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NUMBER 27

COURSE IN
MACHINE GUNS

Prepared By
CAPTAIN WALTER C. SHORT,
Infantry

THE GENERAL SERVICE SCHOOLS
The Army School of the Line
AND
The Army Staff School
1919-1920

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Contents

Lecture.—Organization of the Machine Guns of an Infantry Division. Duties of the Personnel.
Line Class, Oct. 7.
Staff Class, Oct. 7.

Conference.—Direct Fire of Machine Guns.
Line Class, Oct. 8.
Staff Class, Oct. 13.

Conference.—Indirect Fire of Machine Guns, Part I.
Line Class, Oct. 9.
Staff Class, Oct. 16.

Conference.—Indirect Fire of Machine Guns, Part II.
Line Class, Oct. 10.
Staff Class, Oct. 17.

Conference.—Machine Guns in Advance Guards, Rear Guards, Outposts and Combat in Woods. Use of Machine Gun for Anti-Aircraft Defense.
Line Class, Oct. 13.

Lecture.—Machine Guns in the Offensive.
Line Class, Oct. 15.
Staff Class, Oct. 15.

Lecture.—Machine Guns in the Defensive.
Line Class, Oct. 21.
Staff Class, Oct. 21.

Conference.—Machine Guns with Cavalry.
Staff Class, Oct. 20.

Terrain Exercise No. 8.—The Machine Gun Company with the Infantry Assault Battalion.

Tactical Ride T. T. 55.—Employment of the Machine Gun Battalion on the Offensive.

Map Problem No. 5.—Employment of the Machine Guns of an Infantry Brigade in the Initial Stage of the Attack.

Tactical Ride No. 3.—The Machine Gun Company with an Infantry Advance Guard.

Terrain Exercise No. 22.—The Machine Gun Troop with a Cavalry Squadron.

Reference Sheet

FOR

T. T. 23, October 7, a. m., 1919.—Line Class.
T. T. 22, October 7, a.m., 1919.—Staff Class.

LECTURE.—The Organization of the Machine Guns of a Division. Duties of the Personnel.

References:

Tables of Organization, Series A, January 14, 1918.—Tables 8, 9 and 10.

Equipment Manuals for Service in Europe, Series A, No. 2.—Infantry Brigade Machine Gun Battalion and Division Machine Gun Battalion Armed with Browning Machine Guns.

Machine Gun Drill Regulations, 1917.—Pages 107 to 135.

Supplement to Machine Gun Drill Regulations, 1917, A. E. F.—Page 35.

Equipment Required at Lecture:

Tables of Organization, Series A, January 14, 1918.—Lesson sheets.

Lesson Sheets

FOR

T. T. 23, October 7, a.m., 1919.—Line Class.
T. T. 22, October 7, a.m., 1919.—Staff Class.

LECTURE.—The Organization of the Machine Guns of a Division. The Duties of the Personnel.

Organization and Equipment of Machine Gun Units. Duties of the Personnel

1. For details of the machine gun organizations of a division, see Tables 8, 9 and 10, Tables of Organization.

2. The battalion is an administrative and tactical unit. In no case is it ever a fire unit. The direct tactical control of the whole battalion by the major will be exceptional and will occur only where the battalion is employed for mass fire.

The company is an administrative and tactical unit and in rare cases may be a fire unit. It is a fire unit only in the exceptional case where the guns of the company are posted so close together that they can be readily controlled by the captain. Such placing of the guns will usually lead to excessive losses.

The platoon is a tactical and a fire unit. It is almost always the fire unit for indirect fire and is the fire unit for direct fire whenever the guns are placed close enough together to be controlled by the platoon leader.

The section becomes a tactical unit on the offensive when the platoon advances by alternate sections. On the defensive the section is usually a tactical unit as machine guns are usually posted by pairs rather than by platoons. For direct fire the section is usually the fire unit.

The squad is a fire unit and becomes a tactical unit only in the exceptional case where machine guns are used singly.

3. The machine guns of various foreign armies are organized as follows:

FRENCH: Each infantry battalion contains a machine gun company of 12 guns. This makes

a total of 108 guns for the division. In addition to the guns belonging to the divisions there were 200 companies known as sector troops formed from men of the older classes. These organizations were used very largely for defense.

BRITISH: Each infantry division has one machine gun battalion which consists of 3 companies of 24 guns each. During the war the battalion consisted of 4 companies of 16 guns each. All machine gun organizations belong to the Machine Gun Corps. Total guns for the division 72.

GERMAN: Each infantry battalion contains one machine gun company of 12 guns. This makes 108 guns for the division. In addition to these guns, however, the Germans have Machine Gun Marksmanship Detachments consisting of 3 companies of 12 guns each. One of these detachments is usually attached to each division in the line. In the spring of 1918 the number of these detachments was 80. Including a detachment the total number of guns in a division is 144.

The proportion of machine guns to infantry is approximately as follows:

	Infantry	*Machine guns*	*No. per 1000 Inf.*
United States	14,582	168	11.5
France	6,000	108	18.
Great Britain	10,000	72	7.2
Germany	9,600	108+36	11.3+3.7

5. The question of the proper organization of machine guns has given rise to so much discussion that the reasons advanced for different organizations will be given briefly:

6. REASONS FOR THE ADOPTION OF THE PRESENT ORGANIZATION

(1) The war has emphasized the necessity for the closest possible co-operation of all important weapons. Such co-operation in action is promoted

by union in organization and hampered by segregation into independent arms. The organization of a machine gun corps would be a long step in exactly the wrong direction: that is, in separation and away from union. The supporters of a machine gun corps who expect to find in separation a means towards closer co-operation simply believe in an absurdity. Technique would be favored by segregation of the machine gunners; tactics would suffer. Excellent technique is worthless without good tactics. Tactics takes much longer to acquire, and is much more important than technique. The most difficult part of machine gun tactics deals with the close support of rifle companies and is largely a matter of intimate acquaintance and team play. The required team of machine gunners and riflemen can be produced only by continual work and association together.

(2) The American Army contains today too many semi-independent corps and services. Efficiency requires a certain consolidation of what we now have instead of further separation.

(3) Those who argue for a machine gun corps point to the experience and conclusions of the British. The American machine gunner in the war has given far better support to his riflemen than has the British machine gunner. Better organization has been one important reason.

(4) The overwhelming opinion of the officers of the A. E. F. is opposed to the organization of the machine guns into a separate arm, branch, service or corps.

(5) Organization should be based upon the most usual employment to be expected in action. Organization should be based upon the attack. In the attack machine guns have two important func-

tions; the close support of the front line rifle companies and in concentrations to smother the most important hostile resistances.

(6) The regiment will usually deploy on a front of about 1,000 yards. In ordinary country room can be found on this frontage for the employment of no more than four to eight guns in direct support of the rifle companies. A company of 12 guns to the regiment furnishes therefore the correct number.

(7) By placing one machine gun company in each regiment the regimental commander will ordinarily be able to begin the action with sufficient machine guns for the assault. During the development of the action there will be opportunity to determine the need for more which can then be drawn from the brigade battalion. All six companies of the brigade should be equally proficient for close support or for massed fire because the deployment to meet different types of defense and the manner of using reserve battalions are so various as to preclude a fixed method.

(8) Team play in the battalion would be furthered by making four or eight guns an integral part of the battalion, but this in action would waste the guns in the rear battalions and would hamper the regimental commander in fitting machine gun support to the task of the particular battalion. One large company for the regiment likewise facilitates administration and technical training.

(9) The second important functions of machine guns, i. e., use in considerable concentrations, can best be furthered by placing the guns for this purpose under the highest purely infantry commander, the brigadier. He usually needs no echelon outside his two regiments for shock action,

but he does need under his control some unit capable of bringing heavy fire on decisive points. A machine gun battalion gives him a suitable unit for this purpose, both in the beginning of the attack and at the later and decisive moments. To divide these guns between regiments would place them in commands whose sector of action is ordinarily too narrow for exploitation of their full range and powers of overwhelming concentration of fire. To go beyond the brigade and concentrate the guns in a divisional organization is to place them in the usual case outside the zone of their powers and proper radius of action. Great concentrations under divisional or higher commanders for long range barrage are seldom expedient except in the operations against highly organized positions.

(10) Employment in depth naturally results from the present organization. This organization, consequently, well fits the minor uses of machine guns, i. e., the protection of flanks, the holding of ground gained, etc.

(11) The present organization has been well tested in war and has well met the test. Radical changes therein should be made only for affirmative and conclusive reasons.

