

Figure 32

blades of grass, horse hair, or other fine material held in place by string or grease.

(2) For breech boresight: remove safety piece and firing pin, and sight through firing pin hole.

(3) In order to have permanent measurement of $16 \frac{7}{16}$ inches, cut notches this distance apart in rammer staff.

125. BORESIGHTING 3" GUN, M7 ON MOTOR CARRIAGE, M10.--a. Sighting equipment.

(1) Telescope sight M51: A three-power telescope consists of a straight tube about 24" long and two inches in diameter, with a large rubber eyeshield at rear. The sight is mounted to the left of the gun and held in place by means of spherical bearings and collars on the telescope mounting bracket fastened to the carriage of the gun.

(2) Telescope mount.

(a) A bracket bolted to the gun trunnion yoke on left of gun tube.

(b) The front of mount forms a ring which is machined on inner surface to hold spherical bearing of sight.

(c) Rear bracket ring at rear of mount is provided with two round knurled adjusting knobs which provide the means of moving the sight right or left and up or down.

1. Upper half of ring is a separate piece, hinged at one side and held by a screw and wing nut at other side so that the ring can be drawn down tightly to hold rear spherical bearing collar telescope.

CAUTION: In mounting the telescope into the sight mount, it is very important that the bearing on rear collar of telescope tube be properly seated in the hole in bottom of rear bracket ring before the hinged clamp is tightened. Otherwise the rear bracket ring will break when an attempt is made to force the telescope into position.

(3) Test target equipment.

(a) Test target.

(b) Test target stand.

(c) Breech boresight.

(d) Muzzle boresight. (If muzzle boresight is not available thread, string, grass, or other substitutes may be held in place by using grease in cross-thread notches.)

(4) Test target method.--(a) Level tube by eye; install breech boresight in chamber; mount muzzle boresight on muzzle or stretch threads tightly across muzzle notches.

(b) Place test target 80 to 100 feet from gun, perpendicular to the direction tube is pointing.

(c) Remove retainer, firing spring, cover, cocking fork plunger, and firing pin guide assembly from percussion mechanism housing of breechblock.

(d) Sight through firing pin well and move test target until right butterfly coincides with muzzle crosshairs on the gun.

(e) Look through sight and bring the zero range dot to the correct position on the left butterfly of test target by means of the adjusting knobs on the rear sight bracket.

(5) Distant aiming point method.--(a) Place crosshairs on the muzzle cross-notches, using grease (ODO) to hold them in place.

(b) Remove the retainer, firing spring, cover, cocking fork plunger, and spring and firing pin guide assembly from the percussion mechanism housing of breechblock.

(c) Sight through the firing pin well and move the gun by elevating and traversing until the muzzle crosshairs are laid on a distant aiming point.

(d) Look through the sight and bring zero range dot to distant aiming point by means of the adjusting knobs on the rear sight bracket.

126. BORESIGHTING THE 3" GUN ON CARRIAGE, M1 3" TOWED.

See par. 66-68 TM 9-322.

127. BORESIGHTING THE 76-mm. GUN ON MOTOR CARRIAGE T70.--a. The sight on the T70 is mounted co-axially with the bore. The procedure for test target

and distant aiming point method of boresighting the T70 is the same as for the Car, Armored, Light M8 or the 3" Gun, M7 on Gun Motor Carriage, M10.

128. TARGETING (ZEROING).--a. Targeting is the process of adjusting the sight on the gun so that the point of strike of a projectile at a known range from the gun coincides with the exact aiming point used. For 1000-inch firing the gun should always be targeted rather than bore-sighted.

b. To target a gun for 1000-inch firing:

(1) Using the zero lead line and any desired range line in sight reticle, lay on an aiming point on the 1000-inch target.

(2) Fire one round.

(3) Mark the shot hole with a black paster or otherwise to make it clearly visible through the sight.

(4) Check the laying of the gun on the original aiming point and re-lay if necessary.

(5) Without moving the gun tube adjust the sight so that the zero lead line and the same range line used in (1) are laid on the shot hole in the target. In other words make the point of aim coincide with the point of strike.

(6) As a check, re-lay on an aiming paster and fire a round. If the above procedure has been accurately followed the round will hit the aiming point.

(7) If an error still exists, repeat steps (1) to (6) inclusive until the point of aim and the point of strike coincide.

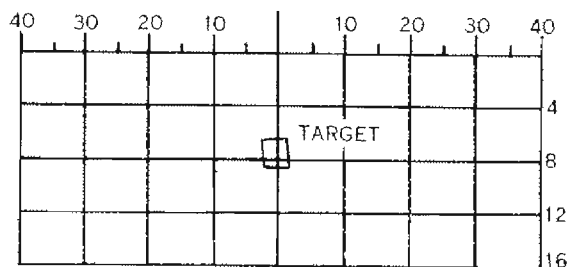
Note: The selection of the range line to be used for targeting the gun is an arbitrary one. The 600, 800, or 1000-yard range lines are the ones normally used. Once the selection has been made and the gun targeted, this same range line must be used for all subsequent firing.

c. The targeting method of sight adjustment may be used for long range as well as 1000-inch firing. It is quick and sufficiently accurate when firing is done at ranges which do not vary more than 400 yards from the range at which the gun was targeted. Its use is not recommended except for 1000-inch firing, or long range subcaliber firing, as it throws the gun out of boresight.

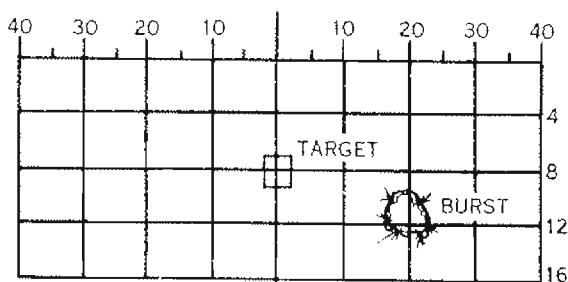
129. A method of precision fire on a point target is that of placing the point of burst in the sight reticle on the target for the second round. If you have fired using a range of 300 yards, and in your sight you see the burst on the 1200-yard range line, move this range line on to the target and fire again. Similar deflection adjustments are made at

the same time as shown by the following diagrams.

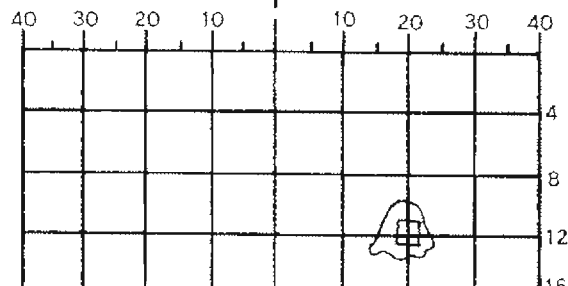
PLACING POINT OF BURST IN RETICLE ON TARGET



Range estimated to be 800 yds. Shot fired.



Burst as shown.



Place point of burst in reticle on target

d. Adjustment by destroyer commander.--The gunner may be unable to observe the burst through the sight due to poor visibility. In this case the destroyer commander will sense the bursts through his field glasses and announce actual corrections (rather than sensings) to the gunner. Range corrections will be announced in yards and deflection corrections in mils. For example, the destroyer commander might give RIGHT FIVE, DOWN TWO HUNDRED. This means to the gunner to move the gun 5 mils right and lower the range two hundred yards from his laying for the preceding round. This process is continued until a hit is obtained.

130. RANGE CARDS.--a. General.--(1) In order to be prepared to deliver fire promptly on likely targets in any situation, a gun commander should maintain a range card of his assigned sector to facilitate rapid determination of ranges to targets. The data must be recorded on the card in a form which will serve as a guide to the leaders and gun crew. Range cards must be kept up to date by entering data based on the results of firing.

(2) Use.--The employment of range cards allows decentralization

of command without loss of fire control. Duplicates of the original range cards with explanatory remarks are sent back to the company commander so that he can see exactly what the guns can do and where co-ordination or rearrangements are necessary.

(3) Preparation.--Range cards should be prepared immediately upon occupation of position. They should be prepared as soon as possible for all positions, including alternate and supplementary.

(4) Form.--A simple range card of the type shown in fig. 33 should prove adequate for the needs of a gun commander. It should show the gun position, direction of magnetic north, field of fire in the sector, which for tank destroyers is 6400 mils, prominent features of terrain, and ranges thereto. To aid persons using the range card the compass or magnetic azimuth to each target may be placed on the range lines to the various terrain features if the position is to be occupied for any length of time.

131. TD AMMUNITION.--a. 37-mm. ammunition.

(1) 37-mm. cannister.--A shell built on the principle of a large shot gun shell. Steel balls enclosed in a light metal container fitted into the shell case. Effective against personnel at ranges less than 200 yards.

(2) 37-mm. HE.--High velocity HE ammunition. 2800 f/s, 5-yard bursting radius. Used against small unarmored targets such as machine gun nests and unarmored vehicles.

(3) 37-mm. AP.--Solid shot with tracer element. 2600 f/s. Used against armored targets up to 500 yards.

(4) 37-mm. APC.--Solid shot with windshield and tracer element. 2900 f/s.

(5) 37-mm. AP-HE.--Armor piercing with a bursting charge and base detonating fuze. Bursts after penetration.

b. 75-mm. ammunition.--(1) 75-mm. AP.--Solid shot with tracer element.

(2) 75-mm. APC.--Same as APC for 37-mm.

(3) 75-mm. AP-HE.--Same as for 37-mm.

(4) 75-mm. HE.--High explosive shell with fuze that can be set for delay or superquick. Used against personnel and light materiel in the open when set on superquick. With delay setting can be used against buildings and light armor.

c. 3" ammunition.--(1) 3" AP.--Same as for 37-mm.

(2) 3" APC.--Same as for 37-mm.

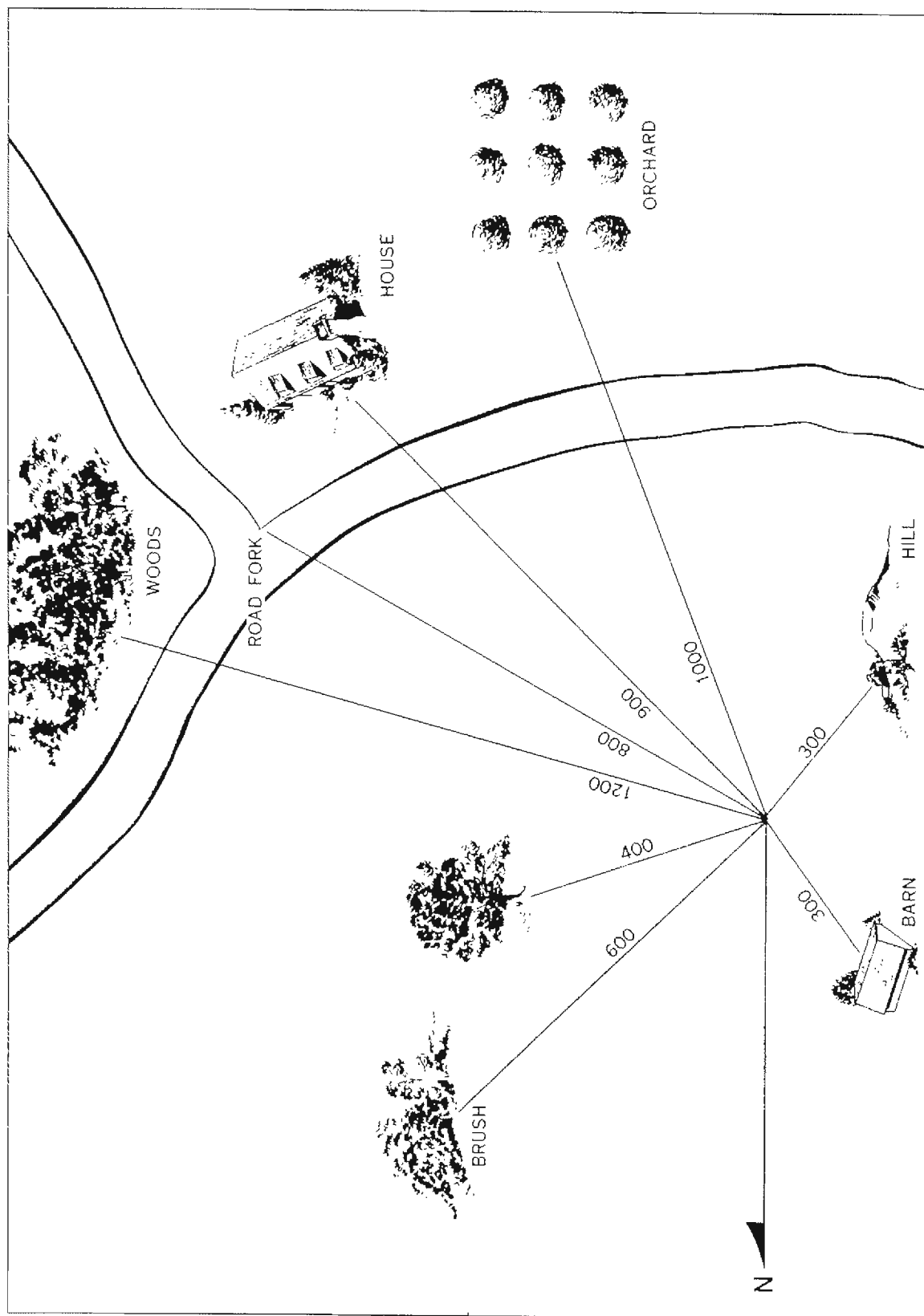


Figure 33

(3) 3" AP-HE.—Same as for 37-mm.

(4) 3" HE.—Same as for 75-mm.

d. 76-mm. ammunition.—(1) AP.—APC.—HE.

e. The use of TD ammunition will be governed by the targets selected. APC and AP-HE will be used against armor. HE to be used against personnel, light armor, and emplacements.

132. EFFECT OF AMMUNITION ON USE OF RANGE GRADUATION OF SIGHT RETICLE.—a. Effect of service ammunition—In order to know your weapon properly it is necessary to be thoroughly familiar with the range graduations of the sight reticle. Nearly all new sight reticles have numbers opposite the range lines to identify them, for example, examine the new TD reticle (fig. 34).

