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## PROVISIONAL MACHINE-GUN DRILL AND NOTES ON THEIR TACTICAL HANDLING, FOR 24TH COMPANY

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1. **T**HE machine-gun section consists of two Benét-Mercie machine guns and the following personnel:

One lieutenant, machine-gun commander.

One gunnery sergeant, chief of section, and second in command.

One corporal, leader gun crew No. 1.

One corporal, leader gun crew No. 2.

One private, orderly to machine-gun commander.

Two privates, scouts, range finders, and signalmen.

One lieutenant, one gunnery sergeant, two corporals, eleven privates; total, fifteen.

2. The general duties of the personnel are as follows: The machine-gun commander is responsible to the company commander for the tactical handling of the section and for its general efficiency both as to personnel and matériel.

3. The junior officer of the company will be designated as machine-gun officer; in the event it is impracticable to detail an officer for this duty, then the company gunnery sergeant should be detailed.

4. Prior to an engagement the company commander will make known to the machine-gun commander the situation in detail, the ends sought, the company objective, and the manner in which he will conduct the company in order to secure the same. He will in a general way designate to the machine-gun commander the initial machine-gun positions and the manner in which the section may best cooperate to secure the desired results, being careful, however, not to restrict the machine-gun commander to a set method of action,

thereby hampering the section in later unforeseen phases of the engagement, and which would also encroach upon the prerogatives of the machine-gun commander.

5. After receiving the above information the machine-gun commander will assemble the section and explain to all minutely the situation, the objective and the plan of action for the section which he deems will best insure the success of the company commander's plans.

6. He will select, as far as practicable in advance, successive gun positions for the section, send out scouts, estimate and plot ranges, arrange for the future supply of ammunition, and in general be thoroughly prepared to intelligently and energetically carry out the task allotted the section when the time arrives.

7. The chief of section's duties in general are as those of the first sergeant of a company. He is also responsible for the efficiency of the matériel at all times.

8. He will usually accompany the machine-gun commander, but may be posted wherever his services may best be utilized and he will be prepared to take command of the section should the machine-gun commander become a casualty.

9. The section corporals will act as gun-crew leaders, they direct, control the fire and movements of their respective guns in accordance with orders from the machine-gun commander.

10. The orderly will accompany the machine-gun commander. He must be a qualified signalman.

11. The scouts will be specially selected machine-gun men and qualified signalmen with courage and initiative, and proficient in the use of the type EE, field glass, Barr & Stroud range finder, estimating distances by eye, and also capable of making fair landscape maps when necessary and plotting ranges to objectives of the same.

12. The members of the gun crews must be thoroughly drilled in the duties pertaining to all members so that in the event of casualties they can instantly fill in and maintain the fire action.

13. All members must be proficient in sending and receiving by semaphore and estimating distances by eye.

14. The duties of each member of the gun crews is laid down as follows:

15. *No. 1 gunner:*

Carries gun into action.

Sets sights.  
Operates gun.  
Calls to No. 4, for spare barrel as necessary.  
Repeats range and target.

*No. 2 gunner:*

Carries two boxes of ammunition.  
On going into battery, places ammunition boxes hinges to the front, 2 feet to the right of and in line with the sight leaf.  
Inserts clip in magazine, standing by to replace with full clip instantly when first clip is exhausted.  
Calls "Ammunition" to No. 4 when approximately half of the second box of ammunition has been expended.  
Assists in extraction of jams.

*No. 3 gunner:*

Carries two boxes of ammunition.  
On going into battery places boxes ten paces in rear and three paces to the right of position selected for the gun, at post of No. 4.  
Takes tool kit from No. 4.  
Takes post one pace to the left of No. 1.  
Assists No. 1 in setting up gun, spreads tripod legs, opens tool kit and places same near at hand.  
Calls "Ready, No. 1 or 2," to gun leader when gun is ready to fire.  
Lies prone, holds down tripod legs during firing.  
Assists in the extraction of jams and mounting spare barrel.  
Places empty clips in haversack as used.  
Takes post as gunner in case same becomes a casualty.

