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FM 17–69

WAR DEPARTMENT

ARMORED COMMAND FIELD MANUAL

CREW DRILL, SERVICE OF THE PIECE, AND GUNNERY

(75-MM ASSAULT HOWITZER ON MOTOR CARRIAGE M8)

30 November 1943

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ARMORED COMMAND FIELD MANUAL

CREW DRILL, SERVICE OF THE PIECE, AND GUNNERY

(75-MM ASSAULT HOWITZER ON MOTOR CARRIAGE, M8)

CHANGES No. 2

WAR DEPARTMENT
WASHINGTON 25, D. C., 24 January 1945

FM 17–69, 30 November 1943, is changed as follows:

■ 90. SENSING.—The observer calls * * * upon his recollection.

a. Every round must be sensed for range as one of the following (fig. 29):

* * * * *

AGO 453D--Jan. 622604°—45

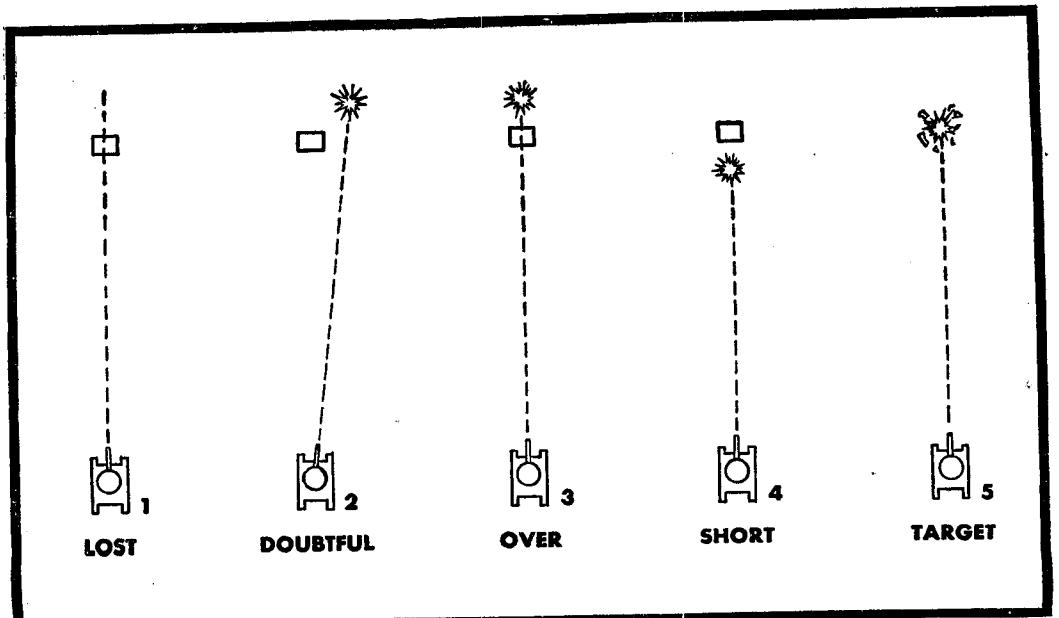


FIGURE 29.—The five basic sensings for range.

[AG 300.7 (23 Dec 44).]

BY ORDER OF THE SECRETARY OF WAR:

OFFICIAL:

J. A. ULIO
Major General
The Adjutant General

G. C. MARSHALL
Chief of Staff

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For explanation of symbols, see FM 21-6.

U. S. GOVERNMENT PRINTING OFFICE: 1945

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ARMORED COMMAND FIELD MANUAL

CREW DRILL, SERVICE OF THE PIECE, AND GUNNERY

(75-MM ASSAULT HOWITZER ON MOTOR CARRIAGE, M8)

CHANGES No. 1

WAR DEPARTMENT,
WASHINGTON 25, D. C., 31 May 1944.

FM 17–69, 30 November 1943, is changed as follows:

■ 96. METHODS OF INDIRECT FIRE.

* * * * * * *

c. (Added.) It is generally not desirable to lay an individual howitzer when the piece is not visible from the OP. However, the platoon may be laid to fire from a position not visible from the OP by use of the aiming circle and compass, or by the compass alone.

(1) By means of a compass, the observer measures the magnetic azimuth of the target from the OP. The target offset (angle T, fig. 36 and par. 99) is applied to this azimuth to determine the azimuth of the howitzer-target line, and the result is communicated to the howitzer position. When only one aiming circle is available, it is used at the howitzer position. The 0–3200 of the aiming circle line is laid on the howitzer-target azimuth and the howitzers are laid parallel as in paragraph 98.

(2) If the aiming circle is not available, the platoon commander or sergeant in charge at the firing position selects an object or definite terrain feature at least 1,500 yards away as an aiming point and measures the azimuth to it with a compass. He then takes the difference between this azimuth and the howitzer-target azimuth as the shift for the piece. The other howitzers are laid parallel to the howitzer just laid by the method of reciprocal laying (par. 98).

AGO 322D 585001°—44

Example 1:

Aiming point to right of howitzer-target line
Howitzer-target azimuth (from observer)_____ 1400
Azimuth of aiming point_____ 1600
Target is 1600—1400=200 mils left of howitzer-aiming point line.

Platoon commander commands:

No. _____ AIMING POINT
DEFLECTION 0
LEFT 200

Gunner sets 200 on the azimuth scale and lays on the aiming point.

Example 2:

Aiming point to left of howitzer-target line
Howitzer-target azimuth (from observer)_____ 1400
Azimuth of aiming point_____ 6000
Target is 1400+6400—6000=1800 mils right of howitzer-aiming point line.

Platoon commander commands—

No. _____ AIMING POINT.
DEFLECTION 0
RIGHT 1800

Gunner sets 1400 on the azimuth scale and lays on the aiming point.

(3) When a suitable aiming point is not available, the platoon commander or chief of section places himself at least 25 yards behind one of the howitzers, placing the M2 compass on a stake or other firm support and commands: No. _____ AIMING POINT THIS INSTRUMENT, DEFLECTION 3200. The gunner sets 3200 on his panoramic sight and lays on the compass. The platoon commander then measures the azimuth to the panoramic sight. This is the direction in which the tube is pointing. He takes the difference between the azimuth to the target and the azimuth to the sight and computes the deflection as in (2) above.

(4) The platoon commander may substitute aiming stakes for the compass as soon as he has read the azimuth of the sight. The gunner sets the announced deflection on his sight and lays on the compass or aiming stakes.

(5) When no aiming circle is available, only one howitzer is laid on the aiming point. The others are laid parallel to it by reciprocal laying (par. 98).

■ 98. LAYING HOWITZERS PARALLEL.

* * * * *

c. With the azimuth index set at zero and the micrometer index set at zero he lays the vertical crosshair on the target, using the lower motion of the aiming circle. He clamps the lower motion in position.

d. The observer commands * * * "Aiming point identified."

* * * * *

m. (Added.) The howitzers may be laid paralled when the platoon commander or noncommissioned officer in charge has an aiming circle and is furnished the magnetic azimuth of the howitzer-target line. In this case he subtracts the azimuth of the howitzer-target line from 6400, sets the resulting difference on the azimuth scale of the aiming circle and azimuth micrometer scale. With the lower motion and orienting knob, he then turns the whole aiming circle head, having first released the needle, until the needle is opposite its index. The 0–3200 line of the instrument is now parallel to the howitzer-target line and laying of the howitzers is accomplished as described in *c* to *k* above

■ 99. CORRECTING FOR POSITION OF OBSERVER.—If the observer * * * howitzers (fig. 36). The amount of the shift is called the target offset. The target offset *T* is equal to the amount of shift *T'* (fig. 36). If the observer is to the left of the howitzer-target line, the shift is left. If the observer is to the right of the howitzer-target line, the shift is right. In laying with the method prescribed in paragraph 96c, the target offset is applied to the observer-target azimuth to obtain the azimuth of the howitzer-target line. The observer always applies the offset to the observer-target azimuth before sending it to the howitzer position. In this case, if the observer is to the left of the howitzer-target line, the howitzer-target azimuth is determined by subtracting the angle *T* from the observer-target azimuth. If he is to the

right of the howitzer-target line, the howitzer-target azimuth is determined by adding the angle *T* to the observer-target azimuth.

[A. G. 300.7 (25 May 44).]

BY ORDER OF THE SECRETARY OF WAR:

G. C. MARSHALL,
Chief of Staff.

OFFICIAL:

J. A. ULIO,
Major General,
The Adjutant General.

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As prescribed in paragraph 9a, FM 21–6: except D2, 17 (10); I Bn H7 (5); I Bn 2 (5); IC 2, 7 (10).
I R 7: T/O 7–21, Armd Inf Regt;
I Bn 2: T/O 2–25, Cav Rcn Sq (Mecz);
I Bn 7: T/O 7–25, Armd Inf Bn;
I C 2: T/O 2–28, Assault Gun Trs, Cav Rcn Sq, Mecz;
I C 7: T/O 7–26, Hq Co, Armd Inf Bn.
For explanation of symbols, see FM 21–6.

U. S. GOVERNMENT PRINTING OFFICE: 1944

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FM 17–69

ARMORED COMMAND FIELD MANUAL

CREW DRILL, SERVICE OF THE PIECE, AND GUNNERY

(75-MM ASSAULT HOWITZER ON MOTOR CARRIAGE M8)

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UNITED STATES
GOVERNMENT PRINTING OFFICE
WASHINGTON : 1943

WAR DEPARTMENT,
WASHINGTON 25, D. C., 30 November 1943.

FM 17–69, Armored Command Field Manual, Crew Drill, Service of the Piece, and Gunnery (75-mm Assault Howitzer on Motor Carriage M8), is published for the information and guidance of all concerned.

[A. G. 300.7 (20 Oct 43).]

BY ORDER OF THE SECRETARY OF WAR:

G. C. MARSHALL,
Chief of Staff.

OFFICIAL:

J. A. ULIO,
Major General,
The Adjutant General.

DISTRIBUTION:

D 2, 17 (10); IBn and H 2, 7 (5); IC 2, 7 (10).
(For explanation of symbols see FM 21–6.)

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ARMORED COMMAND FIELD MANUAL

CREW DRILL, SERVICE OF THE PIECE, AND GUNNERY (75-MM ASSAULT HOWITZER ON MOTOR CARRIAGE M8)

CHAPTER 1

ASSAULT HOWITZER SECTION

SECTION I

GENERAL

■ 1. PURPOSE AND SCOPE.—This manual is designed to present instructional material for the platoon leader and chief of section in training members of the 75-mm self-propelled assault howitzer section and the platoon ammunition section. It is to be used as a guide to achieve precision, accuracy, and speed in gunnery and the service of the piece, and orderly, disciplined, and efficient mounted and dismounted action.

■ 2. REFERENCES.—See appendix.

■ 3. DEFINITION.—The howitzer section is composed of one howitzer and motor carriage with trailer, and the personnel and equipment required to serve the weapon. The assault howitzer platoon, armored infantry, consists of three howitzer sections and one ammunition section. The assault gun platoon, mechanized cavalry consists of two gun sections and an ammunition section.

■ 4. MATÉRIEL.—*a. Motor carriage M8.*—This is an armored, full-track vehicle with mechanical characteristics similar to those of the light tank M5. (See TM 9–732B.)

b. 75-mm assault howitzer.—The tube and breech assemblies of the piece are, with minor modifications, the same as those of the 75-mm pack howitzer M1A1. (See TM 9–321 and 9–732B.)

c. Sighting equipment.—(1) The sighting equipment used with the howitzer includes a panoramic telescope, a direct vision telescope, and an open sight for emergency use.

(2) The panoramic telescope is connected to the gun so that it is elevated or traversed with it. This telescope can also be operated in either a horizontal or a vertical direction independently of the gun to permit indirect laying.

(3) A three-power telescope is mounted on the gun cradle for direct laying. Markings on the reticle indicate range when sighting.

(4) There is an open sight on the panoramic telescope for use in emergencies.

d. Ammunition trailer.—The carriage tows a two-wheeled trailer from a pintle in the rear.

e. Armament.—Besides the howitzer, the armament of the carriage M8 consists of one caliber .50 machine gun in an antiaircraft (ring) mount and provided with a ground mount for dismounted action. The individual weapons of the chief of section, gunner and loader are carbines, caliber .30, M1; the driver is armed with a caliber .45 submachine gun.

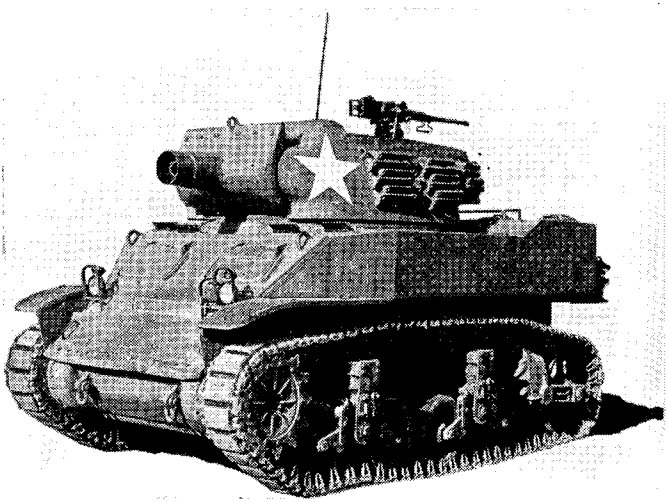


FIGURE 1.—75-mm assault howitzer on motor carriage M8.

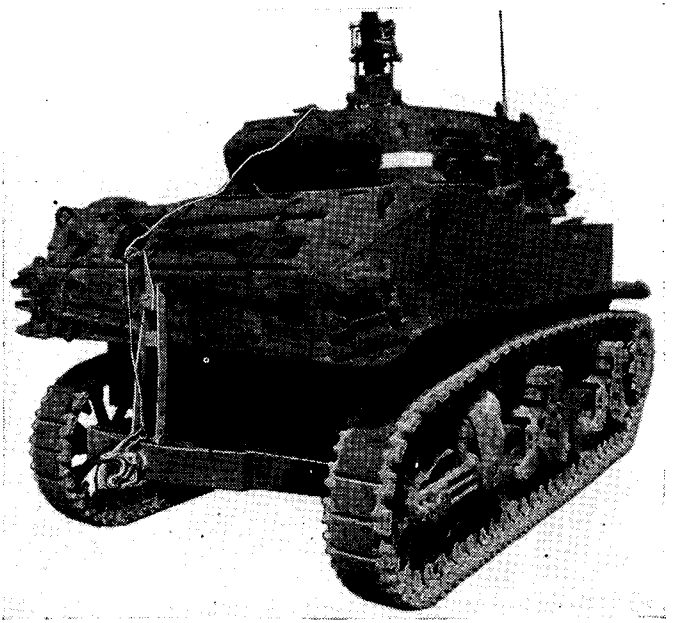


FIGURE 2.—Rear view of motor carriage M8, showing quick release hitch for trailer.

SECTION II

SECTION COMPOSITION AND FORMATIONS

■ 5. COMPOSITION.—An assault howitzer section consists of the following:

1 Chief of section ..... CHIEF
1 Corporal gunner ..... GUNNER
1 Loader ..... LOADER
1 Driver, assault howitzer carriage ..... DRIVER

■ 6. FORMATIONS.—*a. Dismounted posts.*—The crew forms in one rank (fig. 3). The chief of section takes post 2 yards in front of the right track of the howitzer carriage, facing the front. The corporal gunner, loader, and driver of the carriage, in that order, take posts on his left at close interval.

b. Mounted posts.—The howitzer section forms mounted as follows:

(1) *Chief of section.*—In the turret of the howitzer carriage, at the right of the piece, facing the front.

(2) *Corporal gunner.*—In the assistant driver's seat of the howitzer carriage.

(3) *Loader.*—On the howitzer carriage, inside the antiaircraft (ring) mount of the caliber .50 machine gun.

(4) *Driver of howitzer carriage.*—In the driver's seat.

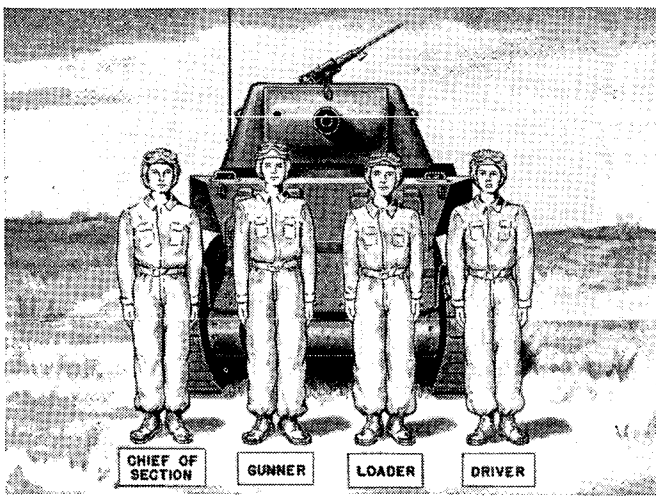


FIGURE 3.—Dismounted posts, howitzer section.

c. Action posts.—Posts of the howitzer section in action are shown in figure 4.

(1) *Chief of section.*—Inside antiaircraft mount of carriage.

(2) *Gunner.*—In turret on right of piece.

(3) *Loader.*—In turret on left of piece.

(4) *Driver.*—In driver's seat of carriage.

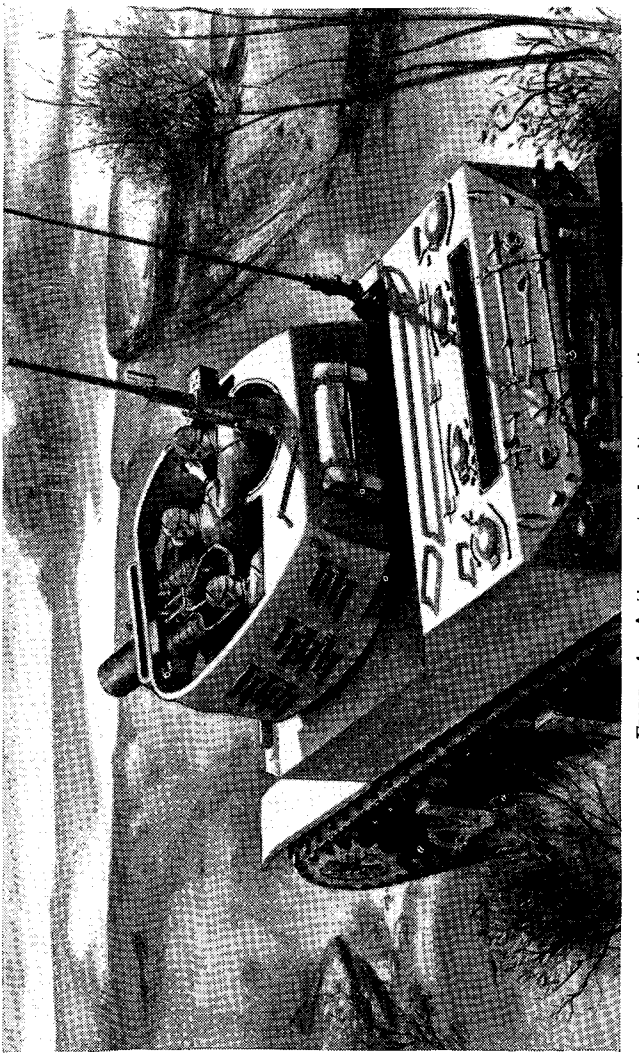


FIGURE 4.—Action posts, howitzer section.

SECTION III

SECTION CONTROL

■ 7. INTERPHONE SYSTEM.—*a.* The motor carriage M8 is equipped with an SCR–510 radio and an interphone system. The system uses a separate interphone amplifier BC–367. There are control boxes at each position to which each member of the howitzer section connects his head set and microphone.

b. The howitzer section must practice continually with the interphone to obtain its maximum value during combat. Use the interphone whenever the carriage is operated. After mounting, always put on and test head sets and microphones according to the following procedure:

(1) Chief of section—

(*a*) Turns OFF-ON switch of radio receiver SCR–510 (right sponson) to ON.

(*b*) Turns OFF-ON switch of interphone amplifier (right rear sponson) to ON. (Allow 30 seconds for tubes to warm on receiver and interphone amplifier.)

(*c*) Throws channel switch of radio to desired channel (A or B).

(2) Each member of the section inserts the plugs of the short cords extending from his head set and microphone to the break-away plugs of the extension cords leading from his control box.

(3) The chief of section turns his RADIO-INTERPHONE switch to INTERPHONE, depresses the switch of his microphone cord and orders: CHECK INTERPHONE. Each member of the section, in the following order, gunner, loader, driver, depresses his microphone switch and reports "Ready" to the chief of section. The chief of section then moves his control box switch to RADIO and checks radio reception, adjusting the volume at a satisfactory level.

(4) The RADIO-INTERPHONE switches on all control boxes, except that of the chief of section, should be set on RADIO at all times. The switch on control box of the chief of section may be set on either RADIO or INT according to the type of communication desired by him. With the control boxes set in this manner all crew members can hear the

conversation on the radio. If one member wishes to talk to another member of the section, he switches his control box to INT after making sure the chief of section is not transmitting on the radio. Any control box switched to INT kills the radio transmitter. If the chief of section wishes to talk to his crew without transmitting over the radio, he switches his box to INT. If he wants to transmit over the radio, he switches to RADIO.

(5) Volume control for the interphone system is adjusted on installation, but changes may be made on the amplifier panel with a screw driver.

c. It is the duty of each man to check his interphone equipment immediately upon mounting the carriage, see that it is properly maintained, and report any difficulties to the chief of section.

d. Definite control commands and terminology are set forth in paragraph 8. The desirability and necessity of adhering to this specific language cannot be overemphasized. General conversation on the interphone causes misunderstanding and disorder and is harmful to discipline.

■ 8. INTERPHONE LANGUAGE.—*a. Terms.*

Chief of section	CHIEF
Gunner	GUNNER
Loader	LOADER
Driver	DRIVER
Any tank	TANK
Armored car	ARMORED CAR
Any unarmored vehicle	TRUCK
Any antitank gun	ANTITANK
Infantry	DOUGHS
Machine gun	MACHINE GUN
Airplane	PLANE
High explosive	HE
High explosive antitank	HEAT
Smoke	SMOKE

b. Commands for movement of the carriage.

To move the carriage forward.	DRIVER MOVE OUT
To halt the carriage	DRIVER STOP
To reverse the carriage	DRIVER REVERSE

To decrease speed	DRIVER SLOW DOWN
To turn right 90°	DRIVER CLOCK 3—STEADY . . . ON
To turn left 60°	DRIVER CLOCK 10—STEADY . . . ON
To turn right (left) 180°	DRIVER CLOCK 6 RIGHT (LEFT)—STEADY . . . ON
To have driver move toward a terrain feature or reference point; the carriage being headed in the proper direction.	DRIVER MARCH ON WHITE HOUSE (HILL, DEAD TREE, ETC.)
To follow in column	DRIVER FOLLOW THAT TANK (DRIVER FOLLOW TANK NO. B–9)
To follow on road or trail	DRIVER RIGHT ON ROAD (DRIVER RIGHT ON TRAIL)
To start engine	DRIVER CRANK UP
To stop the engine	DRIVER CUT ENGINE
To proceed at same speed	DRIVER STEADY

c. Commands for control of turret.

To traverse the turret	TRAVERSE LEFT (RIGHT)
To stop turret traverse	STEADY . . . ON

d. Fire orders.—See chapter 3.

SECTION IV

CREW DRILL

■ 9. TO FORM ASSAULT HOWITZER SECTION.—*a.* Being dismounted the howitzer section takes dismounted posts (fig. 3) at the command FALL IN. If it is desired that the section form at the side or rear of the vehicle, the chief of section takes his post at the designated point and orders: FALL IN. The section falls in on his left in the same order.

b. To call off.—The crew being at dismounted or mounted posts, at the command CALL OFF, the members of the section call off their designations in the order given in paragraph 5.

c. The crew being at dismounted posts, at the command, FALL OUT, the section breaks ranks. Members of the section habitually fall out to the right of the vehicle unless the command includes TO THE LEFT or other instruction.

■ 10. TO CHANGE DESIGNATIONS AND DUTIES DURING DRILL.—The crew being at dismounted posts, to change designations and duties during drill, the command is: FALL OUT, CHIEF (GUNNER) (LOADER).

a. At the command—

(1) The man designated to fall out moves at double time by the rear to the left flank position and becomes DRIVER.

(2) The members of the section on the left of the vacated post move smartly to the right, one position, and call off their new designations. (See par. 9*b*.)

b. The movement may be executed by ordering any member or members of the section to fall out except the driver.

■ 11. TO MOUNT ASSAULT HOWITZER SECTION.—The section, being at dismounted posts or dismounted, is mounted at the command or signal MOUNT. At the command or signal, the section mounts as follows:

a. The driver and loader by way of the left sponson of the carriage and the gunner and section leader by way of the right sponson of the carriage in the order named, and take their mounted posts.

b. Immediately after mounting, the interphone system is tested (see par. 7).

c. The command MOUNT may be preceded by the command PREPARE TO MOUNT.

■ 12. TO DISMOUNT ASSAULT HOWITZER SECTION.—The section being at mounted posts or mounted, is dismounted without vehicular weapons at the command or signal PREPARE TO DISMOUNT; DISMOUNT. At the preparatory command, earphones and microphones are disconnected at the break-away plugs. At the command of execution, members of the section dismount in reverse of the order prescribed in paragraph 11 and take their dismounted posts.

■ 13. TO DISMOUNT THROUGH BOTTOM ESCAPE DOOR.—The howitzer section being at mounted posts or action posts, is dismounted without vehicular weapons at the command

DISMOUNT THROUGH BOTTOM ESCAPE. At the command or signal, the section dismounts as follows:

a. The gunner moves the assistant driver's seat forward and detaches the back rest. He lifts the floor panel, detaches the spare parts box, releases and drops the bottom escape door, and dismounts.

b. The chief of section leaves the carriage in the same manner as the gunner.

c. The loader and driver, in that order, move over to the right of the turret and follow the chief of section out of the vehicle.

d. After leaving the carriage, the crew members of the section assume their dismounted posts (see note, par. 41).

■ 14. TO MOUNT THROUGH BOTTOM ESCAPE DOOR.—(The bottom escape door must be open.) The crew being at dismounted posts or dismounted, is mounted at the command MOUNT THROUGH BOTTOM ESCAPE. At the command or signal, crew members mount in reverse of the order prescribed in paragraph 13. The gunner replaces the door, the spare parts box and floor panel, attaches the back rest of the assistant driver's seat, and members of the section assume their mounted posts.

■ 15. TO OPEN OR CLOSE HATCHES.—*a. To open hatches.*—The hatches being closed, at the command OPEN HATCHES, the driver and gunner open their respective hatches and lock them in that position.

b. To close hatches.—The hatches being open, at the command CLOSE HATCHES, the driver and gunner close their respective hatches.

SECTION V

MOUNTED ACTION

■ 16. AMMUNITION TRAILER.—The armored ammunition trailer towed by the M8 carriage should never be allowed to handicap the section in mounted action. It should be parked near the firing position of the section, under cover if practicable.

■ 17. TO RELEASE TRAILER.—*a.* Upon the command RELEASE TRAILER, the driver stops the carriage. The gunner and loader

dismount, set the trailer brakes, drop the folding trailer support stand, and release the lunette ring from the pintle. The chief of section orders the necessary movement of the carriage. The loaded trailer is too heavy to be man-handled by the men available in the howitzer section. Therefore, care must be taken to halt at the place where it is desired to park the trailer.

b. When the carriage and trailer are in motion, and circumstances do not permit stopping the vehicles to release the trailer as in *a* above, the chief of section or, if he is a casualty, the next senior member of the section, will pull the quick release hitch to disconnect the trailer from the carriage. This is an emergency measure and should be taken *only if the security of the howitzer section depends upon the release of the towed load.*

■ 18. TO PREPARE FOR ACTION.—In combat, PREPARE FOR ACTION will be executed before leaving bivouac area. The section being mounted, at the command or signal PREPARE FOR ACTION, the section proceeds as follows:

a. Chief of section.—(1) Checks head space and half loads antiaircraft machine gun.