(1) Note to the right and left of alternate range lines the numbers 8, 16, 24, and 32, are etched indicating the ranges in hundreds of yards. The unnumbered lines are the 400, 1200, 2000, and 2800 range lines.

(2) The question is, will the range numbers indicate the same ranges for all types of ammunition of one caliber? The answer is "No." The numbers correspond to only one type of ammunition. The type for which the reticle was graduated will usually be etched near the top of the reticle.

(3) The range lines represent elevations of the tube, in mils, above the line of site (refer to figure 35). For example, the new TD reticle is graduated for 3" APC M62 ammunition. If we were to use this

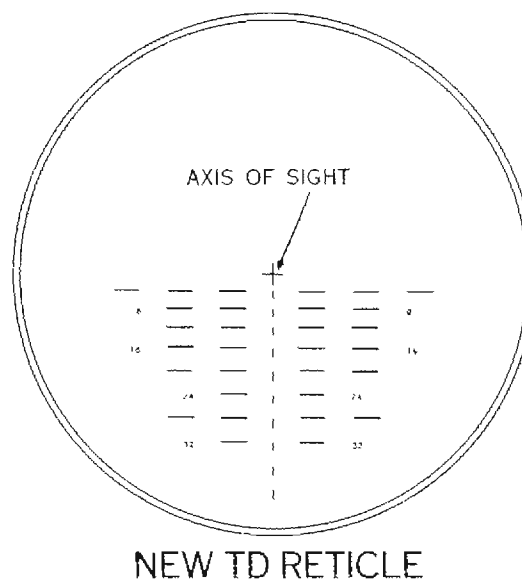


Figure 34

ammunition and fire at a target 800 yards away, using the 800 yard line in the reticle, we would hit the target. We would have elevated the tube 6.2 mils above the line of site. Now, if we do not disturb the lay of gun and fire a round of 3" HE M42 we will not hit the target; we will have an "over" because 6.2 mils elevation for 3" HE M42 represents a range of 1000 yards. This difference of range for different types of ammunition increases as the range increases.

(4) What does the example above prove? It proves that for accurate fire with other than the ammunition for which the reticle is made we must know to what ranges the range lines correspond for each type of ammunition used. This information can be found very easily. For example, we already know the new TD reticle is graduated for 3" APC M62. Look in the firing table for M62 and find the elevation in mils for 400, 800, 1600, etc. Armed with the elevations (400 equals 3.0 mils, 800 equals 6.2 mils, 1200 equals 9.6 mils, 1600 equals 13.2 mils, etc.), turn to the 3" HE M42 firing table and find the ranges which correspond to these mils of elevation. 3 mils equals 500, 6.2 mils equals 933, 9.6 mils equals 1400, 13.2 mils equals 1825 yards, etc. Reduce these ranges to the nearest hundred yards and we now have the range graduation for 3" HE M42 ammunition. Find the AP M79 range graduation in the same manner. Now we know what range lines to use when using AP or HE even though the reticle was made for APC.

(5) These different ranges of the reticle must be memorized by every member of the unit. Paint on the inside of the shield, next to the gunner's position, the reticle with the ranges which each line represents for every type of ammunition which you may use in combat.

b. Sub-caliber firing.--In order to know definitely the standard of marksmanship of a unit which is shooting .30 and .50 caliber sub-caliber from a destroyer it is necessary to make an entirely new set of range figures for the range lines. These are obtained in the same manner as those above. Since the trajectories of sub-caliber ammunition and service ammunition have a wide variance, the change of range will vary over a wider area.

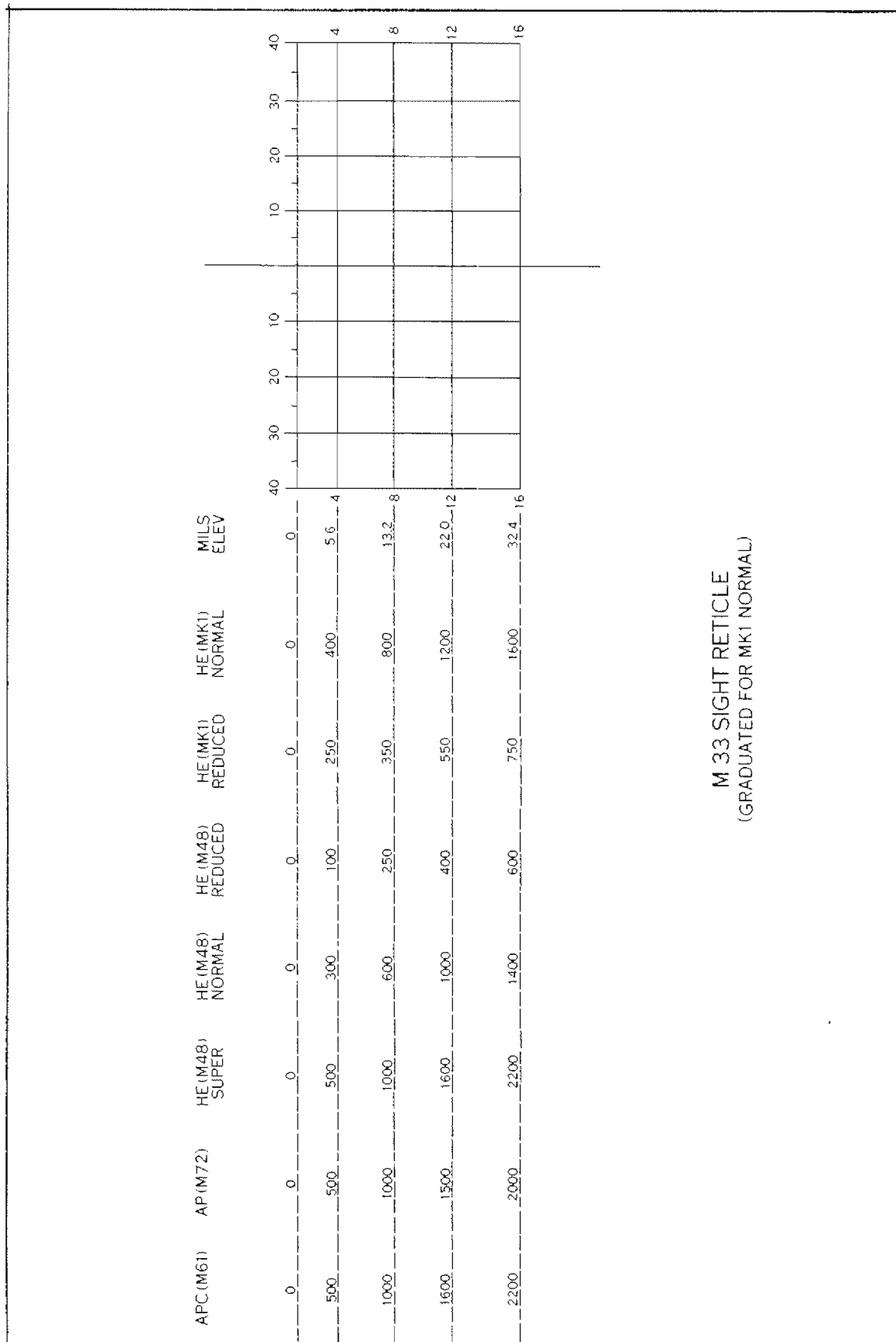
c. Figures 35 to 38 show the new reticle to be used on all destroyers and the present reticles for the 75-mm., the 3" towed gun, and the M10 together with range represented by each line for the various types of ammunition available.

DIRECT SIGHT DIAGRAM FOR 3" GUN MOTOR CARRIAGE M10

SHOT APC M62 2600 F/S	SHOT AP M79 M42 W/FUZE M48		SHELL HE 2800 F/S		MILS ELEV
	0	400	800	1200	
0	0	400	800	1200	0
400	400	800	1200	1600	3.0
800	800	1200	1600	2000	6.2
1200	1200	1600	2000	2400	9.6
1600	1600	2000	2400	2800	13.2
2000	2000	2400	2800	3200	17.2
2400	2400	2800	3200	3600	21.4
2800	2800	3200	3600	4000	26.0
3200	3200	3600	4000	4400	30.8
3600	3600	4000	4400	4800	36.3
4000	4000	4400	4800	5200	41.8

NEW SIGHT RETICLE TO BE
PLACED IN ALL DESTROYER SIGHTS

Figure 35



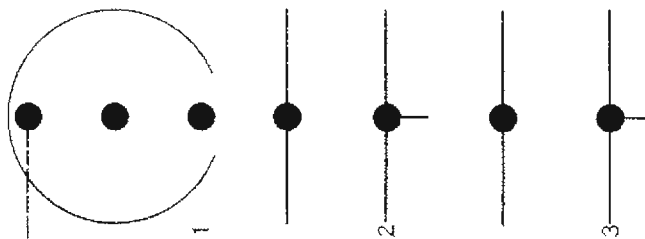
M 33 SIGHT RETICLE
(GRADUATED FOR MK1 NORMAL)

Figure 36

GUN, 3' INCH. M5 (ANTITANK) W/TELESCOPE M41

MILS. ELEV	SHOT APC		SHOT AP		SHELL HE	
	M 62	2600 F/S	M 79	2600 F/S	M 42	2800 F/S
2.5	300	200	200	200	200	200
6.2	800	800	800	800	800	800
9.6	1200	1100	1100	1300	1300	1300
14.0	1700	1500	1500	1800	1800	1800
19.3	2200	1900	1900	2400	2400	2400
24.8	2700	2300	2300	2900	2900	2900
30.8	3200	2600	2600	3400	3400	3400

SIGHT DIAGRAM



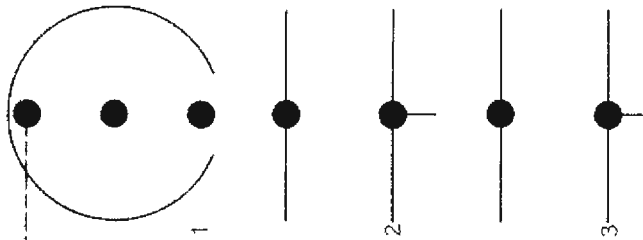
ESTIMATE RANGE. FIND ESTIMATED RANGE IN COLUMN UNDER TYPE OF AMMUNITION BEING USED. READ SIGHT SETTING FROM SIGHT DIAGRAM.

Figure 37

GUN, 3' INCH, M7 (ANTITANK) W/TELESCOPE M51

MILS ELEV	SHOT APC M 62 2600 F/S	SHOT AP M 79 2600 F/S	SHELL HE M 42 2800 F/S
0	0	100	100
4.7	600	600	700
8.0	1000	1000	1100
10.4	1500	1400	1700
17.2	2000	1800	2300
24.9	2500	2200	2800
28.4	3000	2600	3300

SIGHT DIAGRAM



ESTIMATE RANGE. FIND ESTIMATED RANGE IN
COLUMN UNDER TYPE OF AMMUNITION BEING
USED. READ SIGHT SETTING FROM SIGHT DIA-
GRAM

Figure 38

133. SERVICE OF THE PIECE.--Service of the piece for the various weapons is not included in this manual or any War Department FM's. Some of it is available in publications of the Weapons Department, TD School, Camp Hood, Texas, as follows:

- a. 37-mm. destroyer: TDS 105-12.
- b. 75-mm. destroyer: TDS 105-11.
- c. 3-inch gun on motor carriage, M10; W280.
- d. 3-inch gun (towed): W313.
- e. 37-mm gun on motor carriage, M8 and 76-mm. gun on motor carriage, T70, are not available. Pending publication of appropriate FM's, the service of the piece for the other destroyers may be used as a guide, and modified as necessary.

134. POSITION OF THE GUNNER.--a. The axiomatic rule is that the gunner must be "comfortable even to the extent of utter luxury." There are two reasons for this doctrine: the first and probably most important is that the physical effort required in manipulating any of our major caliber weapons, such as the tank destroyer gun, is such that unless the gunner is in a solid position with a portion of his body securely placed against some part of the gun mount or its carriage, his eye will move and will vary its position with respect to the sight. This causes the gunner to be slow in taking the correct laying, or else it causes a hurry-up shot and hence inaccurate laying. The second reason is that men in combat, particularly when subjected to hostile fire in their vicinity, become very nervous. The nervousness, referred to in many discussions on firing as "buck fever," coupled with the muscular strain of the cramped position, destroys the ability to lay the piece accurately.

b. Because of these reasons, the following positions have been adopted and will be insisted upon during firing:

(1) M3 destroyer.--The tool chest of the destroyer will be placed on the left of the well on the deck above. The gunner will use this chest as a seat, placing his left foot forward, his right foot in the well, and keeping his eye directly in line with the sight.

(2) M10 destroyer.--The gunner will rest his forehead lightly on the rubber pad of the telescope while sighting. He will traverse the gun with his right hand and elevate with his left. During the manipulation the gunner's hands will be crossed in front of his body. This will not affect his efficiency in tracking.

(3) 3-inch towed gun, M1.--It is necessary in firing the towed gun that the gunner have a firm position without endangering himself by the movement of the gun and carriage in recoil. This movement varies from 6 to 14 inches, and is more during the firing of the first two or

three rounds before the trails are firmly seated. On firing the first round, the gunner must take every precaution. He must either sit firmly on the trails so that his body moves back with the carriage in recoil, his eye at least 16 inches from the sight, or he must stand completely free of the sight and trails so that the recoil of the carriage will not strike a disabling blow.

(4) The most advantageous position for the average man is for him to sit on the trails so that he will have firm support for his body without endangering himself by the recoil. Whether he sits astraddle the trails or sits with both legs on one side, depends largely on the direction of fire. With the gun traversed to the right, it is best to put both legs on the outside or left of the trail. With the gun traversed to the left, it is best to put both legs on the inside, or the right of the trail. With the gun centered or nearly centered in its traverse, it is best to straddle the trail.

