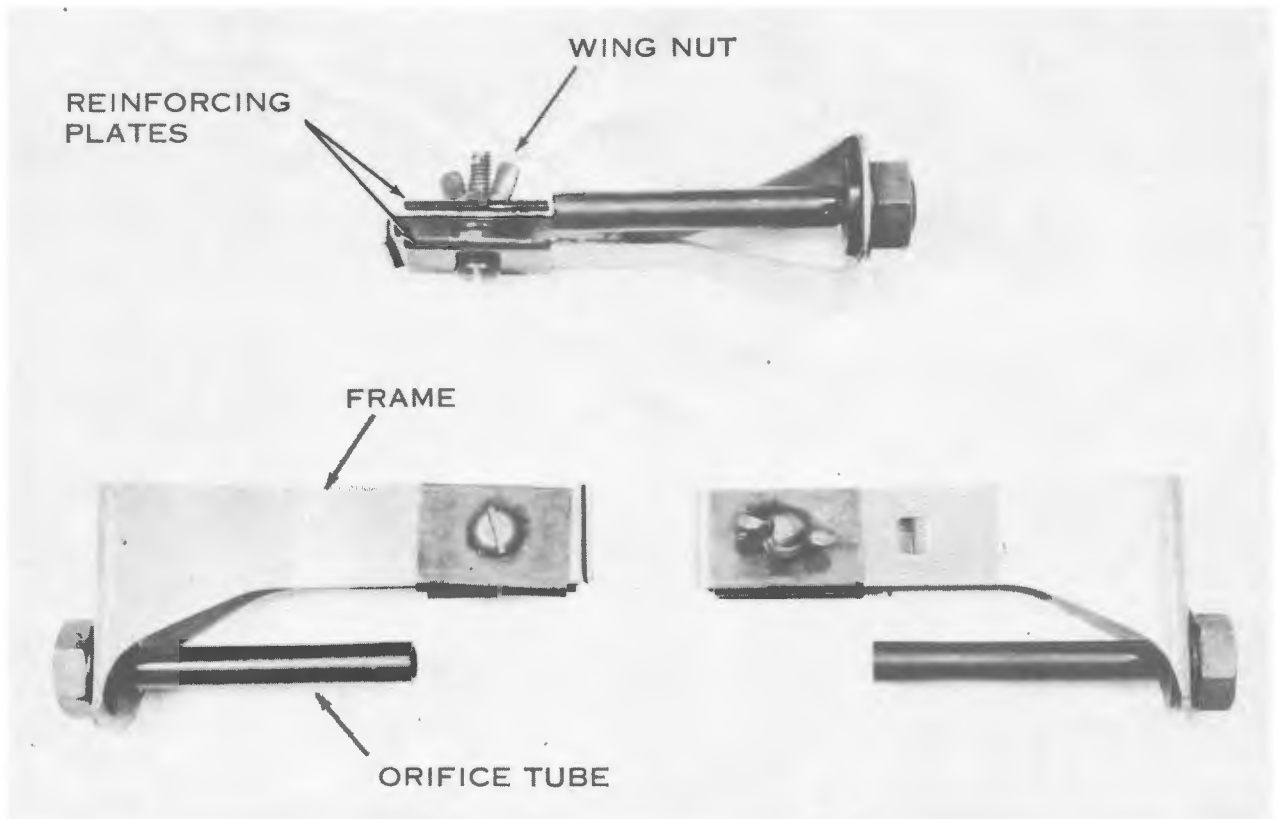


Figure 168. Blank firing attachment.