(2) Supervises preparation for action of all members of the section.

(3) Receives crew report; reports "Ready."

b. Gunner.—(1) Closes hatch and moves to turret.

(2) Assisted by loader, removes breech cover.

(3) Checks operation of traversing mechanism.

(4) Checks operation of elevating mechanism.

(5) Adjusts sights.

(6) Checks firing mechanism.

(7) Checks recoil cylinders.

(8) Locks turret traversing lock.

(9) Reports "Gunner ready."

c. Loader.—(1) Moves from ring mount to left side of piece.

(2) Assists gunner in removing breech cover and places it on floor directly beneath the breech.

(3) Operates breech mechanism and examines breechblock, chamber, and bore, cleaning any parts requiring it; closes breech.

(4) Checks ammunition for 75-mm howitzer and antiaircraft machine gun.

(5) Locks howitzer traveling lock.

(6) Helps gunner check recoil cylinder.

(7) Replaces breech cover.

(8) Reports "Loader ready."

d. Driver.—(1) Removes muzzle cover.

(2) Swabs bore and places crosshairs on 75-mm howitzer.

(3) Makes vehicle inspection as prescribed for the vehicle.

(4) Checks periscope and hatch.

(5) Reports "Driver ready."

■ 19. PREPARE TO FIRE.—When action is imminent, PREPARE TO FIRE will be executed. The section being mounted and prepared for action, at the command PREPARE TO FIRE, the section proceeds as follows:

a. Chief of section.—(1) Fully loads the antiaircraft machine gun.

(2) Supervises preparation to fire of all crew members.

(3) Receives crew report; reports "Ready."

b. Gunner.—(1) Assists loader in removing breech cover.

(2) Unlocks turret traversing lock.

(3) Removes panoramic telescope from its case and seats it in telescope mount.

(4) Uncovers telescope mount bubbles, sets deflection at zero, angle of site at 300, elevation at zero; sets the indexes on the telescope rotating head at zero, and levels both bubbles.

(5) Checks sights for cleanliness.

(6) Sets safety switch on solenoid box to ON position.

(7) Reports "Gunner ready."

c. Loader.—(1) Assists gunner in removing breech cover.

(2) Unlocks howitzer traveling lock.

(3) Opens breech.

(4) Pulls safety lever to fire position.

(5) Connects power cable to electrical firing mechanism.

(6) Unlocks ammunition rack and inspects ammunition.

(7) Assembles sponge and rammer.

(8) Assembles aiming stakes if ordered by the chief of section.

(9) Reports "Loader ready."

d. Driver.—(1) Closes hatch.

(2) Reports "Driver ready."

■ 20. SECURE GUNS.—When action is suspended for any length of time and a movement of some distance is to be made, SECURE GUNS will be executed. The section being mounted and prepared to fire, at the command SECURE GUNS the section proceeds as follows:

a. Chief of section.—(1) Unloads and half loads antiaircraft machine gun.

(2) Receives crew report; reports "Ready."

b. Gunner.—(1) Sets safety switch on solenoid box to OFF position.

(2) Locks turret traversing lock.

(3) Sets deflection of panoramic telescope at zero, site at 300, elevation at zero; sets indexes on rotating head at zero and covers both bubbles.

(4) Removes panoramic telescope from mount and returns it to the case.

(5) Reports "Gunner ready."

c. Loader.—(1) Inspects and closes breech.

(2) Checks and refills ready rack.

(3) Locks howitzer traveling lock.

(4) Reports "Loader ready."

d. Driver.—(1) Opens hatch.

(2) Reports "Driver ready."

■ 21. OUT OF ACTION.—Upon arrival in the park or bivouac area OUT OF ACTION will be executed except for those weapons to be used for security. At the command OUT OF ACTION, the section proceeds as follows:

a. Chief of section.—(1) Supervises work of the members of the section.

(2) Inspects matériel; makes sure the howitzer is not loaded and that traveling locks are locked.

(3) Cleans antiaircraft machine gun.

(4) Checks radio.

(5) Checks to see that ammunition, fuel, and other supplies are replenished.

(6) Receives crew report; reports "Ready" to the platoon leader or reports the supply requirements of the section.

b. Gunner.—(1) Sets safety switch on solenoid box at OFF position.

(2) Checks elevating and traversing mechanism.

(3) Checks sights.

(4) Locks turret traversing lock.

(5) Checks recoil cylinders.

(6) Checks firing mechanism.

(7) Cleans breechblock.

(8) Reports "Gunner ready."

c. Loader.—(1) Inspects chamber and closes breech.

(2) Disconnects power cable from electrical firing mechanism and places it under the floor.

(3) Locks howitzer traveling lock.

(4) Swabs bore of howitzer.

(5) Checks ammunition.

(6) Disassembles rammer and places it in carrying position.

(7) Disassembles aiming stakes.

(8) Assisted by gunner replaces breech cover.

(9) Reports "Loader ready."

d. Driver.—(1) Makes vehicle inspection as prescribed for the vehicle.

(2) Checks bottom escape hatch.

(3) Checks periscope and hatch.

(4) Replaces muzzle cover.

(5) Reports "Driver ready."

SECTION VI

DUTIES IN FIRING

■ 22. GENERAL.—In general, the duties of all members of the section in firing are as follows:

a. Chief of section.—Supervises and is responsible for the actions of all members of the section. When operating individually, the chief of section is an individual commander and acts accordingly, using his initiative in conduct of fire. Sees that all commands are executed rapidly and accurately and that all safety precautions are observed. Mans caliber .50 machine gun in case of attack.

b. Gunner.—Lays for direction and range (elevation), and fires the piece.

c. Loader.—Operates the breech, loads the piece, and inspects and cleans ammunition.

d. Driver of assult howitzer carriage.—Moves and places vehicle on order of the chief of section.

■ 23. CHIEF OF SECTION, ENUMERATION OF DUTIES.—*a. Direct laying.*—(1) Gives the fire orders and directs the fire of the piece. (See FM 17–12 for fire orders.)

(2) Determines ranges to critical points.

(3) Reports errors and other unusual incidents of fire to the platoon commander.

(4) Records basic data.

(5) Observes and checks frequently the functioning of the matériel.

(6) Mans the caliber .50 machine gun in case of attack.

(7) Operates the radio.

(8) Measures the minimum elevation and minimum range.

b. Additional duties in indirect laying.—(1) Measures the elevation (range).

(2) Follows fire orders.

(3) Indicates when the piece is ready to fire.

(4) Indicates to the gunner the aiming point or referring point.

■ 24. DETAILED DESCRIPTION OF CERTAIN DUTIES OF CHIEF OF SECTION.—*a. To give fire orders and direct fire of the piece.*—See paragraph 93 and FM 17–12 for the procedure to be followed in giving fire orders and directing the fire.

b. To determine ranges to critical points.—After the howitzer has been established in position, the chief of section will determine ranges by estimation or measurement to critical points in his target area for use in subsequent firing.

c. To report errors and other unusual incidents of fire to platoon commander.—If for any reason the piece cannot be fired, the chief of section will report promptly to the platoon commander that fact and the reason therefor; for example, "No. (so and so) out, misfire." Whenever it is discovered that the piece has been fired with an error in laying, the chief of section will report that fact at once; for example, "No. (so and so) fired (so many) mils left (right)." In indirect laying, whenever the gunner reports that the aiming stakes are out of alignment with the sight, the chief of

section will report that fact and request instructions. Likewise, other unusual incidents that affect the service of the piece are promptly reported by the chief of section.

d. To record basic data.—Data of a semipermanent nature will be recorded in a notebook by the chief of section. This includes such data as minimum elevation, aiming points used, ranges, and number of rounds fired. The chief of section normally does not record fire commands.

e. To observe and check functioning of matériel.—The functioning of all parts of the matériel will be observed closely during firing. Before the piece is fired, the chief of section verifies the fact that the recoil mechanism contains the proper amount of oil and thereafter carefully observes the functioning of the recoil system. Any evidence of malfunctioning is reported promptly to the platoon commander.

f. To man caliber .50 machine gun in case of attack.—He fires at both ground and aerial targets when necessary.

g. To measure minimum elevation and minimum range.—(1) *Minimum elevation with elevation scale.*—The command is: MEASURE THE MINIMUM ELEVATION. The chief of section sights along the lowest element of the bore and causes the gunner to elevate or depress the piece until his line of sighting just clears the crest. The gunner then sets the site scale at 300, centers the angle of site bubble with the range-and-elevation-scale knob, and reads the elevation. The chief of section then adds to this measured elevation the elevation corresponding to the range to the crest plus 2 "c's" (from firing tables) at the piece-mask range, plus the angle in mils subtended by 5 yards at the range to the crest if the crest is occupied by friendly troops. (The angle subtended by 5 yards is not added if the range to the crest is less than 200 yards.) Unless there is definite information to the contrary, it is always assumed that a crest is occupied by friendly troops. This sum is the minimum elevation. If operating as part of a platoon, the chief of section reports "Minimum elevation, No. (so and so), (so much)."

(2) *Minimum range.*—The minimum elevation is determined as prescribed in (1) above. Using the firing table for

the ammunition and charge to be fired, the minimum elevation is converted into range. If operating as part of a platoon, the chief of section reports "Minimum range, No. (so and so), (so much)."

h. To measure elevation (range).—At the command MEASURE THE ELEVATION (RANGE), the piece having been laid, the gunner sets site 300, and with the elevating knob levels the elevation bubble. The chief of section then reads the elevation (range) set on the elevating scale (range drum) and announces the elevation (range) thus set; for example, "Elevation (range), No. (so and so), (so much)."

i. To follow fire orders.—The chief of section follows fire orders mentally. He will not repeat orders, but is prepared to give any element of the last order to any cannoneer who has failed to hear it.

j. To indicate when piece is ready to fire.—When arm signals between the chief of section and the platoon commander can be observed, the chief of section extends his right arm vertically as soon as the gunner has called "Ready," as a signal to indicate that the piece is ready to fire. When arm signals cannot be observed, the chief of section reports to the platoon commander "No. (so and so), ready."

k. To indicate to gunner the aiming point or the referring point.—Whenever the platoon commander designates a referring point, the chief of section makes sure that he has properly identified the point in question. He then indicates it to the gunner. When using indirect laying, if there is any possibility of misunderstanding, the chief of section turns the panoramic sight until the horizontal and vertical hairs are on the point designated.

■ 25. GUNNER, ENUMERATION OF DUTIES.—*a. Direct laying.*—(1) Lays for both direction and range when firing on stationary or moving targets.

(2) Fires the piece.

b. Additional duties in indirect laying.—(1) Centers the bubbles on the telescope mount.

(2) Sets or changes the deflection.

(3) Lays for direction.

(4) Sets angle of site if announced.

(5) Sets the elevation (range).
(6) Lays for elevation (range).
(7) Calls "Ready."
(8) Refers the piece.

■ 26. DETAILED DESCRIPTION OF CERTAIN DUTIES OF GUNNER.—*a. To lay for both direction and range when firing on a stationary or moving target.*—In direct laying, the gunner uses the telescope sight as prescribed in FM 17–12.

b. To fire the piece.—(1) In direct laying, the gunner fires the piece without order from the chief of section at the appropriate time after the loader has called "Set" by depressing the electrically operated foot-firing solenoid. *The gunner must keep his hands on the handwheels while the piece is fired.* If the piece is not equipped with an electrically operated foot-firing solenoid, the piece must be fired by the chief of section using a lanyard or by the loader using the manual firing lever.

(2) In indirect laying, the gunner fires at the chief of section's command.

c. To set or change deflection.—(1) *To set deflection.*—The gunner is first taught to read deflections set on the sight and then to set the deflections announced. At the command, for example, DEFLECTION ONE EIGHT EIGHT FIVE, the gunner pushes the throw-out lever with his right hand, and with his left hand turns the rotating head until the hundreds' graduation (18 in this case) is opposite the azimuth scale index. He then releases the throw-out lever and grasping the azimuth worm knob with his left hand, with the thumb on top, turns the azimuth worm knob away from him until the micrometer index is opposite the graduation 85 of the azimuth micrometer. He then checks to see that the azimuth scale index reads between 18 and 19 on the azimuth scale. The line of sight will then be at a horizontal angle of 1,885 mils, clockwise, from the axis of the bore.

(2) *To change deflection.*—The gunner should be trained always to grasp the azimuth worm knob with his left thumb on top, as the command for changing the deflection then will indicate the direction in which he should move his thumb in turning the azimuth worm knob. He also should be taught that turning the azimuth worm knob toward the breech (to-

ward himself) decreases the deflection set on the sight. Similarly, turning the azimuth worm knob toward the muzzle (away from himself) increases the deflection. The deflection having been set at 1,885 mils, if a subsequent command be, for example, RIGHT SIX FIVE, the gunner turns the azimuth worm knob by moving his thumb toward himself until the micrometer index has moved 65 mils on the graduations of the azimuth micrometer.

d. To lay for direction.—The deflection having been set, the gunner brings the vertical hair of the sight on the aiming point by traversing the piece. The final movement of the handwheel is in the direction of greater resistance.

e. To set angle of site.—The "normal" setting of the angle of site scale is 300; that is, with the index of the coarse scale at 3 and the micrometer index at 0. It is always set at 300 for direct laying with the reticle of panoramic telescope, and for direct laying when no sight is announced. In indirect laying when an angle of site is announced, it is set on the angle of site scale, the gunner making sure that the last movement is in the direction of increasing the reading.

f. (1) *To set the elevation.*—The gunner grasps the range drum knob with the right hand and turns it until the reading of the hundreds' scale plus that on the micrometer scale equals the announced elevation, making sure that the last movement is in the *direction of increasing elevation* in order to take up the back lash in the gears.

(2) *To set range.*—The gunner grasps the range drum knob with the right hand and turns it until the announced range is opposite the index, making sure that the last movement is in the *direction of increasing range.*

NOTE.—The range drum must be that prescribed for the charge used.

g. To lay for elevation (range).—The elevation (range) having been set on the elevation (range) scales, the gunner turns the elevation handwheel until the bubble of the level is centered. In centering the bubble, the gunner must be careful to look squarely at it. The final movement of the handwheel is in the direction of greater resistance.

h. To call "Ready."—The piece having been laid for direction, the bubbles centered, and the loader having called "Set,"

the gunner verifies the laying, moves his head clear of the sight, and calls "Ready" to indicate that his piece is ready to be fired.

i. To refer the piece (indirect laying).—The piece having been laid for direction, to refer the piece the command is: 1. AIMING POINT (SO AND SO), 2. REFER. Without disturbing the laying of the piece, the gunner brings the vertical hair of the sight onto the new aiming point. He then reads and announces the deflection thus set and records the deflection and the aiming point on a convenient part of the carriage. An aiming point should be at least 1,000 yards from the sight, preferably to the right. Frequently it will be necessary to use the aiming stakes as aiming points, particularly at night. Aiming stakes are set out at the first opportunity, pieces referred and deflections recorded.

■ 27. LOADER, ENUMERATION OF DUTIES.—*a.* Opens and closes the breech.

b. Loads the piece.

c. Calls "Set."

d. Arranges ammunition and cleans and prepares it for firing.

e. Makes prescribed setting of fuzes.

f. Sets out aiming stakes when directed.

g. Uses the rammer.

h. Inspects the chamber and bore frequently to ascertain if there is any residue.

■ 28. DETAILED DESCRIPTION OF CERTAIN DUTIES OF LOADER.—*a. To open and close breech.*—(1) *To open breech.*—The loader grasps the operating handle with his right hand and compresses the lever latch. He rotates the lever to the right, sliding the breechblock to the right. As soon as the breech is open, the loader looks through the bore to see that it is clear.

(2) *To close breech.*—The loader grasps the operating lever with his right hand and rotates the lever to the left, sliding the breechblock to the left.

b. To load the piece.—The loader grasps the round with his right hand at the base of the case and his left hand in rear of the ogive. He inserts the round in the chamber,

removes his left hand, pushes the round into the chamber with his right hand, and when he feels the round strike the extractor, removes his right hand. It is necessary for the loader to keep his closed fist against the base of the cartridge case until the round is firmly seated against the extractor and the closing motion of the breechblock has been started. The loader will be particularly careful to avoid striking the fuze against any portion of the matériel.

c. To call "Set."—When the loader has completed his duties in loading the piece and closing the breech, he calls "Set."

d. To arrange ammunition and to clean and prepare it for firing.—The loader, when time permits, arranges the rounds so that they are within easy reach. He inspects each projectile to see that it is free from sand and dirt and that the rotating band is not burred. Before loading, he wipes the round with waste to remove any foreign matter. Projectiles having burred rotating bands should be placed aside temporarily until the burs can be removed with a file. He inspects each round and sets the fuze at **DELAY** before stowing.

e. To make prescribed setting of fuzes.—On impact fuzes the loader sets the fuze for superquick action on command.

f. To set out aiming stakes when directed.—See paragraph **31.**

g. To use rammer.—Only the loader handles the sponge and rammer. The rammer is used to extract unfired rounds or cartridge cases which cannot be ejected by the extractor. To extract a cartridge case which cannot be ejected by the extractor, the bottom of the inside of the case is tapped lightly until it is loosened and can be pushed out of the chamber. The chief of section standing at the breech, receives the cartridge case in both hands. To extract an unfired round, follow the procedure prescribed in paragraph **35.**

h. To inspect chamber and bore.—The loader inspects the chamber and bore frequently, especially when firing lower numbered charges, to make certain that no residue from the charge remains in the chamber or bore.

■ 29. DRIVER OF ASSAULT HOWITZER CARRIAGE.—*a. To set hand brake.*—The driver sets his hand brake while the piece is being fired.

b. To shut off engine.—The driver cuts his motor or continues to run it as ordered by the chief of section.

SECTION VII

ADDITIONAL INFORMATION ON THE SERVICE OF THE PIECE

■ 30. ACCURACY IN LAYING.—Sighting and laying instruments, elevating and traversing mechanisms will be manipulated so as to minimize the effects of lost motion. This requires that the last motion in setting instruments and in laying be always in the direction in which movement is the hardest. To insure accurate laying, the gunner will be required to verify the laying after the breech has been closed. When possible, the carriage is established on level ground.

■ 31. AIMING STAKES.—When a suitable natural aiming point is not visible, the piece, having been laid initially for direction, is referred to the aiming stakes as described in paragraph 26. Two aiming stakes are used for each piece. Each stake is equipped with a light for use in firing at night. One stake is set up in a convenient location at least 100 yards from the piece. The other stake is set up at the midpoint between the first stake and the piece, and is lined in by the gunner so that the vertical hair of the sight and the two aiming stakes are all in the same vertical plane. For night use, the lights should be adjusted so that the far one will appear several feet higher than the near one. The two lights thus will clearly establish a vertical line on which the vertical hair of the sight can be laid.

■ 32. REPORTING ERRORS.—Each member of the howitzer squad is constantly impressed with the importance of reporting promptly to the section chief any errors made. The section chief reports errors immediately to the platoon commander when the howitzer is firing as part of the platoon.

■ 33. CEASE FIRING.—Normally the chief of section gives the command CEASE FIRING, but in emergencies anyone present may give the command. At this command, regardless of its

source, firing ceases immediately. Firing is resumed on command.

■ 34. CHANGES IN DATA DURING FIRING.—The announcement to the howitzer squad of any new element of firing data serves as a signal to stop all firing previously ordered but not yet executed. If the piece is not loaded at the announcement of a new element of firing data, the new data will be set off and firing resumed at the command FIRE.

■ 35. TO UNLOAD PIECE.—*a.* When the command UNLOAD is given, the loader opens the breech slowly. The chief of section standing at the breech receives the ejected round or cartridge case.

b. Should the extractor fail to eject the complete round, the assembled staff and rammer are used. The gunner depresses the muzzle to zero elevation or lower. The chief of section sees that the recess in the head of the rammer or device is free from obstructions. Under the direct supervision of an officer, if present, or of the chief of section, the loader inserts the rammer in the bore until the head incloses the fuze and comes in contact with the projectile. He pushes, and if necessary, taps the rammer staff lightly until the round is dislodged from its seat. He then pushes it out of the breech. The chief of section receives it.

c. If the extractor has ejected the cartridge case but not the projectile, the loader fills the chamber with waste and closes the breechblock. He dislodges the projectile as prescribed in *b* above. The chief of section then opens the breech, removes the waste, and receives the projectile as the loader pushes it to the rear.

■ 36. MISFIRES.—In the event of a misfire, at least three attempts to fire the round will be made. After at least 2 minutes have elapsed since the last attempt to fire, the chief of section will command: UNLOAD. The procedure is the same as in paragraph 35. If the extractor ejects the round, the round will be disposed of as prescribed in TM 9–1900. If the extractor ejects only the cartridge case (which will happen most frequently), the case will be immediately thrown clear of all personnel to prevent injury in case of a hangfire. Another cartridge case with the proper charge

will be inserted in the breech, care being taken not to damage the case. Authority to fire the round will be obtained from the officer of chief of section conducting fire.

■ 37. AMMUNITION.—*a. Protection.*—Ammunition must be protected from damage, especially the rotating bands and cartridge cases. It is sorted and stored by lots and kept in the fiber containers as long as practicable. Whether in or out of containers, it is protected from dirt and moisture by being placed on paulins when stored on the ground. It is protected from the sun and rain by paulins or other shelter above it.

b. Fuzes.—The rounds are removed from the fiber containers and fuzes set at DELAY when loaded in the carriage. In handling, care must be taken that the cartridge case and the projectile do not become separated.

c. Reduction of charge.—Normally, only charge IV will be fired. However, the charge may be reduced in the following manner: the loader places the round, base down, on the floor of the carriage. He withdraws the projectile by lifting it straight upward. Setting the projectile on the floor, he removes the increments not required from the cartridge case. He then inserts the projectile in the case.

SECTION VIII

DISMOUNTED ACTION

■ 38. TO FIGHT ON FOOT.—*a.* When it is desired to dismount the section with vehicular weapons, the command is: FIGHT ON FOOT. At the command, the members of the howitzer section proceed as follows:

(1) *Chief of section.*—Dismounts by way of the right sponson and supervises the disposition of the dismounted section.

(2) *Gunner.*—Dismounts by way of the right sponson and receives the caliber .50 machine gun from the loader.

(3) *Loader.*—Dismounts the caliber .50 machine gun and hands it to the gunner on the ground. He takes one box of caliber .50 ammunition, dismounts by way of the left sponson, and removes the machine gun tripod from the fender of the carriage.

(4) *Driver.*—At signal TO THE REAR, the driver moves the carriage to cover, dismounts with two boxes of caliber .50 ammunition and the vehicular first-aid kit, and rejoins the section.

(5) *Dismounted section.*—The dismounted section moves to the position indicated by the chief of section, or in drill, 5 yards in front of the dismounting point. The section takes posts and performs duties as prescribed for gun drill in FM 23–60 as follows:

Chief of section	Squad leader
Loader	No. 1
Gunner	No. 2
Driver	No. 3

b. In combat, the section dismounts on the less exposed side of the vehicle and unloads such additional ammunition as the situation may require or permit.

c. Members of the section, except the driver, dismount with individual weapons.

■ 39. To ABANDON HOWITZER.—At the command ABANDON HOWITZER, the section proceeds as in paragraph 38 and performs additional duties as follows:

a. The driver dismounts at once with the caliber .45 submachine gun.

b. The maximum practicable amount of caliber .50 and caliber .45 ammunition is unloaded from the carriage.

c. The howitzer is disabled by removing the firing lock from the breechblock, and from the spare parts box.

d. If it is necessary to leave the caliber .50 machine gun, it is disabled by removing the backplate.

■ 40. To ABANDON AND DESTROY HOWITZER.—*a.* At the command ABANDON AND DESTROY HOWITZER, the section proceeds as in paragraph 39, and in addition, destroys the howitzer as outlined in *d* below.

b. The destruction of matériel, subject to capture or abandonment in the combat zone, will be undertaken only when in the judgment of the military commander concerned such action is necessary. For destruction of machine guns and small arms, see appropriate Field Manuals.

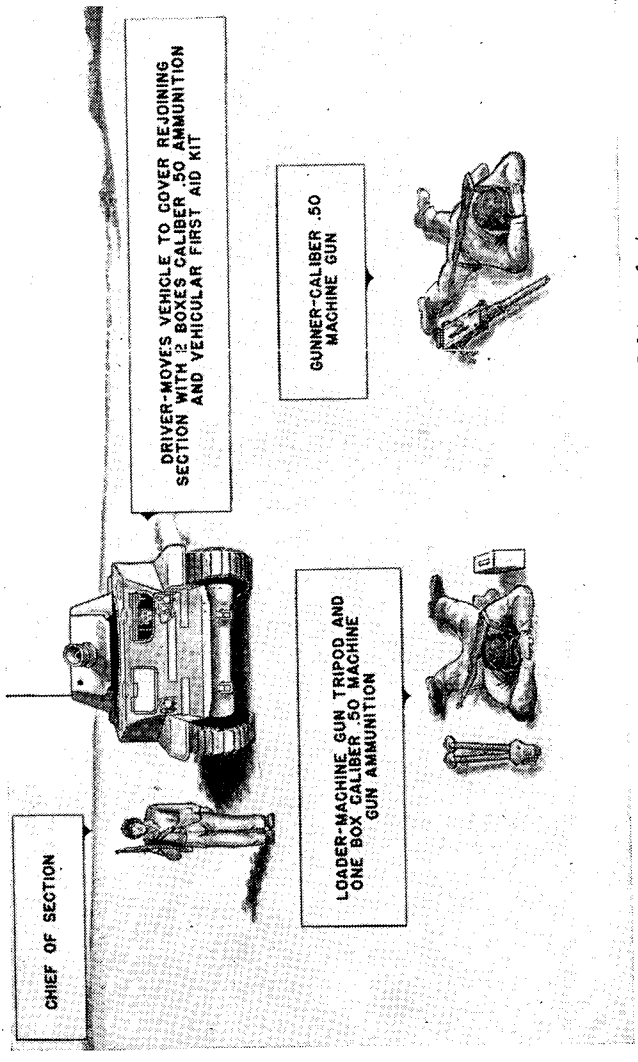


FIGURE 5.—Howitzer section dismounted to fight on foot.

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

d. Methods.—(1) *Method No. 1.*—(*a*) Open drain plugs on recoil mechanism, allowing recoil fluid to drain. *It is not necessary to wait for the recoil fluid to drain* completely before firing the howitzer in (*c*) below.

(*b*) Place an armed (safety pin removed) M9A1 antitank grenade, HE, or armed (safety pin removed) M6 antitank rocket in the tube about 6 inches in front of and with the ogive (nose) end toward the HE shell.

(*c*) Fire the piece with a lanyard at least 100 feet long. The person firing should be under cover to the rear of the piece and approximately 20° off the line of fire. Elapsed time: Approximately 2 to 3 minutes.

(2) *Method No. 2.*—(*a*) See (1) (*a*) above.

(*b*) Load an HE round and with fuze set superquick, jam an HE round in the muzzle. Fire, taking precautions prescribed in (1) (*c*) above.

(3) *Method No. 3.*—Insert two to three TNT blocks in the bore near the muzzle, four to six in the chamber of the howitzer. Close the breechblock as far as possible without damaging the safety fuze. Plug the muzzle tightly with earth for a distance of approximately 9 inches from muzzle. Detonate the TNT charges simultaneously.

(4) *Method No. 4.*—Fire at the breech mechanism, recoil mechanism, or tube, of the howitzer with another cannon, using HEAT or AP ammunition until the howitzer is damaged beyond usefulness.