135. CALIBER .22 1000-INCH FIRING.--a. General. 1000-inch firing marks the transition from the individual instruction phase of gunnery training to the team instruction phase. In the earlier phase the gunner is trained to get good shot groups--first by triangulation exercises, then by actually firing at moving targets--without special regard to what part of the target he hits. In the team phase the gunner, working with the crew and following the commands of the gun commander, is trained to place his groups on a definite part of the moving target.

b. Purpose.--As in the case of the other weapons, the purpose of each phase of 1000-inch firing is threefold:

(1) Individual instruction phase:

- (a) To teach manipulation.
- (b) To show the gunner a picture of the effect of each round fired.
- (c) Above all, to teach uniform gun-pointing.

(2) Team instruction phase:

- (a) To teach the gunner to adjust his properly aimed fire in accordance with the fire orders of the gun commander.
- (b) To give the gun commander instruction in rapid and accurate sensing and the issuance of fire orders.
- (c) To start the development of the team (gun crew).

c. Targets.--(1) Target "A" for use in parallel-level and parallel-hilly course, and Target "B" for oblique runs are illustrated in figs. 39 and 40.

37 MM AND 75 MM GUN, PARALLEL LEVEL AND PARALLEL HILLY COURSES
1000 IN. A.T.



TARGET "A"

Figure 39

37-MM GUN, OBLIQUE COURSE
1000 IN. A.T.

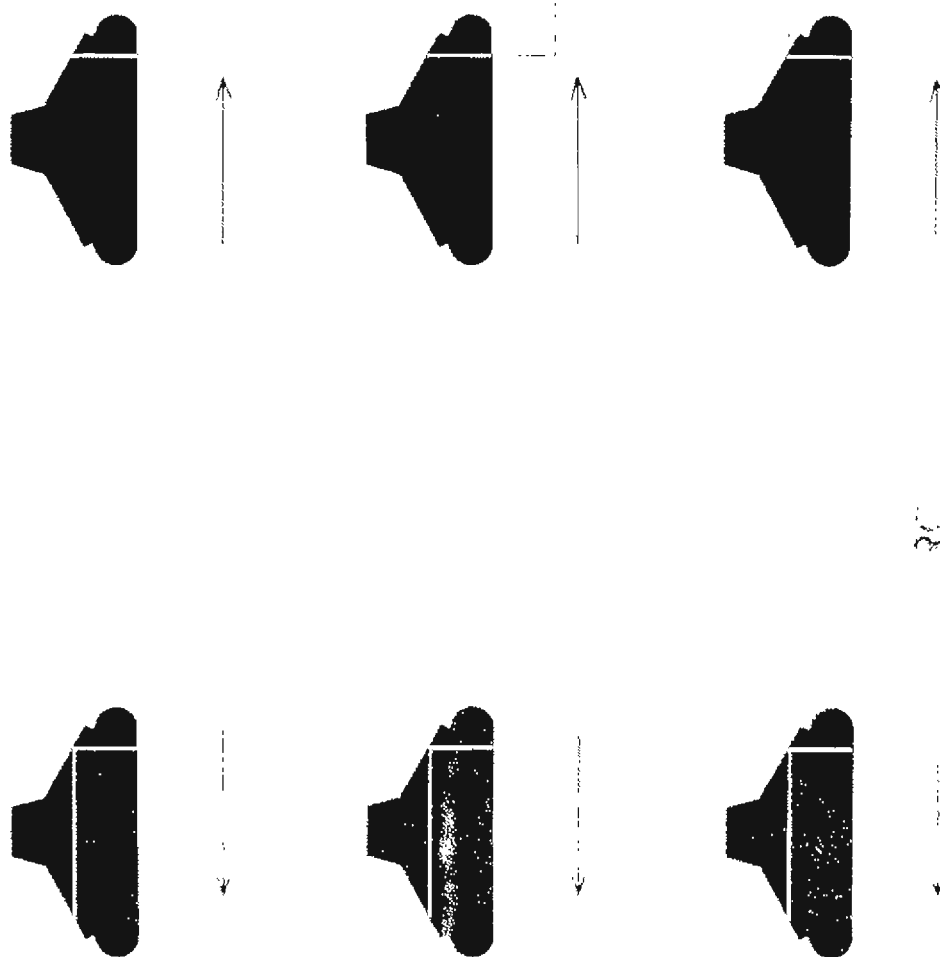


Figure 40

(2) Construction of ranges and target equipment and a good general procedure for the operation of a 1000-inch range will be found in FM 23-70. Though this FM is prepared for a specific weapon, the principles involved apply as well to all destroyers.

136. 37-MM. SUB-CALIBER SHELL, CALIBER .22.—a. Description and use.—The 37-mm. sub-caliber shell, caliber .22 (fig. 41), is not an item of issue. The shell consists of a machined brass or steel casing, of the same size as the service shell, into which a section of caliber .22 rifle barrel has been assembled. This rifle bore is off-center .062 inch throughout to permit rimfiring of the caliber .22 cartridge. Because of this, the shell must always be placed in the 37-mm. chamber in the same position to prevent erroneous shot groups. A reduced firing spring is used when firing the sub-caliber shell. These shells, especially when loaded, must be handled with care to prevent accidental discharge, and must never be allowed to strike the ground or any hard object.

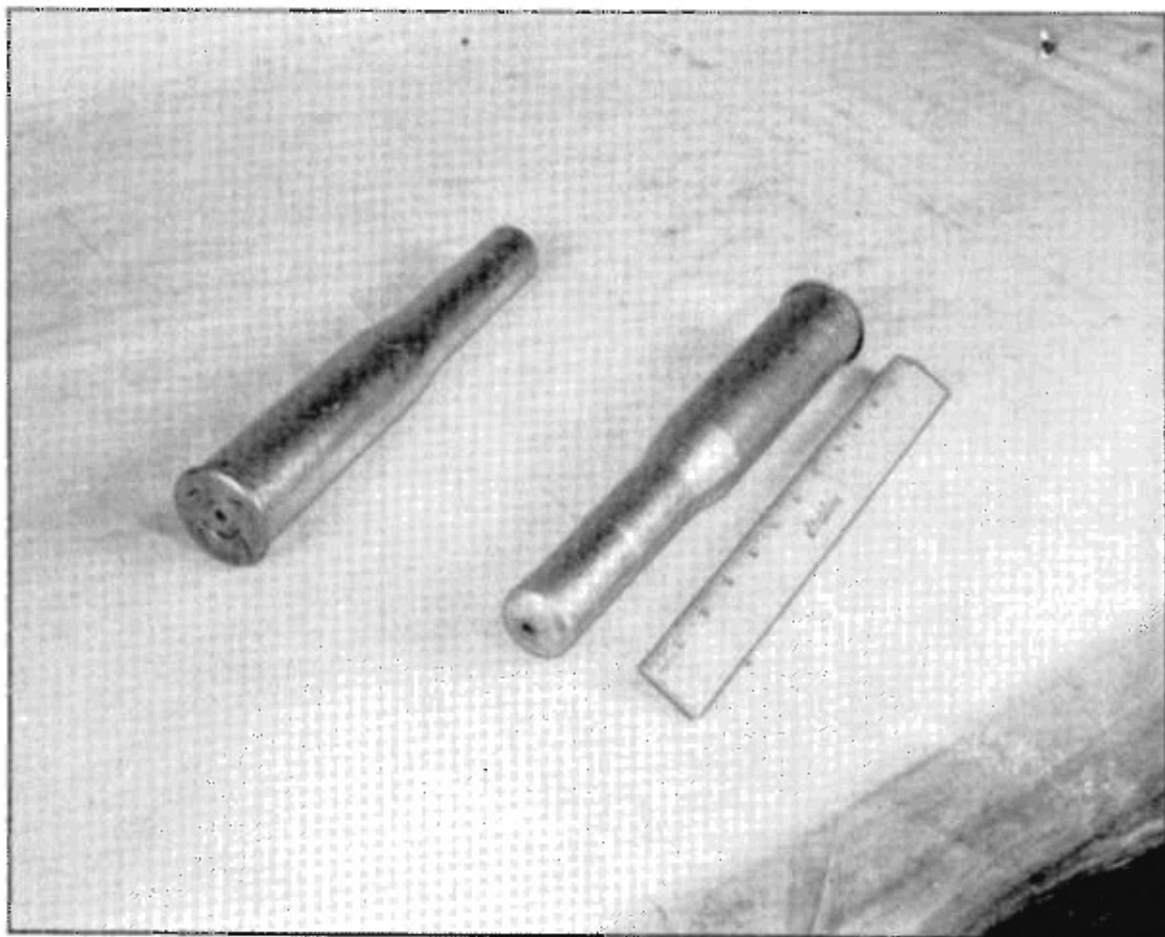


Figure 41

b. Care and cleaning.--The 37-mm. sub-caliber shell should be cleaned with issue bore cleaning solution or a suitable substitute immediately after firing and on three successive days to prevent "sweating" and corrosion of the rifle bore. Special cleaning rods are available, but any caliber .22 cleaning rod can be used. After cleaning, the shell should be dried and inspected for cleanliness, general condition, and tightness of all screws. The shell should then be thoroughly oiled. A periodic check should be made to see that the shell will chamber properly in the 37-mm. gun. The bore of the 37-mm. gun also must be cleaned after use of the sub-caliber shell, as prescribed in TR 1395-A.

137. SUB-CALIBER MOUNT, M6, CALIBER .22-.30.--a. Description and use.--(1) This mount is designed for use on the 37-mm. gun, but can be adapted for use on the 75-mm. destroyer, as will be shown. Its installation and use with the 37-mm. gun are described in FM 23-70.

(2) The component parts of the M6 sub-caliber mount are:

(a) Tube--pipe, 86 inches long, threaded at muzzle and furnished at the other end with the breech bushing.

(b) Breech bushing.

(c) Firing support assembly.

(d) Muzzle flange.

(e) Nut, threaded to fit the muzzle of the extension and to hold the muzzle flange in place.

(3) Additional equipment to adapt the mount to the 75-mm. destroyer:

(a) Pipe extension, 25 inches from the coupling to the end of the sub-caliber tube.

(b) One wooden breechblock to serve as a bushing for the mount in the breech recess of the 75-mm. gun.

(c) Four wooden spools to act as bushings for the sub-caliber tube inside the 75-mm. gun tube.

b. To assemble the mount in the 75-mm. gun.--(1) Place the wooden breechblock on the sub-caliber tube and slide it down over the breech bushing.

(2) Slide three wooden spools on the sub-caliber tube and space them evenly along the tube.

(3) Assemble the extension to the tube and screw it securely into place.

(4) Place the fourth wooden spool on the extension.

(5) Remove the breechblock from the 75-mm. gun.

(6) Insert the mount into the tube of the 75-mm. gun.

(7) See that the sub-caliber tube is fully seated, and that the firing support assembly is straight up and down (i.e., not canted).

(8) Place the muzzle flange over the end of the sub-caliber tube and secure it with the nut provided for that purpose.

(9) For installation of the rifle see FM 23-70.

c. Care and cleaning of the M6 sub-caliber mount.--(1) After firing, both the rifle and the primary weapon must be cleaned in the manner prescribed in TR 1395-A.

(2) The tube of the sub-caliber mount must also be cleaned. This can be accomplished effectively by tacking emory cloth on a long stick which has been shaved down to fit into the tube. This cleaning must remove all the carbon deposited in firing, as this carbon will accumulate and cause ricochets inside the tube.

d. Machine guns.--A sketch of the improvised strap mount for machine guns is shown in figure 42.

138. PRECAUTIONS DURING FIRING WITH M6 SUB-CALIBER MOUNT.--a. Check the muzzle flange frequently to see that it is securely in place; keep the nut tight.

b. Check the front and rear trigger guard screws. Allowing these to become loose during firing will result in breakage of the screw housings, rendering the rifle useless.

c. Swab the bore of the rifle as often as practicable. Do not attempt to force the patch all the way through the tube on the first thrust. Swab with successively longer thrusts, pulling the rod completely out of the bore and wetting the patch again after each thrust. This will obviate removing the rifle from the mount to dislodge a rod which has become stuck. It also will cool the bore more efficiently.

139. GENERAL RULES FOR 1000-INCH RANGE PRACTISE.--a. Before targets are removed from the track and brought to the gun for the analysis and critique, the gun will be cleared.

b. The gunner who has completed his run will remove the target. No one else will go forward to the target. The same rule applies in replacing the target.

c. No one will be allowed to lounge around at the guns. If not a member of the gun crew, personnel will remain in the rear of the gun, ALERT, as observers.