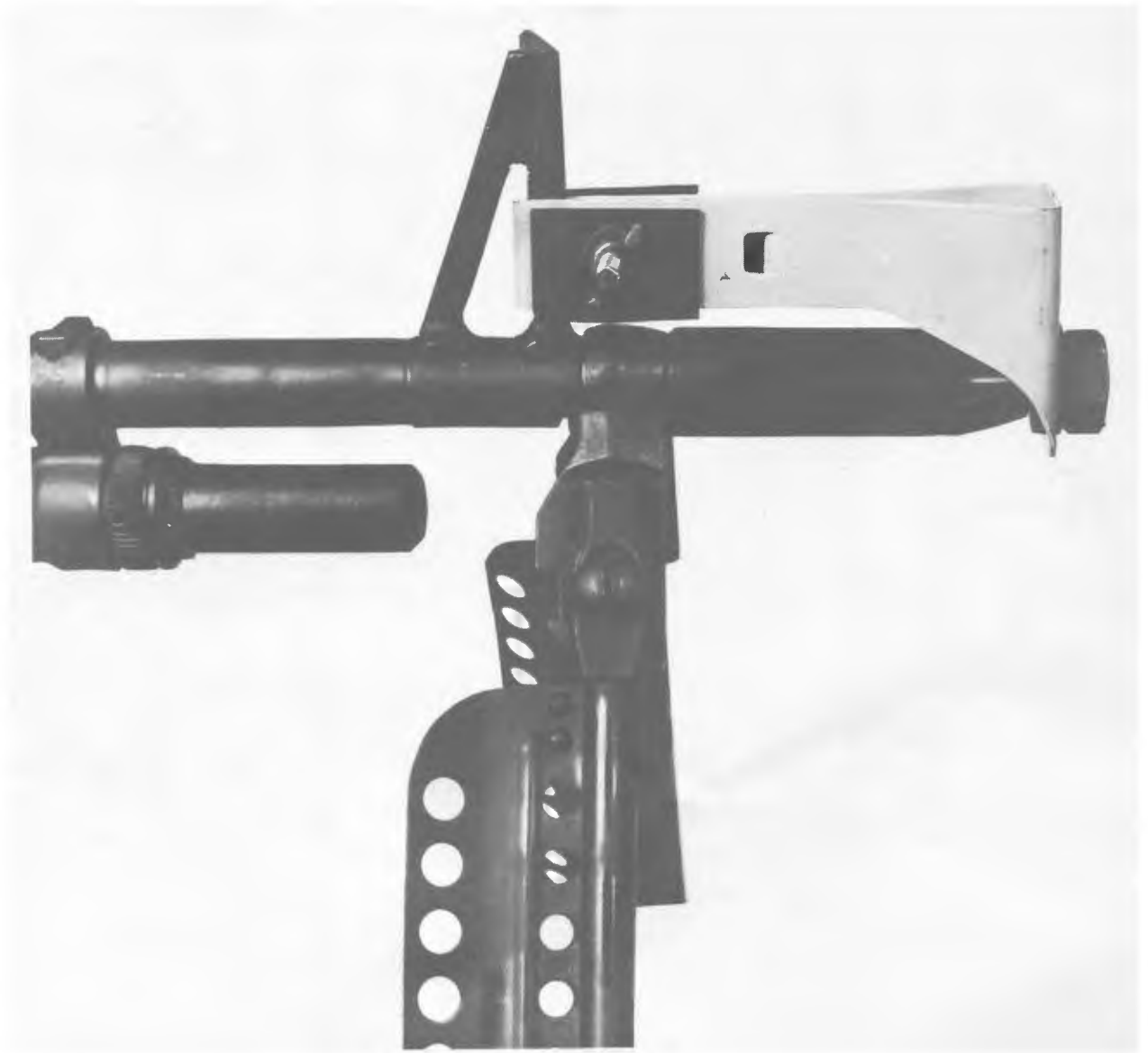


Figure 169. Blank firing attachment mounted on the M60.

correct adjustment for every weapon because the distance from the muzzle to the forward end of the flash suppressor varies from weapon to weapon. It is necessary in some instances to break the peg and then adjust the attachment to fit the particular machinegun. It is also important that the retaining nut be only "finger tight." If tightened too much, the retaining wingnut will cause the end of the blank firing attachment frame (which fits around the front

part of the front sight) to spread, thus loosening the fit of the blank firing attachment to the gun.

3. Care of the M60 Machinegun While Utilizing the Blank Firing Attachment

a. A buildup of carbon inside the weapon causes friction in the moving parts of the gun. Carbon deposits build up most rapidly in the

machinegun when used in the blank firing role. When these deposits become excessive, stoppages occur in the weapon. Keeping the machinegun (particularly the gas system) clean during blank firing is of utmost importance.

b. By applying the following procedures, stoppages will be minimized, and the best performance will be obtained.

- (1) Prior to firing, inspect the weapon for damaged parts, excessive wear, cleanliness, and proper lubrication.
- (2) Test fire the machinegun using ball ammunition, whenever feasible.
- (3) Adjust the blank firing attachment to fit the gun as described in paragraph 2 above. Use pliers to screw the orifice

tube either into or out of the frame of the blank firing attachment. When adjusted correctly, the portion of the blank firing attachment frame that fits around the front leg of the front sight (figs. 168 and 169) must be forced together so there is no forward or rearward movement of the blank firing attachment.

- (4) Apply proper immediate action when stoppages occur.
- (5) Clean the gas system after firing 500 rounds with one barrel.
- (6) Clean and lubricate the entire gun after firing 1000 rounds.

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By Order of the Secretary of the Army :

J. C. LAMBERT,
Major General, United States Army,
The Adjutant General.

Official :

HAROLD K. JOHNSON,
General, United States Army,
Chief of Staff.

Distribution :

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DCSPER (2)

ACSI (2)

DCSLOG (2)

ACSFOR (2)

CORC (2)

CRD (1)

COA (1)

CINFO (1)

TIG (1)

TSG (1)

CNGB (5)

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LOGCOMD (1)

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NG: State AG (3) ; units—same as Active Army except allowance is one copy to each unit.

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For explanation of abbreviations used, see AR 320-50.