(5) *Method No. 5.*—Insert four unfuzed M14 incendiary grenades end to end midway in the tube at 0° elevation. Ignite these four grenades by a fifth equipped with a 15-second Bickford fuze. The metal from the grenades will fuze with the tube and fill the grooves. Elapsed time: 2 to 3 minutes.

■ 41. TO FIGHT ON FOOT THROUGH BOTTOM ESCAPE DOOR.—When it is desired to dismount the howitzer section by the bottom escape with vehicular weapons, the command is: FIGHT ON FOOT THROUGH BOTTOM ESCAPE. At the command or signal, the section proceeds as follows:

a. The gunner moves the assistant driver's seat forward and detaches the back rest. He lifts the floor panel, detaches the spare parts box, and opens and drops the bottom escape door. He takes the caliber .50 machine gun and one box of ammunition from the chief of section and places them on the ground under the carriage and goes through the opening. He then remains under the carriage to assist the remainder of the section by receiving their loads of equipment and ammunition.

b. The *chief of section* dismounts the caliber .50 machine gun and hands it to the gunner with one box of ammunition. The chief of section then leaves the vehicle by the bottom escape door and furnishes local security for the section until the machine gun is ready to fire.

c. The *loader* leaves the vehicle by the bottom escape door and assists the gunner in getting the caliber .50 machine gun and the box of caliber .50 ammunition out from under the carriage. He then takes the box of ammunition, removes the tripod from the fender, and moves to the position designated by the chief of section.

d. The *gunner* takes the machine gun and goes to the position designated by the chief of section.

e. The *driver* replaces the escape door and at the signal TO THE REAR from the chief of section moves the carriage to the rear and places it under cover. He then dismounts with two boxes of caliber .50 ammunition and the vehicular first-aid kit, and rejoins the section.

f. For drill, the machine gun is mounted 5 yards in front of the center of the carriage, and crew takes posts as prescribed for gun drill in FM 23–60 and paragraph 38.

g. In battle, the crew will leave by the less exposed end of the carriage.

NOTE.—The construction of the carriage M8 is such that no set technique for dismounting through the bottom escape can be prescribed. Each man must experiment until he finds a technique suited to his conformation. These techniques should be observed in detail by the chief of section and platoon leader and altered if necessary before habits are formed. Once each man has found the most efficient method of dismounting he should be required to adhere rigidly to it.

■ 42. TO REMOUNT FROM ACTION THROUGH BOTTOM ESCAPE DOOR.—*a.* At the command or signal OUT OF ACTION, the ma-

chine gun is taken out of action as prescribed in gun drill, FM 23–60. The chief of section signals BRING UP THE VEHICLE. The driver brings up the carriage and opens and drops the escape door. At the command MOUNT THROUGH BOTTOM ESCAPE, the crew is mounted in the same manner as prescribed for mounting through the bottom escape door. The driver assists all members of the crew by holding equipment while crew members are entering the bottom escape door.

b. After entering the vehicle, crew members replace the weapons and ammunition which were removed for dismounted action. The gunner replaces the escape door.

■ 43. TO ABANDON HOWITZER BY WAY OF BOTTOM ESCAPE DOOR.—At the command ABANDON HOWITZER, DISMOUNT BY BOTTOM ESCAPE, the crew follows the procedure prescribed in paragraph 41 except that the driver dismounts at once, taking one box of caliber .50 machine-gun ammunition, the spare barrel, the spare parts roll, and the vehicular first-aid kit. Crew members disable abandoned weapons (par. 39), take weapons and equipment as prescribed in paragraph 39 and dismount through the bottom escape door. Each unit should devise a signal indicating "Disabled vehicle" which will identify such a vehicle to maintenance crews.

■ 44. ACTION IN CASE OF FIRE.—*a. Engine compartment fire, howitzer carriage.*—The first man to discover the fire calls "ENGINE FIRE." The members of the howitzer section proceed as follows:

(1) The chief of section dismounts to the rear deck, and receives a hand extinguisher from the loader and uses it in case the remote control extinguisher does not put out the fire.

(2) The gunner pulls the fire extinguisher remote control handle and dismounts.

(3) The loader takes the hand extinguisher and passes it to the chief of section.

(4) The driver of the carriage immediately stops the engines, if practicable, and dismounts. If impracticable to stop the engines, he reduces their speed below 1,200 rpm.

b. Turret or hull fire, howitzer carriage.—The first man to discover the fire calls "TURRET (HULL) FIRE." The members of the section proceed as follows:

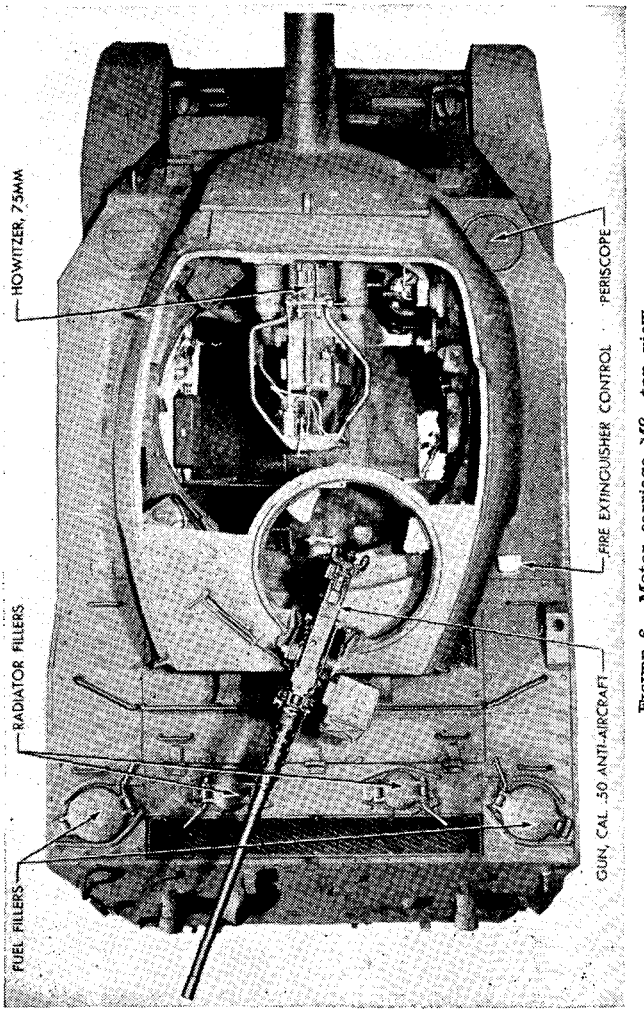


FIGURE 6.—Motor carriage M8—top view.

(1) The chief of section supervises the operations and orders the section to dismount when further progress is impossible.

(2) The loader takes the hand fire extinguisher and directs it on the fire.

(3) The driver stops the carriage, stops the engines, and assists the loader in any manner possible.

c. Trailer fire.—The first man to discover the fire calls "TRAILER FIRE." The loader takes the hand extinguisher and directs it on the fire. Adequate precautions should be taken in all cases to prevent a fire in one vehicle from spreading to another.

■ 45. ADVICE TO INSTRUCTORS.—*a.* Disciplined and effective dismounted action requires long and arduous drill. Satisfactory results can be obtained only by painstaking repetition of each movement.

b. Training in dismounted action should be undertaken in the field rather than in the vehicle park. Crews should be required to dismount to fight on foot on all types of terrain and under every variety of simulated combat conditions with full loads of ammunition. Rough terrain complicates the problem of dismounting from the bottom escape of the howitzer carriage and develops ingenuity and physical agility as no vehicle park training can.

SECTION IX

CARE AND MAINTENANCE OF MATÉRIEL

■ 46. GENERAL.—*a.* This section covers such operations in the care and maintenance of the howitzer as may be performed by a platoon in the field.

b. Complete instructions for platoon maintenance, including disassemblies, are found in the Technical Regulations and Standard Nomenclature Lists referred to in the appendix, especially TM 9–321 and SNL C–20. Operations not covered therein are functions of the Ordnance Department.

c. In general, the platoon is charged with preventive maintenance, that is, without routine cleaning, lubricating, and preserving. Certain classes of repairs, adjustments, and replacements of parts may also be made under the direction

of an officer or the chief mechanic. Parts which may be drawn by a platoon for replacement purposes are indicated in SNL C–26 by the symbol %. Unless specifically prohibited, such parts may be installed by or under the direction of the company mechanic. For routine care and maintenance, assign specific duties to individuals and enforce a strict accountability for the proper performance of such duties.

d. In general, the following operations may be performed within the platoon:

(1) Draining and replenishing recoil oil.

(2) Disassembly, maintenance, and assembly of breech and firing mechanisms.

(3) Removal or replacement of the tube assembly and breech ring.

(4) Removal and replacement of gear case covers for cleaning gear cases.

(5) Minor operations necessary to replace certain parts such as flexible joints, traversing and elevation stops, cradle trunnion pins, etc.

■ 47. CLEANING.—*a.* Dirt and grit accumulated in traveling or from the blast of the piece in firing settle on the bearing surfaces, and in combination with the lubricant form a cutting compound. Primer fouling attracts moisture and hastens the formation of rust. During lulls in firing and immediately after firing, the piece must be thoroughly cleaned. At other times, clean it at intervals not exceeding 2 weeks, depending upon the use and condition. Dirt on nonbearing surfaces can usually be removed by water; lubricated or other greasy parts must be cleaned with dry-cleaning solvent applied with a rag. The procedure in cleaning the bore and breech mechanism is described in paragraph 51. The following cleaning materials are issued by the Ordnance Department for use in the field:

(1) *Soda ash (dehydrated sal soda).*—Used for cleaning the bore, breech mechanism, and firing mechanism after firing.

(2) *Dry-cleaning solvent.*—For removing grease. It is preferred to kerosene because it does not leave a corrosive film, and to gasoline because it is less inflammable.

(3) *Crocus cloth.*—This is the coarsest abrasive permitted for cleaning rust and stains from bearing surfaces.

(4) *Emery cloth.*—Used for cleaning unfinished or nonbearing steel surfaces only. Issued in five degrees of coarseness, of which 00 is the finest.

(5) *Burlap, jute.*—Issued for cleaning the bore.

(6) *Cotton waste, clean rag, and sponges.*—For general cleaning purposes.

b. A division of duties for members of the howitzer squad in routine cleaning and maintenance is as follows:

(1) *Gunner.*—Telescopes, telescope mounts, gunner's quadrant, range quadrant, elevating and traversing mechanism.

(2) *Loader.*—Firing mechanism, breech mechanism, firing lock, bore, recoil sleeves.

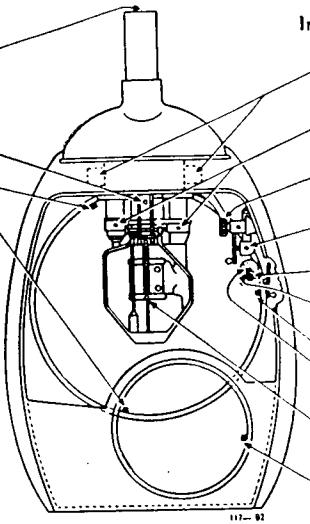
(3) *Driver.*—Responsible for maintenance of vehicle assisted by other members of the section.

■ 48. LUBRICATION.—*a.* To facilitate identification, mark all oilholes and grease fittings with bright red enamel.

b. Lubrication instructions for the howitzer are covered on lubrication chart below.

■ 49. PROTECTION AGAINST CHEMICALS.—*a.* Whenever chemical attacks are anticipated, cover all bright parts with oil. After a gas attack, wipe off the oil and apply fresh oil. If mustard or other persistent gas is used, absorbent objects may be deeply contaminated, and even hard surfaces may be dangerous for from 6 to 8 days, if the chemical is not neutralized. Bleaching powder or a noncorrosive decontaminating agent (a solution of either a light tan or white powdery material in acetylene tetrachloride) are the standard. The noncorrosive agent will be used for the decontamination of weapons when corrosion or other serious damage might result from the use of chloride of lime.

b. The noncorrosive decontaminating agent is sprayed on with the hand-operated decontaminating apparatus. The contaminated surfaces should be given a number of light applications of the spray at intervals of 15 to 30 minutes until the required amount of solution has been applied (see FM 21–40). After all the solution has evaporated from the treated surfaces, the matériel should be scrubbed, preferably with soapy water, rinsed with clear water, and thor-



Lubricant • Interval

Howitzer bore **OE D** (Note 11)

Cradle liner **OG W**

Turret race ring bearings **CG ¼**

Interval • Lubricant

OG Elevating trunnion bearings (Note 15)

RH Recoil chambers (fill plugs) (Note 10)

M OG Elevating pinion (Coat sparingly)

OG Elevating worm shaft housing (Note 15)

M OE Traversing worm housing (plug) (Note 15)

M OG Traversing pinion (Coat sparingly)

¼ CG Turret race ring bearing

Traversing worm housing drain plug

-D OE Breech and firing mechanism (Note 12)

¼ CG Race ring bearing

KEY

LUBRICANTS

OE—OIL, engine
SAE 30 (above +32° F.)
SAE 10 (+32° F. to 0° F.)

CG—GREASE, general purpose
No. 1 (above +32° F.)
No. 0 (+32° F. to 0° F.)

OG—GREASE, O.D.
No. 0 (above +32° F.)
No. 00 (below +32° F.)

RH—OIL, recoil, heavy

INTERVALS

¼—250 MILES W—WEEKLY
D—DAILY M—MONTHLY

HOWITZER AND MOUNT

LUBRICATION CHART

oughly dried. When appropriate, metal surfaces should then be oiled or greased to prevent corrosion.

c. All cleaning rags and sticks used in decontamination must be destroyed or otherwise disposed of to prevent danger from subsequent handling. If destroyed by burning, care must be taken to prevent contamination by dangerous vapors produced. If possible, the articles should be buried. In all cleaning operations, the gas mask and special gasproof gloves must be worn.

■ 50. RECOIL MECHANISM.—*a. General.*—(1) Crew maintenance of the recoil mechanism is limited to exterior cleaning and lubricating, and to draining and filling with recoil oil. Use only the heavy low-pour-point recoil oil as issued by the Ordnance Department. This oil must be kept free of dirt, water, and air bubbles, and not mixed with other oils. The recoil cylinder may be filled either with an oil gun or a funnel. In using the screw filler, free it of air before using, and exercise care to prevent crossing of the threads. Turn the screw handle with both hands.

(2) Examine the rear end of the recoil cylinder and the filling-and-drain plug hole for oil leakage. The presence of a few drops of oil is not important. If there is undue leakage, do not fire the piece; report the condition to the ordnance maintenance company.

(3) Lubricate the sleeve bearing.

b. Operations during firing.—(1) During firing, maintain the recoil oil at the proper level, and keep the sleeve properly lubricated.

(2) The chief of section constantly verifies the complete return of the piece to battery.

(3) The chief of section constantly observes the behavior of the recoil mechanism in firing, and takes such action in the case of malfunctioning as is necessary. (See TM 9–321.)

■ 51. TUBE ASSEMBLY, BREECH MECHANISM, AND FIRING MECHANISM.—*a. Operations during firing.*—(1) During firing, all exposed bearing surfaces must be kept clean and covered with a thin film of lubricating oil.

(2) Whenever the rate of firing permits, swab the bore with clean water and a sponge.

(3) The chief of section constantly observes for malfunctioning of the matériel. Causes and corrections of malfunctioning of the breech and firing mechanisms are given in TM 9–321.

b. Operations after firing.—(1) As soon as possible after firing, disassemble the breechblock and firing mechanism, clean all parts, and oil lightly. Thoroughly clean the bore.

(2) Wash the bore, breech mechanism, and firing mechanism with a hot solution of ½ pound of soda ash or 1 pound of sal soda in 1 gallon of water. Cleaning the bore is accomplished by means of a swab of burlap stretched around the end of the rammer staff. Make no attempt to remove copper fouling. When all powder fouling has been removed, swab the bore with clear water and then wipe dry. Finally, coat lightly with lubricating oil, either light or heavy, depending on the weather. The gun *must* be cleaned every day for 3 days after firing. If the piece is not to be kept in constant service, the bore should be slushed with light rust-preventive compound instead of with oil.

■ 52. SIGHTING AND FIRE CONTROL EQUIPMENT.—*a. General.*—Special care is required to insure the positive and accurate functioning of the sighting and fire control mechanism. Exercise care to prevent denting the soft metal surfaces or scratching the glasses. Remove dirt from optical surfaces by brushing lightly with a camel's-hair brush, soft cloth, or lens paper. Remove oil or grease from glass by applying alcohol, or if alcohol is not available by breathing on the glass then wiping lightly with lens paper or a clean soft cloth. Keep the unpainted steel surfaces covered with a light film of high-grade lubricant to prevent corrosion. In general, the sights are correct:

(1) *Telescope sight.*—(*a*) *In direction,* if the line of sighting through the vertical center line of the sight is in a plane parallel to the vertical plane passing through the axis of the bore.

(*b*) *In elevation,* if the line of sighting through the zero range line of the sight is in a plane parallel to the horizontal plane passing through the axis of the bore.

(2) *Panoramic telescope.*—(*a*) *In direction,* if the deflection scales read zero when the line of sighting is in a plane

parallel to the vertical plane passing through the axis of the bore.

(*b*) *In elevation,* if, with the elevation scale of the mount and the elevation scales of the rotating head set at zero, the line of sighting is parallel to the axis of the bore.

(3) If there is no excessive lost motion between the sights and the sight mounts.

b. Testing equipment.—Equipment used in testing sights consists of bore sights and a gunner's quadrant. The target for sight adjustment may be a distant terrain object, more than 1,000 yards away, or a test target for use in close proximity (fig. 7). If the vehicle is on uneven ground, cant the test target to correspond with the cant of the vehicle. Tests can be made without the bore sights by sighting through the firing pin recess or a brass cartridge case with the primer removed, using improvised crosshairs at the muzzle. (See FM 17–12, and Ordnance TB 732 B–1).

c. Test of gunner's quadrant.—To test the gunner's quadrant, set the scales at zero, place it on the quadrant seat of the howitzer, and level the quadrant bubble by means of the elevating handwheel. Then reverse the quadrant on its seat. The bubble should center itself. If it does not, and the quadrant must be used, center the bubble by using the micrometer knob. Take one-half the resultant reading and apply it as a correction in the proper direction on all future settings. The quadrant should be adjusted at the earliest opportunity by ordnance personnel if the error exceeds 0.3 of a mill.

d. For detailed instructions covering tests and adjustments of the sighting equipment see Ordnance TB 732 B–1.

SECTION X

INSPECTION AND MAINTENANCE OF VEHICLES

■ 53. VEHICLES.—*a.* The chief of section is responsible for seeing that all vehicular inspections are made. He receives the reports from the members of the section relative to their individual inspections. He indicates in his report anything requiring the services of maintenance personnel. In supervising first echelon maintenance, he has the responsibility of

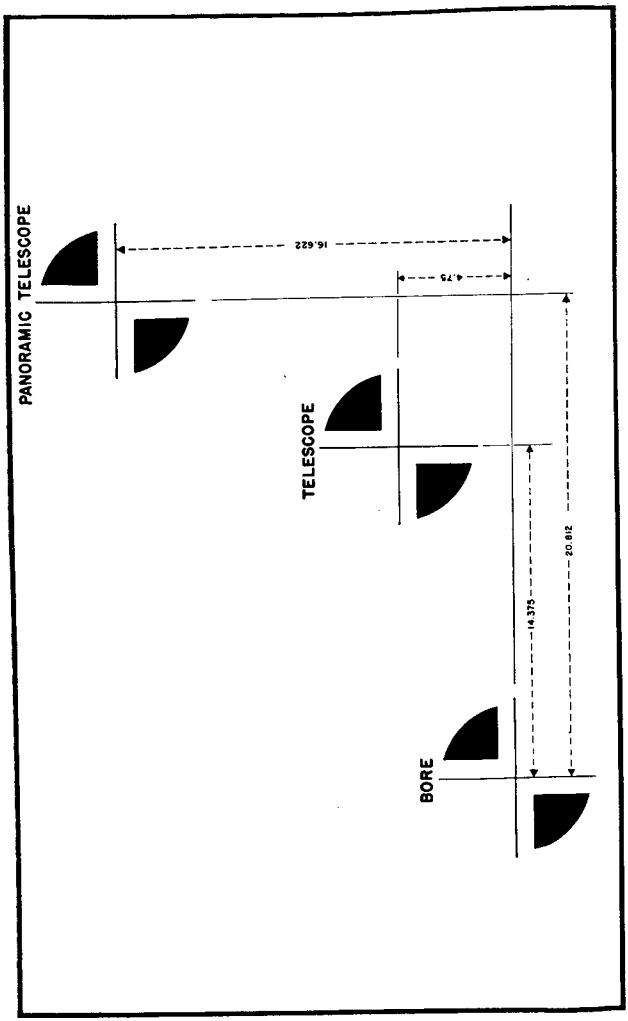


FIGURE 7.—Testing target.

delegating the various inspection duties to members of the section.

b. The *drivers,* assisted by the crews, make the vehicular inspections prior to operation, during operation, at the halt and after operation as outlined on the reverse side of W. D. Form No. 48 (Driver's Trip Ticket and Preventive Maintenance Service Record). Those daily inspections, and the prescribed periodic inspections for the vehicles, will be made in strict conformity with the procedure laid down in TM 9–2810. They are responsible for filling in the driver's reports daily, indicating anything requiring maintenance work. The driver's report should be carefully and thoroughly made out. Any irregularity noted by the driver and entered upon his report which is not repaired before the vehicle is used again should be reentered on the report until the item has been properly taken care of.

■ 54. PRESTARTING INSPECTION, MOTOR CARRIAGE M8.—*a. Driver.*—(1) Mounts carriage and opens all hatches.

(2) Raises floor panels and checks for fuel and oil leakage inside hull; opens fuel valves.

(3) Checks oil of transfer unit and controlled differential on left side of transfer unit.

(4) Checks both sets of steering levers and the selector levers for free operation over entire ranges.

(5) Checks instrument panel and sees that voltmeter reads zero with battery switch open and other instruments indicate normal shut-off readings.

(6) On signal from the gunner, closes battery switch and watches ammeter and voltmeter. If ammeter shows excessive discharge, battery switch should be opened immediately.

(7) Starts engines together on gunner's signal.

(8) Checks tachometers to see that both engines are idling at 400 rpm, then speeds engines with lights on to see if the ammeter shows a charge.

(9) Listens for unusual noises.

(10) Checks "Tell-Tale" indicators.

(11) Checks sirens and lights.

(12) Stops engines, waits 1 minute, and checks oil level in hydramatic transmissions; replenishes if necessary.

(13) Starts engines and adjusts idling speed at 400 rpm.

(14) Moves vehicle forward one length when ordered by chief of section.

b. Gunner.—(1) SEES THAT BATTERY SWITCH IS OPEN.

(2) Opens rear doors.

(3) Checks for fuel, oil, and water leakage in engine compartment.

(4) Checks engine oil levels with the bayonet gauge at the rear of each engine.

(5) Checks tension of fan and generator belts.

(6) Checks level of coolant in both radiators.

(7) Closes rear doors.

(8) Signals driver to close the battery switch and start engines; listens for unusual noises.

NOTE.—Under no circumstances will the rear doors be opened until the crew member who is making the engine inspection has personally observed that the battery switch is open. The switch will not be closed by *anyone* except upon signal from the crew member making the engine inspection. The positions of the fans at the rear door openings make these precautions necessary.

c. Chief of section and loader.—(1) Walk around vehicles and inspect—

(*a*) For evidence of fuel, oil, and water leaks on the ground under the vehicles.

(*b*) Mounting of outside accessories.

(*c*) The general condition of sprockets, bogies, springs, guides, gudgeons, track support rollers and idlers.

(*d*) Track for wear and tension, and the connectors for wear.

(*e*) Presence, tightness, and wear of wedges and wedge nuts.

(*f*) Condition and tightness of grousers, if used.

(*g*) Inspect trailer tires for inflation and casing injuries.

(*h*) Check trailer lights and batteries.

(*i*) Check quick release hitch for correct functioning.

(*j*) Check trailer box covers, handles, latches, and straps for condition and functioning.

(*k*) Check running gear and brakes of trailer.

(2) Have the vehicle moved forward one length and check for presence, tightness, and wear of inside wedges and wedge nuts.

(3) Operation of all lights and sirens with the driver.

(4) Pertinent stowage, including presence and condition of fire extinguishers and vehicular tools.

(5) Make necessary entries in the report of the chief of section and notify platoon commander when ready.

■ 55. INSPECTION DURING OPERATION, MOTOR CARRIAGE M8.—*a.* The driver should observe continually for any abnormal functioning or unusual noises. Instrument panel gauges should be observed at frequent intervals for indications of trouble; particularly the "Tell-Tale" light system, in order to detect high oil temperatures and incorrect pressures in the transmission and engines.

b. Engine temperature gauges should be watched for indications of overheating. The ammeter should be checked to see that it is charging. Short driving experience with hydramatic will familiarize the driver with the usual speeds for gear changes. During operation, gear changes should be checked for proper functioning. All normal driving should be done with the controls in the "Drive" (Dr) position.

c. Only under exceptional circumstances should a vehicle be operated after indications of trouble have been observed. When in doubt, stop the engines and obtain assistance. Inspection during operation applies to both vehicle and trailer.

■ 56. INSPECTION AT THE HALT, MOTOR CARRIAGE M8.—*a. Driver.*—(1) Allows engines to run a short time at idling speed.

(2) Listens for unusual noises.

(3) Stops engines and opens battery switch on signal from gunner.

(4) After 1 minute, checks oil level in hydramatic transmissions; replenishes if necessary.

(5) Lifts floor panels and examines inside of vehicle for leaks.

(6) Checks amount of fuel in both tanks; replenishes if practicable.

b. Gunner.—(1) Dismounts and listens for unusual noise in engine compartment.

(2) Signals driver to stop engines and open battery switch.

(3) OBSERVES THAT BATTERY SWITCH IS OPEN.

(4) Opens rear doors.

(5) Examines engine compartment for leaks.

(6) Checks oil level in each engine; replenishes if practicable.

(7) Closes rear doors.

c. Chief of section or loader (one of whom must remain in the turret).—(1) Walks around carriage and trailer. Examines tracks for adjustment, and for worn, loose, broken, or missing parts, tires of trailer for inflation, cuts, imbedded objects, and misalignment.

(2) Removes dirt or any foreign material lodged in the suspension units.

(3) Checks the bogie wheel hubs and idler hubs for excessive heat by feeling them.

(4) Inspects hull and fittings for missing, worn, or loose parts.

(5) Checks brake bands, and wheel hubs of trailer for evidence of overheating. Checks wheel nuts for tightness.

(6) Checks running gear and brakes of trailer.

(7) Checks lights of trailer.

(8) Checks condition and tightness of straps in trailer and condition of load.

(9) Checks operation and security of quick release hitch.

■ 57. INSPECTION AFTER OPERATION, MOTOR CARRIAGE M8.—*a. Driver.*—(1) Allows engine to idle and moves vehicle to complete check of suspension system.

(2) Cuts engine and opens battery switch. Checks air cleaner and cleans as required.

(3) Replenishes fuel.

(4) Checks oil level in the transfer unit and controlled differential. If necessary, fill to the proper level.

(5) Closes fuel shut-off valves, and checks oil level in hydramatic transmissions. This oil level should be checked shortly after engines are stopped.

(6) Checks battery water level.

(7) Inspects electrical wiring for loose connections and abrasions.

(8) Inspects all control linkage to locate loose or broken parts.

(9) Reports to chief of section total mileage, total time of engine operation and total amount of fuel and lubricants used.

(10) Completes driver's report and gives it to the chief of section.

b. Gunner.—(1) Listens for unusual noises in engines.

(2) Checks fluid level in both radiators and fills if necessary. In cold weather checks freezing point of solution.