7. REASONS ADVANCED FOR MAKING THE MACHINE GUN COMPANY AN INTEGRAL PART OF THE INFANTRY BATTALION

(1) A machine gun is one of a number of infantry weapons; it is a mechanical device for delivering infantry fire and by means of which there is obtained greater concentration of fire, and increase in rate, control and direction of fire.

(2) The machine gun must be prepared to attack with infantry and to hold the ground the

infantry has gained. It must protect the flanks of the advancing infantry and be prepared to fill in gaps. It must be able to support attacking infantry by direct or indirect overhead or flank fire and to deliver massed fire.

(3) The organization of the infantry must be such as gives the greatest efficiency in offensive combat, the defensive being a secondary consideration.

The battalion is the combat unit and proper organization and training of this unit with all its infantry weapons is of the utmost importance. In the operation of the battalion today the machine guns form a very essential part of the organization nor can a situation be conceived that will not include machine guns.

(4) Organization and training of the battalion must be based on combat and if machine guns are a part of the battalion in combat they must be an integral part of its organization. The battalion is not a complete unit without the machine gun weapon.

(5) There is a tendency on the part of some machine gun officers to favor a machine gun corps. This loses sight of the principle that machine guns exist solely to increase the combat efficiency of the infantry and it is the general combat efficiency that must be constantly kept in mind rather than the highly technical training of any special corps or unit.

The best results cannot be obtained by separating machine guns from battalion organization and training and attaching them in combat or on special occasions. A battalion commander must be trained, and constantly pursue his work under conditions approaching combat as nearly as possible. Likewise all officers of rifle companies and machine

gun companies must train with the most complete conception of the battalion in combat.

(6) The following are lessons taken from the war:

The battalion is the combat unit.

Machine guns form an essential part of the unit.

In offensive action there can be but one command exercised over the battalion and this command must be exercised over all its weapons.

Failures on the part of battalion commanders to give definite and complete instructions to machine gun units attached to their battalions, or failures of machine gun officers to function properly with the battalion have been causes of not getting the best support or fire effect from machine guns.

(7) If we consider the second role of machine guns as delivering mass fire, this can be performed by drawing companies from reserve battalions or by using the divisional machine gun battalion.

(8) The assignment of machine gun companies to infantry battalions would render necessary a machine gun officer on the regimental, brigade, and division staffs, to prepare training memoranda for the machine gun units, supervise their technical training, make frequent inspections, and during operations to advise and inform his commander on machine gun matters.

8. REASONS ADVANCED FOR A MACHINE GUN CORPS

(1) The machine gun is not an infantry weapon, but is an intermediate weapon between the infantry and the field artillery and forms a connecting link between the two.

(2) While machine guns must habitually fight in close co-operation with the infantry, and under the command of infantry officers, the tactical handling of machine guns is a separate and distinct thing from the tactical handling of the infantry.

The forward guns with the assaulting battalions must be under the control and direction of the infantry battalion commander and under the immediate control of the machine gun company commander. The supporting guns under the control of the brigade commander must be commanded by a machine gun officer well qualified in machine gun tactics.

(3) The role of the machine guns that accompany the infantry assault battalions is second in importance to those executing barrage fire and to the intermediate or supporting guns which fire over the advancing infantry and protect the flanks.

(4) To successfully carry out all the missions that are likely to confront a machine gunner requires a high degree of training both in the technique and tactical employment of the weapon. Machine gunnery today is a science more difficult than artillery. The trajectory of the machine gun is more difficult to handle; the instruments are more crude, the machine gunner is generally in the zone of small arms fire working under great physical stress with a high pressure gas engine requiring constant and skilled attention.

(5) To effectively support the infantry by a proper distribution of guns and correct methods of fire requires years of study and application. The recent advance in technical methods and the nature of the tasks assigned to machine guns are such that it is impracticable for the average infantry officer to pass to and from a machine gun

company and at the same time discharge with efficiency the duties of an infantry officer and a machine gun officer in succession.

Modern infantry is a very complicated piece of human mechanism with many weapons and methods of action and has quite enough with which to concern itself without adding a whole scientific service.

In the cavalry with three weapons and a horse, it is doubtful if one can find officers who are expert in all three weapons and in horse training.

(6) The test of war has demonstrated that the regimental machine gun company was generally less efficient than the companies of brigade battalions that were trained under machine gun majors. The result of questionnaires submitted to higher officers of infantry, staff officers and machine gun officers shows that there is a very strong sentiment against the retention of the regimental machine gun company. The vote was: For the retention of the regimental machine gun company 19; against such retention 133.

(7) The organization of machine guns as a separate corps and a permanent personnel would result in:

Better and more uniform training, both technical and tactical.

A distinct improvement in the morale and esprit of machine gun units.

A collation and digestion of information and its distribution to the service, and a study of all things affecting machine gun organization, equipment, training, technique and tactics by infantry and machine gun officers that will result in higher standards of training, improved methods and better and more efficient machine gun units.

9. For details of the transportation of the various machine gun units, see pages 12, 13, 14 of Equipment Manuals for Service in Europe, Series A, No. 2.

The following are the chief articles of Machine Gun Equipment, Fire Control Equipment, Engineer Property, and Signal Property that make up the equipment of a machine gun company and battalion headquarters:

Machine Gun Equipment:	M. G. Co.	Bn. Hq.
Belts, amm., 250 rounds each, carried 12 on each amm. cart, 5 on gun cart, 96 on combat wagons	300	
Belt filling machine	12	
Boxes, amm., carried same manner as belts	300	
Cases, spare parts	16	
Boxes, water (includes 1 for each spare gun)	52	
Cartridges, Cal. .30:		
In combat wagon (24,000 in belts—48,000 in cases)	72,000	
In ammunition carts	36,000	
In gun carts	15,000	
Carts, ammunition	12	
Carts, gun	12	
Covers, machine gun	16	
Devices, steam condensing	16	
Guns, machine, Browning	16	
Harness, cart	24	
Machine gun cart repair outfits	12	
Mittens, asbestos, pairs	16	
Rods, cleaning	16	
Spare barrels	16	
Tripods, gun	16	
Buckets, canvass	24	
Cases, dispatch	6	
Picks, mattock	12	
Shovels, short handled	12	
Fire Control Equipment:		
Aiming marks, luminous	24	

	M. G. Co.	Bn. Hq.
Aiming stakes	12	
Alidade protractors	6	1
Angle of site instruments	4	1
Board plotting, 40 cm. x 40 cm. with declinator	4	1
Boxes, night firing, with batteries and switches	12	
Cases, canvass carrying, for plotting boards	4	1
Clinometers	12	
Compasses, Brunton or lensatic	6	1
Graphs, Corsellis	4	1
Panoramic sights	4	
Protractors, M. G.	12	1
Range finders, 80 cm.	1	
Sights, luminous, front and rear	12	
Tripods:		
For plotting boards	4	1
For compasses	6	1
For range finder	1	
Tables of fire	32	4
Trajectory graphs	32	4
Zinc rules	4	1
Zinc squares	4	1
Engineer Property:		
Compasses, watch	32	11
Signal Property:		
Glasses, field, type EE	15	5
Kits, flag, combination, standard	8	4
Projectors, 14 cm., complete	2	2
Reels, breast	2	2
Switchboards, telephone, 4-line		2
Telephones, camp, 1917	1	4
Wire, outpost, T. P. km.	1	4
Watches, wrist, luminous dial	12	

The equipment given for battalion headquarters is that for a Brigade Battalion. The equipment for the headquarters of the Division Battalion is the same, except that there is a set of fire control equipment added for issue to the division machine gun officer.

10. All officers and men of the machine gun organizations are armed with automatic pistols and bolos with the exception of 40 men of the headquar-

ters detachment of each brigade machine gun battalion. These men are armed with the rifle.

11. The following officers and men are mounted: mounted:

Machine gun company: Captain, reconnaissance officer, supply officer, 1st sergeant, range finder sergeant, 2 buglers, mounted on horses.

Mess sergeant, supply sergeant, stable sergeant, mounted on mules.

Brigade machine gun battalion: Major, adjutant, supply officer, 2 sergeants major, 2 privates, mounted orderlies, mounted on horses.

DUTIES OF THE PERSONNEL PRECEDING AND DURING COMBAT

12. General reconnaissance is the function of the infantry, cavalry, and aviation. Machine gun commanders should be kept suficiently well informed of the situation to enable them to use their guns effectively.

13. The machine gun commander makes such special reconnaissance as is necessary to ensure the proper posting and the employment of the guns in the execution of the tasks assigned. For this purpose the machine gun commander is assisted by reconnaissance officers, agents and scouts.

14. The effectiveness of machine gun fire is influenced by:

The positions.