*No. 4 gunner:*

Carries one box of ammunition in right hand, tool kit in left hand and spare barrel slung diagonally across back.  
On going into battery takes post ten paces in rear of and three paces to the right of position selected for gun.  
Places ammunition box along with boxes deposited by No. 3 with their lengths perpendicular to the front and spare barrel muzzle to the front to right of boxes.

Carries forward ammunition and spare barrel as called for.

Watches for signals from machine-gun commander and scouts.

16. Gun crew leaders take post in rear of their respective gun or where their services may be needed most.

17. They will watch for signals and orders and transmit same instantly.

18. When No. 3 of their respective gun crews call "ready," leaders will elevate right hand vertically above the head as a signal to the machine-gun commander, who will acknowledge same.

19. On going into battery gun crews will habitually assume the prone position and make all use of the cover available. Members not actively engaged will preserve immobility as far as practicable.

20. The personnel will be armed and equipped as follows:

	Pistol	M. C. Bolo	EE glasses	S. flags	In tools
Machine gun cmdr..	1	1	1	..	1 wire nippers
Chief of section.....	1	1	1	..	1 spade
Gun crew leaders.....	1	1	1	2	Nippers and pick
Scouts.....	1	1	1	2	Nippers and spade
Orderly.....	1	1	..	2	Nippers and spade
Nos. 2.....	1	1	..	..	1 spade
Nos. 3.....	1	1	..	..	Nippers and pick.
Nos. 4.....	1	1	..	..	

22. Semaphore flags should be made about one-fourth regulation size.

### 23. NORMAL FORMATIONS

Command "SECTION FALL IN"; at the last word of command the guns are placed on line by Nos. 1 of each gun crew, Nos. 2 on line with and ten paces to the left of gun No. 1.

Nos. 2 place ammunition boxes on line with and two paces to the right of the sight leaf of their respective guns.

Nos. 3 place ammunition boxes three paces in rear of guns and tool kits one pace to the left of sight leaves.

Nos. 4 place ammunition boxes three paces in rear of guns, spare barrel, with muzzle to the front, to right of ammunition boxes.

24. On completion of the above the section falls in, in double rank

from right to left on the chief of section, who takes post ten paces in rear of gun No. 1, gun crew leaders taking post on the left flank, each in line with his respective crew.

25. Gun crew No. 2 forms the front rank and gun crew No. 1 the rear rank.

26. The chief of section commands "Count off," "Right dress," "Front," whereupon all numbers and leaders count off from right to left as ONE, TWO, THREE, FOUR, etc., dress smartly to the right and assume the front at command.

27. Command "IN BATTERY, MARCH," gun crew No. 2 executes left turn in double time, each member taking post and performing the duties as previously explained for the gun crews.

28. Gun crew No. 1 executes "Right by files" in double time, conforming to the movements as above indicated for gun crew No. 2.

29. To march the section to the front, "COMMAND, FORWARD MARCH." At the command "Forward," all members secure their part of the matériel and rise, at the command "March," given when the section is ready to move forward, each member picks up his part of the matériel and marches to the front in column of files, No. 1's, leading, followed by Nos. 2, 3, 4 and gun crew leader at three-pace intervals.

30. The chief of section marches opposite to and on the right of No. 1, conducting the march when in command.

31. The section will usually be marched in line of gun crews in column of files at three-pace intervals; intervals may be increased or diminished by order.

32. The section may be deployed as skirmishers. "COMMAND, AS SKIRMISHERS, MARCH." Nos. 1, 2, 3 and 4, of each crew execute "Left front into line" and maintain the interval of three paces.

33. The normal interval between files in column and skirmishers in line is three paces; intervals may be increased or decreased at will by the command so many paces "Open" or so many paces "Close."

34. The normal interval between gun crews is ten paces, which may be increased or diminished by the following commands: "ON NO. 1 GUN FIFTEEN PACES EXTEND," or "ON NO. 1 GUN TWO PACES CLOSE"; the extension or closing may be made on either gun crew.