d. No person will be in front of the muzzle until the gun is

SKETCHES OF SUB-CALIBER MOUNT
FOR 75MM. 3" GUN M7 AND 3" GUN AT M1

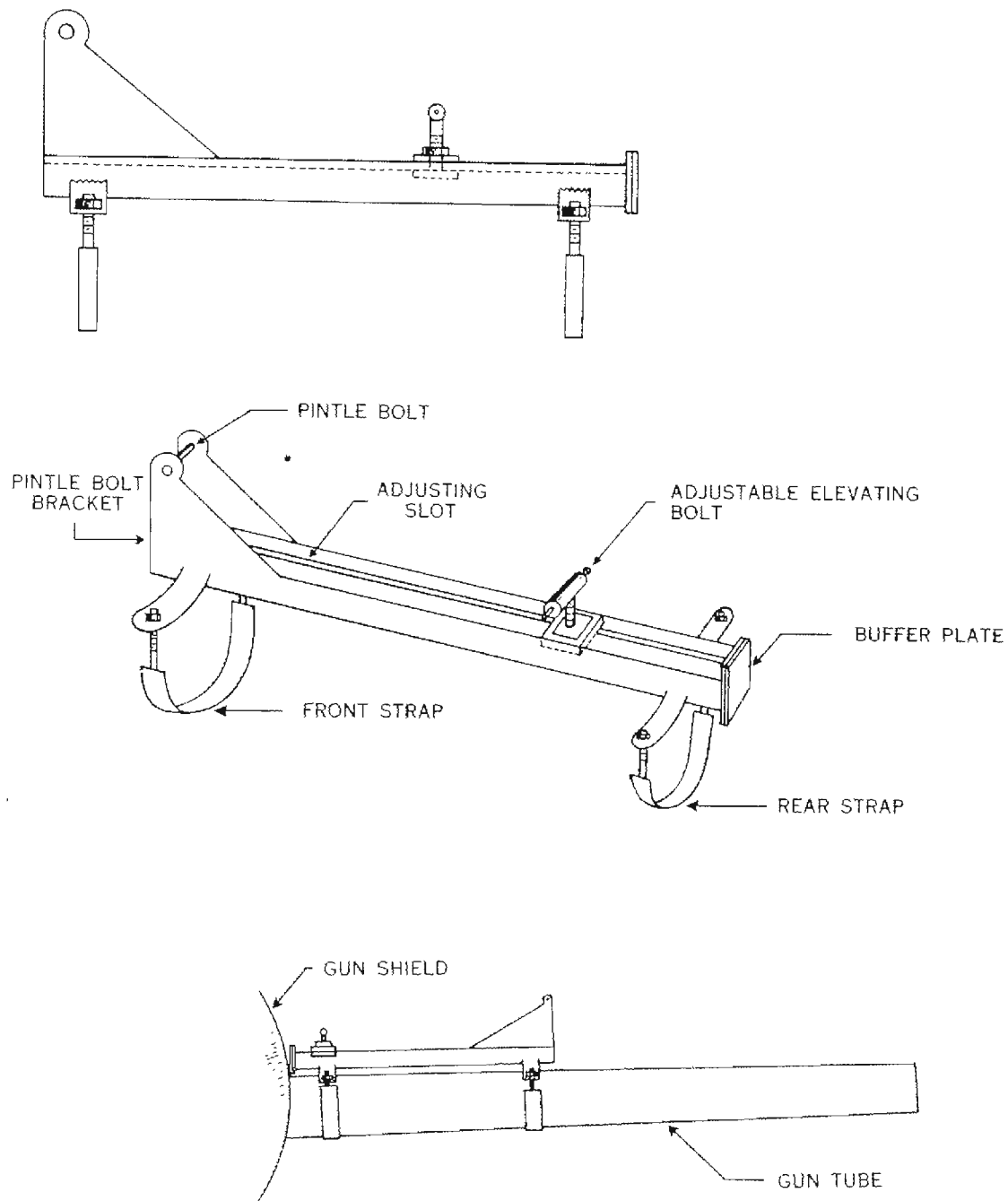


Figure 42

reported CLEAR.

e. Malfunction of any materiel will be reported to the officer conducting fire as soon as the defect is noted.

140. 1000-INCH FIRING COURSES.--The only courses for destroyer weapons are those prescribed for the 37-mm. gun in FM 23-70. They may be used for all destroyers.

141. CRITIQUES.--The group instructor should carefully observe the gun crews' performance of each exercise, note errors, and hold frequent critiques. The critique is an analysis of the performance of duty of each individual as a member of the gun crew, but principally of the gunner at this stage of training.

142. CHECK LIST FOR THE CRITIQUE OF THE GUNNER.--a. Did he:

(1) Repeat the fire order in a loud voice, saying CHECK when the target was identified?

(2) Move his sight to the target without delay?

(3) Elevate, depress, and traverse smoothly as he tracked and fired?

(4) Continue manipulation of the handwheels when he fired?

(5) Keep his eye the proper distance from the sight?

(6) Repeat sensings (if given)?

(7) Aim at the proper point on the tank?

(8) Take the correct lead and range? (Verify by having him draw silhouette on sight reticle.)

b. Or did he:

(1) Jerk the elevating or traversing handwheels when gun was fired?

(2) Get ahead of the target and stop traversing to wait for the target to catch up?

(3) Get behind the target and traverse quickly to catch up?

143. CRITIQUING SHOT GROUPS.--a. The critiquing of shot groups is one of the most important phases of preliminary marksmanship. For this reason, the unit commander must make certain that each platoon leader and gun commander is fully qualified to offer constructive criticism to his crew. Shot group analysis must be specific and complete.

b. During firing, a coach other than the gun commander must be

specifically assigned to watch the gunner. This coach must make every effort to detect even the slightest error in the gunner's manipulation and position, for herein often lies the reason for erroneous shot groups.

c. Once the gunner can consistently fire a good shot group, whether on the proper part of the target or not, definite progress has been made. Should the shot group be out of the designated section of the target, the gun commander or the coach can detect his error, which must lie in his sight picture, by having him reproduce his sight picture on the gunner trainer. Should there be no error in his sight picture, check to see that the gun is properly targeted.

d. As was previously stated, erroneous shot groups can often be traced to faulty manipulation. The coach should familiarize himself with the common faults in leading and tracking moving targets and use these errors as a basis for his critical analysis of the erroneous shot groups. When the gunner is making obvious, large errors, his firing should be stopped by the coach, the errors corrected, and the gunner allowed to start over.

144. BEHIND-THE-LINE INSTRUCTION.—The unit commander should plan behind-the-line instruction for all gun squads which cannot be advantageously kept busy on the firing line. The nature of this instruction and the time to be spent on it will depend upon what instruction is needed and the material available for giving it. Since this is the basic training period for the individual gunner, this instruction should be limited primarily to marksmanship and the use of sight trainers. It also provides an excellent opportunity to drive home to the men the combat value of this training, and to show them the absence of distribution, cover, etc. on the firing line.

145. UNKNOWN DISTANCE FIRING (CALIBERS .30 AND .50 SUB-CALIBER).--a. Purpose.--Sub-caliber firing provides training in tank destroyer marksmanship and technique of fire. It develops co-ordination in gun crews, along with skill in laying, tracking, and firing on moving targets.

b. Targets.--(1) Firing on a moving tank with caliber .30 ammunition is the best sub-caliber training a gunner can receive. Welded target tanks move across the range at various speeds and ranges. The gunner must use the information in the initial and subsequent fire orders to get on the target and stay on it.

(2) In the absence of tanks, towed panel targets may be used.

146. SUB-CALIBER EQUIPMENT.--a. Caliber .30 or caliber .50 machine guns are fastened to the outside of the gun tube by an improvised mount. The mount may be any attachment which will hold the machine gun securely to the tube, with the axis of its bore parallel to that of the destroyer.

b. The principles involved in boresighting such equipment are the same as those used in boresighting the destroyer itself. Because crosshairs cannot conveniently be used on the machine gun, however, the test target

method of boresighting may not be practicable. The machine gun may be boresighted by the distant aiming point method as follows:

- (1) Remove the backplate and the bolt from the machine gun.
- (2) Move the destroyer sight on its mount and/or the machine gun on its mount until:
 - (a) The zero range, zero lead point of the destroyer sight is laid on a distant aiming point.
 - (b) The bore of the machine gun is laid on the same aiming point.
- (3) Clamp both the destroyer sight and the machine gun in this position.

c. Instead of being boresighted, the machine gun may be zeroed at a convenient range near the center of the range band to be fired. For example, let us assume we are to fire between 600 and 1000 yards. We would then zero at 800 yards, as follows:

- (1) Select a clearly defined point at an estimated range of 800 yards.
- (2) Fire one round and adjust (by moving the traversing and elevating mechanisms of the destroyer) until the strike is on the selected point.
- (3) Without moving the machine gun, adjust the destroyer sight until the zero lead, 800-yard range point, is on the strike.
- (4) Clamp the machine gun and the destroyer sight in position.

d. Sub-caliber devices for the 37-mm. and 75-mm. destroyers are identical to those used for 1000-inch firing, except for the use of a caliber .30 M1903A1 rifle in lieu of the caliber .22 rifle.

e. A sketch of the improvised strap mount used with the machine guns is shown in fig. 42.

147. TRAINING.--Sub-caliber firing should train gun commanders in sensing rounds as well as train gunners to shoot. For this reason qualified personnel should be assigned to supervise and correct the gunners, thus allowing the gun commanders to get all the practice possible in observing strikes and tracer and announcing sensings. If additional trained personnel is not available, the coach-and-pupil method may be used, the coach devoting his entire time to observing and correcting the gunner, while the gun commander performs his normal combat duties.

148. CHECK LIST FOR RANGE FIRING.--a. See that the clamps on the sub-caliber mount are tight.

- b. See that the guns are properly boresighted.
- c. Check the boresight of each machine gun frequently.
- d. Check the gunner's firing continually, especially as to whether he is making the proper changes in range and deflection based on subsequent fire orders.
- e. Check the gunner's position with respect to the sight.
- f. See that the gunner tracks the target smoothly.
- g. Check the gunner's sight picture occasionally.
- h. Check initial fire orders.
- i. Check sensings and subsequent fire orders.
- j. Check range cards.
- k. Check gun commander's critiques of firing.
- l. Check coach's critiques of firing.

149. BEHIND-THE-LINE INSTRUCTION.--a. In order that no individual be idle during a firing period, concurrent instruction is carried on behind the firing line. Subjects should include:

- (1) Review of the sight reticle and use of the gunner trainer.
- (2) Review of functioning and malfunctions.
- (3) Service of the piece and loading.
- (4) Camouflaging of destroyers.
- (5) Digging in a destroyer position.
- (6) Range cards.
- (7) Selection of gun positions. Place guns in good and bad positions and hold critiques to demonstrate the good and bad points of each.

b. It is very important that behind-the-line instruction be conducted with existing units under their regular leaders. When the gunner goes up to fire, the whole crew goes with him; the same principle applies to behind-the-line instruction.

150. GUNNER'S TEST.--a. Purpose.--To measure the proficiency of the individual crew member in gunnery before he fires service ammunition.

b. Responsibility.--Determination that a high standard of pro-

iciency has been attained before crews are permitted to fire service ammunition is a command responsibility. The gunner's test is a means of determining the state of training.

c. Procedure.--(1) Place targets at ranges of 300, 500, 800, and 1000 yards. The gun crew prepares the piece for action. Check the gunner's laying for range and deflection. Allow no credit if the laying is not precisely correct.

(2) Starting with the zero range, zero lead point of the sight on a selected target, have the gunner lay on the target with an announced range and lead. Time this operation with a stop watch, check his sight picture, and repeat the operation six times with a different range and lead each time. Compute the average time.

(a) The successive ranges and leads should vary considerably to give maximum practise in traversing and elevating operations.

(b) The time chosen as a standard for measurement of proficiency will vary with the type of destroyer used for the test. With the M10 the time allowed should be 6 seconds (average for six tries).

(c) A sample set of commands for the test follows:

800, 2 LEADS
2200, 4 LEADS
1500, 1 LEADS
1600, 2 LEADS
2500, 3 LEADS
200, 4 LEADS

(3) Select a varied piece of terrain. Place tanks, scout cars, etc., at various unannounced, predetermined ranges (300 to 2000 yards) from the observer. Upon command, the vehicles are driven across the range at prearranged speeds and at various angles to the line of observation. Give the gunner five trials, having him write down in each one the answers to the following questions:

(a) What is the range? (During the critique, use aerial photographs to show the correct range.)

(b) What is the speed?

(c) What is the proper lead?

(4) Have the gunner lay the zero range and zero lead point of the sight on a selected target. Give him the range and direction elements of an initial fire order, then three subsequent fire orders. Check his sight picture after his last laying. This can be determined in advance for any number of such tests, which may be conveniently preserved on small cards. Example, using M51 sight:

1000, 2 LEADS

OVER
LEFT
OVER, RIGHT

The sight picture at this point should be that for 600 leads. The exact laying will depend on the direction in which the gunner was told to assume the target was moving.

151. UNKNOWN DISTANCE FIRING WITH SERVICE AMMUNITION.--a. The importance of service ammunition firing cannot be over emphasized. The firing of service is the culmination of all previous training.

b. Only the gunners who have passed the gunner's test should be allowed to fire.

c. The ranges and targets should be prepared well in advance of the firing. The line must be well organized and a system of control set up. Ammunition should be placed in the destroyer before firing begins.

d. The gunner should know the type of ammunition that he will fire and the correct ranges in the sight for that ammunition.

e. Safety precautions should be explained to the assembled crews. Right and left safety limits should be pointed out to the crews.

f. The officer conducting fire should explain the target runs and timing of the runs to the crews. Each gunner should know the number of rounds allowed and the maximum time allowed.

g. Each gunner before firing will check the boresight of his destroyer and re-boresight if in error.

h. Each gunner should fire on stationary targets and moving targets.

i. Each gunner's action and his firing should be critiqued by his gun commander.

j. Behind-the-line instruction, as in all other firing periods, should be given under platoon and squad leaders. It should include:

- (1) Review of marksmanship.
- (2) Care and cleaning.
- (3) Range cards.
- (4) Selection and occupation of position.
- (5) Service of the piece (pep drill) which should continue for short periods through all phases of training.
- (6) Night firing methods.

152. TECHNIQUE OF TD DIRECT FIRE.--a. Direct laying is pointing a weapon for direction and elevation by directing the line of sighting on a target visible to the gunner. It is the simplest, most rapid and accurate, and usually the only effective method of engaging a tank destroyer target.

b. Tank Destroyer direct fire involves a knowledge of the following subjects:

- (1) Characteristics of fire.
- (2) Classes of fire.
- (3) Range and speed estimation.
- (4) Target designation.
- (5) Fire distribution.
- (6) Fire control.
- (7) Fire orders.
- (8) Selection and occupation of position.
- (9) Preparation and use of accurate range cards.

153. CHARACTERISTICS OF FIRE.--a One of the outstanding characteristics of TD fire is its high armor-piercing ability. The ammunition used has a high velocity and a flat trajectory. The use of high velocity ammunition permits gunners to fire at moving targets with facility.

b. Because of the difficulties involved in firing from a moving vehicle, TD's will fire from a stationary position.

154. TARGET DESIGNATION.--a. Any accurate and dependable method of designating the target to the gunner so that he may be able to deliver quick and accurate fire on the desired target may be used.

b. The method used in the fire orders for direct fire is the simplest and most accurate. The gun commander gives the description, range, direction, and lead in his fire order to the gunner. Example: LEADING TANK, 600, TRAVERSE RIGHT, STEADY...ON, 2 LEADS. "Leading tank" identifies target; "600" gives range to use to fire on the target and assists designation by telling the gunner how far "out" to look. "Traverse right, steady...on" gives gunner direction; "2 leads" gives him proper lead.

c. Another method used to designate targets is the reference point method. This is used only in case the target is very small, or difficult for the gunner to pick up. A prominent terrain feature that is easy to see is chosen as a reference point. By using this point to

start from, the gun commander can direct the gunner to a target by means of measurements, field glasses, or 100-yard units, if the range is short and measurement in yards is possible. The gunner then picks another reference point and redesignates the target to the gun commander to be sure they are looking at the same target. An example is shown in figure 43.