The preliminary dispositions, such as securing firing data and organizing suitable lines of signal communication.

Concealment and protective cover.

Posting of guns without discovery by the enemy.

Surprise fire.

15. When necessary that guns be brought into action quickly everything else must be subordinated to speed. No time should be wasted in selecting positions, for in such cases concealment will be out of the question. The best position immediately obtainable should be taken.

All machine gun commanders invariably precede their commands to the positions to be occupied. All preliminary arrangements for action should be made prior to the arrival of the guns when possible.

The machine gun commander should accompany the commander of troops, should be kept constantly informed of the tactical situation and the plan of action, and should receive orders as early as possible.

At the earliest possible moment the machine gun commander selects the positions for his companies, platoons or sections, and informs his subordinates as to where they are to report for instructions.

16. When the machine gun commander goes forward for reconnaissance, he instructs the next in command on the following points:

The tactical situation.

Whether or not the command is to follow at once.

Any division of the organization and the routes to be followed, with the rate of march.

Disposition of the carts.

Agents or scouts may meet organizations and guide them to their positions.

17. Reconnaissance officers or agents should accompany advanced troops in order to give the machine gun commanders information as to when

machine gun support is required and where the guns can be used most effectively. Rocket signals should be arranged to call for machine gun support but the reconnaissance officer should have not less than two agents for sending information to the rear. Scouts may be employed to assist in reconnaissance, but will not work in advance of the front line.

RECONNAISSANCE OFFICERS

18. A reconnaissance officer attached to advanced troops should, as soon as possible after the determination of the enemy's location, submit a report giving all possible information and the most suitable positions for machine guns. Where this officer has been issued a number of maps for making reports, the following information can be given quite quickly:

Positions of guns.
The routes of approach showing covered and exposed portions.
Position for carts.
Number of guns required.
Location of targets and their relative importance.
Position of belt filling stations and carts.

AGENTS

19. Agents are used for two general classes of duties:

As messengers.—Such agents should keep themselves constantly informed as to the locations of the various elements of the commands and the routes thereto. The best service is obtained by using one agent always for communicating with a particular element of the command. All of the duties prescribed for messengers in the Field Service Regulations apply to these agents.

As information agents.—Such agents are those sent to infantry organizations to keep their own organizations constantly informed of the situation, location of enemy, friendly infantry, etc.

SCOUTS

20. Scouts are employed as follows:

To obtain information of the enemy or friendly infantry. They do not go in advance of the front line.

For reconnaissance of positions.

To guide troops to positions or to act as markers at road crossings, etc.

THE MAJOR

21. The following duties enumerated for the major pertain only to the machine gun companies that are under his direct command in any particular engagement and apply more fully to situations that permit of using machine guns en masse.

In Attack

Before the employment of his battalion he remains with the commanding officer of the troops he is supporting.

After receiving his orders to go into action he reconnoiters the ground; orders certain machine gun companies forward, specifying routes and formations if necessary; assembles company commanders for orders.

His orders should include the following information:

(1) Information of the enemy.
Position of friendly troops.

(2) General object to be attained.

(3) The number of guns that each company is to place in action and the positions.

The number of guns that each company is to hold in reserve and the positions.
Designation and apportionment of target.
Time or signal for opening fire.
Orders for flank protection and reconnaissance.

(4) Lines of signal communication to be established.
Arrangement for ammunition supply.

(5) Location of Bn. Hqrs. and of the next higher commander.

During the attack he orders such changes in positions, targets, etc., as are necessary.

If the attack succeeds he designates certain organizations to fire on the retreating enmey, others upon probable places for formation of counter-attacks, and others to move forward to assist in the consolidation of the position. As soon as possible he should arrange for a complete protective barrage.

In case the attack is unsuccessful, he makes disposition of guns to meet counter-attack or to cover retirement.

In Defense

If the position is not occupied deliberately it will be necessary for the major to make his first dispositions from the map. His orders will cover the following:

(1) Information of the enemy.
Disposition of the friendly infantry.

(2) The general mission of the battalion.

(3) Assignment of sectors of fire to be covered by the companies, calling attention to objectives of particular importance.

Assignment of zones or positions in which guns are to be emplaced.

Construction of cover for crews and guns. Preparation of obstacles.

Designation and location of reserve guns.

(4) Lines of Signal communication to be established.

Locations of carts and animals.

Arrangements for ammunition supply.

Arrangements for supply of rations.

(5) Location of Bn. Hqrs. and Hqrs. of the next higher commander.

As soon as possible the major should make a complete inspection of the guns of his battalion and make such changes of positions of guns or their lines of fire as will provide the maximum amount of flanking fire. He provides for alternative emplacements. He arranges for an S. O. S. barrage. His inspection should be so thorough as to determine whether the gun squads are properly performing their duties and whether they are being properly inspected and supervised by company officers.

THE ADJUTANT

22. The adjutant is the major's assistant. He acts for the major in the latter's absence. Both the adjutant and major should not be absent from Bn. Hqrs. at the same time.

The adjutant should relieve the major of all purely administrative matters. He will usually reduce to writing all orders of the major.

SERGEANT MAJOR

23. The sergeant major is in direct charge of all orderlies, agents and signalmen.

He marks the route to be followed by the battalion, when necessary.

He supervises the signal detail in the establishment of the lines of information ordered.

He is in charge of all messages sent or received and is responsible for the filing of all records.

SUPPLY OFFICER

24. The battalion supply officer, assisted by one of the sergeants major, is responsible for all of the details of supply of the battalion. He should have timely knowledge of all actions in order to make provisions in advance.

THE CAPTAIN

In Attack

25. When his company is supporting an infantry battalion the captain designates the platoons that are to support the assault companies and assigns them to places in the formation. He gives directions as to whether the guns will be carried by hand or on the carts. He designates a place in the battalion formation for the reserve platoon and if guns with assault companies are to be carried by hand assigns part of the personnel of the reserve platoon as ammunition carriers for the other two platoons. He uses the reserve platoon to reinforce the others or protect the flanks when necessary. When opportunity offers, he uses the fire of his company to assist the advance of neighboring battalions by flank fire.

He takes full advantage of every opportunity to concentrate the fire of his platoons, usually with-

out changing their position, on hostile nests or strong points which are making most trouble. He sees that the maximum use is made of the carts. The position of the captain is normally with the infantry battalion commander.

When the company is part of a machine gun battalion the position of the captain is where he can best control his company and maintain communication with the major. During the approach the captain decides when it is necessary to abandon the carts. After receiving orders from the major to go into action the captain reconnoiters the position. If the company is not going into action as a unit he gives definite tasks to his platoons. If the company is going into action as a unit, he designates the target, alloting to each platoon its sector; causes the range to be measured, or taken from the map; decides upon the kind of fire to be used; designates a reference object and announces fire data if indirect fire is to be used. In either case his instructions would cover the following points:

Where the guns are to be held under cover.
What positions are to be occupied and when.
When fire is to be opened.
What cover if any is to be constructed.
Lines of communication to be established.
Supply of ammunition from combat train to belt filling stations.
His own position and that of the major.

During the advance prescribes routes and formations for changes of positions and gives instructions as to the use of carts.

Senior Lieutenant

26. The senior lieutenant is second in command and reconnaissance officer. He has supervi-

sion of all administrative details. As reconnaissance officer he has supervision of the work of the scouts and observers. He is responsible for procuring information of the enemy and the preparation of fire data.

Supply Officer

27. The supply officer is responsible for the supply of rations and ammunition. He has charge of the transportation of the company and provides for getting the ammunition from the combat train to the belt filling stations when the company is acting as a unit. This duty devolves upon the platoon leader when the company is divided.

First Sergeant

28. He is general assistant to the captain. He is in direct charge of the headquarters detachment of agents, scouts and signalmen. He is responsible that communications ordered within the company are established. He is responsible for the recording of all messages and orders.

THE PLATOON LEADER

In Attack

29. In the approach the platoon leader marches at the head of his platoon. In action he takes a position from which he can best control his platoon and receive signals from his captain or infantry commander whom he is supporting.

Precedes his platoon for selection of gun positions and preparation of firing data. May conduct platoon to its position.

Assigns positions and tasks to his sections.

Orders and supervises construction of cover.

Specifies kind and rate of fire and gives commands or signal for opening fire.

Establishes belt filling stations.

Observes the fire effect and controls the fire of his platoon.

Orders changes of position of his platoon.

In Defense

Reconnoiters the sector to be occupied by his platoon and selects gun positions.

Prepares range cards and complete data for firing, including indirect and night firing.