(3) When engines stop, *observes that battery switch is open.*

(4) Opens rear doors.

(5) Checks oil level in both engines and replenishes if necessary.

(6) Checks fan, water pump, and generator belt tension.

(7) Checks exhaust connections and mufflers.

(8) Sees that oil, dirt, and debris are removed from the engine compartment.

(9) Closes rear doors.

c. Loader.—Remains in turret if in tactical bivouac and the chief of section performs the following duties. Otherwise, the loader—

(1) Walks around vehicle and checks condition of sprockets, bogies, springs, guides, gudgeons, track support rollers, and idlers.

(2) Examines track for wear and tension, and the connectors for wear.

(3) Checks for presence, tightness, and wear of wedges and wedge nuts.

(4) Performs all checks on trailer required for inspection at halt, and also removes hub cap of trailer to check lubrication.

(5) Has vehicle moved forward one length and checks for presence, tightness, and wear of inside wedges and wedge nuts.

(6) Removes expended and loose rounds of ammunition from the crew compartment.

(7) Unloads all vehicular weapons, ammunition, field, and other equipment necessary to clean vehicle.

d. Chief of section.—(1) Helps loader in inspection of the suspension system.

(2) Insures that the vehicles are completely serviced, and are cleaned as thoroughly as conditions permit.

(3) Reports ammunition expended and losses or damage of vehicular equipment, accessories and parts, promptly to the supply section.

(4) Reports all losses, breakage, or malfunctions of vehicular weapons or parts thereof to the platoon leader.

(5) Checks driver's report and sends it to the motor sergeant.

SECTION XI

INSPECTION AND MAINTENANCE OF RADIO

■ 58. RADIO AND INTERPHONE.—Successful operation of the radio set or interphone system depends on first echelon maintenance. It is the responsibility of the chief of section to perform the following checks prior to operation:

a. Check microphone, head set, and extension cords for wear and moisture and to see if the plugs are making proper contact.

b. Check antenna.

(1) See that mast sections are tight to prevent their loss. Do not remove tape on the joints in this operation. Two antenna sections are used.

(2) Check antenna leads at transmitter, receiver, and mast base. Vibration may cause the antenna leads to be broken at the terminals.

(3) See that the mast base is tight and that the insulator is not broken or cracked.

c. Check radio set mountings, snaps, and snubbers to see that all bolts are tight.

d. See that microphones and head sets are in good condition and in their proper places. Hooks are welded or bolted at convenient places in the carriage for hanging up microphones and head sets when not in use. Replace all defective head sets and microphones from spares and turn in defective equipment for replacement or repair.

e. See that spare antenna sections are in their proper place in the roll and stowed so that they will not be damaged or be in the way of personnel.

f. Replace burned out fuzes and maintain supply of spare fuzes of proper rating.

g. Keep set and associated equipment clean.

h. Report immediately any failure or unusual operating condition such as noisy dynamotor in the amplifier of the interphone.

i. Double check with the driver of the vehicle to see that the specific gravity of the battery is kept up. If the battery voltage drops below 12 volts while the radio set is operating, the efficiency of the radio is materially reduced.

j. Be sure all interphone boxes are securely mounted in place.

k. Keep the interphone cable, the rubber-covered cable connecting the radio set, and interphone amplifier free from oil. Oil will damage the rubber cover. This also applies to microphone and headset cords.

l. See that all interphone cable clamps are tight.

CHAPTER 2

AMMUNITION SECTION, ASSAULT GUN PLATOON

SECTION I

COMPOSITION, FORMATION, AND CONTROL

■ 59. DEFINITION.—The ammunition section of the assault gun platoon consists of one half-track ammunition carrier, one ammunition trailer, and necessary personnel and equipment to handle the ammunition supply of the platoon and serve the vehicular weapon.

■ 60. MATÉRIEL.—The ammunition carrier is a half-track modified for this purpose. It tows, from the pintle on the rear, an ammunition trailer.

■ 61. ARMAMENT.—The armament of the ammunition carrier may be either a caliber .30 machine gun on a pedestal or ring mount or a caliber .50 machine gun on the same mount (fig. 8) and one rocket launcher. The driver is armed with a caliber .45 submachine gun, and the other members of the section are armed with carbines M1 as individual weapons.

■ 62. COMPOSITION.—The ammunition section of the assault howitzer platoon consists of the following:

1 Chief of section.
3 Cannoneers or ammunition handlers (numbered 1, 2, and 3).
1 Driver.

■ 63. FORMATIONS.—*a. Dismounted posts.*—The crew forms in one rank (fig. 9). The chief of section takes post 2 yards in front of the right fender of the ammunition carrier, facing the front. The cannoneers Nos. 1, 2, and 3 and the driver of the carrier, in that order, take posts at his left at close interval.

b. Mounted posts.—The ammunition section forms mounted (fig. 10) as follows:

(1) *Chief of section* on the right front seat of the ammunition carrier.

(2) *Cannoneer No. 1,* center front seat.

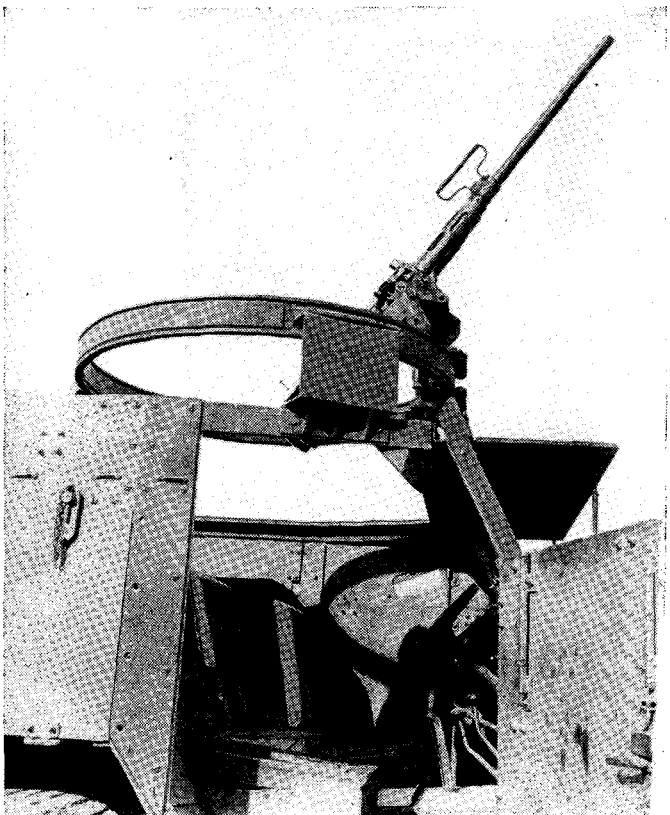


FIGURE 8.—Caliber .50 machine gun on ring mount.

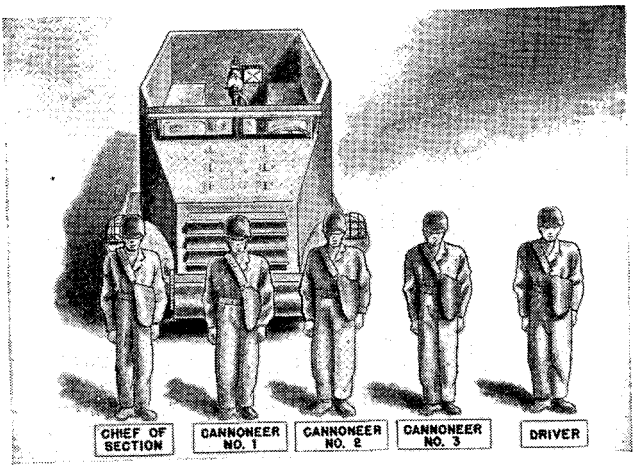


FIGURE 9.—Dismounted posts, ammunition section.

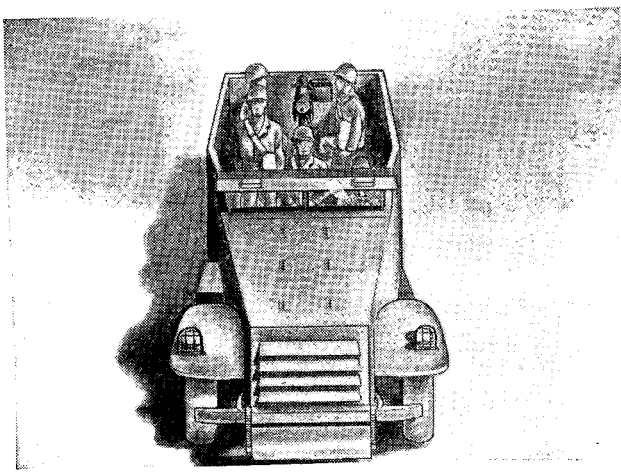


FIGURE 10.—Mounted posts, ammunition section.

(3) *Cannoneers Nos. 2 and 3,* in the right and left rear corners of the carrier, respectively.

(4) *Driver,* in the driver's seat of the carrier.

■ 64. SECTION CONTROL.—Control of the ammunition section is by voice and arm-and-hand signals. The chief of section maintains close liaison with the platoon leader of the assault gun platoon, who will dispose the ammunition section to replenish the supply of the individual sections as required and to furnish local security for the firing position of the platoon when it operates as a unit.

SECTION II

CREW DRILL

■ 65. TO FORM AMMUNITION SECTION.—*a.* Being dismounted, the ammunition section takes dismounted posts (fig. 9) at the command FALL IN. If it is desired that the section form at the side or rear of the vehicle, the chief of section takes his position at the designated point and orders: FALL IN.

b. The section being at dismounted posts at the command FALL OUT the section breaks ranks. Members of the section habitually fall out to the right of the vehicle unless the command includes TO THE LEFT or other instructions.

■ 66. TO CHANGE DESIGNATION AND DUTIES DURING DRILL.—The section being at dismounted posts, to change designations and duties during drill the command is: FALL OUT, CHIEF (NO. 1), ETC. The movement is executed as prescribed in paragraph 10.

■ 67. TO MOUNT AMMUNITION SECTION.—The section being at dismounted posts or dismounted, is mounted at the command or signal MOUNT. At the command or signal, the section mounts as follows (fig. 10):

a. The driver mounts to his seat from the left side of the vehicle. No. 1 and the chief of section mount to their respective seats in that order from the right side of the vehicle. Cannoneers Nos. 2 and 3 mount over the right and left sides of the rear of the vehicle respectively to their posts.

b. The chief of section remains standing facing the rear of the vehicle until he sees that the last of the section is

mounted. He then faces the front and takes his seat or remains standing as the situation requires.

c. During training when execution of this movement is by the numbers, the command MOUNT is preceded by PREPARE TO MOUNT.

■ 68. TO DISMOUNT AMMUNITION SECTION.—The section, being at mounted posts or mounted, is dismounted without vehicular weapons at the command or signal DISMOUNT. At the command or signal, members of the section dismount in reverse of the order described in paragraph 67 and take their dismounted posts.

SECTION III

MOUNTED AND DISMOUNTED ACTION

■ 69. MOUNTED ACTION.—The ammunition section of the assault gun platoon fights from its vehicle only to protect itself, except when the vehicle is disposed for the local security of the platoon.

a. Prepare for action.—At all times when attack by the enemy is imminent, the ammunition section will be prepared for action. At the command PREPARE FOR ACTION the section proceeds as follows:

(1) *Chief of section.*—Uncovers, checks head space, and fully loads the vehicular machine gun if it is on the ring mount, and supervises preparation for action by the section.

(2) *No. 1.*—Uncovers, checks head space, and fully loads the vehicular machine gun if it is on the pedestal mount. If the vehicle is in motion, he checks the driver's submachine gun.

(3) *Cannoneers Nos. 2 and 3.*—Remove carbines from racks. If the command includes ROCKETS READY, cannoneer No. 2 assembles the rocket launcher, while No. 3 removes the ammunition bags from their compartment. Each puts on his ammunition bag. No. 2 places two rockets in his bag. No. 3 puts four rockets in his bag. No. 2 assists No. 3 in loading the bags, checks the electrical firing mechanism of the launcher, and both resume their posts.

b. To fire rockets from vehicle.—When necessary to fire rockets from the vehicle the chief of section commands, for

example: ROCKETEER, TWO HUNDRED, LEFT (RIGHT) TANK, FIRE. The rocketeer, No. 2, takes a position with the rear of the launcher pointing over the side of the vehicle. No. 3 loads a rocket, and fire is opened as soon as practicable.

c. To fire vehicular machine gun.—(1) *Ring mount.*—The chief of section fires the vehicular machine gun as required (fig. 8).

(2) *Pedestal mount.*—Upon an appropriate fire order from the chief of section (see FM 23–50), No. 1 fires the vehicular machine gun.

d. Out of action.—At the command OUT OF ACTION, weapons and equipment are returned to their stowage positions and members of the section resume their mounted posts.

■ 70. DISMOUNTED ACTION.—The ammunition section must have thorough training in dismounted action. Only intensive drill will develop proficiency in dismounting and mounting with vehicular weapons and full ammunition loads. When this proficiency is attained, every occasion should be taken to utilize it in the field.

■ 71. TO FIGHT ON FOOT.—*a.* At the command FIGHT ON FOOT members of the ammunition section proceed as follows:

(1) *Chief of section.*—Dismounts and supervises the disposition of the section.

(2) *Cannoneer No. 1.*—Dismounts and receives the caliber .30 machine gun from No. 2.

(3) *Cannoneer No. 2.*—Dismounts the caliber .30 machine gun and hands it to No. 1 on the ground. He hands one box of caliber .30 machine-gun ammunition to No. 3 on the ground. He dismounts with the machine-gun tripod.

(4) *Cannoneer No. 3.*—Dismounts and receives one box of caliber .30 ammunition and the water chest from No. 2.

(5) *Driver.*—Upon signal TO THE REAR moves the carrier and trailer to cover and dismounts with one box of caliber .30 ammunition, the spare parts roll, spare barrel, the vehicular first-aid kit, and rejoins the crew.

(6) *Dismounted section.*—The dismounted section moves to the positions as indicated by the chief of section, or in drill, 5 yards in front of the carrier (fig. 11). The section

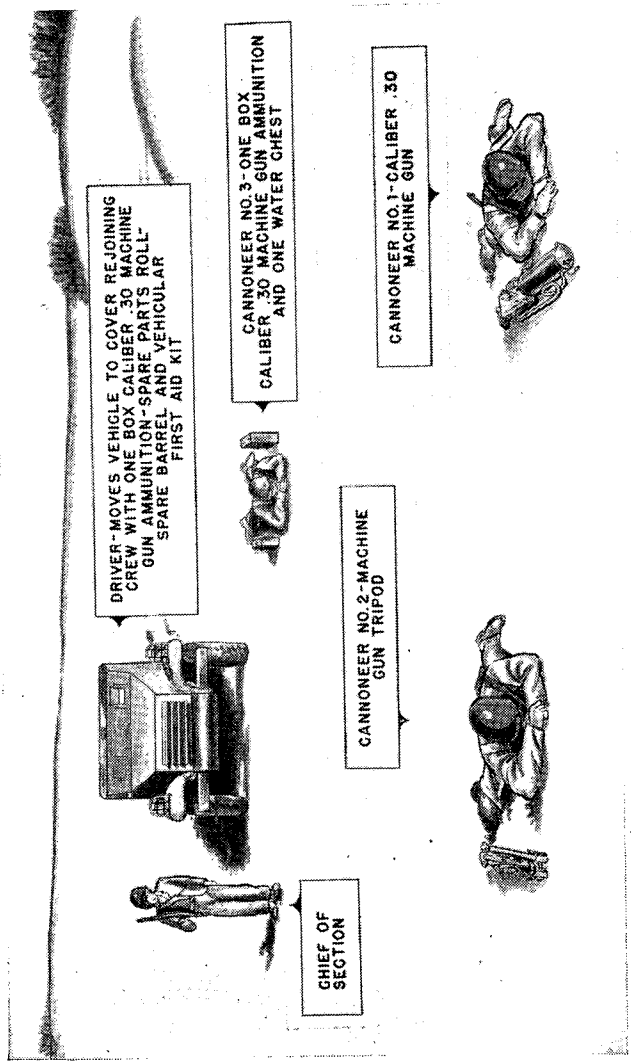


FIGURE 11.—Ammunition section, dismounted to fight on foot.

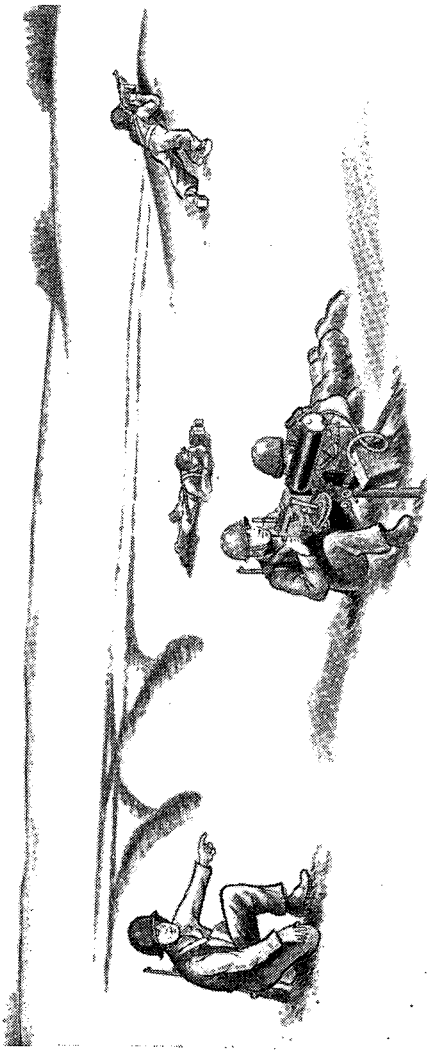


FIGURE 12.—Ammunition section in dismounted action.

takes posts and performs duties as prescribed in gun drill for their weapon in FM 23–45 as follows:

Chief of section	Squad leader
Cannoneer No. 1	No. 1
Cannoneer No. 2	No. 2
Cannoneer No. 3	No. 3
Driver	No. 4

b. In combat, the section dismounts on the less exposed side of the vehicle and unloads such additional ammunition as the situation may require or permit.

c. If the armament of the carrier is the caliber .50 machine gun, the above procedure is modified as required (FM 23–60).

d. Members of the section always dismount with individual weapons.

e. When it is necessary to dismount the rocketeer and loader to defend the carrier from mechanized attack, the command is: ROCKETEER, ACTION, LEFT (RIGHT), DISMOUNT. The rocketeer being prepared for action, at the command, the loader opens the rear door of the carrier and dismounts followed by the rocketeer. The loader inserts a rocket in the launcher and fire is opened as soon as practicable. Both rocketeer and loader dismount with their carbines.

■ 72. TO ABANDON AND DESTROY AMMUNITION CARRIER.—At the command ABANDON CARRIER the ammunition section proceeds as in paragraph 71 and performs additional duties as follows:

a. The maximum practicable amount of machine-gun and submachine-gun ammunition is unloaded from the carrier.

b. If the howitzer is nearby and still in action, the ammunition agent directs the transfer of as much 75-mm ammunition from the carrier as there is room for in the carriage and trailer.

c. If the machine gun must be abandoned with the carrier, it is disabled by removing the backplate and spare parts chest.

d. Destruction of ammunition carrier.—(1) *Method No. 1.*—Remove and empty the portable fire extinguishers.

Smash radio. Puncture fuel tanks by fire from a .50 caliber machine gun or a tank gun or by fragmentation grenades. Place TNT charges as follows:

2 pounds over clutch housing at rear of cylinder block.

1 pound on left side of engine as low as possible.

Insert tetryl nonelectric caps with at least 5 feet of safety fuze in each fuzed charge. Ignite fuzes and take cover.

(2) *Method No. 2.*—Remove and empty the portable fire extinguishers. Smash the radio. Puncture fuel tanks. Fire on the vehicle using other howitzers, antitank guns, tank guns, or other artillery, or antitank rockets or grenades.

(3) *Method No. 3.*—Remove and empty the portable fire extinguishers. Puncture fuel tanks. Smash all vital elements (such as distributor, carburetor, radiator, engine block, crankcase, transmission) with a heavy ax, pick, or sledge. Pour gasoline, oil, or distillate over entire unit and ignite.

■ 73. ACTION IN CASE OF FIRE.—*a. Ammunition carrier fire.*—The first man to discover the fire calls "CARRIER FIRE." The driver of the carrier stops the engine, if running, takes the hand fire extinguisher and directs it on the fire.

b. Trailer fire.—The first man to discover the fire calls "TRAILER FIRE." The nearest man to the hand extinguisher takes it from the carrier and directs it on the fire. Adequate precautions should be taken in all cases to prevent a fire in one vehicle from spreading to another.

■ 74. PRESTARTING INSPECTION, AMMUNITION CARRIER AND TRAILER.—The driver will—

a. Perform those checks enumerated on the reverse side of W. D. Form No. 48, under "Before Operation Service," which are applicable to the carrier and trailer.

b. Check trailer box covers carefully for correct functioning of handles and latches.

c. Check straps for holding down ammunition load, both on lid and inside of boxes, and see that straps and fasteners are in good condition.

d. Check brakes on both carrier and trailer.

■ 75. INSPECTION DURING OPERATION, AMMUNITION CARRIER AND TRAILER.—Those checks prescribed on the reverse side of

W. D. Form No. 48, under "During Operation Service," which are applicable, will be made continually.

■ 76. INSPECTION AT HALT, AMMUNITION CARRIER AND TRAILER.—*a.* Those checks prescribed on the reverse side of W. D. Form No. 48, under "At Halt Service," which are applicable, will be made with the engine running and stopped.

b. Check wheel nuts on trailer.

c. Check trailer loader and straps. Be sure they have not shifted or loosened.

d. Remove debris which may have accumulated on the vehicle.

■ 77. INSPECTION AFTER OPERATION, AMMUNITION CARRIER AND TRAILER.—The driver will—

a. Perform checks prescribed on the reverse side of W. D. Form No. 48, under "After Operation Service," which are applicable.

b. Check straps and fastenings on trailer for wear and general condition.

CHAPTER 3

GUNNERY

SECTION I

GENERAL

■ 78. TRAINING IN GUNNERY.—Gunnery training of the assault gun section and platoon is, for the most part, identical with that of tank gunnery. Therefore, assault gun platoon commanders will train their crews according to principles found in FM 17–12.

■ 79. EMPLOYMENT.—*a.* The assault howitzer is primarily a close-support weapon and it is therefore employed with direct laying as the principal method of laying. It may also be laid effectively with indirect methods. In training crews, place emphasis on the fact that the immediate situation and mission determines the speed factor for going into action. Most close-support missions will call for immediate and direct fire with little or no time available for selection of position; when time permits, defiladed positions may be sought and fire delivered by indirect laying.

b. Preferable positions for the howitzer are as follows:

(1) *Partial defilade,* or hull-down position, in which the line of aim just clears a crest. This is the *ideal* (but not obligatory) position for direct laying, since most of the vehicle is hidden and a smaller target is offered to the enemy. Direct laying is employed in this as well as in any other position from which the target is visible through the sight.

(2) *Full defilade,* in which position the vehicle and crew are completely hidden from the enemy's view. Indirect laying is here employed.

c. In selecting firing positions for howitzers, see that each carriage is as nearly level as possible. If the carriage is canted or tipped, traversing the piece will change the elevation and complicate adjustment of fire.

■ 80. SPEED IN ADJUSTMENT.—*a.* Assault gun platoons are located relatively close to the hostile positions; it is therefore difficult to conceal their location from the enemy and

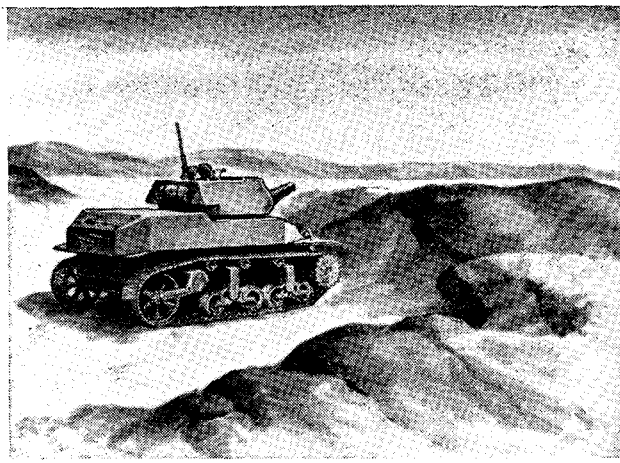


FIGURE 13.—Assault howitzer in hull-down position.

to supply them with ammunition. Once fire has been opened, speed in adjustment is essential. It facilitates destruction of the enemy before he can scatter or seek cover, reduces the length of time in which the guns may be picked up by hostile observers, and conserves ammunition. However, speed without accuracy is useless.

b. Speed in adjustment of fire is gained primarily by accurate initial fire data and thorough training of all personnel. Recorded data of previous firing in the same area will also facilitate adjustments.

SECTION II

FIRE CONTROL INSTRUMENTS

■ 81. SIGHTING INSTRUMENTS.—*a. Telescope M56.*—(1) The telescope M56 is a three-power instrument used for direct laying. It is mounted on the right side of the cradle and moves with the howitzer as it is elevated or depressed.

(2) The forward end of the telescope is inserted through a bracket which is rigidly bolted to the right trunnion seat. The rear end is mounted in a support which is bolted on the inside of the elevating rack. The rear support has a pivoted

cap which opens to allow the telescope to be mounted. A bolt and wing nut holds the telescope secure.

b. Telescope M70C.—This telescope is a three-power instrument identical to the M56 in outside appearance. The optics are greatly improved over the M56. It also has a broken dash reticle.

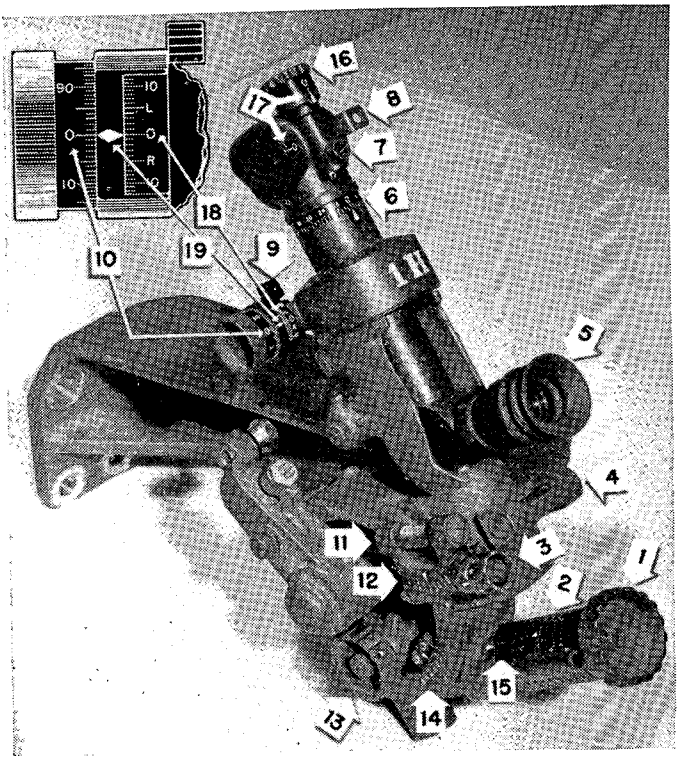
c. Telescope mount M44.—(1) This instrument, on which the panoramic sight M12A5 is mounted, is used to lay the howitzer for range or elevation. Its use is primarily for indirect laying where the target is not visible from the howitzer's position. The telescope mount is mounted on the right side of the front wall of the turret by means of the mounting bracket. (See fig. 14.)

(2) A cross-level mechanism is provided on the mount with a spirit level and knob by which the instrument is kept cross-leveled regardless of the cant of the vehicle.