35. The section may be marched to the front, flanks and rear by

the same commands and in a similar manner as the company.

36. The following conventional signals should be used and thoroughly understood by all members of the section.

37. By semaphore when spotting must be done from a distance from the gun's position.

P = plus. Fire observed 50 yards or more beyond the target.

M = minus. Fire observed 50 yards or more short of the target.

R = right. Fire observed to right of target.

L = left. Fire observed to left of the target.

C = center. Fire direction correct.

U = unobserved.

Up = up so many yards.

D = down so many yards.

38. After gun leaders have signalled that guns are ready to fire the machine-gun commander will make signal "COMMENCE FIRING" by raising and lowering right hand above the head several times. To cease fire the conventional infantry signal will be used for the same.

39. To signal gun out of action gun leaders will extend right arm, point hand toward machine-gun commander, and describe small circles.

40. Machine guns are primarily weapons of opportunity and the best results will be obtained when their fire is in the nature of surprise. They may be used only for short periods of time as their fire will immediately draw a heavy concentrated rifle fire and artillery fire; therefore they must be prepared to deliver an accurate and rapid fire, their limit of speed being obtained during the firing interval.

41. Positions which offer the best field of fire and excellent concealment should be selected, great stress must be laid on the subject of perfect concealment for without the same the object of fire surprise will be defeated.

42. Concealment may be divided into: (1) cover from fire, (2) cover from view, cover from fire must be of sufficient strength to secure the guns against rifle fire and shrapnel fire, and also fulfil the conditions necessary to give cover from view.

43. Alternating firing positions will be selected with view to (1) the field of fire offered; (2) cover of position; (3) cover offered in advancing to or retiring from position to position.

44. Owing to the small frontage occupied by a machine gun,

good cover will generally be readily found. The average frontage of a gun will be 2 yards, from which it can deliver a fire equal in volume to that of 30 or 40 rifles and at the same time offering an exceedingly small target to the enemy. It must be remembered, however, that machine guns cannot effectively reply to a great volume of concentrated rifle fire or artillery fire.

45. The Germans have placed the fire of one machine gun equal to that of from 50 to 120 rifles.

46. Due to the highly concentrated fire of a machine gun which makes the shot group about twice as small as that of a rifle firing the same number of rounds at the same target, it can readily be seen how very important it is to make a correct estimate of the range, if we expect to obtain good results at the longer ranges where the danger space decreases rapidly with each increase in range.

47. The beaten or effective zone is that area which contains 75 per cent of the shots fired. The following table gives approximately the depth of the effective zone at different ranges and shows further, the importance in estimating ranges correctly in order that the target will be within the effective zone.

<i>Range in yards.</i>	<i>Depth of effective zone in yards.</i>
500	225
600	200
700	200
800	175
1,000	140
1,200	115
1,500	75

48. Machine guns are of great assistance in the attack, in helping the infantry to gain and maintain the superiority of fire. Light guns may advance with the firing line while the heavier types will be better used in covering fire either from the rear of the lines or on the flanks.

49. Gun positions on the flanks are usually the best, as they can deliver an enfilading fire which is most destructive.

50. After a position has been gained by the infantry, the machine-gun section must reach the position as quickly as possible and open fire on the retreating enemy. Their fire will give time for their own infantry to reform and secure the position, and aid the infantry

should the enemy deliver a counter-attack. Guns should change position as seldom as possible after once going into action if their position has not been discovered by the enemy.

51. Machine guns are valuable in the defense of bridges, defiles, roads, and in covering a retiring body of troops.

52. In a defensive line guns should cover all important approaches, alternate positions must be selected and cover for the same provided previous to their occupation. Ranges will be determined to all important objectives.

53. In the defense of towns and villages, first floors and basement windows of houses will usually offer good machine-gun positions if well concealed. The British cited instances where the German machine guns took up positions on first floors of farm houses and allowed the British lines to pass beyond them whereupon they opened a most destructive fire from the British rear. In defensive lines the Germans placed their guns many times in rear of their front line trenches, covering gaps in the wire entanglement which they purposely left open to lure the British through.