Supervises the construction of emplacements, cover for men, obstacles, trenches, ammunition caches, etc.

Arranges for communication within the platoon.

Specifies kind, rate and time of opening fire.

Provides for the posting and relief of sentinels over guns and for necessary patrolling in immediate vicinity of guns.

Provides for belt filling stations.

Controls fire of platoon.

Replaces casualties.

Platoon Guide and Range Finder

30. Should be expert in use of range finder and in estimation of range.

Prepares range cards.

Takes command of platoon when platoon leader goes forward for selection of positions. Conducts platoon to the position.

Makes all details for guard, fatigue, etc.

THE SECTION LEADER

In Attack

31. The section leader precedes his section and reconnoiters his gun positions.

In action he takes position where he can control his gun squads, observe the target and fire effect and watch the leader for signals.

Establishes belt filling stations.

Constructs cover.

Obtains fire data.

Selects aiming marks when targets are indistinct.

Announces sight setting and assigns targets to gun squads.

Specifies kind, rate of fire, and commands or signals commence firing. Checks safety angle if overhead fire is ordered.

Keeps front under constant observation.

Observes fire effect and controls fire.

Notifies platoon leader of casualties.

When platoon is advancing by alternate sections, determines upon the time of advance.

In Defense

Assists platoon leader in preparation of range cards.

Instructs corporals in the orders for the gun positions.

Directs the construction of emplacements, cover for men, obstacles, etc.

Arranges for commuication with platoon leader.

Establishes belt filling stations.

Observes the fire effect and controls the fire of his sections.

Replaces casualties.

THE CORPORAL

In Attack

32. The corporal is directly responsible for the fire discipline of the gun squad and assists in fire control.

In action he takes position where he can observe the fire of his gun and communicate with the section leader.

He gives to his squad all the information he posesses as to situation and plan of action.

He constructs such cover as time will permit.

He issues the fire order:

(1) Announces range and deflection and verifies sight setting.

(2) Designates the target or aiming point to his gunner, taking the target assigned or the portion of the section's target that corresponds to the position of the squad in the section.

(3) Announces kind of fire, and number of rounds.

(4) Signals section leader when ready and opens fire on signal or command commence firing.

He observes fire effect, makes changes in sight setting, etc., and enforces strict fire discipline.

Takes all possible advantage of cover while advancing or in action.

In Defense

Thoroughly familiarizes himself with his sector and the range card.

Inspects, when position is occupied and thereafter at least twice daily, his machine gun and tripod, tool box, water box, belt filling machine, belts, and ammunition.

Constructs emplacements, cover, obstacles, etc.

Posts number of emplacement outside emplacement where it can be readily seen.

Posts the orders for the sentinel at the gun inside the emplacement and sees that all men read and understand them.

Posts a sentinel over the gun.

Establishes a belt filling station.

Assigns alarm posts to all members of his squad.

THE GUNNERS

No. 1

33. Carries the tripod.

Personally cleans and looks after the gun, sees that the mechanism is working smoothly and the water jacket is full.

Observes his own fire when possible.

Sets sights and fires as ordered.

Watches for and corrects stoppages.

No. 2

Carries the gun.

Loads the gun.

Sees that belts are clean and properly loaded.

Assists No. 1 in reducing stoppages.

Nos. 3 and 4

Carry water and ammunition boxes, supply No. 2 with ammunition and return empty belts to belt filling station.

Nos. 5 and 6

Establish belt filling stations and refill belts.

No. 7

Is responsible for the gun mule, cart and equipment.

No. 8

Is responsible for the ammunition mule, cart and ammunition.

Supplies ammunition to the belt filling station.

Refills his cart at the combat train.

Reference Sheet

FOR

T. T. 28, October 13, a.m., 1919.—Staff Class.
T. T. 25, October 8, a.m., 1919.—Line Class.

CONFERENCE.—Direct Fire of Machine Guns.

Machine Gun Drill Regulations, 1917.—Paragraphs 154 and 155.

Supplement to Machine Gun Drill Regulations, 1917.—Pages 117 to 142, and 314 to 343.

Machine Gun Firing Manual, 1917.—Paragraphs 82 to 93, 216 to 238, 98 to 106.

Equipment Required at Conference:

Lesson sheets.
Map of Fort Leavenworth and Vicinity 1:21120.
Protractor graduated in mils.

Lesson Sheet

FOR

T. T. 25, October 8, a.m., 1919.—Line Class.
T. T. 28, October 13, a.m., 1919.—Staff Class

CONFERENCE.—Direct Fire of Machine Guns.

Fire Direction

1. Correct application of machine gun fire is only possible with an understanding of the trajectory and of the size and shape of the shot group. These subjects therefore will be considered briefly before taking up the methods of fire.

TECHNICAL TERMS

Axis of the bore.—An imaginary line following the center of the bore from breech to muzzle.

Line of aim.—The straight line passing through the sights and the point aimed at.

Trajectory.—The curved path described by the bullet in its flight.

Cone of fire, or cone of dispersion.—The figure formed in space by the trajectories of a series of shots.

Maximum ordinate.—The highest point of the trajectory above the line of aim. Its position is approximately .6 of the range.

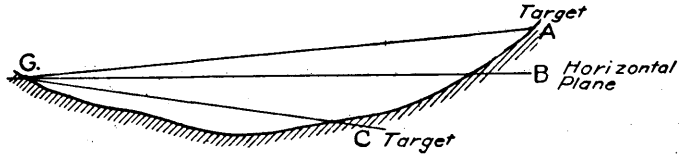
Danger space.—The sum of the distances in the path of the bullet in which an object of a given height will be struck. At long ranges the danger space at the farther end of the range alone is considered.

Beaten zone.—The area of ground beaten by a cone of fire.

Effective beaten zone.—The area of ground beaten by the best 75 per cent of the shots. This is the zone that is always considered in machine gun fire. While in musketry fire it is essential to so place the cone of fire that the target will be included in the 50 per cent zone, the cone of fire of the machine gun is sufficiently dense that results commensurate with the amount of ammunition expended can be produced provided the target lies within the 75 per cent zone.

Drift.—The lateral deviation of the bullet caused by the resistance of the air and the rotation of the bullet on its longer axis. The drift is partially corrected by the sight and can be neglected except for indirect fire at the longer ranges.

Angle of site.—The angle contained between the line of aim and the horizontal plane.



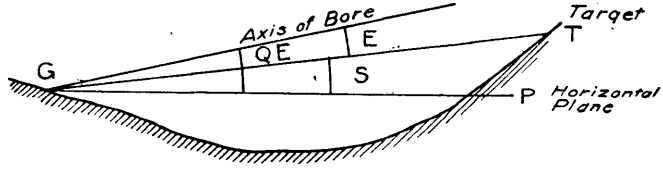
Angle AGB is the angle of site for target A.

Angle BGC is the angle of site for target C.

Angle of elevation or the angle of tangent elevation.—The angle between the axis of the bore and the line of aim.

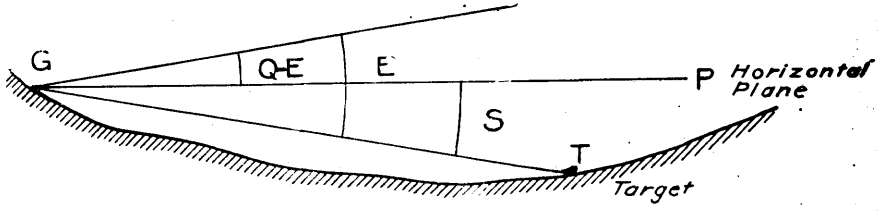
Angle of quadrant elevation.—The angle between the axis of the bore and the horizontal plane.

When the target is above the gun the quadrant elevation is equal to the angle of elevation plus the angle of site.



Q. E. equals E plus S.

When the target is below the gun the angle of quadrant elevation is equal to the angle of elevation minus the angle of site.



Q. E. equals E minus S.

Angle of fall.—The angle which the tangent to the trajectory, at the point of impact, makes with the line of aim.

Angle of incidence.—The angle between the plane of the surface struck and the tangent to the trajectory at the point of impact.

ORDINATES OF THE TRAJECTORY OF THE BROWNING MACHINE GUN IN METERS

Table No. II

Based on Experimental Firing at Springfield Armory During September, 1918—U. S. Cal. .30—Model 1906—150 grain bullet.