(3) The range drum and angle of elevation scales operate simultaneously when the range drum knob is turned. There is a different range drum for each of four propellent charges for this ammunition. The range drum is graduated in yards. The elevation scale is graduated from 0 to 7, in steps of 100 mils each. The elevation micrometer scale is on the forward end of the range drum and is graduated in 1-mil steps from 0 to 100.

(4) The angle of site mechanism is mounted on the left side of the body of the mount and above the range drum. The coarse scale is graduated from 0 to 6 in hundreds of mils and the micrometer scale, mounted just in front of the angle of site micrometer knob, is graduated in mils from 0 to 100. The angle of site level is mounted just above the coarse scale and is tipped toward the front or rear as the angle of site knob is turned. The horizontal or "normal" setting for the angle of site mechanism is 300. Settings below 300 are negative or minus angles. Settings above 300 are positive or plus angles.

(5) The telescope socket is on the top rear of the body of the mount and receives the panoramic sight. The socket is equipped with a latch which locks the sight securely in position. The latch is actuated by a wing knob on the right side of the socket.



1. Range and elevation knob.
2. Range drum.
3. Angle of site knob.
4. Cross-level.
5. Telescope eye shield.
6. Azimuth scale.
7. Rotating head.
8. Open sight.
9. Throw-out lever.
10. Azimuth micrometer scale.
11. Angle of site level.
12. Angle of site scale.
13. Cross-level knob.
14. Angle of elevation scale.
15. Angle of elevation micrometer scale.
16. Field prism micrometer knob (tilting head).
17. Field prism scales.
18. Azimuth micrometer fixed index.
19. Azimuth micrometer movable index.

FIGURE 14.—Telescope mount M44, with panoramic telescope M12A5.

d. Panoramic telescope M12A5.—The panoramic telescope M12A5 is a sighting instrument used to lay the howitzer for direction. It is mounted in the socket of the telescope mount. The panoramic telescope is a four-power telescope with a rotating head and an azimuth scale by which the line of sight may be moved to any desired angle with respect to the axis of the bore. When the readings on the azimuth scale and the micrometer scale are 0, the line of sight is parallel to the axis of the bore, providing the proper sight adjustment has been made. The azimuth scale near the bottom of the rotating head is laid off in 100-mil graduations numbered every 400 mils progressively from 0 to 32 in two consecutive semicircles. The rotating head is rotated by pressing the throw-out lever forward and turning the head by hand (for large changes) or by turning the azimuth micrometer knob on the right of the telescope (for small changes). The azimuth micrometer scale is laid off in 1-mil graduations numbered every 10 mils progressively from 0 to 100. This azimuth micrometer scale supplements the azimuth scale.

(1) *Field prism elevation (tilting head).*—On top of the rotating head is the prism elevating knob which rotates the movable field prism in a vertical plane, so that the gunner can keep the aiming point within his field of view. The zero or normal position of the field prism is indicated by a coarse index on the left side of the rotating head and a fine index on the prism elevating knob.

(2) *Gunner's aid.*—An index is mounted on the left side of the telescope on the azimuth micrometer shaft and indicates the azimuth setting on the micrometer scale. The index is movable and permits a movement of 20 mils in either direction. A scale laid off in 1-mil graduations to 20 mils right (R) or left (L) is opposite the movable index.

(3) *Open sight.*—An open sight mounted on the right side of the rotating head aids in picking up aiming points or targets in the panoramic telescope.

(4) Eyepiece.—The eyepiece of the telescope is at the bottom and has a rubber shield to protect the gunner's eye.

(5) *Reticle.*—The reticle of the telescope has a grid etched on it, the horizontal lines forming the range scale, and the

vertical lines forming a deflection scale. The deflection scale is graduated in 5-mil steps and numbered every 10 mils from 0 to 40, both right and left of the vertical center (0) line. The range scale is graduated in 400-yard steps and numbered from 0 to 16. This range scale is graduated for charge IV, and is used for direct fire only. (See fig. 15.)

e. To place panoramic telescope M12A5 and telescope mount M44 in operation.—(1) Turn the wing knob of the socket of the mount toward the muzzle and insert the telescope gently in the socket.

(2) Seat telescope in socket as far as it will go and release the wing knob locking the telescope in position.

(3) Uncover the angle of site level and cross level of the mount by rotating their covers.

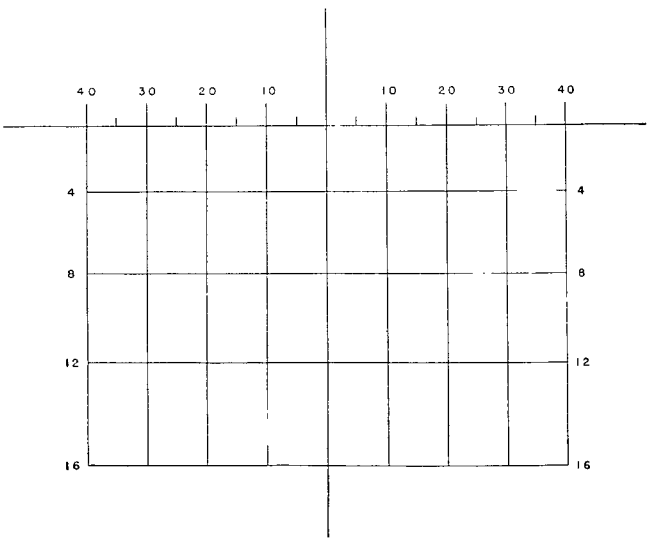
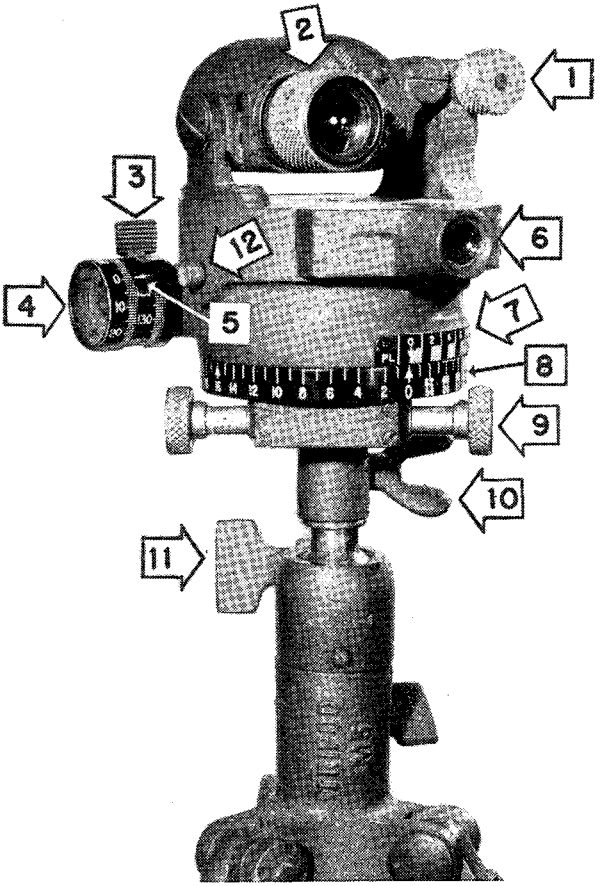


FIGURE 15.—Reticle, panoramic telescope M12A5.

■ 82. AIMING CIRCLE M1 (fig. 16).—Description and instructions for use of the aiming circle M1 are found in TM 6–220.

■ 83. QUADRANT, GUNNER'S, M1 (fig. 17).—*a. Description.*—This quadrant has a heavy sector-shaped frame to which is



1. Elevation knob.
2. Telescope eyepiece.
3. Throw-out lever.
4. Azimuth micrometer scale.
5. Azimuth micrometer index.
6. Compass magnifier.
7. Plateau scale.
8. Azimuth scale.
9. Orienting knob.
10. Lower motion clamp.
11. Leveling clamp.
12. Needle release button.

FIGURE 16.—Aiming circle M1.

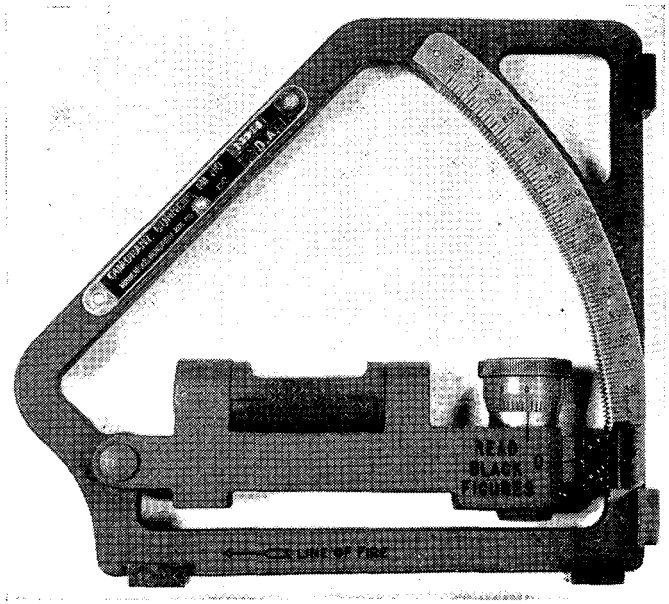


FIGURE 17.—Gunner's quadrant M1.

pivoted an arm carrying a level. Two coarse scales are provided on opposite sides of the curved part of the frame. Notches on the frame engaging with a plunger on the arm permit rapid setting of the arm in 10-mil steps to the desired angle as indicated on the coarse scale. The arm is provided with a screw type micrometer which permits the setting of angles in graduations of 0.2 mils, supplementing the angle set off on the coarse scale. The frame has two sets of shoes, one set used for elevations from 0 to 800 mils and the other set from 800 to 1,600 mils. The two coarse scales on the opposite sides of the quadrant are used for the two different elevation regions.

b. Care and preservation.—Never leave the quadrant on the piece when firing. Exercise particular care to prevent burring, denting, or nicking of the shoes and of the notched portion of the frame.

■ 84. FINDER, RANGE, M7 (T16).—This is a very accurate, 1-meter, range finder designed for rapid, accurate determination of ranges. The description and instructions for its use are very similar to those for the range finder M1916, as found in TM 6–220.

SECTION III

DIRECT LAYING

■ 85. GENERAL.—*a.* Direct laying is employed whenever the gunner can sight his piece directly on the target or target area.

b. Study appropriate sections of FM 17–12 and 17–25 in conjunction with this section.

■ 86. INFLUENCE OF RANGE.—The range to the target affects the manner in which the adjustment is conducted.

a. At short ranges, under 1,000 yards, the gunner is frequently able to hit the target with the first round, laying with the sight reticle; or if the first round misses, to hit the target with the second round by relaying with the sight reticle so that the observed error of the first round is automatically corrected (par. 92*b*). At longer ranges, the gunner must bracket the target and split the bracket successively until effective fire is placed on the target. In making the adjustment, he may use either the graduated handwheel, sight reticle, elevation quadrant, or range drum, preferably the graduated handwheel, because it is simpler and faster. (See par. 92*c*.)

b. At short ranges, targets are attacked by individual howitzers. At long ranges the fire power of the platoon will be most effective when the commander concentrates the fire of several howitzers on a single target.

c. Where a platoon is concentrating its fire on a target, the platoon commander may determine the range with one piece and then announce it to the rest of the platoon (fig. 19).

■ 87. COORDINATION AND CONCENTRATION OF FIRE.—The fire power of the platoon is most effective when it is coordinated by the platoon commander. He indicates when each section is to open fire or cease fire. He prevents waste of ammuni-

tion on unimportant targets or enemy vehicles which are already knocked out. He designates targets for elements of his platoon by—

a. Dismounting chiefs of section and pointing out targets.

b. Indicating positions of targets with HE shell, announcing "Watch burst" (fig. 19).

c. Designating targets with reference to prominent objects.

■ 88. DIRECT LAYING WITH COAXIAL TELESCOPE.—*a. Stationary target.*—Lay for *direction* by traversing until the telescope is centered on the target. Lay for *range* by elevating and depressing the muzzle, stopping on the DOWNWARD movement of the muzzle when the graduation for the announced range is on the center of the target.

b. Moving target.—(1) For the first round, lay the vertical center of the reticle on the target, using the range graduation indicated by the chief of section. Track the target for a short distance to get the "feel" of it, then swing out ahead of the target to establish the lead. Fire as the correct lead is approached. Do not stop traversing. Do not lay ahead of the target and wait for it. Continue to track the target and adjust both the lead and the range as indicated by your observation or the subsequent commands of the chief of section. Fire each time as the correct lead is approached.

(2) Leads are announced in mils. For practical purposes, the lead in mils depends only upon the speed of the target, not on range. Leads are measured from the center of the target. Present reticles are so designed that the gunner can set the lead with reasonable accuracy (fig. 21). Skill is acquired by practice, and not merely by memorizing a lead table. Use lead table (fig. 20) for the first round only, adjusting lead according to observed results.

(3) If the target is moving directly toward the howitzer, no lead is used. Lay on the center of the target. In this case the announced range should be 100 yards less than the estimated range. If the target is moving directly away from the howitzer, the announced range should be 100 yards greater than the estimated range.

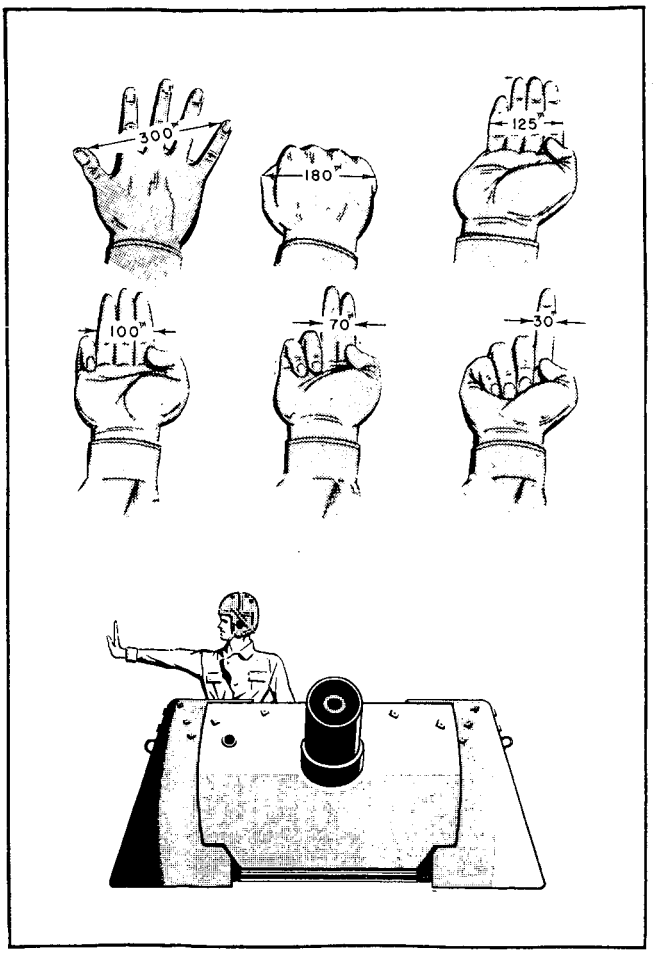
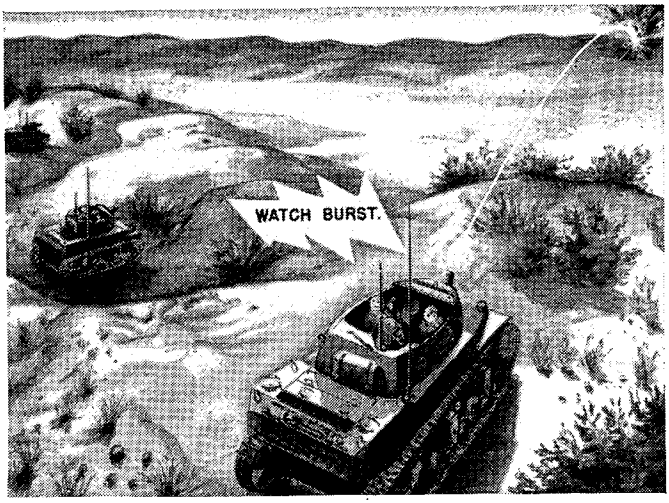
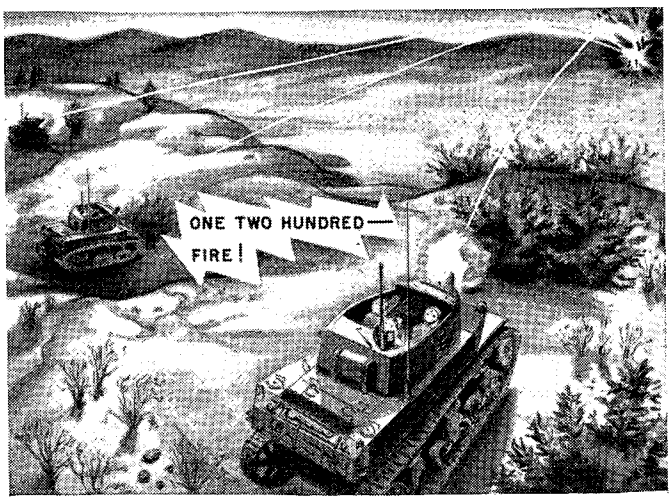


FIGURE 18.—Measuring angles with the hand. Each individual must find the exact number of mils subtended by his fingers and hand (held at arm's length from the eye). The illustration shows approximate figures for the average person.



①

FIGURE 19.—Concentrating direct fire of platoon.



②

FIGURE 20.—Leads in mils.

75-mm howitzer

Speed of target	Target traveling perpendicular to line of fire	Target traveling at 45° to line of fire
Slow (0–10 mph)	10	6
Medium (10–20 mph)	20	14
Fast (20–30 mph)	30	20

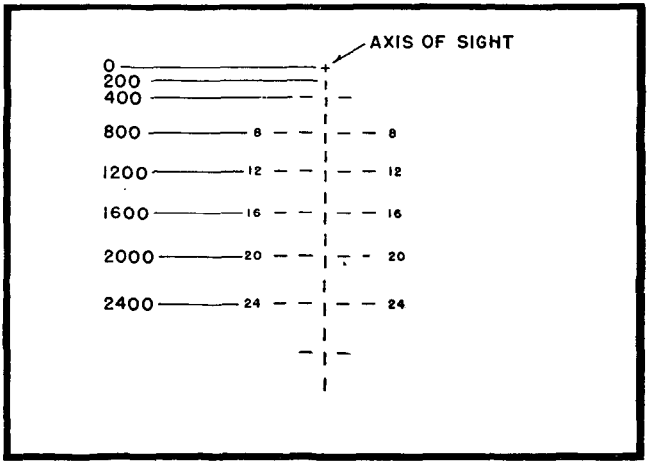
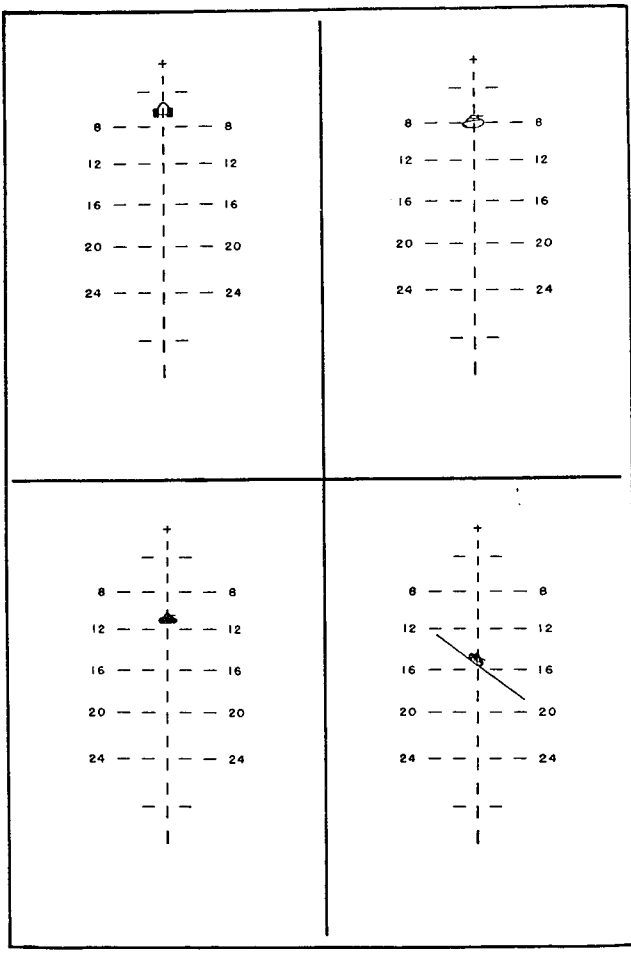


FIGURE 21.—Reticle, coaxial telescope, with dimensions.



Range to target:
Top left — 600 yards
Top right—800 yards
Lower left—1,100 yards
Lower right—1,500 yards

FIGURE 22.—Direct laying with coaxial telescope. Lay proper range graduation on center of target.

■ 89. DIRECT LAYING WITH PANORAMIC TELESCOPE M12A5 AND MOUNT M44.—*a. Stationary target.*—(1) Set the elevation and azimuth scales at zero, and the angle of site scale at 300.

(2) Set the indexes of the field prism (tilting head) at zero.

(3) Center the cross-level bubble.

(4) Bring the intersection of the zero deflection line and the appropriate range line of the reticle on the target by operating the elevating and traversing handwheels.

b. Moving target.—(1) Same as (1) and (2) above.

(2) Same procedure as in 88*b*.

■ 90. SENSING.—The observer calls his sensing of the burst instantly, based upon what he sees as the burst first *begins,* and not upon his recollection.

a. Every round must be sensed for range as one of the following:

(1) *Over*—when the target is clearly defined or silhouetted against the burst.

(2) *Short*—when the target is obscured by the burst.

(3) *Doubtful*—whenever the observer is not positive that the range is either *over* or *short.* Generally, sensings of *doubtful* can be diminished in number by keeping the deflection corrected down to the nearest mil. However, the observer should not hesitate to sense as *doubtful* and repeat at the same range any round which he cannot sense positively as *over* or *short.*

(4) *Target*—only when effect on the target is seen or when effect is observed on the ground both in front of and behind the target at the same time.

(5) *Lost*—when no part of the burst or no smoke or dust from it is seen. A sensing of *lost* usually calls for a bold change in range or deflection. A close study of the terrain will frequently reveal a deep depression, ravine, or gully, into which the round may have fallen.

b. A sensing may sometimes be obtained from drifting smoke from the burst, but drifting smoke is deceptive and frequently unreliable. If the wind is nearly perpendicular to the line of fire, smoke drifting in front of the target indicates a *short;* behind the target indicates an *over.* However, a *quartering* wind may blow the smoke of a *short* behind the

target, or that of an *over* in front of the target if the deflection error is great enough. Be extremely cautious in sensing such rounds. Unless *positive,* fire again at the same range, correcting the deflection so as to bring the burst onto the gun-target line.

■ 91. SELECTION OF AMMUNITION.—*a. High explosive shell (HE).*—This is the principal ammunition for the assault howitzer. It is usually equipped with the M48 PDF fuze. This is a point detonating fuze (PDF) of the combination (superquick—delay) type. The ammunition is issued with the fuze set at SUPERQUICK. It may be set to burst .05 second after impact by turning the slotted setting sleeve on the side of the fuze so that the slot is aligned with the word "DELAY" stamped on the body of the fuze. Always set the fuze at DELAY before stowing the ammunition. (See fig. 23.)

(1) *Superquick action.*—This action is so sensitive that the shell detonates instantly upon contact with even light material. Therefore, when striking armor plate, a gun shield, buildings, or other solid objects, no penetration is obtained from the burst. The superquick (impact) burst is effective against personnel in the open, although to a lesser degree than a ricochet burst (air burst) which is usually obtained with the delay action. (See fig. 24.)

(2) *Delay action.*—The .05-second delay action allows the projectile to penetrate before bursting, when it strikes armor, gun shields, or buildings. Or, if the material struck is too dense for penetration by the projectile, the delay action has the effect of "capping" or confining the blast against the material, doing far greater damage than the superquick action. If the projectile strikes the ground, it ordinarily ricochets, travels approximately 20 yards beyond the point of impact, and bursts in the air, usually at a height of from 5 to 10 feet. The ricochet burst is distinguishable by its bright orange flash surrounded by very black smoke, and because of the downspray of fragments is extremely effective on personnel without overhead cover. It is much more effective than the impact (graze) burst of a superquick fuze setting. With the fuze set at DELAY, a direct hit will kill or injure nearby personnel; a short will give a ricochet (air)

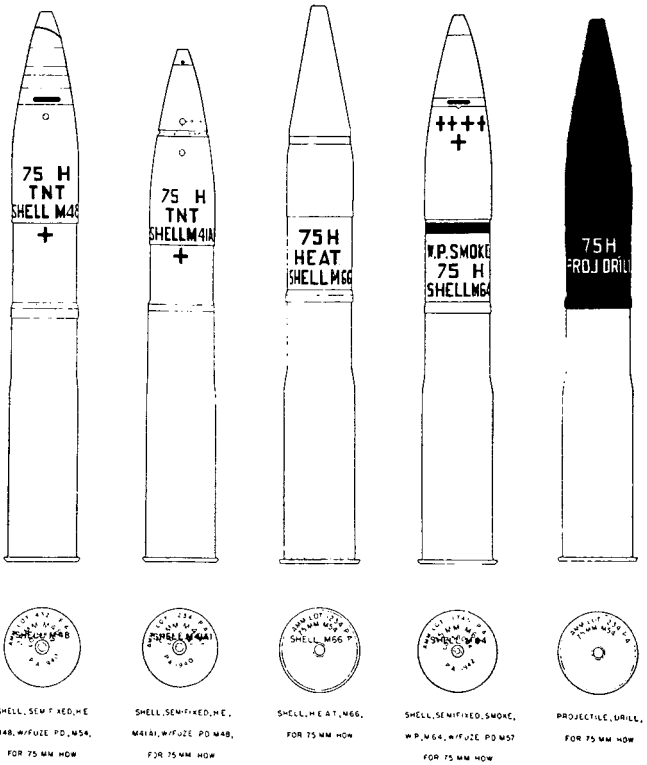


FIGURE 23.—75-mm howitzer ammunition.

burst which is deadly against personnel. With the delay action, therefore, dispersion is in your favor, as long as the range error is not excessive. (See figs. 25, 26, and 27).

b. High explosive antitank (HEAT).—This ammunition is very effective against armor plate, as long as the striking velocity is not greater than 1,000 feet per second. However, since comparatively small amounts of this ammunition are carried in the vehicle, it should be conserved. Use HE at the greater ranges, saving the HEAT for use against tanks at close range.

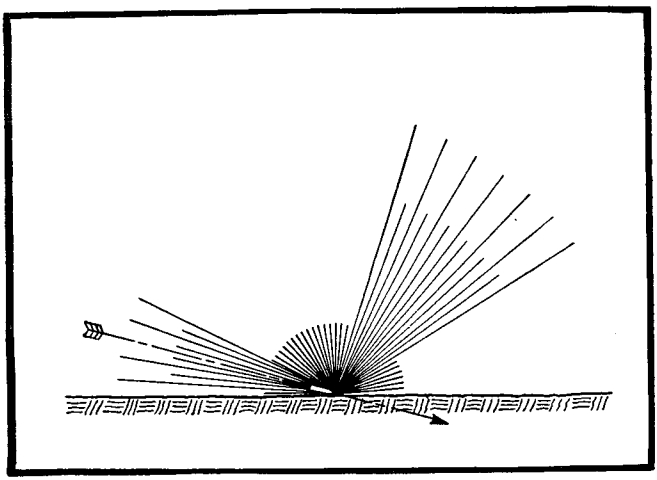


FIGURE 24.—Impact burst.