54. A cross fire should be delivered instead of a purely frontal fire, as the direction of the former is not easily determined by the enemy and lessens the chance of discovering the gun positions.

#### 55. FIRE

Machine guns should only open fire: (1) to facilitate the movements of infantry, (2) to deny or delay movement of the enemy, (3) against favorable targets.

Fire should not be opened unless there is a good chance of obtaining the desired results; otherwise it is only a waste of ammunition and disclosure of the gun position which renders future service in that position of no value.

56. Fire should not be opened at targets over 1,200 yards in range unless they present an exceptionally favorable target, such as large bodies of troops, cavalry or field artillery and supply trains on the march. Machine guns are extremely effective at all ranges under 1,200 yards.

57. Machine guns will usually fire on the target which is most dangerous to its own infantry. Here it must be remembered that machine guns cannot reply to artillery fire effectively; to do so usually means an annihilation.



## METHODS OF FIRE

58. Ranging fire.

Rapid fire.

Sweeping fire.

Sweeping rapid.

59. In ranging, fire strings of from 10 to 20 rounds will be fired by the right gun in order to determine the sight leaf setting to be used.

60. Ranging fire will never be used when surprise is of importance.

61. Rapid fire is used when a great volume of fire is required, whole clips of 30 rounds will be fired, between clips the gunner will check the sight leaf for elevation.

1. It will be used for surprise fire habitually.

2. Against moving artillery, cavalry, and infantry.

3. It may be used with combined sights.

62. Sweeping fire will be used against linear targets, strings of approximately 6 rounds will be fired, the gunner will move the butt of the gun one-fourth the distance of its lateral train after each string of 6 rounds; thus a clip of 30 rounds will be expended when the gun has been traversed its limit from right to left.

63. If sweeping fire is used with two guns in action the right gun will sweep from right to left on the designated target, returning at the end of the traverse to the right edge of the target and resuming the fire as above indicated.

The left gun will sweep from left to right on the designated target in the same manner as explained for the right gun. In this manner the entire target is thoroughly covered and a cross fire obtained which makes it exceedingly hard for the enemy to determine the gun positions.

64. Sweeping rapid fire will be used against dense targets. Whole clips of 30 rounds will be fired while the butt is traversed its limit from right to left without stop, new clip inserted and butt traversed from left to right and so on.

65. In selecting gun positions for the offensive or the defensive care must be exercised to have sufficient interval between gun positions in order that a shell bursting on or near one gun will not also put the other gun out of action.

66. When targets of depth present themselves it is considered advisable to use sweeping fire with combined sights set at a difference

of 100 yards for ranges from 800 to 1,200 yards, and a difference of 50 yards for ranges above 1,200 yards.

67. In using combined sights the range first announced will be that taken by the right gun and the range given next will be applied to the left gun.

68. To designate that combined sights will be used it is only necessary when announcing the range to order "Range 800-900," etc., whereon gun leaders will instruct their respective gun crews accordingly.

#### PROFICIENCY TESTS

69. In order that all members of the gun crews will be thoroughly familiar with all operations of the guns they will be required to become expert in the following tests and a record of their proficiency in, and time for each test, will be recorded.

1. To dis-assemble gun...	Prof.	Time.
2. Name and explain action of all parts.	Prof.	No Time.
3. Assemble gun.....	Prof.	Time.
4. Mount gun for action from shoulder....		Prof. Time.
5. To load from open box.....		Prof. Time.
6. To unload.....		Prof. Time.
7. Set sights and lay on target.....		Prof. Time.
8. Change barrel.....		Prof. Time.
9. Resize and refill clip.....		Prof. Time.
10. Rectify stoppages.....		Prof. Time.

#### FIRING COURSES

70. The following courses will be fired by all members of machine-gun crews, and those men obtaining the necessary score for qualification at each range will be designated as machine gunner, first class, and machine gunner, second class, in company orders. They will be issued with gun pointer insignias and wear the same on sleeve of left forearm midway between the wrist and elbow.