Range	Horizontal Distance Meters																								
Meters	100	200	300	400	500	600	700	800	900	1,000	1,100	1,200	1,300	1,400	1,500	1,600	1,700	1,800	1,900	2,000	2,100	2,200	2,300	2,400	2,500	2,600
100	.0	—.18	—.57	—1.24	—2.25	—3.66	—5.6	—8.16	—11.52	—15.8	—21.26	—29.2	—36.79	—47.32	—60.	—75.2	—93.16	—114.66	—138.51	—166.4	—199.71	—239.58	—290.95	—361.68	—453.75	—568.62
200	.09	.0	—.30	—.88	—1.8	—3.12	—4.97	—7.44	—10.71	—14.9	—20.24	—27.12	—35.62	—46.06	—58.65	—73.76	—91.63	—113.04	—136.8	—164.6	—197.61	—237.6	—288.88	—359.52	—451.5	—566.28
300	.19	.20	.0	—.48	—1.3	—2.52	—4.27	—6.64	—9.81	—13.9	—19.14	—25.92	—34.32	—44.66	—57.15	—72.16	—89.93	—111.24	—134.9	—162.6	—195.51	—235.4	—286.58	—357.12	—449.	—563.68
400	.31	.44	.36	.0	—.7	—1.8	—3.43	—5.68	—8.73	—12.7	—17.82	—24.48	—32.76	—42.98	—55.35	—70.24	—87.89	—109.08	—132.62	—160.2	—192.99	—232.76	—283.82	—353.76	—446.	—560.56
500	.45	.72	.78	.56	.0	—.96	—2.45	—4.56	—7.47	—11.3	—16.28	—22.6	—30.94	—41.02	—53.25	—68.	—85.51	—106.56	—129.96	—157.4	—190.05	—229.68	—280.60	—350.88	—442.5	—556.92
600	.61	.84	1.26	1.20	.8	.0	—1.33	—3.28	—6.03	—9.7	—14.52	—20.88	—28.86	—38.78	—50.85	—67.04	—82.79	—103.68	—126.92	—154.2	—186.69	—226.16	—276.92	—347.04	—438.5	—552.76
700	.8	1.42	1.83	1.96	1.65	1.14	.0	—1.76	—4.32	—7.8	—12.43	—18.6	—26.39	—36.12	—48.	—62.4	—79.56	—100.26	—123.31	—150.4	—182.7	—221.98	—272.55	—342.48	—433.75	—547.82
800	1.02	1.86	2.49	2.84	2.85	2.46	1.54	.0	—2.34	—5.6	—10.01	—15.96	—23.53	—33.04	—44.7	—58.88	—75.82	—96.3	—119.13	—146.	—178.08	—217.14	—266.80	—337.2	—428.25	—542.1
900	1.28	2.38	3.27	3.88	4.15	4.02	3.36	2.08	.0	—3.	—7.15	—12.84	—2.15	—29.4	—40.8	—54.72	—71.4	—91.62	—114.19	—140.8	—172.62	—211.42	—261.51	—330.96	—421.75	—535.34
1,000	1.58	2.98	4.17	5.08	5.65	5.82	5.46	4.48	2.7	.0	—3.85	—9.24	—16.25	—25.2	—36.3	—49.92	—66.3	—86.22	—108.49	—134.8	—166.32	—204.82	—254.61	—323.76	—414.25	—527.54
1,100	1.93	3.88	5.22	6.48	7.4	7.92	7.91	7.28	5.85	3.5	.0	—5.04	—11.7	—20.3	—31.05	—42.72	—60.35	—79.92	—101.84	—127.8	—158.97	—197.12	—246.56	—315.36	—405.5	—518.44
1,200	2.35	4.52	6.48	8.16	9.5	10.44	10.85	10.64	9.63	7.7	4.62	.0	—6.24	—14.42	—24.75	—37.6	—53.21	—73.36	—93.86	—119.4	—150.52	—187.88	—236.9	—305.28	—395.	—507.52
1,300	2.83	5.48	7.92	10.08	11.9	13.32	14.21	15.28	13.95	12.5	9.9	5.76	.0	—7.7	—17.55	—29.92	—45.05	—63.72	—83.74	—109.8	—137.97	—177.32	—225.86	—293.76	—383.	—495.04
1,400	3.38	6.58	9.57	12.28	14.65	16.62	18.06	18.88	18.9	18.	15.95	12.36	7.15	.0	—9.3	—21.12	—35.7	—53.82	—74.29	—98.8	—128.52	—165.22	—213.21	—280.56	—369.25	—480.74
1,500	4.	8.02	11.43	14.76	17.75	20.34	22.4	23.84	24.48	24.2	22.77	19.8	15.21	8.68	.0	—11.2	—25.16	—42.66	—62.51	—86.4	—115.5	—151.58	—198.95	—265.68	—353.75	—464.62
1,600	4.7	9.22	13.53	17.56	21.15	24.54	27.3	29.44	30.78	31.2	30.47	28.2	24.31	18.48	10.5	.0	—13.26	—30.06	—49.21	—72.4	—100.8	—136.18	—182.85	—248.88	—336.25	—446.42
1,700	5.48	10.78	15.89	20.68	25.15	29.22	32.76	35.68	37.8	39.	39.05	37.56	34.45	29.4	22.2	12.48	.0	—16.02	—34.29	—56.8	—84.42	—119.02	—164.91	—230.16	—316.75	—426.14
1,800	6.37	12.56	18.54	24.24	29.6	34.56	38.99	42.8	45.81	47.9	48.84	48.24	45.02	41.86	35.55	26.72	15.13	.0	—17.48	—39.	—65.73	—99.44	—144.44	—208.8	—294.5	—403.
1,900	7.29	14.4	21.3	27.92	34.2	40.08	45.43	50.16	54.09	57.1	58.96	59.28	57.98	54.74	49.35	41.44	30.77	16.56	.0	—20.6	—46.41	—79.2	—123.28	—186.72	—271.5	—379.08
2,000	8.32	16.46	24.39	32.04	39.35	46.26	52.64	58.4	63.36	67.4	70.29	71.64	71.37	69.16	64.8	57.92	48.28	35.10	19.57	.0	—24.78	—56.54	—99.59	—162.	—245.75	—352.3
2,100	9.5	18.82	27.93	36.76	45.25	53.34	60.9	67.84	73.98	79.2	83.27	85.8	86.71	85.68	82.5	76.8	68.34	56.34	41.99	23.6	.0	—30.58	—72.45	—133.68	—216.25	—321.62
2,200	10.89	21.6	32.1	42.32	52.2	61.68	70.63	78.96	86.49	93.1	98.56	102.48	104.78	105.14	103.35	99.04	91.97	81.36	68.4	51.4	29.19	.0	—40.48	—100.32	—181.5	—285.48
2,300	12.65	25.12	37.38	49.36	61.	72.24	82.95	93.04	102.33	110.7	117.92	123.6	127.66	129.78	129.75	127.2	121.89	113.04	101.84	86.6	66.15	38.72	.0	—58.08	—137.5	—239.72
2,400	15.07	29.96	44.64	59.04	73.1	86.76	99.89	112.24	124.11	134.9	144.54	152.64	159.12	163.66	166.05	165.92	163.03	156.60	147.82	135.	116.97	91.96	55.56	.0	—77.	—176.8
2,500	18.15	36.12	53.88	71.36	88.5	105.24	121.45	137.04	151.83	165.7	178.42	189.6	199.16	206.78	212.25	215.2	215.39	212.04	206.15	196.6	181.65	159.72	126.50	73.92	.0	96.72
2,600	21.87	43.56	65.04	86.24	107.1	127.56	147.49	166.8	185.31	202.9	219.34	234.24	247.52	258.86	268.05	274.72	278.63	279.	277.02	271.	259.77	241.56	212.06	163.20	93.	.0

To face page 35

RANGE TABLE OF BROWNING MACHINE GUN

Based on experimental firing at Springfield Armory during Sept., 1918—U. S. Cal. .30—Model 1906—150 grain bullet.

Range	Angle of Departure	(Computed) Angle of Fall
Meters	Mils	Mils
100	.8	.9
200	1.7	1.9
300	2.7	3.5
400	3.9	5.6
500	5.3	8.1
600	6.9	11.
700	8.8	14.9
800	11.0	19.4
900	13.6	25.3
1,000	16.6	32.
1,100	20.1	40.5
1,200	24.3	52.2
1,300	29.1	64.1
1,400	34.6	78.5
1,500	40.8	94.3
1,600	47.8	113.
1,700	55.6	133.3
1,800	64.5	160.3
1,900	73.7	175.1
2,000	84.0	205.7
2,100	95.8	246.5
2,200	109.7	302.9
2,300	127.3	398.7
2,400	151.5	567.6
2,500	182.3	751.7
2,600	219.5	943.