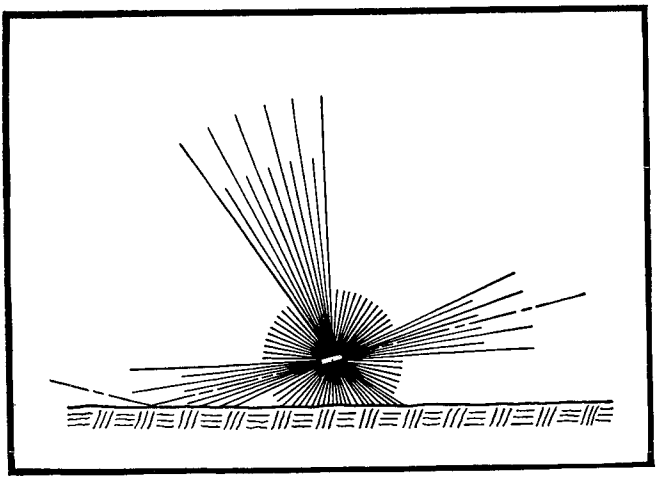


FIGURE 25.—Ricochet burst.

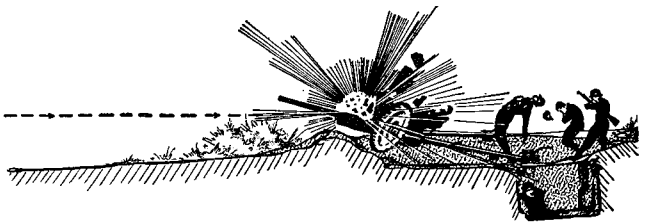


FIGURE 26.—Firing 75-mm shell with fuze DELAY.

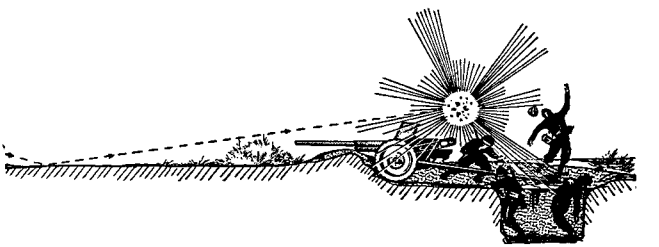


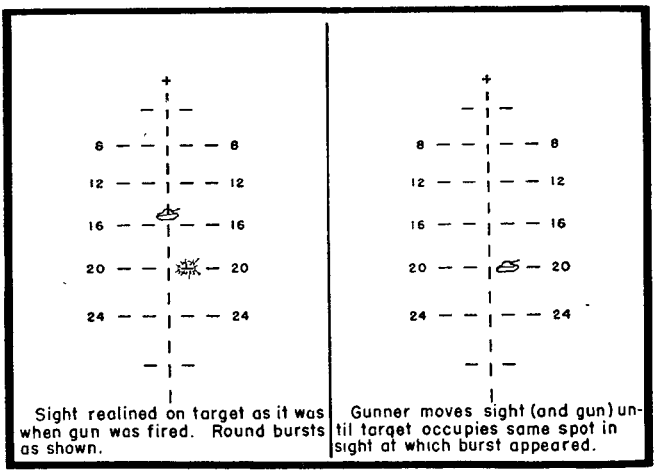
FIGURE 27.—Firing 75-mm shell with fuze DELAY, short bursts on ricochet.

c. Smoke.—Smoke is generally used only for screening purposes. On some occasions it may have incendiary and to a minor degree even casualty effect. When firing smoke for screening purposes, the burst must be placed so that the wind carries the smoke between the enemy and the force to be screened. Observe the drift of smoke from the first burst and then correct the laying. In a brisk breeze, the smoke must be laid some distance from the point to be screened. In a high wind, smoke is ineffective.

■ 92. ADJUSTING FIRE.—*a. General.*—The chief of section always observes firing from the carriage, if possible. Frequently the gunner will be unable to observe consecutive rounds; that is, he may see one round clearly but the next may be obscured by dust or smoke. Therefore the chief of section gives the gunner proper commands for the range and deflection change on each successive round. If the gunner can observe clearly, he makes his own corrections. If he fails to observe the round clearly, he applies the com-

mands given by the chief of section. Close teamwork and understanding are necessary between the chief of section and gunner.

b. Automatic adjustment method.—When visibility is good, the following system is effective at ranges up to 1,000 yards. In order to observe the burst, as soon as the gun is fired, immediately re-lay the gun so that the target occupies the same point on the sight reticle as it occupied when the gun was fired. Watch for the *base* of the burst or strike of the projectile, and then traverse and elevate the howitzer so that the target occupies the same place in the sight as the base of the strike or burst did (fig. 28). Fire the next round



Sight reclined on target as it was when gun was fired. Round bursts as shown.

Gunner moves sight (and gun) until target occupies same spot in sight at which burst appeared.

FIGURE 28.—Adjusting fire using reticle.

with this laying. This procedure applies an automatic correction for both deflection and range. To be effective, the *base* of the burst must be placed on the target. The gunner will use this method whenever possible at ranges under 1,000 yards.

c. Bracketing.—(1) The bracketing method is used when the gunner does not apply the automatic adjustment method.

An over and a short in range gives a bracket (fig. 31). When a bracket is obtained, split it and continue to split it until fire is effective. Inexperienced men usually underestimate the distance of a round from the target and make too small range changes (called "creeping"). Creeping wastes time and ammunition. Avoid it by making bold range change.* At ranges of 1,500 yards or less, the first range change is 200 yards; at greater ranges, the first range change is 400 yards. Announce exact deflection changes in mils to place the burst on the gun-target line. Handwheels, both elevating and traversing, should be graduated in mils; range changes are announced in mils, and set with the graduated handwheel. This is preferable to using the elevation scale or range drum, because it is so much faster. Memorize the change in mils for a 100-yard range change for key ranges. (See par. 106*d*(4).)

(2) Instructors should teach bracketing by blackboard drill and later by the terrain board. The instructor touches a stick to the terrain board at the point of burst and the gunner or chief of section is required to sense it with respect to the target and give the proper range and deflection change. The student should use field glasses. No howitzer section should fire service ammunition without having fired many problems on the terrain board.

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*The exception to this rule occurs when the target is close to friendly troops. Firing should be opened with a range which is surely over. Subsequent changes in range should be such that the shells do not burst short of the target. The procedure is as follows: the observer estimates the range to the target and adds 200 yards for safety. He orders the first round at this increased range. He estimates the distance of the burst from the target and shortens the range for the next round by one-half this estimated error. This procedure is followed until a hit is made.

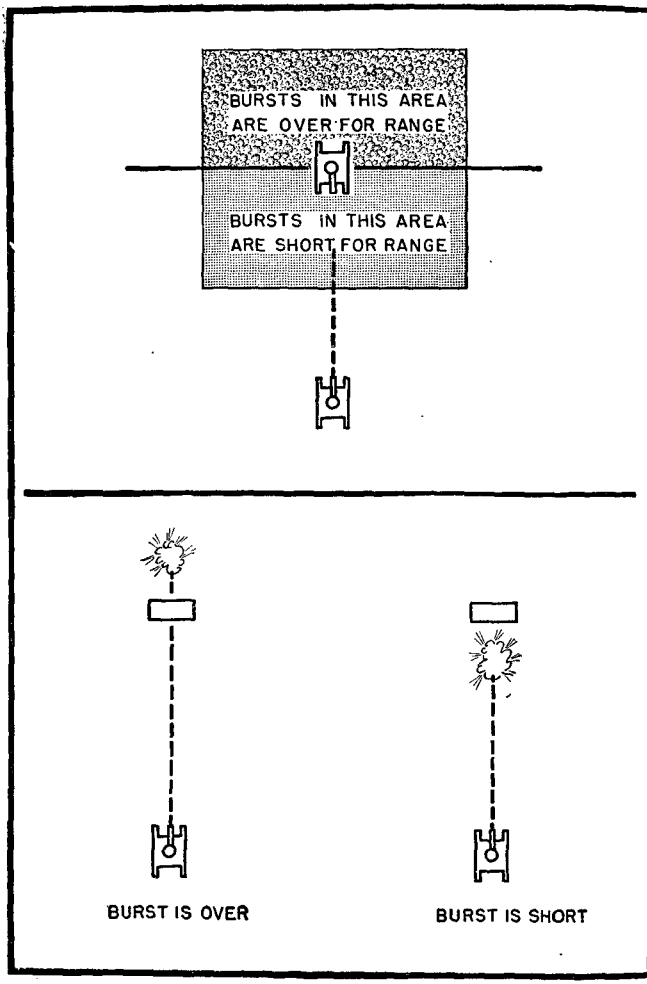


FIGURE 29.—Illustrating overs and shorts.

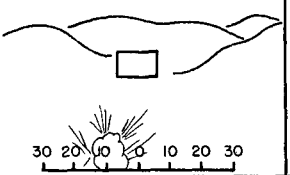
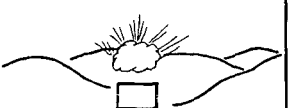
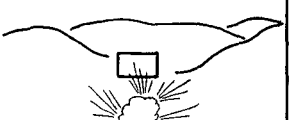
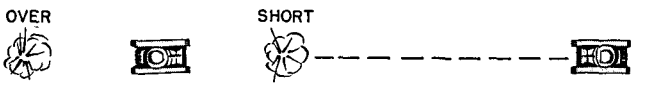
COMMANDS	RESULTS	SENSINGS
(TARGET: ANTITANK GUN) GUNNER, ANTITANK, H E, TRAVERSE RIGHT, STEADY.....ON ONE SIX HUNDRED, FIRE. (100 YARD RANGE, CHANGE = 4 MILS)		SHORT
RIGHT ONE ZERO, UP ONE SIX, FIRE		OVER
DOWN EIGHT, FIRE		SHORT
UP FOUR, FIRE		TARGET

FIGURE 30.—Example of problem, chief of section adjusting fire, gunner using graduated handwheels.



1–FIRST ROUND, OVER. FIRED WITH RANGE SETTING OF 1600 YARDS.

2–SECOND ROUND, SHORT. FIRED WITH RANGE SETTING OF 1200 YARDS. TARGET IS BRACKETED.

3–TO SPLIT THE BRACKET, FIRE NEXT ROUND WITH RANGE SETTING OF 1400 YARDS.

FIGURE 31.—Bracketing the target.

■ 93. FIRE ORDERS.—*a.* Before giving fire orders, alert the gunner. Say "Gunner." Give the commands in the following sequence:

Sequence	*Example*
1. Target description	ANTITANK
2. Type of ammunition to fire	HE
3. Direction to traverse turret	TRAVERSE RIGHT
4. Stopping traverse	STEADY . . . ON
5. Range	ONE TWO HUNDRED
6. Lead	LEAD ONE ZERO
7. Command to open fire	FIRE

b. Describe the ammunition as follows:

High explosive-antitank	HEAT
High explosive	HE
Smoke	SMOKE

■ 94. EXAMPLES OF FIRE ORDERS, DIRECT LAYING.—*a. Stationary target.*

GUNNER!

1. ANTITANK
2. HE
3. TRAVERSE RIGHT
4. STEADY . . . ON
5. ONE TWO HUNDRED
6. FIRE

b. Moving target.

GUNNER!
1. MOVING TANK
2. HEAT
3. TRAVERSE LEFT
4. STEADY . . . ON
5. EIGHT HUNDRED
6. LEAD ONE ZERO
7. FIRE

c. Platoon commander concentrating fire of platoon on stationary target.

PLATOON
ANTITANK
WATCH MY BURST

The platoon commander then orders one section to fire until the target is plainly indicated to the others, after which he commands:

PLATOON
ONE EIGHT HUNDRED
FIRE

d. Subsequent fire orders after sensing.

LEFT SIX
DOWN FOUR HUNDRED (or DOWN ONE SIX, if handwheels graduated)
FIRE

Sensing range correct or doubtful, order—

REPEAT RANGE
FIRE

SECTION IV

INDIRECT LAYING

■ 95. GENERAL.—Indirect laying is used whenever the gunner cannot see the target.

a. The purpose of placing a howitzer in a defiladed position and firing by indirect laying is to enable it to destroy targets without exposing itself to enemy fire.

b. The first step in indirect laying training is clear-cut explanation that indirect laying of the howitzer consists of laying the piece on a target, not visible to the gunner, according to directions received from the person who is directing

the fire. Make the men realize that indirect laying is easy to understand and to use.

c. Before training the men in indirect laying, explain its employment. Drill the crews in indirect laying by means of simulated firing exercises. After the men understand the mechanics of indirect laying, have simulated firing from tactical positions. Conduct terrain walks and have the crews select defiladed positions. Discuss their selections, keeping in mind the problem of minimum elevation.

d. Avoid placing the howitzer in such a position that the minimum elevation required to clear a crest or a mask of trees will make it impossible to hit the target when charge IV is used. It is true that reduction of charge, to require a greater elevation for the same range, is possible with the semifixed ammunition fired by the howitzer. In practice, reduced charges are difficult to prepare in the M8 carriage and occasions for them should be avoided.

e. As soon as each howitzer is in position, minimum elevation should be determined and reported to the observer. If the platoon is firing as a unit, the observer announces the greatest minimum elevation so reported as the minimum elevation for the platoon.

■ **96. Methods of Indirect Laying.**—*a. Single howitzer.*— Two methods for the indirect laying of a single howitzer are discussed below. They are—

(1) *Observer on carriage.*—(*a*) When the deflilading mask is low enough, the chief of section may observe and conduct the fire of his howitzer from the turret, or from a standing position on the rear deck of the vehicle. The howitzer is laid for direction as he sights over the howitzer tube and commands: TRAVERSE RIGHT (LEFT) . . . STEADY . . .ON. Initial laying for range is made by means of the elevation scale or range drum.

(*b*) If in a hull-down position only, the gunner may lay for range initially with the reticle of the coaxial telescope, even though he may not see the target. He lays the proper point of the reticle's range scale on that part of the landscape which he estimates to be at the announced range. The range error of the first round will not be excessive unless his estimate of range is poor.

(*c*) Subsequent commands for range are announced as changes in mils, as "Up (down) one six." The elevation change is made by means of the graduated handwheel.

(2) *"Lining-in" method.*—(*a*) When the defilade is sufficiently deep that fire cannot be observed from the vehicle, the chief of section selects a point to the front or rear from which he can observe the target or target area. He then "lines-in" the howitzer and target by standing on or by driving a stake on the gun-target line, and commands: LAY ON ME. The gunner lays for direction on the stake or chief of section using the panoramic telescope with azimuth scales set at zero. He then refers to an aiming point.

(*b*) An alternate method for the chief of section getting on the howitzer-target line, applicable when the chief of section must advance a considerable distance to the front in order to see the target, includes the use of an assistant. The chief of section and assistant, facing each other, and about 20 yards apart, place themselves on the line howitzer-target by alternately signaling each other to move right (left) until they are both on the line.

(*c*) Initial laying for range may be made by means of the elevation scale, range drum or gunner's quadrant. Subsequent changes may be announced in mils "Up (down) (so many mils)," using graduated handwheel, or they may be announced as a new elevation (elevation scale or gunner's quadrant) or new range (range drum). (See par. 102.) Precision adjustments are made with the gunner's quadrant. When great speed is required, the elevation scale or range drum is used.

(*d*) Laying for angle of site. (See par. 103.)

(*e*) Communication is by voice, or if necessary, by voice relay.

b. Platoon.—(1) *"Lining-in" method.*—(*a*) The platoon may be laid on a single point as easily as one howitzer by this method. The platoon commander dismounts the section chiefs and points out the target to them. Each section chief then proceeds to line in his howitzer as explained in *a*(2)(*a*) above.

(*b*) Laying for range is accomplished in the same manner as for a single howitzer.

(*c*) Communication is by voice or voice relay.

(2) *Parallel laying method.*—(*a*) This is the usual method of laying the platoon. The observer (generally the platoon commander) sets up an aiming circle at a point from which he can see the target and the howitzers. He then—

1. Lays the howitzers parallel to the observer-target line (See par. 98.)
2. Commands a shift right or left which will lay the adjusting piece on the target. (Correcting for observer's position, par. 99.)

(*b*) Laying for range on each piece is accomplished by means of the elevation scale or range drum.

(*c*) One observer conducts the fire of all pieces.

(*d*) Communication may be by radio or voice.

■ 97. MIL RELATION.—*a.* In gunnery the unit of measure for distance is the yard. The unit of measure for angles is the mil, $\frac{1}{6400}$ of a circle (fig. 32). Practically, a mil is the angle subtended by 1 yard at a distance of 1,000 yards (fig. 33).

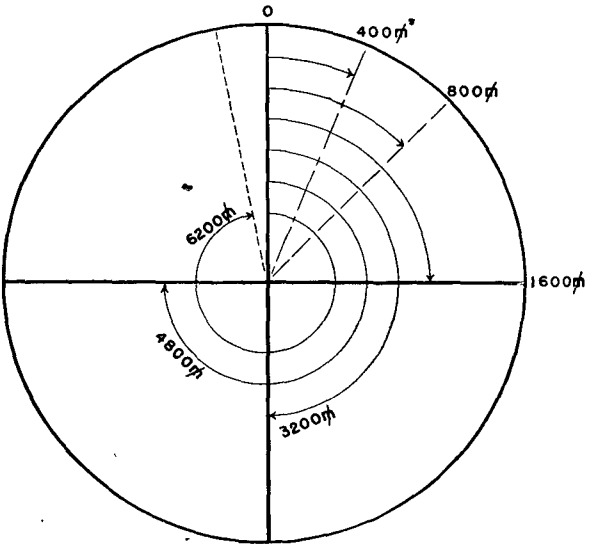


FIGURE 32.—Measuring angles in mils.

b. The mil relation is expressed as $\frac{W}{Rm}$ (*WORM*) where m is the angle in mils, W is the width at the base, and R is the range expressed in thousands (fig. 34).

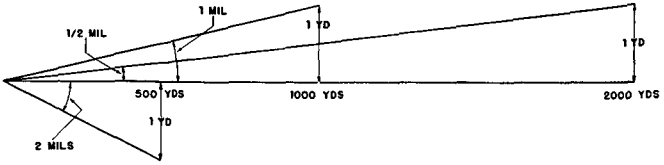


FIGURE 33.—Relation of mils to width and range in yards.

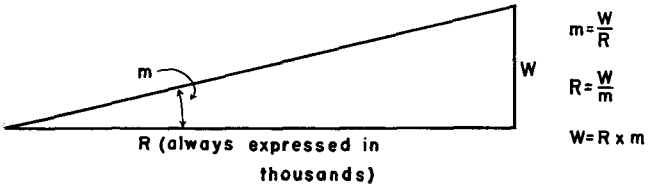


FIGURE 34.—Mil relation.

c. By memorizing the relation $\frac{W}{Rm}$ (*WORM*) the individual can at once determine the value of any one of the three factors (W, R, m) if he knows the value of the other two. Simply remove the unknown factor from the relation; the unknown equals the remainder.

Example 1: The known width of an object is 20 yards. It measures 10 mils in the binoculars. What is the range? Taking the relation $\frac{W}{Rm}$, remove the unknown (R), then R is equal to the remainder, $\frac{W}{m}$, or $\frac{20}{10}$, or 2; since R is always in thousands, the range is 2(000) yards.

Example 2 (fig. 35): The observer is 60 yards to the right of the howitzer. The howitzer is laid parallel to the observer-target line. The range to the target is 1,500 yards. How much must the gun be shifted to the right to lay on the target? Taking the relation $\frac{W}{Rm}$, remove the unknown (m),

then m is equal to the remainder, $\frac{W}{R}$, or $\frac{60}{1.5}$, or 40. The shift is 40 mils.

■ 98. LAYING HOWITZERS PARALLEL.—*a*. The howitzers are placed in position and the general direction of the target is made clear to the chiefs of section.

b. The observer sets up his aiming circle where he can see the target and the howitzers. He levels the head of the aiming circle by the spherical level in the head.

c. With the azimuth index set at 3200 and the micrometer set at zero he lays the vertical crosshair on the target, using the lower motion of the aiming circle. He clamps the lower motion in this position.

NOTE.—This conforms to the method used in laying tanks equipped with the azimuth indicator.

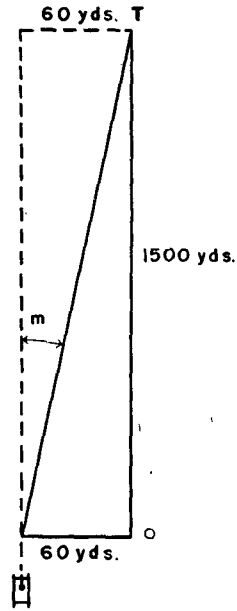


FIGURE 35.—Computing shift by mil relation.

d. The observer commands: AIMING POINT THIS INSTRUMENT. Each chief of section checks to see that his gunner identifies the aiming point. Each gunner reports "Aiming point identified."

e. Using the upper motion, the observer rotates the head of the aiming circle until the vertical crosshair is laid on the panoramic sight of the No. 1 howitzer.

f. He reads the setting of the azimuth scale, lower row, and the micrometer scale. This is the deflection for the piece.

g. He commands: DEFLECTION NO. 1, (SO MUCH).

h. The gunner on No. 1 then repeats and sets off the deflection on his azimuth scale and micrometer and traverses the piece to bring the vertical crosshair on the aiming circle and reports, "No. 1 ready for recheck."

i. The observer then determines and announces the deflection for each of the other howitzers in the same manner, and each gunner sets off the deflection for his piece.

j. If time permits, the observer rechecks the deflection of each piece to correct for the displacement of the gun's panoramic sight caused by traversing the piece. Using the upper motion the observer again lays the vertical crosshair of the aiming circle on the sight of each piece and announces the deflection thus: "Recheck No. (1), deflection (so much)." A second recheck may be made if extreme accuracy is desired. Each time the deflection is rechecked, the gunner repeats the deflection read to him. He then reports the difference in mils between the announced deflection and the deflection set on his sight by calling, "(So many) mils out" or "zero mils" if the deflection is correct. When the observer is satisfied with the laying of a piece, he calls "No. (1), laid" and makes no further check of that piece.

k. The howitzers are now laid parallel.

l. The panoramic sight of one howitzer can be used to lay the others parallel. From a hull-down position where he can observe the target and the other howitzers, the observer lays on the target with the azimuth and micrometer scales of the sight at zero. He turns the head of the telescope so as to lay the crosshair on the sight of one of the other howitzers. The reading of the azimuth scale and micrometer

is the deflection for that howitzer in mils. The deflection for each of the other howitzers is found in the same manner.

■ 99. CORRECTING FOR POSITION OF OBSERVER.—If the observer is on the line of fire, laying the howitzers parallel lays them on the target. If the observer is not on the line of fire, it is necessary to correct for his position (fig. 36). The observer can determine his position with respect to the line of fire in this way. If the angle read to No. 1 howitzer (par. 98) is less than 3,200 mils, the observer is to the left of the howitzer-target line, but if the angle is greater than 3,200 mils (upper scale, aiming circle) he is to the right of the line. He estimates the perpendicular distance from his position to the line of fire. Next he estimates the distance from the observation point to the target. By means of mil formula, he determines the amount necessary to shift the howitzers (fig. 36). He shifts the pieces as soon as he has laid them parallel. The shift is right if the observer is to the right of the howitzer and vice versa.

■ 100. LAYING FOR DIRECTION USING A STAKED LINE (fig. 37).—When howitzers are used as auxiliary artillery, the artillery command frequently will stake out a line on the ground near the firing position. The artillery officer then gives the platoon commander the general direction of fire and the angle to use in laying the howitzers. The platoon commander—

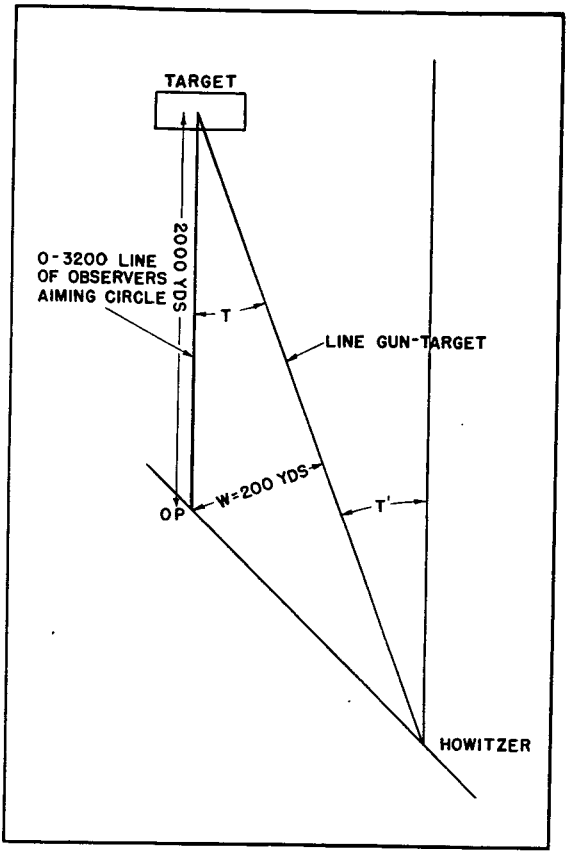
a. Sets up the aiming circle accurately on the line.

b. Sets off on the aiming circle the angle supplied by the artillery officer.

c. Using the lower motion, lays the vertical hair of the reticle on the more distant end of the line. The 0–3200 line of the instrument is now parallel to the direction in which the pieces are to be laid.

d. Lays the howitzers parallel to the 0–3200 line as described in paragraph 98.

■ 101. SUBSEQUENT SHIFTS IN DIRECTION.—The howitzer having been laid on the target, in order to make subsequent shifts in direction, have the gunner refer to an aiming point or aiming stakes and record the deflection reading on a convenient part of the carriage. At the command LEFT 50 the gunner must move the panoramic sight to the right 50 mils,



Howitzer is laid parallel
Observer is at *OP*

$$\text{Value of } T \text{ in mils } \frac{\text{(Range in thousands of yards)}}{\text{(Width)}} = \frac{200}{2} = 100$$

Angle T = Angle T_1

Therefore the shift is left 100. This brings howitzer on the target.

FIGURE 36.—Correcting for position of observer.

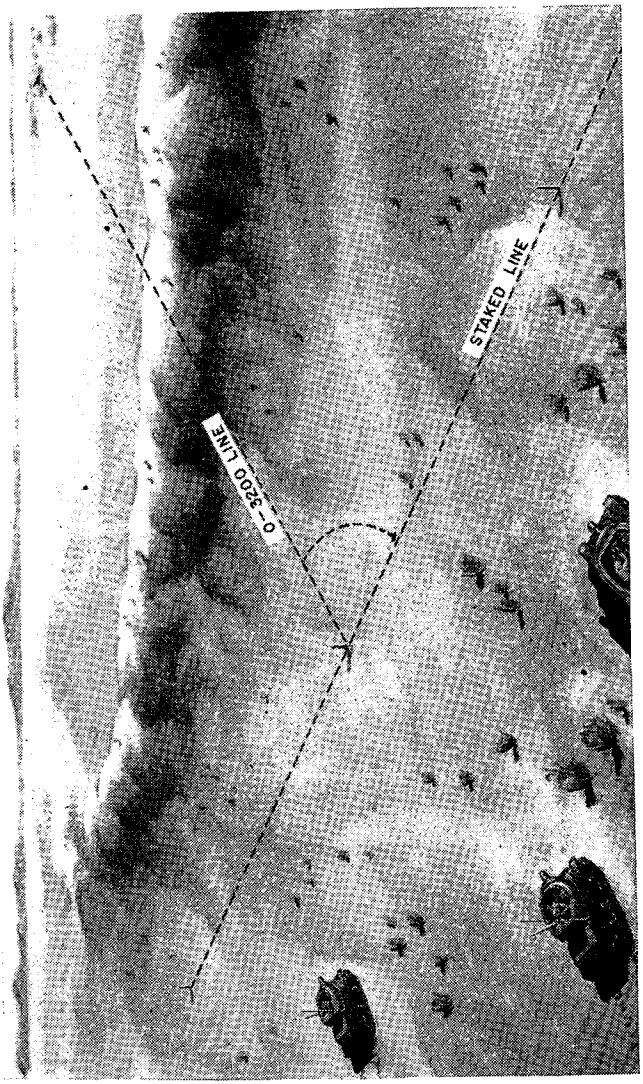


FIGURE 37.—Staked line.

increasing the deflection reading by that amount so that when he traverses the piece to bring the vertical crosshair back on the aiming point, the tube will move to the left 50 mils. In a like manner, if the command is RIGHT 50, he must move the sight to the left 50 mils *decreasing the deflection reading* by that amount so that the tube will move to the right when the piece is traversed to bring the vertical crosshair back on the aiming point. Remember the rule LARS (Left Add, Right Subtract). If the command is LEFT (SO MUCH) add to the deflection; if it is RIGHT (SO MUCH) subtract it from the deflection.