White insignia.....first class  
Blue insignia.....second class

71. The ammunition allowance for instruction practice is unlimited.

72. Target "D" will be used at all ranges.

## CLASSES OF FIRE

73. Grouping fire.  
Sweeping fire.

*Grouping fire*

Range 200 yds.....	2	S. S. 15 rapid for record.
Range 400 yds.....	2	S. S. 15 rapid for record.
Range 600 yds.....	2	S. S. 15 rapid for record.
Possible score at each range.....		75
Qualification score for gunner, first class.....		70
Qualification score for gunner, second class.....		65

*Sweeping fire*

Range 200 yds.....	5	S. S. two strings of 30 rapid for record.
Range 400 yds.....	5	S. S. two strings of 30 rapid for record.
Range 600 yds.....	5	S. S. two strings of 30 rapid for record.

Procedure.—Five targets will be run up and one sighting shot fired on each target from right to left, which necessitates the butt being traversed from its extreme left position to its extreme right position, moving the butt approximately one-fourth the distance of its traverse for each shot. The 60 shots for record will be fired in two clips of 30 rounds each, one clip firing from right to left and the other clip firing from left to right.

The gunner will endeavor to fire 6 rounds on each target, thus using a complete clip on each traverse; however the total score for all targets will be counted regardless of the number of hits more or less than 6 on each target, except that all targets must be hit at least once for the score to count.

Possible score for each sweep.....	150
Qualification score for gunner, first class.....	110
Qualification score for gunner, second class.....	100

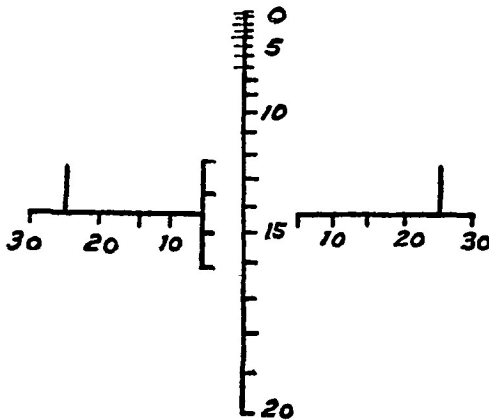
74. Time of all strings fired and the dimensions of shot groups will be measured recorded for information.

75. The firing at 200 yards on August 8 and 9, proved the value of having No. 3 hold down the tripod legs during the firing which finally reduced the average shot groups for 15 shots to 8 by 11 inches. The greatest difficulty encountered was the inability of the gunners to hold the gun on throughout the string, due mostly to the instability

of the gun mounts. With an expenditure of over 2,800 rounds of ammunition only four second class gunners were qualified.

#### FIELD GLASSES

76. In order that targets may be quickly picked up, ranges estimated, fire observed and controlled, all company officers and non-commissioned officers should be issued with excellent field glasses. Reports covering the early stages of the present world war show that the British were seriously handicapped by the shortage of such glasses in the infantry. In the German Army, all officers and non-commissioned officers were issued with exceptionally good glasses before the outbreak of war which, from reports, proved their value in many instances. The Marine Corps is now issuing an excellent type of field glass, manufactured for the Signal Corps of the Army—the type “EE” glass of 6 power, which contains a horizontal scale of mils and a vertical scale which is a reproduction of the rear sight leaf of the Springfield rifle. The contained scales are illustrated below.



77. It would be of great assistance to all officers if the Quartermaster Department inclosed with each pair of type “EE” glasses a printed form giving the formula to be used in connection with the contained scales. The few officers I have seen issued with this type of glass did not know how the scales might be used.

The following information and formulae for use with the type “EE” were taken from “Notes on Instruments” which appeared in

a copy of the *Infantry Journal* in the early part of 1917, and were prepared by the School of Musketry, U. S. Army.

#### SCALES AND THEIR USE

78. The horizontal scale, which is divided into 60 mils, is used for estimating ranges, etc. The mil, the angle whose tangent is .001, is the angular unit used in this course.