Jump for Browning gun, is .5 mil. down. To find angle of elevation add .5 to angles of departure. Tables do not agree exactly with trajectory graph or Searching Reverse Slope Graph as these graphs are based on experimental firing in France, while tables are based on firings at Springfield armory.

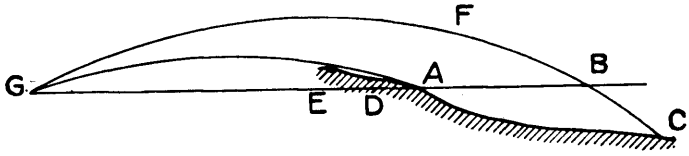
DISPERSIONS OF THE BROWNING MACHINE GUN

(Computed from data obtained by experimental firing at Springfield Armory, and at the Infantry School of Arms, U. S. Cal. .30, Model 1906—150 grain bullet.)

Range	DISPERSION									
	VERTICAL				LATERAL				LONGITUDINAL	
	100% zone		75% zone		100% zone		75% zone		100% zone	75% zone
Meters	Meters	Mils	Meters	Mils	Meters	Mils	Meters	Mils	From Muzzle to	From Muzzle to
100	.52	5.16	.17	1.72	.22	2.20	.08	.77	358 meters	194 meters
200	1.03	5.16	.34	1.72	.44	2.20	.15	.77	426 "	179 "
300	1.55	5.16	.52	1.72	.68	2.27	.24	.80	484 "	161 "
400	2.06	5.16	.69	1.72	.91	2.28	.32	.80	414 "	138 "
500	2.58	5.16	.86	1.72	1.15	2.30	.40	.81	355 "	118 "
600	3.10	5.16	1.03	1.72	1.38	2.30	.48	.81	301 "	100 "
700	3.61	5.16	1.20	1.72	1.62	2.31	.57	.81	262 "	87 "
800	4.13	5.16	1.38	1.72	1.86	2.33	.65	.82	219 "	73 "
900	4.72	5.24	1.57	1.75	2.10	2.33	.74	.82	188 "	63 "
1,000	5.37	5.37	1.79	1.79	2.38	2.38	.84	.84	166 "	55 "
1,100	6.12	5.56	2.04	1.85	2.63	2.39	.92	.84	146 "	49 "
1,200	7.00	5.83	2.33	1.94	2.94	2.45	1.03	.86	130 "	43 "
1,300	8.20	6.31	2.73	2.10	3.31	2.55	1.16	.89	123 "	41 "
1,400	9.71	6.94	3.24	2.31	3.78	2.70	1.33	.95	119 "	40 "
1,500	11.45	7.63	3.82	2.54	4.36	2.91	1.53	1.02	116 "	39 "
1,600	13.46	8.41	4.49	2.80	5.08	3.18	1.78	1.12	114 "	38 "
1,700	15.83	9.31	5.28	3.10	5.94	3.94	2.08	1.23	112 "	37 "
1,800	18.24	10.13	6.08	3.38	6.90	3.83	2.42	1.35	112 "	37 "
1,900	21.05	11.07	7.02	3.69	7.98	4.20	2.80	1.47	114 "	38 "
2,000	25.11	12.55	8.70	4.18	9.22	4.61	3.24	1.62	114 "	38 "
2,100	30.60	14.57	10.20	4.86	10.74	5.11	3.77	1.80	114 "	38 "
2,200	39.31	17.87	13.10	5.96	12.60	5.73	4.42	2.01	115 "	38 "
2,300	54.93	23.88	18.31	7.96	15.00	6.52	5.27	2.29	117 "	39 "
2,400	77.52	32.30	25.84	10.77	18.28	7.62	6.42	2.67	119 "	40 "
2,500	101.66	40.66	33.89	13.55	22.94	9.17	8.03	3.21	122 "	41 "
2,600	130.00	50.00	43.33	16.67	29.73	11.43	10.41	4.00	134 "	45 "
2,700										

5. The tables of dispersions show the beaten zone where the surface of the ground at the point of impact is parallel to the line of aim. The length of the beaten zone, however, varies with the inclination of the ground to the line of aim.

The reverse slope.



Suppose AB is the length of the beaten zone along the line of aim GAB. Then it is clear that if the reverse slope AC be engaged, the beaten zone produced along the reverse slope by the same cone of fire will be AC, and will exceed AB.

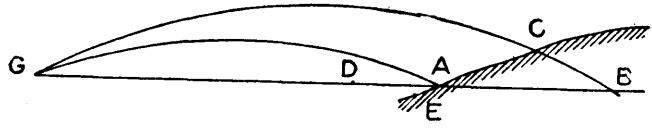
Suppose, also, that DA represents the length of the danger space when firing along GAB, then EA will represent the length of the danger space when firing on the reverse slope.

Along the line of aim, therefore, fire effect will be produced for a distance DB, but on the reverse slope fire effect will be produced for a distance EC, and this distance will greatly exceed DB.

On a reverse slope the ratio of the length of AC to AB at any range can be found as follows:

$$\frac{AC}{AB} \text{ equals } \frac{\text{Angle of fall}}{\text{Angle of fall—Angle of slope of ground.}}$$

The forward slope.



Let AB represent the length of the beaten zone along the line of aim GAB. AC represents the length of the beaten zone produced by the same cone of fire along the forward slope AC.

If DA represents the danger space along the line of aim, EA will represent it along the forward slope.

In all cases on a forward slope, the length of the ground effectively engaged will be less than on the line of aim. On a forward slope the ratio of the length of AC to that of AB can be found as follows:

$$\frac{AC}{AB} \text{ equals } \frac{\text{Angle of fall}}{\text{Angle of fall plus angle of slope of ground.}}$$

ATMOSPHERIC CORRECTIONS

Range tables are based on the following atmospheric conditions:

1. Barometric pressure, 30 inches. (Tables used in France, 750 mm.)
2. Temperature, 70 degrees Fahrenheit. (Tables used in France 15 degrees Centigrade.)
3. Still air.
4. A horizontal line of aim.

ATMOSPHERIC VARIATIONS THAT AFFECT ELEVATIONS

7. **Barometric Pressure.**—The following rule for correction in case of variation in barometric pressure is approximately correct:

For every inch the barometer rises or falls above or below 30 inches add or deduct 1½ meters for each 100 meters of range.

Example: Range, 2000 meters. Barometer, 29 inches.

Allowance equals $1 \times 1\frac{1}{2} \times 20$ equals 30 meters. Corrected range 1970.

8. **Temperature.**—For every degree which the temperature rises or falls above 70 degrees, deduct or add 1/10 meter for each 100 meters of range.

Example: Range, 2100 meters. Temperature, 60 degrees.

Allowance equals

$$1/10 \times (70-60) \times \frac{2100}{100} \text{ equals } 21.$$

Corrected range, 2121.

9. **Head or Rear Wind.**—For 12 o'clock or 6 o'clock wind add or subtract:

Allowance in meters equals

$$\frac{(\text{Range in meters less } 400) \times (\text{velocity of wind in miles per hour.})}{200}$$

For a wind at 1, 5, 7, or 11 o'clock use 7/8 of the allowance.

For a wind at 1:30, 4:30, 7:30, or 10:30 use 3/4 of the allowance.

For a wind at 2, 4, 8, or 10 o'clock use 1/2 of the allowance.

Example: Range, 1400 meters. Wind, 16 miles an hour at 12 o'clock.

$$\frac{(1400-400) \times 16}{200} \text{ equals } 80 \text{ meters.}$$

Corrected range 1480 meters.

10. The following example illustrates the combination of the various corrections:

Example: Range 1000.

Temperature, 30 degrees F.		40 meters	
Barometer, 31 inches		15	
20 mile wind at 6 o'clock			—60 meters.
		55	—60
Total correction	—5.		
Correct range	995.		

ATMOSPHERIC VARIATIONS THAT AFFECT DIRECTION

11. **Drift.**—The rear sight partially corrects for drift so that no changes are necessary when firing direct fire. For indirect fire the following allowance should be made:

1000 meters or less, disregard.
1500 meters allow 2 meters or 1⅓ mils, left.
2000 meters allow 5 meters or 2½ mils, left.
2500 meters allow 10 meters or 4 mils, left.

12. **Wind.**—The correction for 3 or 9 o'clock wind is found with approximate correctness by the following formula:

Correction in mills equals

$$\frac{\text{Range in meters} \times \text{velocity of wind in miles per hour}}{3600}$$

For winds from 2, 4, 8, or 10 o'clock use ⅞ of the allowance.

For winds from 1:30, 4:30, 7:30, or 10:30 o'clock use ¾ of the allowance.

For winds from 1, 5, 7, or 11 o'clock use ½ of the allowance.