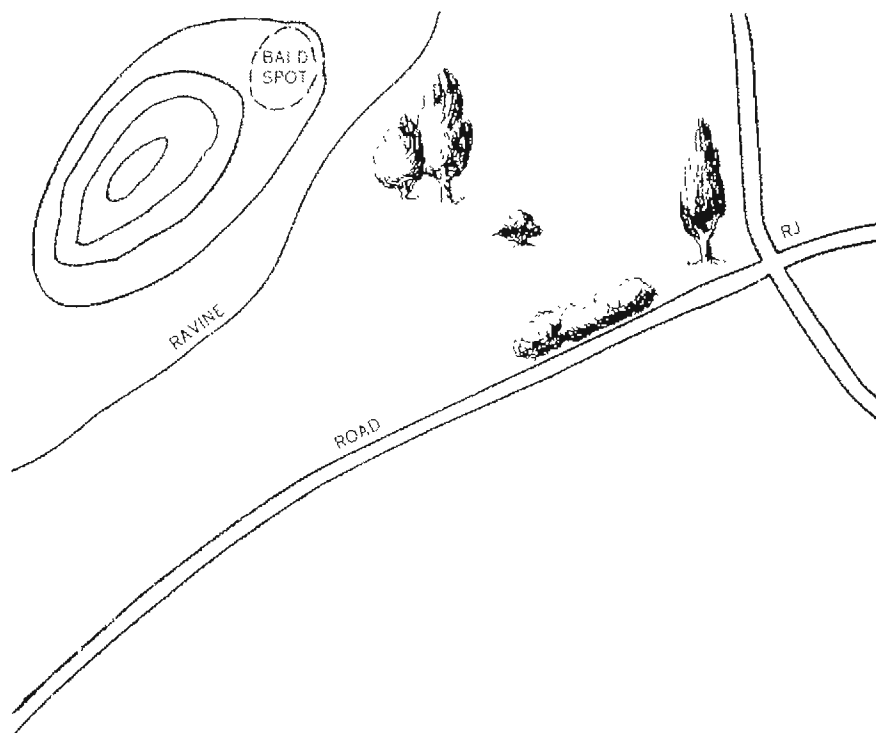
d. A simple, rapid, and accurate method of designating indistinct targets is by the use of tracer ammunition. The person designating the targets commands, "Watch my tracer." He then fires a round or a series of rounds at the target (preferably from a rifle or a machine gun), and completes the designation orally. The maximum range at which targets may be designated by this method is the "burn-out range" of the tracer being used. In the case of the cal. .50 tracer it is approximately 1600 yards; in the case of the cal. .30 it is approximately 800 yards.

155. FIRE DISTRIBUTION AND SELECTION OF TARGETS.--a. Fire distribution is the allocation of targets or portions of a target in order to deliver the most effective fire. Fire distribution goes hand in hand with the proper selection of targets; both subjects must be taught to the platoon in pre-combat training.

b. Remember this key phrase: "First my mission, then my destroyer, and then myself." Other things being equal, a single destroyer engages targets most dangerous to itself. The section or platoon distributes its fire so as to engage targets most dangerous to the section or platoon. In platoon formation each gun commander is responsible for targets immediately to his front. In addition, commanders of flank guns are responsible for targets on their flank. Each gun commander observes to his right, left, and rear and brings fire to bear on targets in front of other guns when he is not engaged on his own front. The gun commander must not hesitate to shift fire to a more dangerous target.

c. Here is an example of what improper fire distribution could cause in a combat situation. A TD platoon is in a good position. A column of four enemy tanks appears, at 500 yards, moving directly across the platoon's front. Suddenly the tanks turn away from the platoon and stop, apparently to inspect the terrain. The platoon fires at the nearest tank destroying it and the remaining three tanks seek cover. The platoon fires again, this time at the trailing tank and succeeds in stopping it. However, the tank crew mans the gun and returns the fire. By this time the other two tanks have reached cover and they also engage in the fire fight.

d. Analyze the situation and see if you agree with the following: The first mistake is very obvious. The platoon should have distributed its fire so that each tank was fired upon by one destroyer. Each TD after accomplishing its own mission could then shift its fire to aid the other destroyers. The mistake of massing the fire of the entire platoon on a single tank and ignoring the other three would be an unforgivable error in combat. After making that error they still could have saved the day if they had delivered their remaining fire in this manner: When the three tanks headed for cover the first and second destroyers should

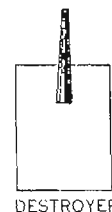


Gun Commander:

"Target machine gun nest in bush. Reference point--bald spot on hill to left front. Four fingers to right, across ravine two trees. One finger right at shorter range. Lone bush in the open."

Gunner:

"Target identified." (Now gunner redesignates to target gun commander.) "Reference point--cross-road right front. Along road to left, lone tree three fingers to left at a slightly greater range. Single bush in the open."



DESTROYER

Figure 43

have taken the leading tank under fire. Each of the other destroyers should have engaged one of the trailing tanks. After knocking out its tank, each destroyer checks to see if it can aid in the destruction of other tanks that still remain.

156. PRIORITIES IN THE SELECTION OF TARGETS.--a. In the selection of targets priority should normally be given in the order listed:

(1) "Over-watching" tanks (i.e., tanks halted, prepared to fire, and covering movement of others) unless other tanks at extremely short ranges have discovered your position and are about to over run it. In other words, the most dangerous tank.

(2) Commander's tank. This will cause loss of control and confuse the enemy. His tank may be the only one equipped with radio. The radio will aid in identifying the commander's tank, and its destruction will cause the tank platoon to lose contact with its higher commander.

(3) Tank nearest to cover. A tank that gains cover is dangerous.

(4) The rear tank when several move across your front. Sometimes the rear tank can be destroyed before the others discover your position.

b. Here is a list of general rules for target selection. These rules should be used as an aid in training. This is not the only way to select targets.

(1) When a column of tanks is moving across your front and you wish to turn them away from an area that they are approaching, shoot at the leading tank first. The other tanks will then seek cover away from your position.

(2) When your fire has immobilized a tank and another is approaching your position at a range of more than 500 yards, shoot at the immobilized tank first--you still have time to shift to the approaching tank. The stopped tank may be able to fire as a stationary gun.

(3) When your fire has immobilized a tank and another is approaching your position at a range of less than 500 yards, fire at the moving tank first as it is the more dangerous target.

(4) If a tank drops out of column and halts, shoot at it first--it is both the easiest target to hit and the most dangerous to you.

(5) When both tanks and armored cars are in the same column, shoot at the tanks first--they are the most dangerous. Use machine guns on the light armor.

Note: Remember, if your mission is to protect the infantry, the tank

most dangerous to them rates the high priority.

157. RANGES AT WHICH TO OPEN FIRE.--The following table indicates ranges at which a platoon of 4 TD's will normally open fire.

	Well-concealed destroyers		Poor concealment or position disclosed		No concealment	
	3" gun	75-mm. gun	3" gun	75-mm. gun	3" gun	75-mm. gun
1 to 5 tanks	1000 yds. or less	500 yds. or less	1000 to 1200 yds.	1200 yds.	1800 to 2000 yds.	1800 yds.
5 to 10 tanks	1000 yds. or less	1200 yds.	1000 to 1500 yds.	1200 yds.	1800 to 2000 yds.	1800 yds.
Over 10 tanks	1500 yds.	1200 yds.	1800 to 2000 yds.	1800 yds.	2000 yds. or over	1800 yds.

158. GENERAL.—a. Fire control of machine guns implies the ability of the leader to open fire at the instant he desires, adjust the fire of his guns upon the target, shift it from one target to another, regulate its rate, and cease firing at will. He must be able to do all of these things promptly if the fire is to be effective. Lack of proper fire control results in loss of surprise, premature disclosure of position, misapplication of fire on unimportant targets, loss of time in securing adjustment, and wastage of ammunition. Fire control is therefore a highly important phase in the technique of direct laying.

b. Fire control is based primarily on discipline and secondarily on correct technical training. Inasmuch as the destroyers of a platoon are frequently separated by wide intervals, control must often be decentralized. To this difficulty are added the excitement and noise incident to combat. Under these conditions good fire control can be had only if all men are well disciplined and have the proper technical training to carry out fire orders promptly and efficiently.

159. SELECTION AND OCCUPATION OF POSITION.—a. By a mounted reconnaissance the platoon leader of a TD Platoon selects the general area to be occupied by his platoon and the approximate location of each destroyer. Destroyer commanders then reconnoiter their assigned positions and accurately locate their destroyers on the ground. Whenever time permits, the platoon leader will inspect the primary and alternate position of each destroyer and make any necessary corrections. This final inspection must be made on foot and where possible it should be made with the destroyers actually in position.

b. There are four (4) requirements of a TD position:

- (1) Field of fire.
- (2) Cover and concealment.
- (3) Concealed routes to and from position.
- (4) Communication.

c. Field of fire--Each destroyer should be in such a position that the gunner can engage targets within his own sector of fire and in addition be able to fire at tanks approaching the other destroyers.

d. Cover and concealment--Cover and concealment are critical factors in the choice of TD positions. Many times only partial concealment is available, but what there is must be used.

(1) Hull defilade. This type of position is often the most desirable from the standpoint of protection afforded, and the rapidity with which it may be occupied or abandoned. It should when possible be selected on foot.

(2) Dug-in position. When the terrain and the tactical situation indicate, the crew may dig the destroyer in to give it added protection and concealment.

(3) Camouflage. Whenever time permits destroyer positions should be camouflaged, either by nets or use of natural material. Use anything to keep your position from being discovered by the enemy.

e. Concealed routes to and from position--Take advantage of concealment when moving into and out of position; avoid movement over or along a crest which will present a clear silhouette to the enemy.

f. Communication--Communication in a TD platoon is normally by radio. Positions should be chosen to place TD's in visual contact with each other so that if for any reason the radio net can not be used, visual means can be used to control the platoon.

g. Types of positions for TD's.

(1) Fire position.--Fire positions are occupied by destroyers in action to cover by fire an assigned sector or avenue of approach. Fire positions are primary, alternate, or supplementary. The primary fire position is the position from which a unit or weapon executes its primary mission. An alternate fire position is a position from which the same fire missions can be executed as from the primary fire position. A supplementary fire position is a fire position from which a destroyer can accomplish fire missions other than those to be accomplished from primary or alternate positions. (figure 44)

(2) Cover position.--A cover position is one in the immediate vicinity of the fire position providing concealment and protection to

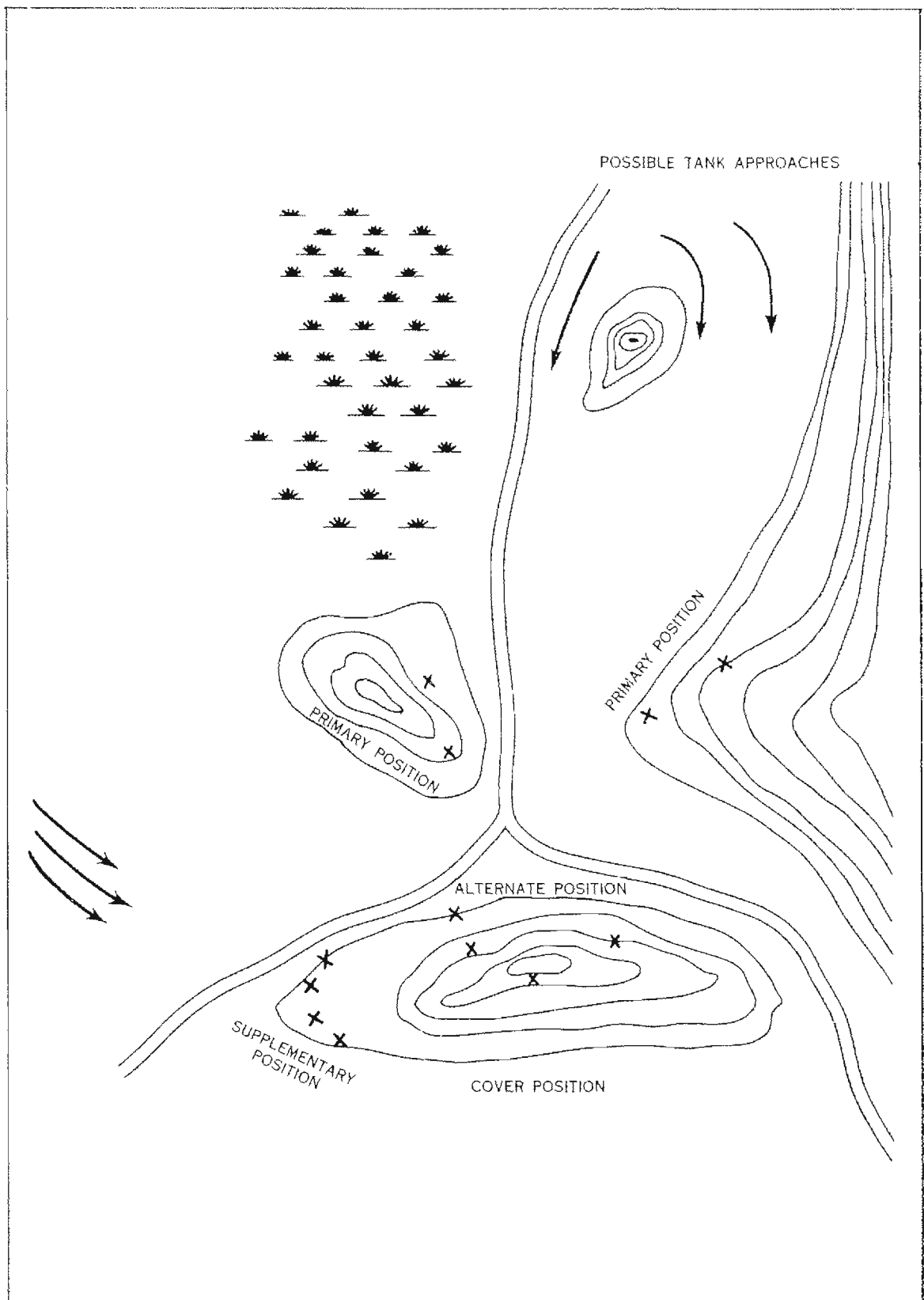


Figure 44

weapons and crew. The cover position is used when adequate cover cannot be had at the fire position. The destroyer remains in the cover position until action is imminent, when it is quickly shifted to the fire position.

h. Selection of positions.--In selecting routes and positions the destroyer commander endeavors to comply with the following basic guides:

(1) Take advantage of concealment when moving into position; avoid movements over or along a crest which will present a clear silhouette to the enemy.