79. For the computations required in the control of fire, the system of angular measurements, in terms of degrees, minutes and seconds, would be very cumbersome. A much more satisfactory unit is the mil. This is the angle whose tangent is .001. Its value in the conventional angular measure is  $3' 22.5''$ , which is arrived at by dividing the circumference of a circle into 6,400 parts. This is a sufficiently close approximation to the true mil and greatly simplifies the manufacture of the scales of such instruments as the battery commander's telescope and panoramic sight.

The mil is used for target and sector designation and in estimating ranges and occupied fronts in terms of yards or men. An object one yard long at a distance of one thousand yards subtends an angle of one mil. The mental calculation of problems involving the solution of triangle is easy if the following equations are kept in mind:

$$R = \frac{W \times 1000}{M} \quad (1)$$

$$W = \frac{R \times M}{1000} \quad (2)$$

$$M = \frac{W \times 1000}{R} \quad (3)$$

Where  $R$  equals range in yards,  $W$  equals width or height in yards,  $M$  equals number of mils subtended by  $W$ .

81. The following examples of the use of these formulae indicate their practical use:

*Example 1 (estimate of range):*

A certain tree is estimated to be 15 yards high. It covers an angle of 25 mils. It is therefore 600 yards away, for

$$R = \frac{W \times 1000}{M} = \frac{15 \text{ yards} \times 1000}{25} = \frac{15000}{25} = 600 \text{ yards.}$$

82. The telegraph poles seen on a distant railroad running at right angles to our line of sight are known (from previous measurements) to be 44 yards apart; the distance between two adjacent poles is observed to be 40 mils; the range to the railroad is therefore 1,100 yards, for:

$$R = \frac{W \times 1000}{M} = \frac{44 \text{ yards} \times 1000}{40} = 1,100 \text{ yards.}$$

83. *Example 2 (estimation of fronts):*

A line of skirmishers at about one yard per man of front covers 40 mils of the scale; the range is known to be 800 yards; the number of men is therefore 32, for:

$$W = \frac{R \times M}{1000} = \frac{800 \text{ yards} \times 40}{1000} = \frac{32000}{1000} = 32 \text{ yards, or men.}$$

84. A column of infantry in fours is seen by a patrol at 1,200 yards range. It is moving across his front and covers 120 mils from head to rear of the column. How many men are in the column?

$$W = \frac{R \times M}{1000} = \frac{1200 \text{ yards} \times 120}{1000} = \frac{144000}{1000} = 144 \text{ yards.}$$

At two men per yard, the column contained 288 men.

85. *Example 3 (determination of mils in distributing of fire):*

A hostile force known to consist of about 100 men is deployed in a position 1,000 yards away but so concealed that its flanks cannot be seen or determined definitely. The company commander decided to cover a front of 200 yards with his fire, 100 yards on each side of the visible group of heads in the hostile line. How many mils should be covered?

$$M = \frac{W \times 1000}{R} = \frac{200 \times 1000}{900} = 200 \text{ mils.}$$

A machine-gun platoon known to comprise two guns is concealed at a range of 900 yards, with one of its guns visible through glasses. The company commander decides to cover a front of 50 yards on each side of the visible gun. How many mils should be covered?

$$M = \frac{W \times 1000}{R} = \frac{100 \times 1000}{900} = 111 \text{ mils.}$$

Where it is possible to measure off a distance  $D$  directly toward or away from any object which subtends a fairly large angle (50 to 300 mils) we may use a formula derived from formula (1) and

which does not contain  $W$ ; in other words, in this case the width of the object or the height does not have to be known. When the distance is measured towards the object, the formula is:

$$R = \frac{D \text{ times } 2d \text{ mil measurement}}{2d \text{ mil measurement, minus } 1st \text{ mil measurement}}$$

When this distance is measured away from the object, the formula is:

$$R = \frac{D \text{ times } 2d \text{ mil measurement}}{1st \text{ mil measurement, minus } 2d \text{ mil measurement}}$$