■ 102. LAYING FOR RANGE.—*a. Initial laying.*—Observer estimates or measures the range from howitzers to target. He may give the command for range in mils of elevation, as ELEVATION, EIGHT ZERO, or in yards, as TWO TWO HUNDRED. The gunner has three possible methods of making his initial lay for range in indirect laying—

(1) By using the range quadrant, setting elevation in mils.

(2) By using the range drum, setting range in yards.

(3) By using the gunner's quadrant.

b. Subsequent laying.—Subsequent commands for range may be given:

(1) As a change, in mils, as UP ONE SIX. The gunner must hold the handwheels when firing. To execute this command then, he merely turns the graduated handwheel in the proper direction, counting off sixteen spaces on the handwheel as they pass the index. (Always make the final motion of the muzzle downward—in this case, the gunner would have elevated 20 mils, then depressed 4 mils.)

(2) As a new elevation in mils, as ELEVATION, NINE SIX. The gunner sets the new elevation on the elevation scale and centers the bubble by elevating and depressing the howitzer.

(3) As a new range, in yards, as, for example, TWO SIX HUNDRED. The gunner turns the range drum until the new range is opposite the index, then elevates and depresses the howitzer until the bubble is centered.

■ 103. ANGLE OF SITE.—*a.* In laying for elevation using indirect methods, consideration must be given to the relative altitudes of the howitzer and target. A gun is laid for ele-

vation with respect to the horizontal plane. A projectile fired at the correct elevation for a range of 1,000 yards will give a range of 1,000 yards only if the target area is on approximately the same level as the gun; if the target is on higher ground than the gun, the projectile will fall short; if the gun is higher than the target, the projectile will fall beyond the target (fig. 38). This difference in altitude must be compensated for in elevating the tube of the gun for range. In order to be applied it is reduced to an angular measurement known as angle of site.

b. The angle of site is the vertical angle measured at the gun between the horizontal plane through the gun and the target. If the target is above the gun, the angle of site is plus; if the target is below the gun, the angle of site is minus.

c. When the elevation scale or the range drum is used, the angle of site is set off on the site scale. Since 300 on the site scale is a zero setting, to set a site of +20 the scale must be set at 320. For a site of −20 the scale is set at 280.

■ 104. COMPUTING ANGLE OF SITE.—While the angle of site can be computed precisely, it is ordinarily unnecessary to do more than approximate it. If the angle of site is less than 5 mils, it may be ignored.

a. When the observer's position is close to the gun he may—

(1) Measure the angle of site with the aiming circle, simply by laying the *vertical* crosshair on the target, leveling the telescope bubble, then reading on the vertical mil scale the number of mils from the horizontal crosshair to the target. Above the horizontal crosshair the value is plus, below it is minus.

(2) With binocular, pick a distant point on approximately the same level as the gun, and read the vertical difference in mils on the binocular reticle between that point and the target.

(3) Measure the vertical distance from one target to another. In a case involving a shift of fire from one target to another on different levels, the vertical distance between the two may be measured in mils on the reticle of the binocular, or aiming circle.

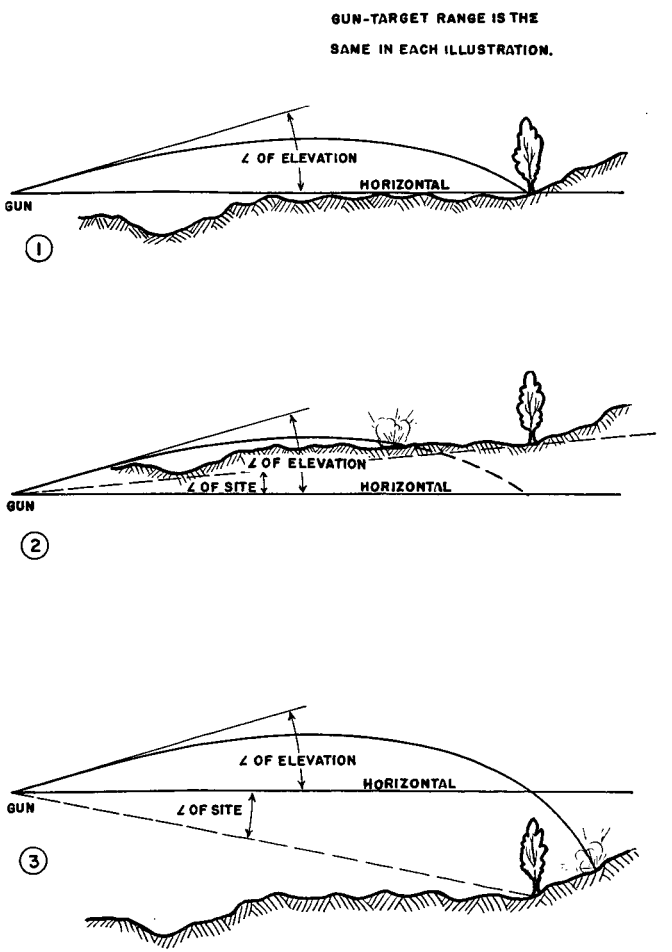


FIGURE 38.—Angle of site and its effect on the trajectory.

b. When the observer's position is considerably removed from the gun, it may be necessary to compute the angle of site accurately (figs. 39 and 40). This is done as follows:

(1) With aiming circle, measure the site from the observer to target; by the mil relation compute the difference in yards between levels of observer and target. ($W=m\times R$.)

(2) Using same method as in (1) above, compute the vertical difference in yards between observer and gun positions.

(3) By comparing the results of (1) and (2) above, determine the difference in yards between levels of gun and target; convert this difference to mils, ($m=\frac{W}{R}$), using the estimated range from gun to target. This is the angle of site.

■ 105. ADJUSTING FIRE.—*a. General.*—(1) The observer stays as close to the line of fire as the terrain permits. Moving to the flank distorts his sensings of range and deflection errors.

(2) First, have the section nearest the observation point fire a round using initial data as computed by the observer. Then, sense the deviation of the burst from the target and give command for a change in deflection which will bring the next round on or near the gun-target line. Then give an order for a change in range which will bracket the target for range. Continue to correct deflection and split the bracket until effective fire can be put on the target with the corrected data. Then fire a salvo (par. 106) with all howitzers to check the deflection and range of each. When effective fire is obtained, change to volley fire (par. 106).

(3) When firing one howitzer in the preliminary adjustment of a platoon, the other howitzers must follow the deflection and elevation changes given to the adjusting piece.

b. Direction.—(1) In correcting direction, measure the deviation of the round from the target by means of the mil scale in the field glasses, or else by measuring it in mils using the hand or finger, the hand being held an arm's length from the eye (fig. 18). Everyone must determine and memorize the width of his hand, fist, and finger in mils. When adjusting two or more howitzers, measure the deviation of the center of the group of bursts.



FIGURE 39.—Computing angle of site.



FIGURE 40.—Computing angle of site.

(2) The *sheaf* consists of the planes of fire of several howitzers handled as a group (fig. 41). A *converged sheaf*

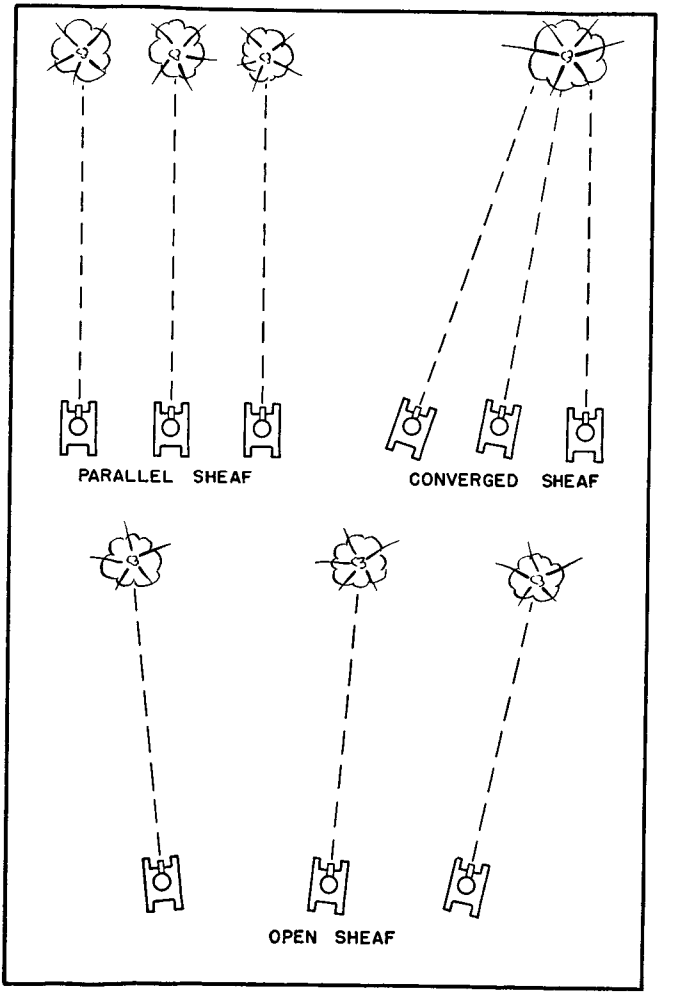


FIGURE 41.—Types of sheafs.

is one in which the fire is converged at the target. A *parallel sheaf* is one in which the guns are laid parallel. An *open sheaf* is one which is spread beyond parallel. Any howitzer badly out of place in the sheaf is corrected individually.

(3) Use a converged sheaf for *point* targets (antitank guns, pill boxes) accurately located. Use a wider sheaf for point targets which are not located accurately, and for area targets (gun positions concealed in general areas, assembly areas). The burst of a 75-mm shell covers an area 30 yards wide and 10 yards deep. Therefore, the maximum effective sheaf with three howitzers is 90 yards, the distance between flank bursts being 60 yards. When there is more than 60 yards between flank bursts, the sheaf must be closed to 60 yards to get complete coverage of the area attacked.

c. Range.—The principles given in this paragraph are repeated because of their great importance.

(1) When the first round is sensed for range, change the range in the proper direction by an arbitrary amount of 200 yards (1,500 yards or less), or 400 yards (over 1,500 yards), unless you *know* the round was near the target. When the round is far from the target, the change is greater than 400 yards. Make range changes bold enough to insure the next round appearing in the opposite sense. Creeping can be justified only when shorts will fall on friendly troops. After a bracket is obtained, further adjustment consists in splitting the bracket successively until effective fire is obtained. If you obtain a salvo giving both overs and shorts, change to fire for effect (volley fire) immediately. During volley fire, the range of each volley as a whole is sensed.

(2) Fire for effect is generally conducted at a single range. Range dispersion gives depth to the beaten zone. Fire several volleys initially. If this range gives a decided preponderance of overs or shorts, make an appropriate range change to center fire on the target.

■ **106. FIRE ORDERS.**—*a. General.*—The sequence of commands is the same as for direct laying. Necessary additional information is shown below.

Target description. No change.
Type of ammunition to fire. No change.
Direction to traverse turret. See *b* below.

Stopping traverse. Not used.
Site. See *c* below.
Range. See *d* below.
Howitzers to fire. See *e* below.
Method of fire. See *f* below.
Fire. See *g* below.

b. Direction.—Initial commands are LAY ON ME or, for example, AIMING POINT, THIS INSTRUMENT, DEFLECTION NO. 1, THREE ZERO NINE ONE. Subsequent commands are the deflection shifts, as RIGHT FIVE, LEFT ONE ZERO.

c. Site.—(1) If angle of site is involved, the command is SI, (pronounced ess-eye) SO MUCH, as, for example, SI, THREE TWO ZERO.

(2) If no site is involved, or if the angle of site is included in the elevation command, no command for site is given.

d. Range and elevation.—(1) The initial elevation is announced to the nearest even mil. The command is, for example, ELEVATION, FOUR SIX, and this indicates use of the range quadrant instead of the range drum. Subsequently changes are announced as "Up (down) so much" if the elevating handwheel is graduated, or may be announced as a new elevation, for example, "Elevation, six two." Use of the graduated handwheel makes for speed in adjustment.

(2) When the range drum is used the initial range is announced to the nearest hundred yards, for example, "Two four hundred." For subsequent range changes, the command is UP (DOWN) SO MANY (MILS), if the elevating handwheel is graduated; or, range changes may be made by announcing the new range.

(3) In column 4 of the firing tables is found the change in elevation for each 100 yards change in range. This change is known as "c." Changes in elevation are found by multiplying "c" to the nearest mil by the number of hundreds of yards of range change desired. Example: The elevation for 1,200 yards range is 40.4. This is announced as ELEVATION FOUR ZERO. The "c" for 1,200 yards is 3.8. Taken to the nearest mil it is 4. For a 200-yard bracket use 2 "c's" or 8. (See par. 102.) To reduce the elevation this figure is subtracted from 40 and the new elevation announced as ELEVATION THREE TWO, or with graduated hand-

wheel, the command is: DOWN EIGHT. To split the bracket increase the elevation to 36 by announcing a new elevation or giving the command UP FOUR.

(4) The following approximate values of "c" for charge IV, shell, HE, M48, should be memorized:

Less than 3,000 yards—4m.
3,000 yards to 4,500 yards—5m.
4,500 yards to 6,000 yards—6m.

e. Guns to fire.—To fire all the howitzers, preface the method of fire by PLATOON. To fire one howitzer, preface the method by designating that piece, for example, NO. 1, ONE ROUND.

f. Method of fire.—Where more than one gun is to fire, there are two methods of fire.

(1) *Salvo fire.*—The command is: PLATOON RIGHT (LEFT). This indicates the flank from which the guns fire successively. Fire is opened by the chief of section on the designated flank as soon as he is ready. Each howitzer follows in sequence 2 seconds after the adjacent gun has fired. If wind is from the right, use salvo left, and vice versa.

(2) *Volley fire.*—Change to volley fire as soon as you get effect. The command is: PLATOON (SO MANY) ROUNDS. Each howitzer fires the specified number of rounds as soon as it is ready without regard to the other pieces.

g. Command to fire.—The command FIRE, given by the observer, is the authority for the piece or pieces to open fire.

■ 107. EXAMPLE OF INDIRECT LAYING.—*a. Single howitzer.*—Target: antitank gun. Range: 2,000 yards. Angle of site: +10. Ammunition: HE, M48, c=4.

b. Platoon (three howitzers).—Target: 88-mm gun accurately located. Range: 2,500 yards. Angle of site: −10. Ammunition: HE, M48. c=4.

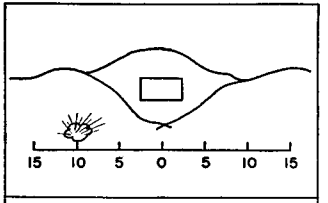
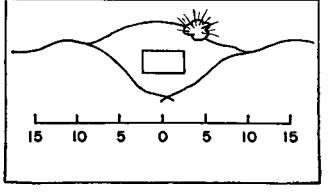
Commands	Observations	Sensings
GUNNER, ANTITANK, HE, LAY ON ME, SI THREE ONE ZERO. ELEVATION, SEVEN FOUR (Using elevation scale) or SI THREE ONE ZERO, TWO THOUSAND (Using range drum). FIRE.		Short
RIGHT ONE ZERO, ELEVATION, NINE ZERO (Using elevation scale) or TWO FOUR HUNDRED (Using range drum) or UP ONE SIX (Using graduated handwheel). FIRE.		Over

FIGURE 42.

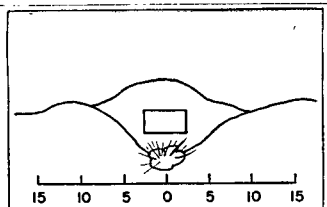
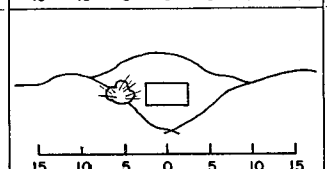
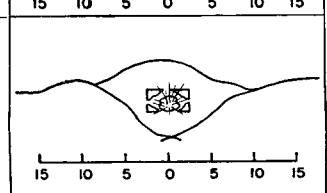
Commands	Observations	Sensings
LEFT THREE ELEVATION, EIGHT TWO (Using elevation scale) or TWO TWO HUNDRED (Using range drum) or DOWN EIGHT (Using graduated handwheel) FIRE		Short
ELEVATION, EIGHT SIX (Using elevation scale) or TWO THREE HUNDRED (Using range drum) or UP FOUR (Using graduated handwheel) FIRE		Doubtful
RIGHT FIVE REPEAT RANGE FIRE		Target

FIGURE 43.

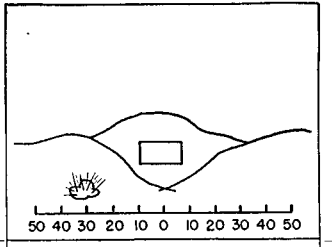
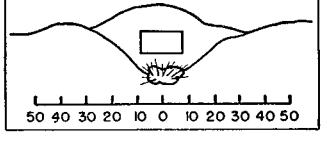
Commands	Observations	Sensings
PLATOON; ANTITANK; HE; AIMING POINT, THIS INSTRUMENT; DEFLECTION NO. ONE, TWO FOUR THREE ZERO DEFLECTION NO. TWO, TWO SEVEN NINE FIVE; DEFLECTION NO. THREE, TWO NINE SIX ZERO (When using indirect laying, the piece at the right is always designated No. 1.) LEFT FIVE ZERO (Correcting for position of observer, par. 99). SI TWO NINE ZERO ELEVATION NINE SIX (Using elevation scale) or SI TWO NINE ZERO, TWO FIVE HUNDRED (Using range drum.) NO. ONE, ONE ROUND FIRE		Doubtful
RIGHT THREE ZERO REPEAT RANGE FIRE		Short

FIGURE 44.

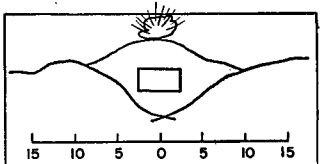
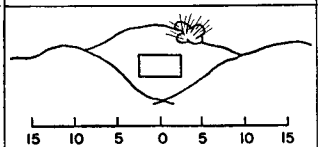
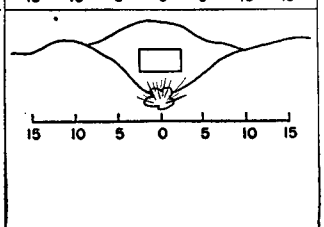
Commands	Observations	Sensings
ELEVATION, ONE ONE TWO (Using elevation scale) or TWO NINE HUNDRED (Using range drum) or UP ONE SIX (Using graduated handwheel) FIRE		Over
ELEVATION, ONE ZERO FOUR (Using elevation scale) or TWO SEVEN HUNDRED (Using range drum) or DOWN EIGHT (Using graduated handwheel) FIRE		Over
LEFT THREE; ELEVATION, ONE HUNDRED (Using elevation scale) or TWO SIX HUNDRED (Using range drum) or DOWN FOUR (Using graduated handwheel) FIRE		Short

FIGURE 45.

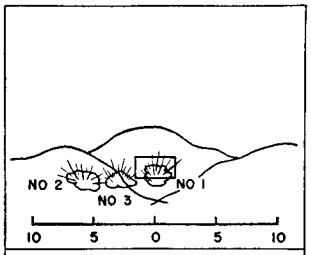
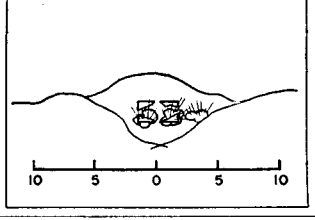
Commands	Observations	Sensings
NO. TWO, RIGHT TWO ZERO; NO. THREE, RIGHT FOUR ZERO (For accurately located point target, use converged sheaf. Howitzers are about 50 yards apart and laid parallel. This would make the distance between bursts 50 yards. 50 yards subtends 20m at 2,500 yards, therefore a shift of 20m will place No. 2 burst on the target. A shift of 40m will place No. 3 burst on the target) ELEVATION ONE ZERO TWO (Using elevation scale) or TWO SIX FIVE ZERO (Using range drum) or UP TWO (Using graduated handwheel) PLATOON RIGHT (Splitting a 4-mil or 100-yard bracket, effective fire will probably be obtained on next round. Therefore, fire all three guns. Use salvo fire to check the deflection) FIRE		(Senses each burst as it appears) Target, doubtful, doubtful
NO. TWO, RIGHT FIVE; NO. THREE, RIGHT THREE; REPEAT RANGE; PLATOON, ONE ROUND (Fire volleys to destroy the target) FIRE		Target

FIGURE 46.

CHAPTER 4

GUNNER'S EXAMINATION

■ 108. GENERAL.—*a.* The time for any trial in the gunner's examination is measured from the last word of the command to the soldier's report "Ready," or "Set."

b. To obtain maximum credit, trials must be performed promptly and without hesitation. The loss of points for excessive time should be proportional to the amount of delay.

■ 109. MATÉRIEL.—The disassembly and assembly of the breech mechanism and firing lock and the lubrication test are not essentially speed tests; the times prescribed for maximum credit in the operations are intended only to insure that the candidate can perform the operations without wasted effort. If during any trial, the examining officer believes that the candidate may, through haste, damage the matériel, the examining officer will stop the trial and give the candidate a grade of zero on it.

■ 110. DISASSEMBLY OF BREECH MECHANISM AND FIRING LOCK (one trial).—*a.* The candidate takes post in the turret of the carriage. The examining officer commands, for example: DISASSEMBLE BREECH MECHANISM AND FIRING LOCK. The candidate performs the operation as described in TM 9–321. As he disassembles each part, he lays it on paulin on the floor of the carriage.

b. The candidate will be marked on the general merit of his work, except that no credit will be allowed if the time required exceeds 1 minute and 30 seconds.

c. If the trial is correctly performed in exactly 1 minute and 30 seconds or less, credit of two points will be given.

■ 111. ASSEMBLY OF FIRING LOCK AND BREECH MECHANISM (one trial).—*a.* All parts of the disassembled breechblock and firing lock will be arranged in order on a paulin on the floor of the carriage. The candidate takes post in the turret of the carriage. The examining officer commands, for example: ASSEMBLE FIRING LOCK AND BREECH MECHANISM. The candidate performs the operation as described in TM 9–321.

b. The candidate will be marked on the general merit of his work, except that no credit will be allowed if the time required exceeds 1 minute and 30 seconds.

c. If the trial is correctly performed in exactly 1 minute and 30 seconds or less, credit of two points will be given.

■ 112. LUBRICATION (one trial).—*a.* The piece will be prepared for action. On a paulin on the floor of the carriage will be placed a complete set of lubrication equipment and, in plainly labeled containers, each type of lubricant used on the piece. The candidate takes the post of the gunner. The examining officer commands: DAILY LUBRICATION TEST. The candidate demonstrates the daily lubrication procedure at each point, using the proper device and lubricant (see W.D. Lubrication Guide No. 117, 31 December 1942), but does not perform the actual operation. When finished, he calls "Ready," and steps clear.

b. No credit will be allowed if the time required exceeds 2 minutes and 30 seconds.

c. A penalty of one-half point will be assessed for each place missed or improperly lubricated, and for each time the proper lubricating device or proper lubricant is not selected.

d. If the trial is correctly performed in exactly or less than 2 minutes and 30 seconds, credit of two points will be given.

■ 113. CREW DRILL (five trials).—Conduct the test by section. Assign each member of the section a position. The entire section executes five of the movements prescribed in the crew drill. After each trial, assign each man a new position. Grade the section as a whole on its performance at each trial. The grade given each member of the section is the section grade less cuts for individual deficiencies. Examples of movements for the test are ACTION, FIGHT ON FOOT, ABANDON HOWITZER, OUT OF ACTION, ENGINE FIRE, TURRET FIRE.

■ 114. DIRECT LAYING (thirteen trials).—*a. General.*—Place targets at ranges of 300, 500, 800, 1,000, 1,500, 2,000, and 2,500. The gun is prepared for action. The examining officer checks the laying after each trial. Allow no credit if the laying is not precisely correct.

b. Stationery targets (six trials).—(1) The soldier takes his position. The examining officer commands, for example:

GUNNER	GUNNER	GUNNER
TANK	ANTITANK	ANTITANK
HEAT	HE	HE
TRAVERSE RIGHT	TRAVERSE RIGHT	TRAVERSE RIGHT
STEADY . . . ON	STEADY . . . ON	STEADY . . . ON
FIVE HUNDRED	TWO THOUSAND	ONE FIVE HUNDRED
FIRE	FIRE	FIRE

GUNNER	GUNNER	GUNNER
TANK	ARMORED CAR	ANTITANK
HEAT	HE	HE
TRAVERSE LEFT	TRAVERSE LEFT	TRAVERSE LEFT
STEADY . . . ON	STEADY . . . ON	STEADY . . . ON
EIGHT HUNDRED	ONE SIX HUNDRED	ONE TWO HUNDRED
FIRE	FIRE	FIRE

(2) At the command FIRE, the soldier lays the gun, calls "Ready," and moves his head clear of the sight.

(3) Time will depend on how accurately the examining officer lays the tank for deflection and the speed at which he delivers the order. Great care must be taken to give this test fairly. Credit value—three points.

c. Tracking moving targets (three trials).—The soldier takes his position. On signal from the examining officer, a vehicle starts across the line of observation. The examining officer gives appropriate commands. At the command FIRE, the soldier lays with the prescribed range and lead and tracks the target. The examining officer observes the target through the panoramic sight and grades the candidate on the general merit of his work.

d. Range, speed, and lead estimation (four trials).—(1) Select a varied piece of terrain. Place antitank guns, tanks, half-tracks, road blocks, machine-gun nests, and other targets at various unannounced, predetermined ranges (300 to 3,000 yards) from the observer. When commanded, vehicles are driven across the range at prearranged speeds, at right angles to the line of observation.

(2) The soldier takes his position. The examining officer designates one of the moving targets and asks:

(*a*) "What is the range?" (Wt. 1 point.) No credit if time exceeds 20 seconds.

(*b*) "What is the speed?" (Wt. 1 point.) No credit if time exceeds 10 seconds.

(*c*) "What is the lead?" (Wt. 1 point.) No credit if time exceeds 10 seconds.

(3) The soldier records his estimates for range, speed, and lead for each trial. This test can thus be conducted for a considerable group. Cut one-half point, if the error in range estimation is over 200 yards, but under 300 yards, at ranges under 1,500 yards cut one-half point, if the error is greater than 400 yards, but less than 600 yards, at ranges greater than 1,500 yards. Cut one point if range estimation is more than 300 in error at ranges less than 1,500 yards or more than 600 yards at ranges over 1,500 yards. Cut one point if the speed is not correctly estimated as slow, fast, or medium. Cut one point if lead is not correct for the estimated speed. In this test, two trials should be held at ranges less than 1,500 yards and two at ranges greater than 1,500 yards.