(2) Do not wait for orders when the enemy launches a surprise attack, but move off the road at once to the nearest position and open fire.

(3) Select positions from which movement can be made without delay to the front or rear.

(4) In any firing position, seek concealment and hasty camouflage. Avoid firing positions on a hill crest; seek a position that provides partial defilade, and which has an irregular background.

(5) Select firing positions with unrestricted fields of fire, and that do not offer covered approaches to the enemy.

(6) Exploit difficult terrain and natural obstacles to the advantage of the destroyer and the disadvantage of the enemy.

(7) TD's not less than 75 yards apart.

(8) Visual contact between TD's.

(9) Each TD able to cover the "dead space" of the destroyer on its right and left flanks.

(10) One or more alternate or supplementary positions for each destroyer, to meet all possible attacks from any direction.

Note: The above rules apply as well to towed guns as to self-propelled. The main difference is that towed guns, due to their lack of mobility, will start the move to alternate positions sooner. The comparatively long time required to change positions makes frequent short moves of towed guns impracticable.

160. AIMING POINTS FOR HITS, NOT "SHORTS". Figures 45 to 51 plainly illustrate the necessity for selecting the aiming point at the center of mass of the tank. That is, the point selected should not be at the apparent junction of the target with the ground, but should be half way up the visible portion of the target. Strict application of this rule will produce the maximum possible number of hits.

RANGEDISTRIBUTION OF SHOTS (%)AIMING AT BASEAIMING AT CENTER

	<u>Short</u>	<u>Target</u>	<u>Over</u>	<u>Short</u>	<u>Target</u>	<u>Over</u>
500	50	50	0	0	100	0
1000	50	50	0	0	100	0
1500	50	50	0	0	100	0
2000	50	50	0	1	98	1
2500	50	50	0	3	94	3
3000	50	48	2	17	66	17
3500	50	46	4	19	62	19
4000	50	35	15	30	40	30