86. *Example 4:*

From this point a hostile trench measures 150 mils. A scout goes forward 330 paces (300 yards) and finds that the trench covers 200 mils. The range from this point to the trench is therefore 1,200 yards.

$$R = \frac{300 \times 200}{200 - 150} = \frac{60000}{50} = 1,200 \text{ yards.}$$

We have come to a river bank, and a village across the river covers 150 mils. An observer walks back 200 yards, keeping our party on the river in line with the village, and finds that at that point the village covers but 120 mils. The range from the river bank to the village is therefore 800 yards.

$$R = \frac{200 \times 120}{150 - 120} = \frac{24000}{30} = 800 \text{ yards.}$$

CHOICE OF AN AIMING TARGET

87. The choice of an aiming target depends primarily on the available features of the terrain that are immediately in line with the area that is to be covered with fire. At ordinary ranges, care must be taken not to choose an aiming target so that a negative sight setting will result. Skylines are not often available on this account. Assuming that the enemies' line to be covered with fire is of the same length as our line, there are three satisfactory aiming targets from a theoretical standpoint.

88. First, an aiming point so far in rear of the enemy's line (several miles) that our fire will be very slightly convergent. In this case the distribution and accuracy of our fire ought to be excellent, but if the aiming point is too close, the flanks of the enemy will not be covered.

89. Second, an aiming target consisting of a well-defined horizontal line within a hundred yards or so of the enemy's line. In this case the accuracy of our fire ought to be excellent, but the distribution will depend on the training of our troops since they must fire on the part of the aiming target immediately to their front in order that the distribution will be good.

90. Third, an aiming point half-way between us and the enemy so that all our fire will cross at the aiming point and the fire of our right flank will strike the enemy's right flank. In this case, the accuracy and distribution should both be excellent, but here again, if the aiming point is not exactly halfway to the enemy, our fire may cover too much or too little of his line.

91. Considerable judgment and experience is required in the choice of aiming targets. Excellent results may be obtained by their judicious use, but they should rarely, if ever, be used if the real target is visible to the firing line.

92. The vertical scale, which is a reproduction of the rear sight scale of the Springfield rifle may be used in connection with auxiliary aiming points and spotting.

93. To use the vertical scale, the graduation marking the true range is laid opposite the target. The selected aiming point will then fall opposite the sight setting to be used by the firers.

94. If, for example (see Fig. 1), the target is a line of heads 900 yards away, the graduation 900 on the scale would be laid on the line of heads seen through the glasses. Any one of several aiming points will then be opposite the appropriate graduation on the scale to be used against this or that aiming point. The sky line, for example, crosses the scale at 500. If aim be taken on the sky line with scales of 500 yards set on the rear sight, the bullets will hit in the line of heads at 900 yards as intended. The bottom wire of the fence immediately in front of the firers crosses the scale at 1,800 yards (the observer lying prone on the firing line), and if the firing line aims at this lower wire with 1,800 yards elevation, the bullet will fall in the line of heads as before. In fact, the entire landscape is available to the director of the fire, who has but to choose that point or line which, because of the color, shape, or nearness, would make the best aiming point in that particular field of view.



## FOR SPOTTING

95. The correction of sights, as a result of ranging, is based upon the observation of the impact and the subsequent estimate as to its distance and direction from the objective.

96. In known distance practice, the strike of the bullet is on the vertical surface, and when the position is shown by the marking disk, the sight is corrected accordingly.

97. In combat however, the observation of impact is usually on the surface that is rising with respect to the line of sight. In such cases, the correction of the sight must compensate not only for the horizontal distance short or over but also for the vertical distance above or below the objective.