■ 115. INDIRECT LAYING (eight trials).—*a. Preparation.*—The piece will be prepared for action. The examining officer will select a suitable aiming point.

b. First and second trial.—The candidate stands at the post of the gunner and identifies the aiming point. The examining officer commands, for example: AIMING POINT, CHURCH STEEPLE TO LEFT FRONT, DEFLECTION TWO EIGHT NINE ZERO. The candidate sets the deflection and traverses the piece until the vertical hair is on the aiming point, centers the cross-level bubble, relays if necessary, calls "Ready," and steps clear.

c. Third and fourth trial.—The piece is laid with the correct settings resulting from the first trial. The examining officer commands, for example: RIGHT SEVEN ZERO. The candidate sets the deflection change, lays on the aiming point, checks the centering of the cross-level bubble, re-lays if necessary, calls "Ready," and steps clear.

d. Fifth and sixth trial.—The piece is laid with the correct settings resulting from the previous trial. The candidate takes the post of the gunner. The examining officer commands, for example: LEFT TWO ZERO. The candidate sets the deflection change, lays on the aiming point, checks the

centering of the cross-level bubble, re-lays if necessary, calls "Ready," and steps clear.

e. Seventh and eighth trial.—The piece is laid with the correct settings resulting from the last trial of the previous group. The aiming stakes are set out at the prescribed distances. The candidate takes the post of the gunner and identifies the aiming stakes. The examining officer commands: AIMING POINT, AIMING STAKES, REFER. The candidate refers his telescope to the aiming stakes, checks the centering of the cross-level bubble, again refers if necessary, reads the deflection, calls "Deflection No. (so and so), (so much)," and records it. The examining officer then commands, for example: LEFT FIVE SEVEN. The candidate sets the deflection, lays on the aiming stakes, checks the centering of the cross-level bubble, re-lays if necessary, calls "Ready," and steps clear.

f. Penalties.—No credit will be allowed if the—

(1) Deflection is set incorrectly.

(2) Vertical hair of the telescope is not on the aiming point after the cross-level is centered.

(3) Last movement of traverse is not in the direction of greatest resistance.

(4) Cross-level bubble not centered.

g. Credit.—If the piece is correctly laid, credit will be given for each trial as follows:

	Time in seconds exactly or less than—			
First and second trials	8	9	10	11
Third and fourth trials	3	3⅗	4	4⅘
Fifth and sixth trials	3	3⅗	4	4⅘
Seventh and eighth trials	9	10	11	12
Credit	3.0	2.5	2.0	1.5

■ 116. LAYING FOR RANGE AND ELEVATION (two trials in range and two trials in elevation).—*a.* The piece will be prepared for action. The candidate stands at the post of the gunner. The examining officer commands, for example: 4000 or

ELEVATION ONE NINE ZERO. The candidate sets the range announced, centers the cross-level and angle of site bubbles, calls "Ready," and steps clear.

b. No credit will be allowed if the—

(1) Site is set incorrectly. (Should be set at 300.)

(2) Range is set incorrectly.

(3) Cross-level bubble is not centered.

(4) Angle of site bubbles is not centered.

c. If the piece is laid correctly, credit will be given for each trial as follows:

Time in seconds, exactly or less than	8	9	10
Credit	2. 0	1. 5	1. 0

■ 117. SETTING AND SEATING GUNNER'S QUADRANT (three trials).—*a.* The piece will be prepared for action. The candidate, with the gunner's quadrant (set at zero) in his hand, takes post to the right of and facing the breech. The examining officer commands, for example: QUADRANT EIGHT ZERO. The candidate sets the elevation, seats the quadrant, calls "Ready," and steps clear.

b. No credit will be allowed if the—

(1) Quadrant is set incorrectly.

(2) Quadrant is not properly seated.

c. If the trial is correctly performed, credit will be given for each trial as follows:

Time in seconds, exactly or less than	5	5¾	6
Credit	2. 0	1. 5	1. 0

■ 118. MEASURING ELEVATION TO A CREST (one trial).—*a.* The piece, prepared for action, will be placed between 200 and 400 yards from a mask of reasonable height with one spot obviously higher than any other portion of the mask. The candidate takes post in rear of the breech. The examining

officer commands, for example: MEASURE THE ELEVATION TO THE MASK. The candidate, sighting along the lowest element of the bore, causes the tube to be elevated until the line of sighting just clears the crest; he centers the cross-level and longitudinal bubbles, reports "Elevation No. (so and so), (so much)," and steps clear.

b. No credit will be allowed if the—

(1) Line of sighting along the lowest element of the bore does not just clear the crest.

(2) Cross-level bubble is not properly centered.

(3) Longitudinal bubble is not properly centered.

(4) Elevation is incorrectly announced.

c. If the trial is correctly performed, credit will be given as follows:

Time in seconds, exactly or less than	14	16	18	20
Credit	3. 0	2. 5	2. 0	1. 5

■ 119. MEASURING DEFLECTION (one trial).—*a.* The piece will be prepared for action with cross-level bubble centered. Aiming stakes will be set out at the prescribed distances. The candidate takes the post of the gunner and identifies the aiming stakes. The examining officer commands, for example: AIMING POINT, AIMING STAKES; MEASURE THE DEFLECTION. The candidate refers to the aiming stakes, checks the centering of the cross-level bubble, again refers the telescope if necessary, reads the deflection, reports "Deflection No. (so and so), (so much)," and steps clear.

b. No credit will be allowed if the—

(1) Cross-level bubble is not properly centered.

(2) Vertical hair is not on the aiming stakes.

(3) Deflection is incorrectly announced.

(4) Traversing handwheel was turned.

c. If the trial is correctly performed, credit will be given as follows:

Time in seconds, exactly or less than	7	8	9	10
Credit	3. 0	2. 5	2. 0	1. 5

■ 120. TEST OF RANGE QUADRANT (one trial).—*a.* The piece will be prepared for action, with the carriage level. The candidate, with the gunner's quadrant (set at zero) in his hand, takes the post of the gunner. The examining officers commands: TEST RANGE QUADRANT. The candidate seats the gunner's quadrant, centers the gunner's quadrant bubble, sets the elevation scale at zero, centers the cross-level bubble, centers the longitudinal bubble with the angle of site knob, checks the angle of site setting, announces "Range quadrant check (out)," and steps clear.

b. No credit will be allowed if the—

(1) Gunner's quadrant bubble is not centered

(2) Cross-level bubble is not centered.

(3) Longitudinal bubble is not centered.

(4) Elevation scale is not set at zero.

(5) Range quadrant is not in or out of adjustment as announced.

c. If the trial is correctly performed, credit will be given as follows:

Time in seconds, exactly or less than	25	28	31	34
Credit	3. 0	2. 5	2. 0	1. 5

■ 121. TEST OF PANORAMIC TELESCOPE (one trial).—*a.* The piece will be prepared for action with deflection set at zero, elevation at zero, site at 300, and the coarse and fine scales of tilting head set at zero. Without disturbing the laying, the bore sights will be installed. A distant point will be selected as a target. The candidate takes post to the right of and facing the breech. The examining officer commands: TEST PANORAMIC TELESCOPE. The candidate traverses and elevates or depresses the piece until the line of bore

sights is on the target, turns the deflection and elevation knobs of the telescope until the intersection of the vertical and horizontal crosshairs is on the target, checks the deflection setting, reports "Deflection check (out)," checks the elevation micrometer, reports "Elevation check (out)," and steps clear.

b. No credit will be allowed if the—

(1) Line of bore sights is not on the target.

(2) Intersection of the crosshairs of the telescope is not on the target.

(3) Deflection and elevation scales are not set as announced.

c. If the trial is correctly performed, credit will be given as follows:

Time in seconds, exactly or less than	30	33	36	39
Credit	3. 0	2. 5	2. 0	1. 5

■ 122. OTHER SIGHTS.—For arms using other sights the appropriate reticle may be substituted in the following written portion of the examination:

Question	*Answer*
1. If your gun and sight are perfectly bore sighted, will the lines of sighting cross each other? (Circle the correct answer.) Yes. No. They are parallel.	1. No. They are parallel. NOTE.—Although bore sighting may be done on a distant aiming point the line of sighting and the line through the bore are considered to be parallel because of the infinitely small angle made by these lines at the aiming point.
2. To adjust the sight and gun accurately, what is the minimum range to a distant object which will give satisfactory results? (Circle correct answer.) 500 yards 1,000 yards 10,000 yards Infinity	2. 1,000 yards.

Question	*Answer*
3. In the sight picture, figure 47, show which range marks correspond to 400 yards 600 yards 1,000 yards 1,300 yards 2,300 yards	3. See figure 47.
4. When laying a gun on a stationary target, on what part of the target do you put—	4. *a.* On the *center* of the target.
a. The range line (or dot) corresponding to the gun-target range?	*b.* On the *center* of the target.
b. The center (deflection) line or dot?	
5. You are adjusting your telescope sight on an object shown thus: Mark in the boresight picture how this object would appear. Mark in the sight picture how this object would appear.	5. See figure 48. NOTE.—Any one clearly defined corner on the object may be used by the candidate for both pictures.
6. In direct laying, what two methods do we have for adjusting fire on the target?	6. *a.* Put the burst on the target. *b.* Bracket the target.
7. Which of the above methods is best when the range is short and the target and the burst are both clearly visible to the gunner through the sight?	7. Put the burst on the target.
8. Why is the foregoing method best?	8. It is faster and saves ammunition.
9. At what ranges may this method be successfully used?	9. Generally at ranges less than 1,000 yards.

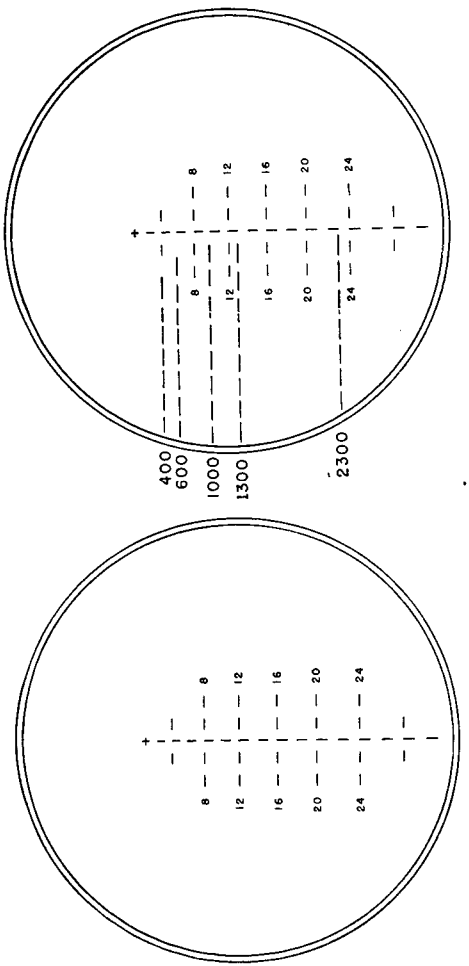


FIGURE 47.

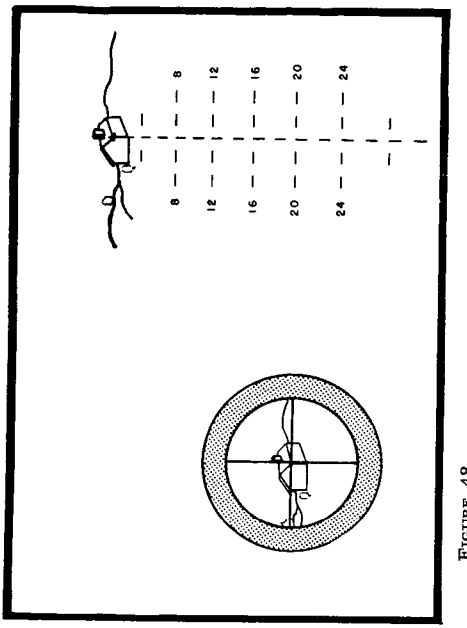
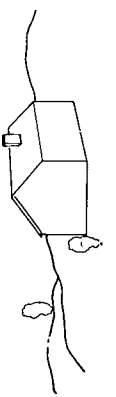


FIGURE 48.



Question	*Answer*
10. Which method of adjustment is best when the target is at a great range, or is not clearly visible?	10. The bracketing method.
11. What is the usual initial range change when adjusting by the bracketing method? *a.* At ranges under 1,500 yards? *b.* At ranges over 1,500 yards?	11. *a.* 200 yards. *b.* 400 yards.
12. While adjusting by bracket methods, you get a short at 1,200 and an over at 1,400. What is your next range?	12. 1,300
13. You are a platoon commander. A German 88-mm AT gun is visible under three low trees to your right front. Sections 1 and 2 are in position but not laid parallel. You estimate the range from the howitzers to the target as 800 yards. Chiefs of sections 1 and 2 are with you and you decide to have them adjust their own pieces on the target. What are your orders?	13. NUMBERS 1 AND 2 ANTITANK HE RIGHT FRONT, THREE LOW TREES EIGHT HUNDRED FIRE
14. You are a chief of section. A German AT gun is clearly visible to your right front. Your gun is under cover. You estimate the range as 800 yards. Give your commands.	14. GUNNER ANTITANK HE TRAVERSE RIGHT STEADY . . . ON EIGHT HUNDRED FIRE

A.T. GUN —

FIGURE 49.

Question	*Answer*
15. The gunner can see the target through his telescopic sight. Show how the AT gun appears to him when the howitzer is properly laid and ready to fire.	15. See figure 49.
16. *a.* What does the gunner do between the time the piece is fired and the projectile strikes?	16. *a.* Immediately re-lays the howitzer so that the sight picture is the same as when the piece was fired.
b. The burst appears as shown in the sight picture below. What does the gunner do?	*b.* Traverses and elevates the gun until the target occupies the same place in the sight as the base of the burst did.

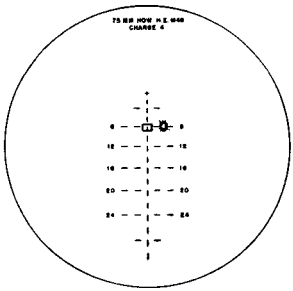
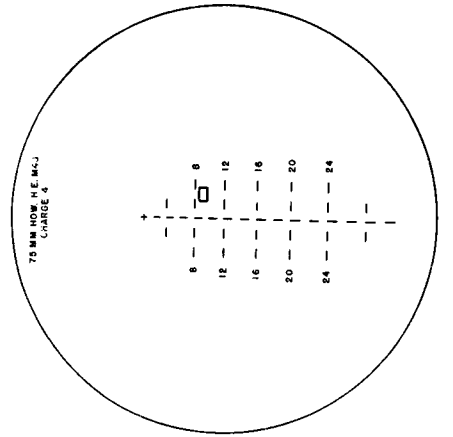


FIGURE 50.

17. How does the target appear in the sight when your gun is laid for the second round?	17. See figure 51.


75 MM HOW H.E. M42
CHARGE 4
8
12
16
20
24

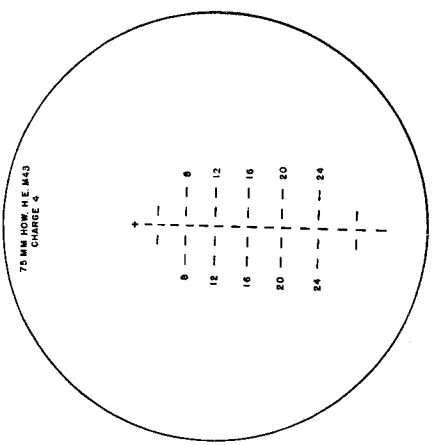

75 MM HOW H.E. M43
CHARGE 4
8
12
16
20
24

FIGURE 51.

Question

18. The smoke from the second burst completely hides the target, as shown in the sight picture below. No smoke or effect is observed behind this target. The target appears as before when the smoke blows away. Was the target hit? Where was the burst with respect to the target?

Answer

18. No. This round is short.

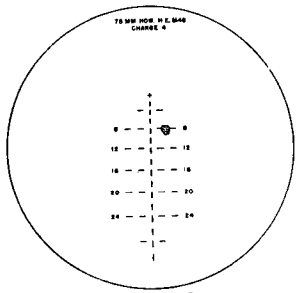


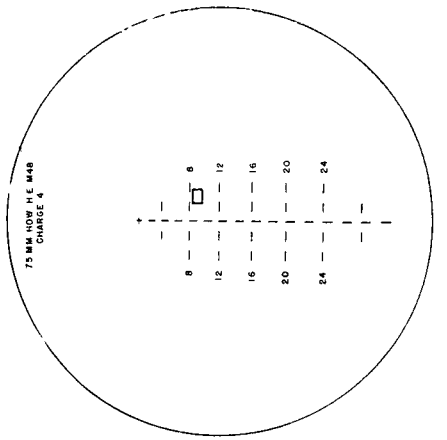
FIGURE 52.

19. When can you be certain that you have hit the target?

19. When the explosion of the shell *moves* any part of the target, the target disintegrates, or effect is observed on the ground both in front of and behind the target at the same time.

20. How would the target appear when your third round is fired?

20. See figure 53.


75 MM HOW H.E. M48
CHARGE 4
8
12
16
20
24

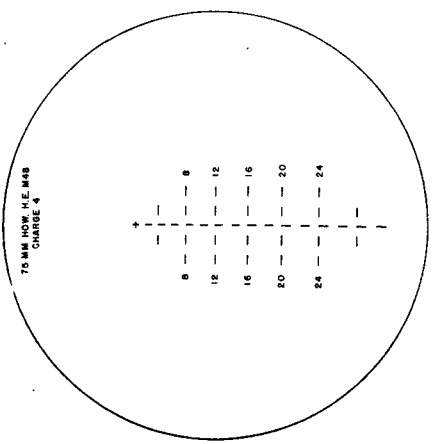

75 MM HOW. H.E. M48
CHARGE 4
8
12
16
20
24

FIGURE 53.

Question

21. You are a chief of section; your gun has halted in a good firing position. From the turret you see a Japanese self-propelled gun go into position to your left front. You estimate the range as 2,500 yards. Give your orders.

22. Your first burst is beyond and 10 mils to the left of the target.

a. Give your sensing.

b. Give your next orders.

23. Your second burst is "line-short."

a. Give your sensing.

b. Give your next orders.

24. Your third round is "line-over."

a. Give your sensing.

b. Give your next orders.

25. Your fourth round knocks a wheel off the target.

a. Give your sensing.

b. Give your next orders.

c. Explain why.

26. You are chief of section and are opening fire on a German scout car traveling at medium speed from left to right across your front at a range which you estimate as 1,200 yards. Give your orders.

27. How does the car appear in the sight when your gun is laid?

Answer

21. GUNNER
ANTITANK
HE
TRAVERSE LEFT
STEADY. . . ON
TWO FIVE HUNDRED
FIRE

22. *a.* OVER
b. RIGHT ONE ZERO
DOWN FOUR HUNDRED
OR DOWN ONE SIX
FIRE

23. *a.* SHORT
b. UP TWO HUNDRED OR
UP EIGHT
FIRE

24. *a.* OVER
b. DOWN ONE HUNDRED
OR DOWN FOUR
FIRE

25. *a.* TARGET
b. REPEAT RANGE
c. I want to finish that gun and its crew with fewest rounds possible.

26. GUNNER
ARMORED CAR
HE
TRAVERSE LEFT
STEADY. . . ON
ONE TWO HUNDRED
LEAD TWO ZERO
FIRE

27. Lead is 20 mils.

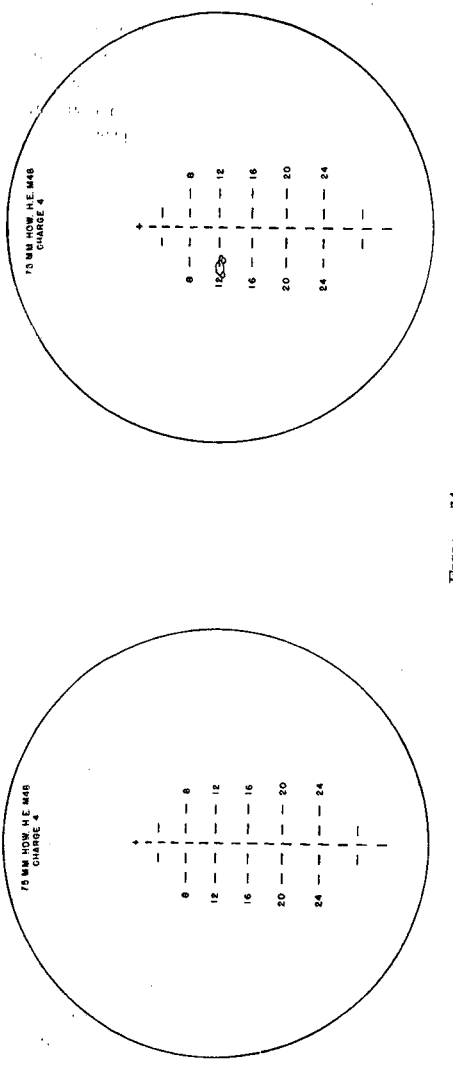

75 MM HOW. H.E. M48
CHARGE 4
0 — 8
8 — 12
12 — 16
16 — 20
20 — 24
24 —
75 MM HOW. H.E. M48
CHARGE 4
0 — 8
12 — 12
16 — 16
20 — 20
24 — 24

FIGURE 54.

Question	*Answer*
28. The first round strikes ahead of and a little below the target, as shown in the sight picture. Give your sensing and next orders.	28. SHORT UP TWO HUNDRED, OR UP EIGHT LEAD ONE ZERO FIRE

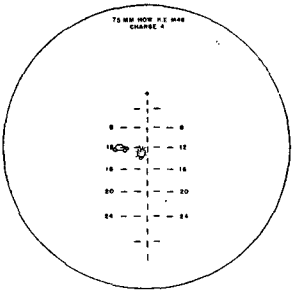


FIGURE 55.

29. How should the target appear?	29. See figure 560.
30. The second round appears to strike just to the left of the target, as shown on the sight picture, figure 57. *a.* Give your sensing. *b.* Give your next orders.	30. *a.* RANGE DOUBTFUL *b.* REPEAT RANGE LEAD ONE FIVE FIRE
31. *a.* What is the unit of measure for leading a moving target? *b.* What initial leads are used if the target is moving at right angles to the line of fire at slow, medium, and fast speeds? State answers as if they were orders.	31. *a.* The mil. *b.* LEAD ONE ZERO LEAD TWO ZERO LEAD THREE ZERO
32. What is meant by the expression, "Adjustment of sights"?	32. Placing the zero line of sighting and the center line (axis of the bore) parallel.

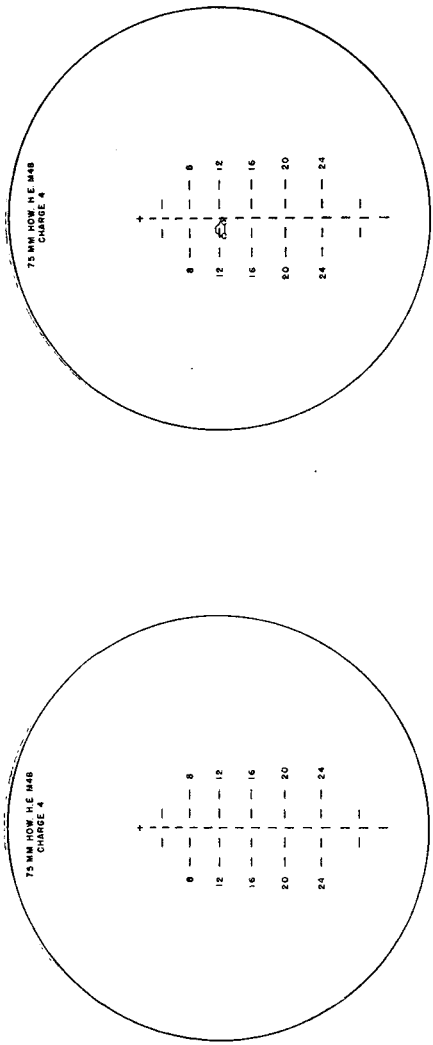

75 MM HOW. H.E. M48
CHARGE 4
8
12
16
20
24
75 MM HOW. H.E. M48
CHARGE 4
8
12
16
20
24

FIGURE 56.

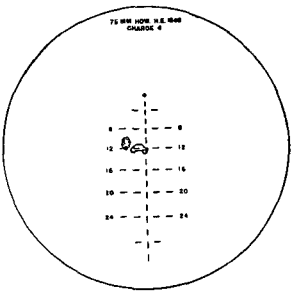


FIGURE 57.

Question	*Answer*
33. *a.* In direct fire at a stationary target, what is the single element of the initial data we do not generally know?	33. *a.* The *exact range.*
b. In firing at a moving target what two elements must we find out in order to hit it?	*b.* The range and the speed.

■ 123. TABULATION AND QUALIFICATION.—*a. Tabulation.*—

Test	No. of trials	Points each	Maximum credit
Practical examination			
Matériel	3	2	6
Crew drill	5	3	15
Direct laying	13	3	39
Indirect laying	8	3	24
Laying for range	4	2	8
Laying for elevation, elevation scale	4	2	8
Setting and seating gunner's quadrant	3	2	6
Measuring minimum elevation	1	3	3
Measuring deflection	1	2	2
Test of range quadrant	1	3	3
Test of panoramic telescope	1	3	3
Written examination	33	1	33
Total			150

b. Qualification.—Qualification on the 75-mm assault howitzer will be rated as follows:

(1) *Second class gunner.*—Any individual so rated by his unit commander after the individual has completed the initial 13 weeks training period or the equivalent.

(2) *First class gunner.*—Any officer or enlisted man who makes a grade of at least 80 percent (120 points) on the above examination.

(3) *Expert gunner.*—Any officer or enlisted man who makes a grade of at least 90 percent (135 points) on the above examination.

APPENDIX

LIST OF REFERENCES

Firing	FM 6–40
Pack artillery	FM 6–110
Signal organizations and operations in the armored division and armored corps	FM 11–17
Armored force drill	FM 17–5
Tank gunnery	FM 17–12
Combat practice firing, armored force units	FM 17–15
Assault gun section and platoon	FM 17–25
Decontamination of armored force vehicles	FM 17–59
Thompson submachine gun, caliber .45 M1928A1	FM 23–40
Browning machine gun, caliber .30, HB M1919A4 (ground)	FM 23–45
Browning machine gun, caliber .30, HB M1919A4 (mounted in combat vehicles)	FM 23–50
Browning machine gun, caliber .50, HB M2 (ground)	FM 23–60
Browning machine gun, caliber .50, HB M2 (mounted in combat vehicles)	FM 23–65
Radio procedure	FM 24–6
Combined United States-British radiotelephone (R/T) procedure	FM 24–9
Joint Army and Navy radio procedure	FM 24–10
Field artillery fire-control instruments	TM 6–220
75-mm howitzer M1A1, mounted in combat vehicles	TM 9–321
Half-track vehicles	TM 9–710
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75-mm howitzer motor carriage M8	TM 9–732B
75-mm howitzer matériel	TM 9–1320
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Carriage, motor, 75-mm howitzer M8	SNL G–127
Cleaning, preserving, and lubricating materials, recoil fluids, special oils and similar items of issue	SNL K–1
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Field artillery—elementary gunnery	FS 6–7
Browning machine gun, caliber .30, HB M1919A4 (ground), parts I and II	FS 7–60, 7–61
Browning machine gun, caliber .30 M1917 part VIII, section I, stoppages and immediate action	FS 7–63
Browning machine gun, caliber .50, HB M2 (ground), parts I, II, and III	FS 7–69, 7–70, 7–71
Identification of foreign mechanized vehicles, part I	FS 7–78
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Tank maintenance, first echelon, part I	FS 17–6
Tank maintenance, first echelon, part II	FS 17–7
Half-track—description and characteristics	FS 17–9

Caliber .50, MG (HB), mounted in combat vehicles, parts I and II ---------- FS 17-15, 17-16
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