Based on a 7-foot vertical target

Figure 45

PZ KW IV

RANGE 500 YDS

CENTER OF IMPACT

2	7	16	3	8	2	16	1	16	2
2	7	16	3	8	2	16	1	16	2

SCALE
1 INCH = 2 FEET

PZ KW IV

RANGE 500 YDS

CENTER OF IMPACT

SCALE 1 INCH = 2 FEET

PZ KW IV

RANGE 500 YDS

CENTER OF IMPACT

SCALE 1 INCH = 2 FEET

PZ KW IV

RANGE 500 YDS

CENTER OF IMPACT

SCALE 1 INCH = 2 FEET

PZ KW IV

RANGE 500 YDS

CENTER OF IMPACT

SCALE 1 INCH = 2 FEET

Figure 46

PZ KW IV

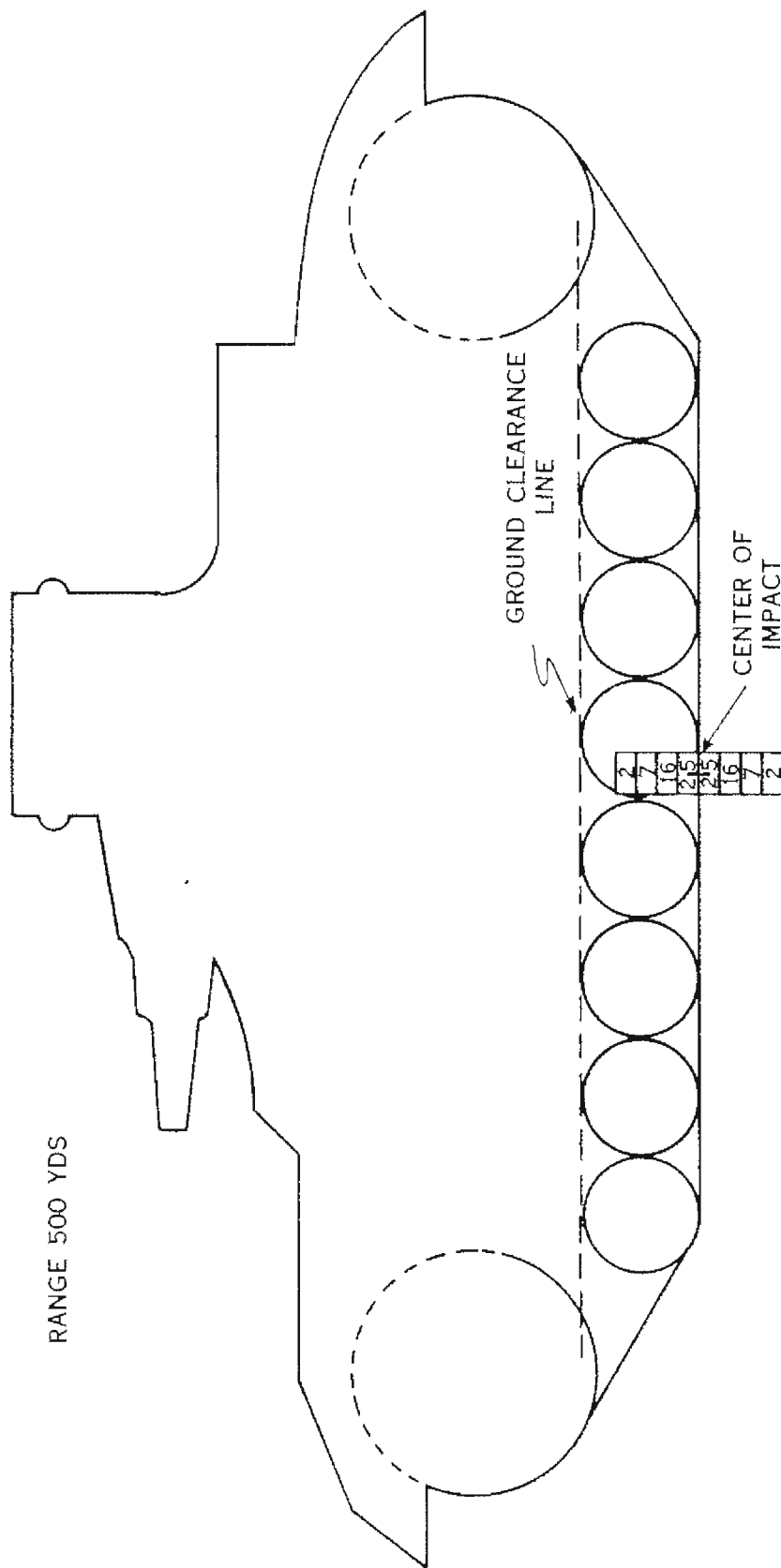


Figure 47

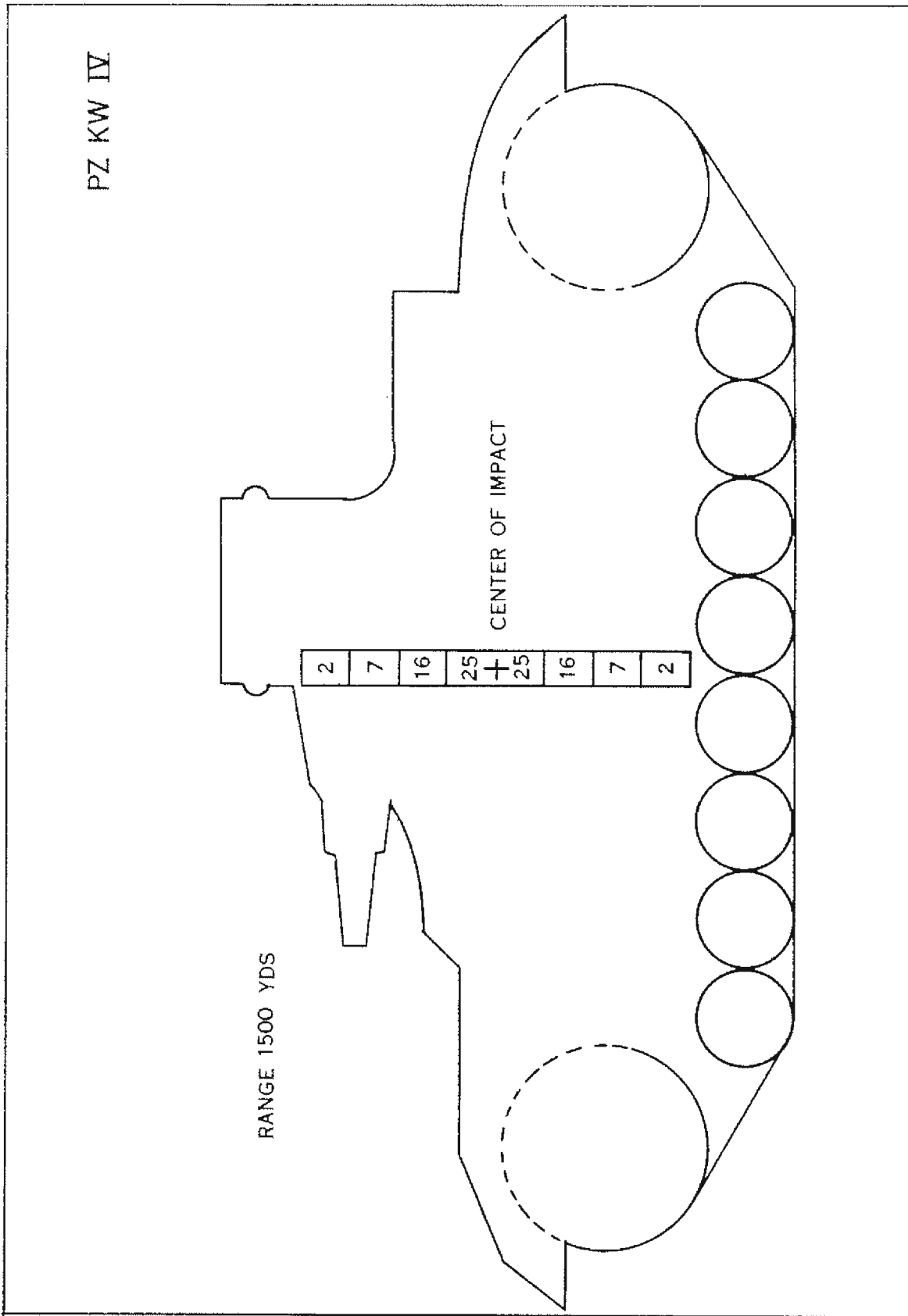


Figure 48

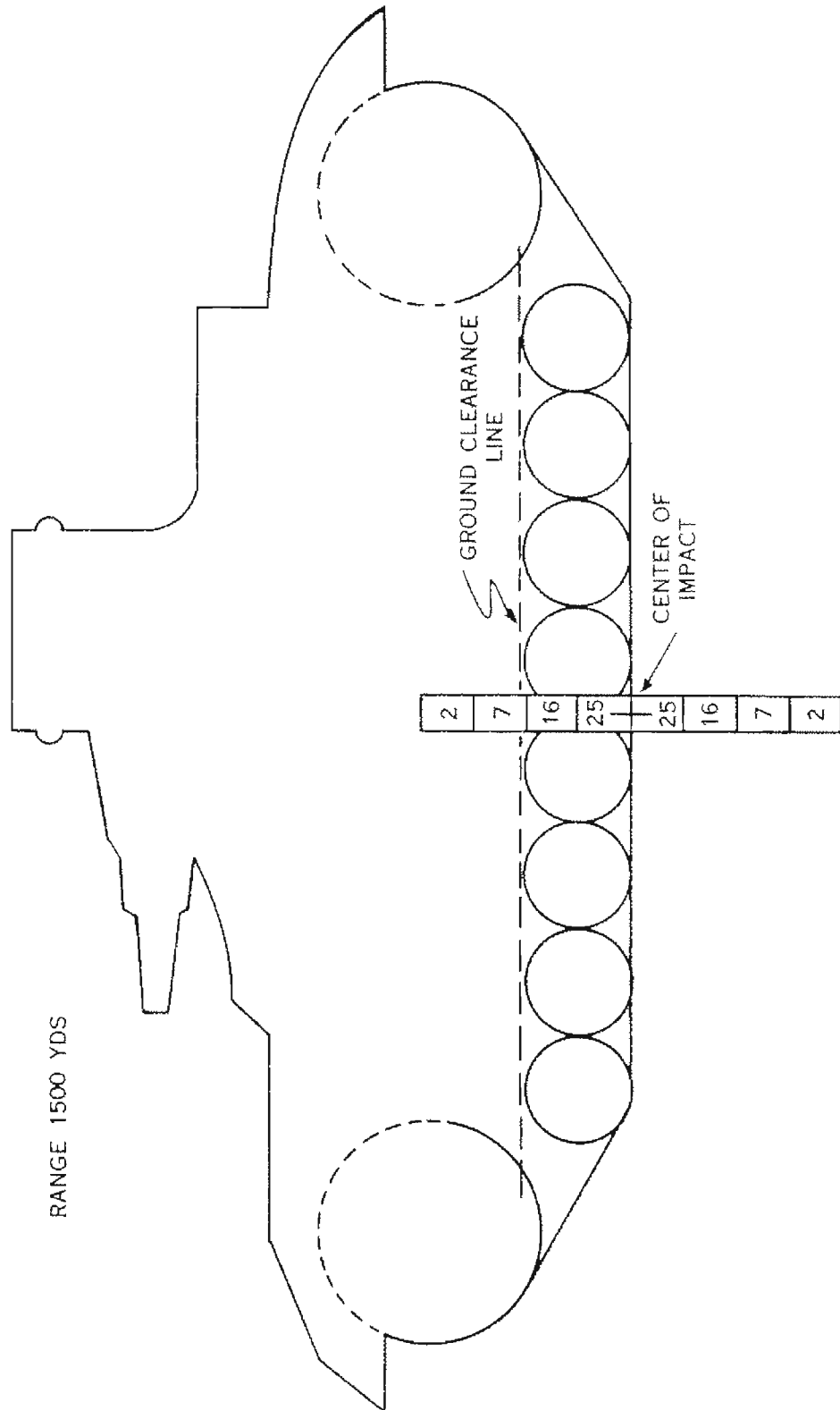


Figure 49

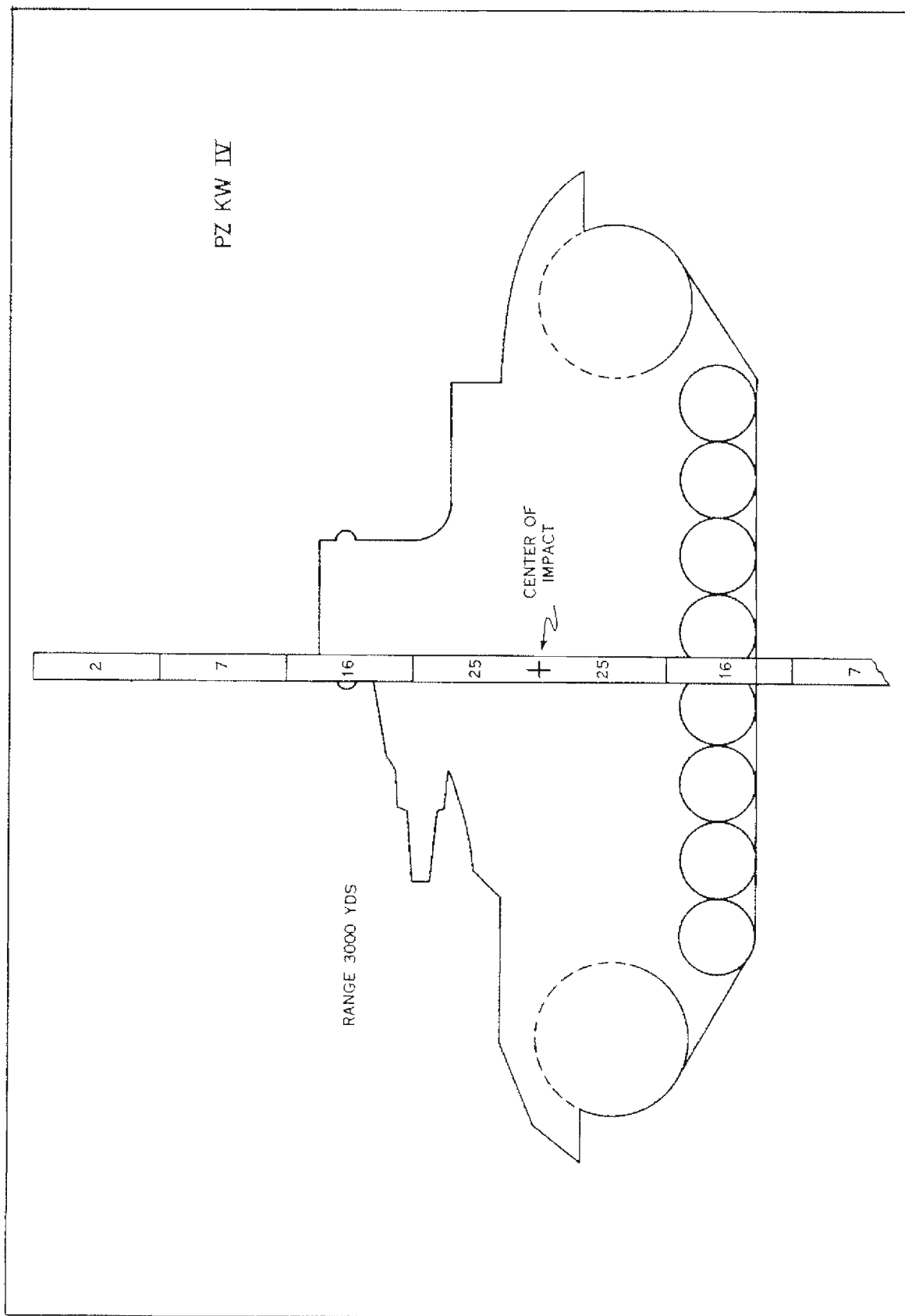


Figure 50

PZ KW IV

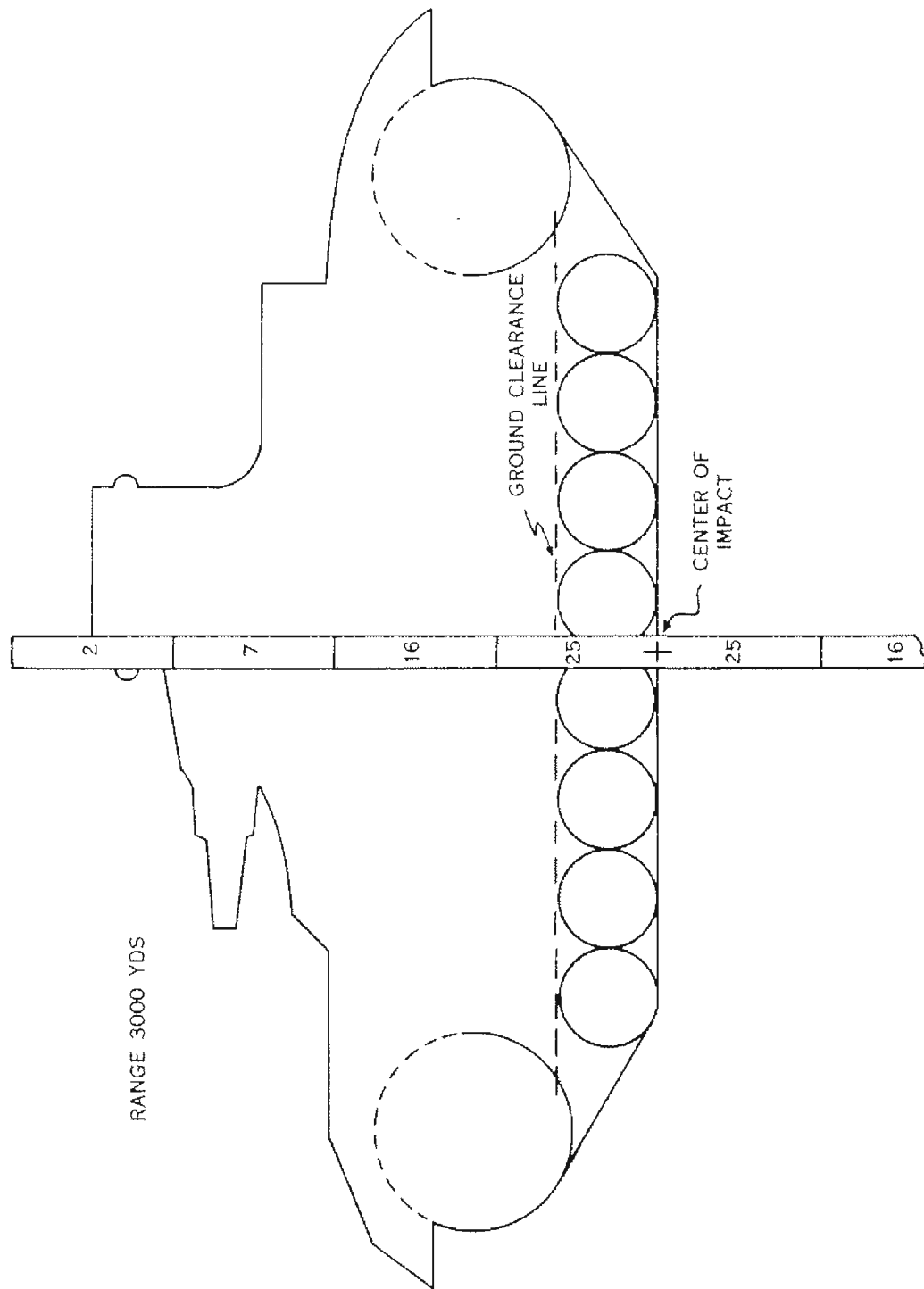


Figure 51

161. THE TD'S "TWELVE COMMANDMENTS."--a. The two quadrant seats, which are located on the breech ring, should never be painted.

b. Use nothing but lens tissue to clean the lens of your sight.

c. Be sure your sight base is free from grit or foreign matter before the sight is mounted.

d. Handle the sight carefully--your sight is your life!

e. Every time your vehicle is halted for a period of 10 minutes or longer, clean the breech and boresight, boresight, boresight!

f. Make a range card immediately upon the occupation of a firing position and keep it up to date by correcting data as a result of firing.

g. Check your recoil system every morning.

h. First your mission, then your destroyer, then yourself.

i. Replenish your ammunition supply at every opportunity.

j. Make every shot count--~~ammunition~~ is vital!

k. Always seek a "belly shot."

l. Never get shorts at short ranges. They are comparatively ineffective and the resulting dust obscures the target.

TANK DESTROYER INDIRECT FIRE

162. INDIRECT FIRE.--a. Indirect fire is fire placed on a target which is not visible to the gunner. Indirect laying is the method by which this is accomplished.

b. When hostile tank action is not an immediate threat, TD units must be prepared to place their fire power at the disposal of higher commanders for secondary missions. Indirect laying will be a vital factor in such operations.

c. Since it is also possible that TD's may sometimes accomplish their primary mission of destroying tanks by employing this technique, it is believed the material presented here is the absolute minimum TD personnel should know about indirect fire.

d. Because indirect fire is an artillery method, and because TD's may be teamed with the Field Artillery on certain combat missions, terms and procedures established by use must be adhered to in order to insure effective co-ordination.

e. The technique of indirect fire will be more easily grasped if its broad principles are kept in mind.

(1) Since the target cannot be seen from the destroyer position, a forward observer is used. He takes up a position, called the observation post (OP), which commands a view of the target area and from which he can therefore adjust the fire of the guns.

(2) The observer does this by sending back to the destroyer position (usually by radio) sensings of the rounds fired; that is, he tells where the rounds land with respect to the point on which fire is to be delivered. The point may be a base point or it may be a target.

(3) These sensings are translated at the destroyer position into commands which move successive rounds nearer and nearer this point, until it is hit.

f. Indirect fire will be taken up under three general headings:

(1) At the destroyer position--what must be done before the guns can comply with the observer's initial request for fire, and how to do it.

(2) At the OP--how the observer gets fire delivered on the desired point.

(3) Back at the destroyer position--how corrections based on

the observer's sensings are made and how fire is actually delivered.

g. Following the material on indirect fire proper, there is a brief discussion of sub-caliber firing, a summary of indirect fire in the form of a step-by-step description of firing a typical mission, and finally, a suggested form of gunner's examination in indirect fire.

163. THE DESTROYER POSITION.--Certain things must be done at the destroyer position to prepare the guns to deliver fire with the greatest possible speed when the forward observer sends his request. These things may be called the opening procedure.

164. OPENING PROCEDURE.--a. Immediately upon arrival at the firing position, the platoon commander lays the guns parallel and generally in the center of the sector. Then he measures the compass of the line along which the platoon is laid. Every line has a magnetic compass bearing. Through usage this bearing has come to be referred to simply as the compass of the line. The compass of any line is the horizontal angle, measured clockwise from the north, to the line.

b. The method of laying and of measuring the compass varies with the type of sights the destroyers are equipped with. The procedures will be taken up in the following order:

- (1) Laying with the panoramic sight.
- (2) Laying with the deflection scale.
- (3) Laying with the azimuth indicator.
- (4) Laying with the direct fire sight.
- (5) Measuring the compass.

165. LAYING WITH THE PANORAMIC SIGHT.--a. The platoon commander points No. 1 gun in the desired direction (i.e., generally toward the center of the sector) and commands: ON NO. 1 LAY PARALLEL.

b. The gunner on No. 1 gun "refers" (turns the rotating head of his sight, but does not move the gun tube) to the sight of the No. 2 gun.

c. When the vertical crosshair of his sight reticle is exactly on the sight of the No. 2 gun, he reads the deflection on his sight and calls it out to the No. 2 gunner. In the case illustrated in fig. 52, he would call: "No. 2, deflection 1300."

d. The gunner on No. 2 gun sets off on his own sight the deflection which has just been read to him. He then traverses his piece (that is, moves the gun tube) until the vertical crosshair in his sight is properly alined on the sight of the No. 1 gun. The tubes of the two guns are now parallel.