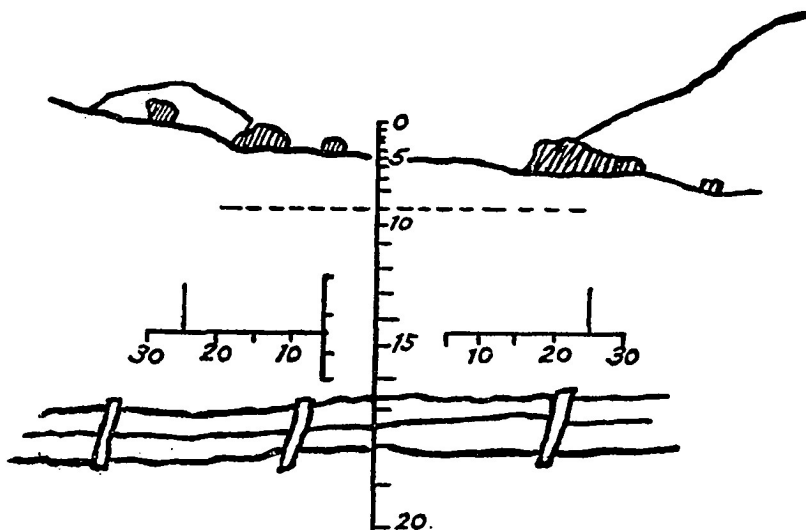


FIG. 1

98. In practice, the actual distance in yards that the center of the impact is distant from the target must, in most cases, be estimated. The vertical correction, however, may be measured with a fair degree of accuracy by using the vertical scale.

99. To measure the amount of this vertical correction with the glass place the graduation of the range scale corresponding to the elevation actually used in coincidence with the target, then the graduation opposite the point where the impact was noted will be the elevation necessary to use in order to correct for the vertical

error. It is to be noted that this vertical correction gives the range (in terms of the sight) to the point of impact.

100. The vertical correction having been made, then the correction is completed by adding (if the impact is short) or subtracting (if the impact is over) a number of yards equal to the estimate of the horizontal distance from the impact to the objective and setting the sight accordingly.

Figure 2 will illustrate this method.

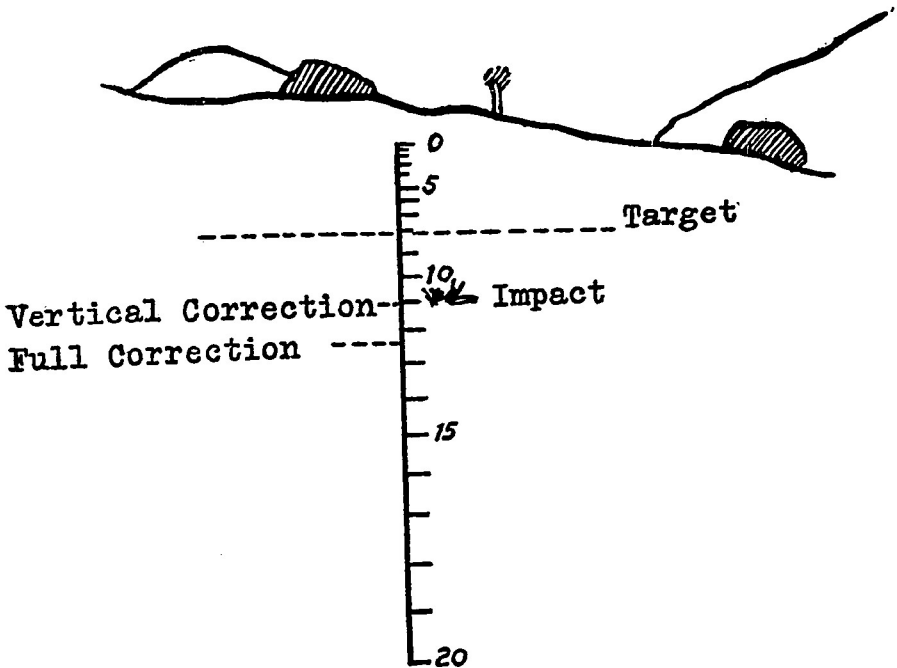


FIG. 2

101. Assume the range to have been estimated at 800 yards. Then with the 800 yards graduation held opposite the target, the splash of impact is observed opposite the 1,100-yard graduation and is estimated to be 150 yards short. The full correction therefore would be 1,100 yards (vertical correction) plus 150 yards (horizontal correction) or a final elevation of 1,250 yards as a result of this observation.