Example: Range 1000. 12 mile wind at 3:00 o'clock.

$$\text{Correction equals } \frac{1000 \times 12}{3600} \text{ equals } 3\tfrac{1}{3} \text{ mils.}$$

For direct fire corrections for lateral winds are set off on the wind gauge; for indirect fire on the traversing dial.

METHODS OF MACHINE GUN FIRE

13. Fire is said to be adjusted when the target lies within the 75 per cent zone.

Adjustment is accomplished by one of the following means:

1. By use of the "battle sight."

2. By use of a single correct elevation.

3. By use of a beaten zone artificially increased in depth.

14. **Battle Sight.**—The battle sight is an emergency sight to be used on occasions when some material fire effect is demanded instantly, and when the delay incident to a more precise adjustment would render the fire valueless, nothwithstanding the increase in material effect. The battle sight is also used when the objective is so large and at such close range that a more precise adjustment would have no material effect upon the accuracy of the fire.

A study of the table of ordinates of the trajectory in connection with the heights of usual targets, shows the battle sight to be useful at the following ranges:

Against prone figures, with point of aim at the bottom of the target, at ranges less than 510 yards.

Against kneeling figures, with aim at the breast, at ranges less than 600 yards.

Against standing figures, with aim at the breast, at ranges less than 670 yards.

Against mounted figures, with aim at breast, at ranges less than 720 yards.

15. **The Single Elevation.**—Whether a single elevation can be profitably employed depends upon the range and the degree of precision with which ranges are determined.

One-half the length of the 75 per cent zone is the limit of error in range finding that is permissible if a single elevation is to be used.

The probable errors in range finding are:

Single estimates by eye 15 per cent.

The average of the estimates of a few trained men, 10 per cent.

Range finders of the self contained base type, 2 per cent.

Using map ranges with positions estimated by eye, 5 per cent.

Table of 75 per cent Zone and Errors in Range Finding

Range Meters	75% Zone	Permissible Error	15% Error	10% Error	5% Error	2% Error
200	179	90	30	20	10	4
300	161	80	45	30	15	6
400	138	69	60	40	20	8
500	118	59	75	50	25	10
600	100	50	90	60	30	12
700	87	43	105	70	35	14
800	73	36	120	80	40	16
900	63	31	135	90	45	18
1,000	55	27	150	100	50	20
1,100	49	24	165	110	55	22
1,200	43	21	180	120	60	24
1,300	41	20	195	130	65	26
1,400	40	20	210	140	70	28
1,500	39	19	225	150	75	30
1,600	38	19	240	160	80	32
1,700	37	18	255	170	85	34
1,800	37	18	270	180	90	36
1,900	38	19	285	190	95	38
2,000	38	19	300	200	100	40

An examination of the table shows that—

With single estimates by the eye the probable error exceeds the permissible error beyond 450 meters. This range therefore marks the maximum limit at which a single elevation can be employed with profit when the distance is determined by a single estimate.

With the average of several estimates the maximum limit is 550 meters.

Using a map with positions estimated by the eye the maximum distance is 750 meters.

Using a range finder the maximum distance is 1150 meters.

16. **Ranging Fire.**—Where conditions are favorable for observation and the tactical situation is such as to permit of its use, ranging fire may be used to overcome errors in range finding. The tracer bullet has added greatly to the value of ranging fire, but this bullet, owing to its imperfections, cannot yet be used at the longer ranges.

Ranging fire must not be used against targets which, by their nature or that of the terrain, can evade fire for effect during the pause for observation of ranging fire. Such targets are small parties, small columns which can effect a rapid deployment, and body of troops which is rapidly approaching defilade.

Fire for effect should always be preceded by ranging fire against targets which cannot evade machine gun fire. Ranging against moving targets is practicable only when the target cannot deviate from its course.

In ranging fire what is assumed to be the correct elevation is employed without there are special conditions which make observation of the fire easier if the shot group is placed either short or over.

In ranging fire a single gun is usually employed. Ranging will usually be carried out by platoon although at times it may be practicable for one gun to give the range to the entire company. Bursts of 20 rounds are suitable for ranging as a considerable number of shots makes observation easier.

The adjustment of fire to place the shot group on the target is carried out in exactly the same manner as with rifle fire. An exact adjustment can be obtained much more readily, however, as the shot group is more dense and easier to observe.

17. **Combined Sights.**—Combined sights is the term applied to the method of engaging any required depth of ground by applying simultaneously overlapping zones of fire from two or more guns. The depth of the beaten zone is increased by ordering different elevations to be used by each gun, while each uses the same aiming mark.

In direct fire these elevations are put on by ordering each gun to fire with a different elevation on the rear sight. In indirect fire the same effect is produced by ordering a different quadrant elevation for each gun.

By this method, while the effective beaten zone is increased, the density of the fire is greatly reduced. The extreme difference between the elevations of guns which will ensure that no gaps are left between the beaten zones of different guns is the depth of the 75 per cent zone for the range in question. Using a difference of 100 meters at 600, 700 and 800 meters and a difference of 50 meters at all ranges above 900 meters will very nearly comply with the theoretical requirements and gives a practical sight setting.

Combined sights are useful when surprise effect is desired, because each portion of the ground in which the target probably lies is beaten simultaneously. As soon as fire can be observed combined sights should be discontinued and firing continued with the correct elevation. An exception to this rule would be where the target is of greater depth than the 75 per cent zone.

18. **Fixed Fire.**—Fixed fire is that class of fire in which the gun is directed at a single aiming point. The effective beaten zone is not increased artificially either in width or depth.

This class of fire is employed where it is desired to bring an intense fire upon a point or a small group.

19. **Searching Fire.**—The method of engaging any required depth of ground by applying successively overlapping zones of fire from one gun. Alterations in elevation are made by turning the hand wheel and not by changes in the rear sight. The firer sets his sight at the correct range for the near end of the target and lays on it. After firing a burst he elevates two mils and fires again and continues this process until he has covered the entire target. The height of the 75 per cent zone at 100 meters is 1.72 mils, at 1,000 meters 1.79 mils, at 1,500 meters 2.54 mils and at 2,000 meters 4.18 mils. By using turns of the hand wheel of 2 mils we thus ensure that there will be very small gaps and that the amount of overlapping will not be excessive at any range. The overlapping will occur beyond 1,500 meters where the shot group is not so dense and will thus tend to produce the same density of fire at all ranges.

Searching is used to place the shot group on a target whose range is not precisely known or to cover a target that is longer than the beaten zone. It is of little value where surprise effect is desired, because each part of the target is engaged successively.

20. **Distributed Fire.**—The method of engaging any required width of ground by distributing laterally against it the fire of one or more guns. The firer aims at one extremity of the target and fires a burst of five or ten shots. He then turns his traversing worm 2 mils so as to throw his shot group toward the other end of the target and fires again. He continues in this man-

ner until he has covered the entire target or the portion assigned to him. The width of the 75 per cent zone is .77 mils at 100 meters, .84 mils at 1,000 meters, 1.02 mils at 1,500 meters, and 1.62 mils at 2,000. There will be small gaps in the fire when the 75 per cent zone is considered but the width of the 100 per cent zone is nowhere less than 2.20 mils so no portion of the line will be entirely without fire.

21. **Oblique Traversing.**—Where the target is oblique to the line of fire, the best method is to use a combination of combined sights, searching, and traversing. For example if a column of troops extended over a hill obliquely with the head of the column at a range of 1,000 meters and the rear of the column at a range of 1,400 meters, and the target was to be engaged by a platoon, then the guns would be given elevations of 1,000, 1,100, 1,200 and 1,300 respectively. Each would be assigned a fourth of the target. Each would distribute his fire over his portion of the target and would search a sufficient number of mils to cover the depth of his target.

22. **Swinging Traverse.**—This is a method of engaging a wide target by firing continuously and the same time distributing the fire along the entire target. This fire is suitable only for dense targets at very close range.

23. **Direct Overhead Fire.**—This is the type of machine gun fire that will have the greatest application in battle. The safety of the friendly troops is ensured by the employment of a "safety angle," the size of which depends upon the range to the target.

The following rules must be complied with to ensure safety to friendly troops:

(NOTE: Owing to the fact that the scales in EE field glasses are in yards safety angles will be given in yards except for automatic sight correction.)

(1) If the range to the target is 1,000 yards or less the safety angle is 8 mils.

If the range to the target is between 1,000 and 1,500 yards the safety angle is 15 mils.

If the range to the target is over 1,500 yards the safety angle is 20 mils.

(2) Use only machine guns—not automatic rifles.