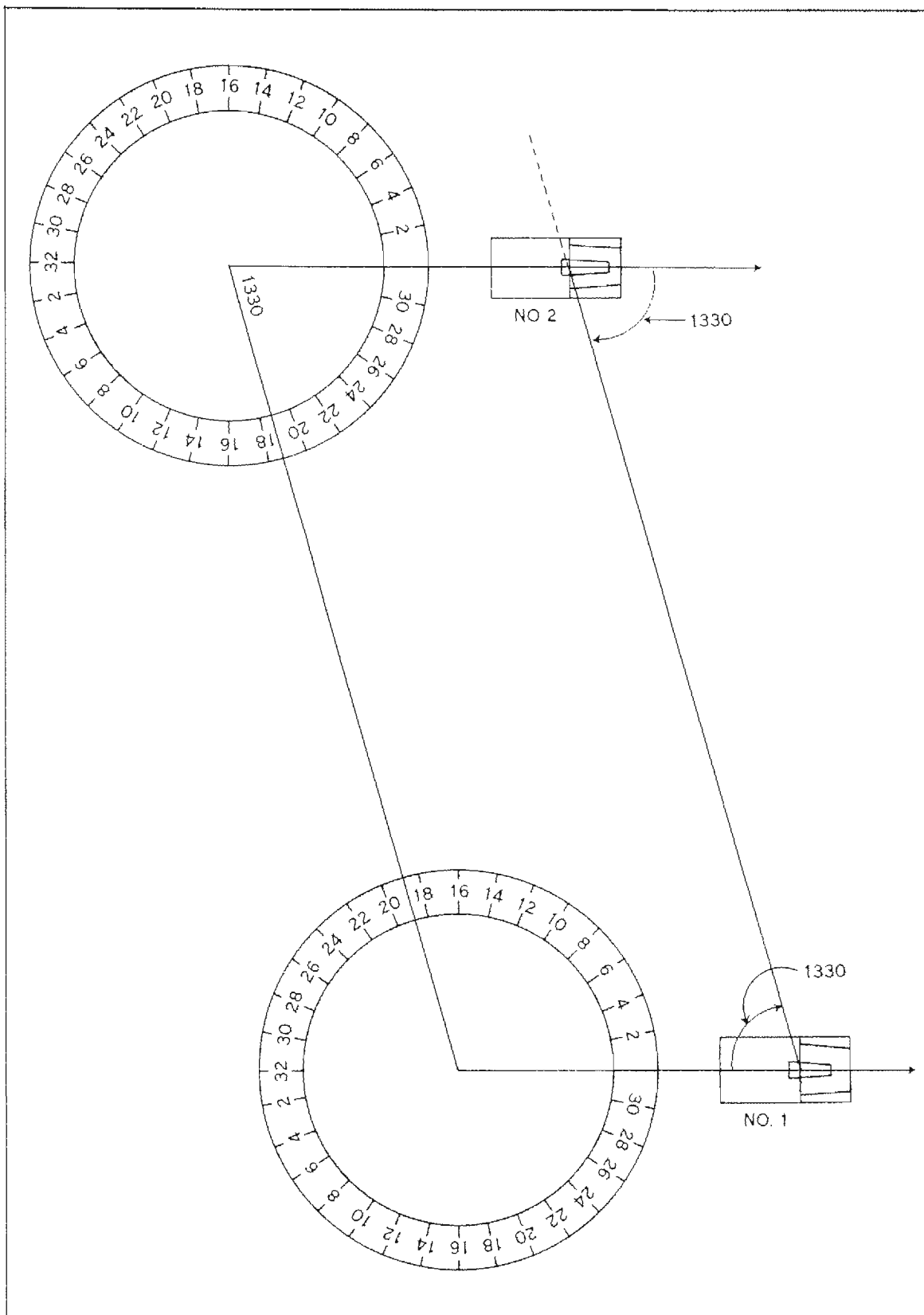


Figure 52

e. The gunner on No. 1 now repeats the above steps with gun No. 3 and then with No. 4. When time permits, the entire procedure should be repeated to obviate small errors. If the situation is such that the gunner on the base piece (No. 1) cannot see the sights of all the other pieces, he lays those which he can see; one of the latter then lays the remainder parallel to it.

Note: An aiming circle will be used if available. It is quicker as well as more accurate. It may be thought of as a fifth gun in the platoon. It lays the platoon parallel in a similar manner to the No. 1 gun in the above procedure. The zero deflection of the aiming circle will be initially laid in the direction of fire. Declination of instruments must be discussed if an aiming circle is included in the TBA of the TD company since all directions used will be in terms of Y-north. Occupy a point in a line of known direction, sight on another point on that line and read your instrument; repeat until three readings have been made. Average the three readings taken, subtract the average from the known Y-azimuth, and the difference is the declination constant. If the average of the three readings is greater than the known Y-azimuth, add 6400 to the Y-azimuth before subtracting the average of the three readings.

f. Now that the platoon is laid parallel in the approximate center of the sector, some means must be used to mark the direction in which the tubes are pointing so that there will be a base to work from and to go back to, if necessary. There are two ways of doing this: with an aiming point and with aiming stakes. The aiming point method permits a quicker initial delivery of fire, but aiming stakes will always be used whether an aiming point is available or not.

g. The procedure for the aiming point method is as follows:

(1) The platoon commander selects some outstanding object on the terrain. This object, called an aiming point, should:

- (a) Have a straight vertical edge.
- (b) Be as far from the guns as possible.
- (c) Be visible from all guns. (However, each gun may use a separate aiming point if necessary)

(2) The platoon commander commands: AIMING POINT (here he gives location and description, such as LEFT FRONT, BARN, LEFT EDGE) REFER.

(3) Having identified the aiming point, each gunner refers to it with his sight. He does not traverse the piece. When the vertical crosshair of his sight is on the aiming point, he reads the deflection which is set off on the dials of his sight. The gunner then writes this deflection on the shield of his destroyer and also announces it to the platoon commander; for example, "No. 3, base deflection, 1400." At any subsequent time the gunner can return the tube of his gun to its original direction simply by setting off on his sight the deflection written on

the shield and then traversing the gun until the vertical crosshair is on the aiming point--in this case the left edge of the barn. When all gunners do this, the guns are parallel and on base deflection.

h. Obviously, an aiming point will not always be available--at night, for instance, or under conditions of fog, smoke or dust, or because of unsuitable terrain. In such cases, aiming stakes would have to be used. In ANY case, aiming stakes will be set out in order to always be available when needed. Where an aiming point is used initially to effect prompt delivery of fire, for example, stakes will be put out at the first opportunity, such as during a lull in firing. The procedure is as follows:

(1) The platoon commander commands: AIMING STAKES OUT.

(2) One man from each destroyer takes out TWO aiming stakes; he sets one up at a convenient location at least 100 yards from his destroyer and the other midway between the first stake and the destroyer. By means of hand signals the gunner directs the placing of the stakes so that both of them are in an exact line with the vertical crosshair of his sight. For night firing, a small shielded light is fixed to each stake, the near light being lower than the far light.

166. LATERAL DISPLACEMENT.--a. Two aiming stakes are always used because the gun is usually jarred by recoil from its original position. If the gunner sighted back on only one stake, his gun tube would not point in the original direction; it takes two stakes to establish the straight line along which the line of sighting must be directed.

b. When a gunner sees that his aiming stakes are out of line he knows the gun has moved. He notifies the platoon commander of this and continues to use the far stake, making necessary corrections as explained below, until the condition can be corrected.

c. The movement of the gun from its original position, called lateral displacement, is corrected by the gunner as follows (with panoramic sight) (fig. 53):

(1) He lays on the far stake (that is, traverses the gun until the vertical crosshair in his sight is on the stake).

(2) He then refers to the near stake (that is, he turns his sight without moving the gun tube until the crosshair is on the near stake).

(3) Next he lays on the far stake with the new reading on his sight (that is, he traverses the tube without changing the sight reading until the crosshair is on the far stake). This makes the gun tube parallel to its original laying.

(4) As soon as practicable, he has the aiming stakes realigned by having the near stake moved.

d. To correct for lateral displacement of a gun equipped with

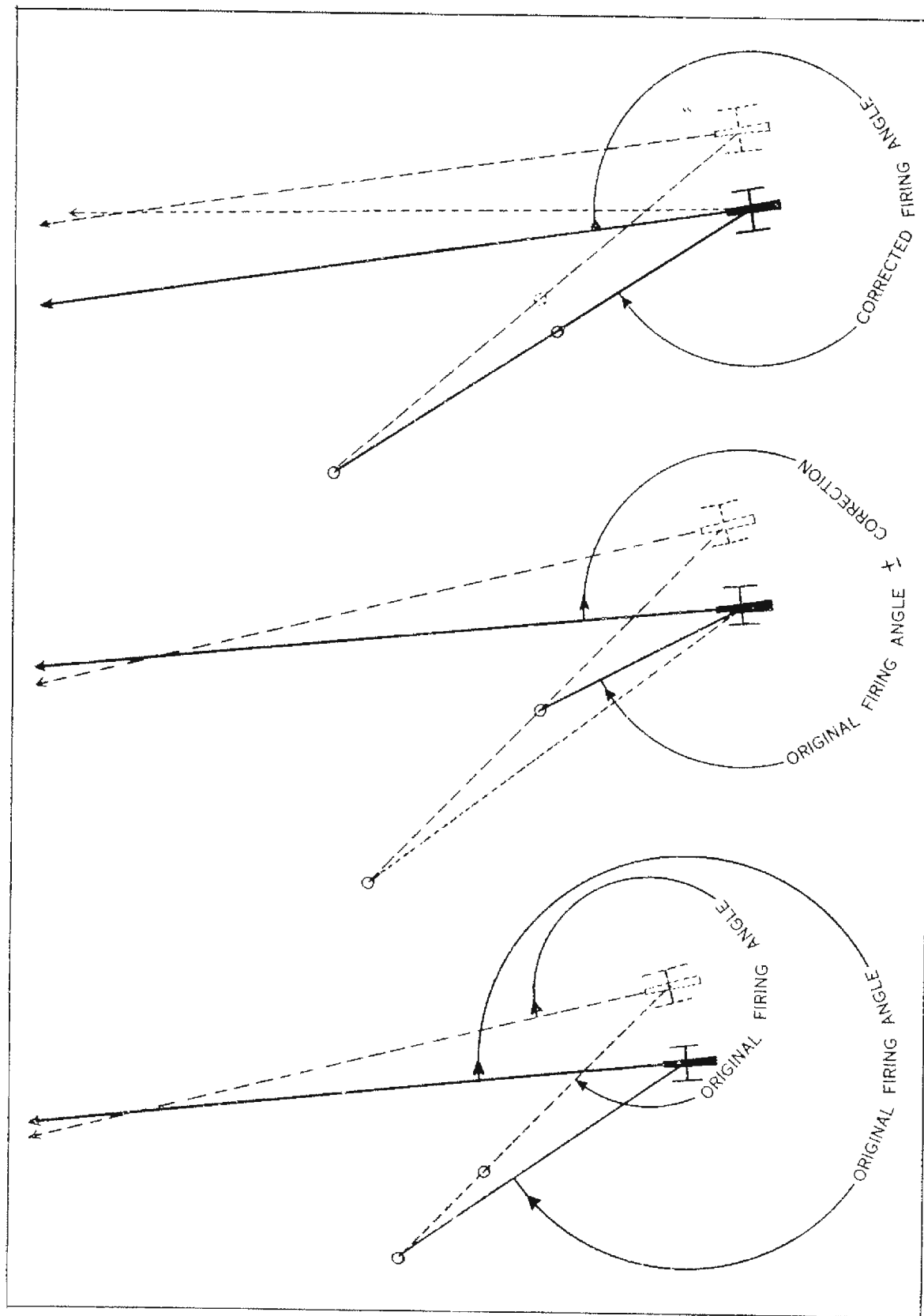


Figure 53

direct fire (telescopic) sight, the gunner:

(1) Traverses the gun until the zero lead line of the sight reticle is on the far stake.

(2) Notes where the near stake intersects the zero range line.

(3) Traverses the piece until the far stake intersects the zero range line at the point noted in (2) above.

(4) Continues to use the far stake--with the new sight reading instead of the zero lead line--until the stakes can be realigned.

(5) As soon as possible, the gunner has the stakes reset as follows:

(a) Lays on the far stake with the new sight reading, as in (4) above.

(b) Has the far stake moved until it is on the actual zero lead line of the sight.

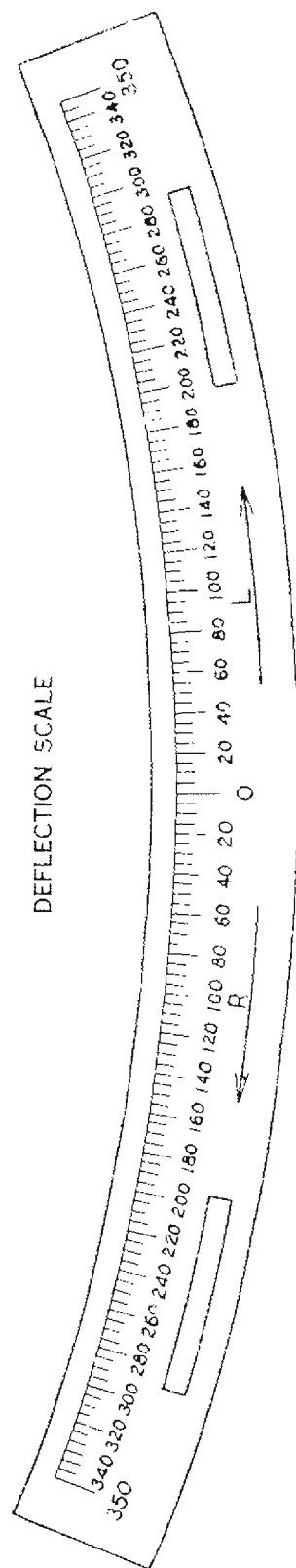
(c) Has the near stake lined in with the far one. The gun tube is now parallel to its original laying.

e. Correction of lateral displacement requires that the near stake be at the midpoint between the far stake and the destroyer. It should be instinctive with the man placing the stakes to pace off the distance as he moves out from the destroyer. The minimum desirable distance for the near stake is at least 50 yards.

167. LAYING WITH THE DEFLECTION SCALE.--a. The deflection scale is a metal arc graduated in 5-mil units up to 350 mils right and left of zero (fig. 54). It is fastened by wing nuts to the ammunition rack below the equilibrators on the M3 destroyer. A steel pointer attached to the lower left bolt of the equilibrator rear cover plate indicates on the scale the amount the gun is traversed. Its center of traverse is indicated by the zero on the scale. This is a home-made scale, not standard equipment, that is used on the M3 destroyer.

b. The platoon is laid parallel by either of two methods: distant aiming point or aiming stakes. They are described in the next two paragraphs.

168. DISTANT AIMING POINT METHOD.--a. The platoon commander selects a point as far away as possible and as near the center of the sector as possible. Since a good destroyer position for indirect fire often may not afford view of such a point, the aiming stake method described in the next paragraph may have to be used more often. The distant aiming point method is quicker, however, and should be used wherever possible. For material equipped with panoramic sights, the best method is reciprocal laying, described in paragraph 165.



DEFLECTION SCALE

Figure 54