(3) Do not use barrels that have fired more than 14,000 rounds.

(4) Have the tripods mounted on T bases well dug in, where possible.

(5) Use only well trained machine gunners at the guns.

(6) Fire in short bursts and verify the laying frequently.

(7) Overhead fire must not be employed if friendly troops are over 1,800 meters from the gun.

(8) If the location of friendly troops is uncertain overhead fire must not be employed.

(9) Friendly troops should be notified that machine guns will support them with overhead fire.

(10) The range to target and friendly troops must be known to within 5 per cent.

24. METHODS OF APPLYING SAFETY ANGLES

Method I.—With the mil scale of the EE field glass measure downward from the line of aim, 8, 15, or 20 mils, depending upon whether the range to the target is less than 1,000 yards, between 1,000 and 1,500 yards, or more than 1,500 yards. Ob-

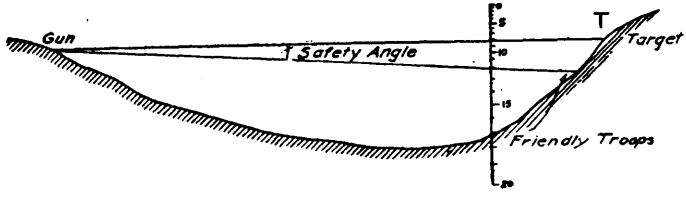
serve where this line cuts the ground. Fire until the heads of the attacking troops touch this line.

Method II.—An objection to the previous method is that only three safety angles are given. This is unsound because the safety angle should vary with every variation in range. Yet it is impracticable to memorize an angle for each range.

This difficulty is overcome by the following method:

The glass is so held that the line on the range corrector scale corresponding to the range to the target cuts the target. The observer then determines the line on the ground that is cut by the scale at a range 400 yards greater than that to the target. This is the safety limit and firing must cease when the heads of friendly troops appear on this line.

Example: Range to target 800 yards.
Place the 800 line of the range scale



on the target T.

Observe where the 1,200 line of the range scale cuts the ground.

Fire until the attacking troops cut this line.

Method III.—Automatic Sight Correction.

In the methods given above the controller alone knows how far it is safe to support the advance. If he should become a casualty, the firer will be in danger either of supporting the advance beyond the safety limit, or of ceasing fire too soon. This difficulty is overcome by the following method:

Stage I.—The firer lays on the target with the range to hit it. Then, without moving the gun, he runs his sights 400 meters higher, and finds at what point on the ground he is now aiming.

This position on his new line of aim becomes his aiming mark, and he continues firing, constantly checking his aim on it, until his line of aim is touched by the advancing troops, when he ceases fire. The fire up to the present will have been directed on the target, because initially the gun was laid on the target with the range to hit it.

Stage II.—When the advancing troops touch the line of aim, the firer elevates the gun,, aims at the target, and fires until the attacking troops reach the target. He then ceases fire or lifts on to a new target farther to the front. By this method of aiming at the target with a range 400 yards greater than the range to the target, the ground beyond on the target is swept with fire. Fire is thus brought to bear either on the troops retreating from the position or on the supporting troops attempting to come to their assistance.

FIRE ORDERS

25. Fire orders will, in general cover the following points and in the sequence given:

1. Directions as to the occupation of the firing position.
2. Range.
3. Designation of target.
4. Class of fire.
5. Number of rounds.
6. Time of opening fire.

Directions as to the occupation of the firing position may be brief as where the platoon commander points out a position in the immediate vicinity and directs No. 1 gun to go to a certain

point, No. 2 gun to another point, etc. On the other hand a platoon leader directing a sergeant to occupy a position at some distance might give directions as to the best method of approaching the position, where he possessed detailed information not in possession of the sergeant.

The range is simply designated as "Range 800." It is unnecessary to say 800 meters. Where windage is required the command would be "Range 800, Right 2 (or Left 3).

The target is designated exactly as in giving commands to a rifle company.

The class of fire is designated as follows:

Fixed fire.
Distributed fire.
Searching fire.
Ranging fire.
Combined sights, No. 1 (or No. 4) gun Range 800, add 50. No. 2 gun uses 850, No. 3 900, etc.
Swinging traverse.

In distributed or searching fire the number of mils that it is desired to cover may be designated by the commands "Distribute 20 right. Search up 2 and down 2."

Number of rounds may be designated as 100 rounds, 20 rounds, 2 belts.

Where it is desired to open fire at once the command or signal "Commence firing" will be given. Where fire is not to be opened at once the orders may be "Open fire on my signal" or "Open fire at 8:45."

The fire orders of the captain or major will usually be in the form of directions rather than commands. Platoon and section leaders may use either directions or commands, depending upon the situation. The gun commander will always give his fire orders in the form of commands.

Examples of fire orders:

Range 800, left 3.
Reference point at 2:00 o'clock a stone house.
Target at 3:00 o'clock a squad column.
Fixed fire.
Forty rounds.
Commence firing.

Range 1,000, right 2.
Target at 11:00 o'clock a column of infantry.
Distribute 20 mils, search up 10 mils.
Two belts.
Commence firing.

Combined sights, No. 1 gun Range 600, add 100.
Target, column of cavalry.
Fixed fire.
One belt.
Signal when ready. Open fire on my signal.

Reference Sheets

FOR

T. T. 27, October 9, a.m., 1919.—Line Class.
T. T. 35, October 16, a.m., 1919.—Staff Class.

Conference.—Indirect Fire of Machine Guns, Part 1.

References.—Supplement to Machine Gun Drill Regulations, 1917—Pages 142 to 179, and 185 to 187.

Equipment Required at Conference:

Lessons sheets.
Map of Fort Leavenworth and Vicinity, $\frac{1}{21120}$.
Protractor graduated in mils.

Lesson Sheets

FOR

T. T. 27, October 9, a.m., 1919.—Line Class.
T. T. 35, October 16, a.m., 1919.—Staff Class.
Conference.—Indirect Fire of Machine Guns, Part 1.

Fire Direction No. 2

Indirect Fire—Part 1

1. Indirect fire is fire directed by any other means than by laying the gun over the sights on to the target.

Indirect fire may be carried out by guns controlled:

(1) Singly.
(2) By platoons.

In laying single guns there are four principal operations:

1. Laying the gun in direction.
2. Laying the gun for elevation.
3. Determination of the ability to clear obstructions.
4. Determination of the ability to fire safely over friendly troops.

In laying guns by platoons, in addition to the above, there are the following factors:

1. The distribution of the fire of the platoon along any line.
2. The concentration of the fire of the platoon on any point or locality.

Indirect Fire of Guns Controlled Singly

2. With a Map

To obtain direction:

Method I.—By map and compass.

1. The position of the gun on the ground must be accurately located on the map. This is done either:

(a) From comparison of the detail of the ground with the detail of the map.
(b) By resection.

2. Find the magnetic bearing from the gun to the target. Proceed as follows:

(a) Draw a line on the map from gun position to the target.

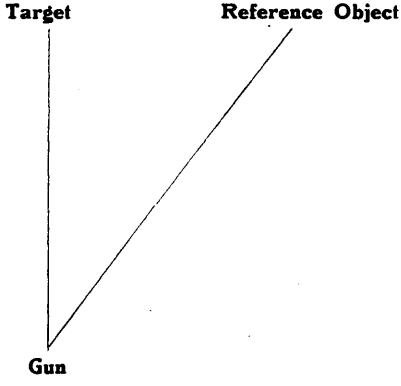
(b) With the protractor measure the angle this line makes with the north and south grid line.

(c) Add or subtract the magnetic declination to or from the above angle. This gives the magnetic bearing.

3. Lay the gun on the magnetic bearing as follows:

Place a stake about six inches high in the gun position. Place the compass on top of the stake and rotate it until it gives the required bearing. Place an aiming post in line with this bearing. Place the gun with the center of the socket exactly over the stake, and lay on the aiming post.

Method II.—By map and reference object.



1. Locate accurately on the map the position of the gun on the ground.

2. Select a reference object which is shown on the map and is plainly visible from the gun position.

4. QUADRANT ANGLE IN MILS KNOWING RANGE AND V. I. (Both in Meters).

TABLE No. IV.

TARGET BELOW GUN

Based on Experimental firing at Springfield Armory during September, 1918—U. S. Cal. .30—Model 1906—150 grain bullet.

V. I.	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	2500	2600
1	10.	5.	3.3	2.5	2.	1.6	1.4	1.2	1.1	1.	9	.8	.75	.7	.65	.6	.6	.55	.5	.5	.45	.45	.4	.4	.4	.4
5	— 49.2	— 23.3	— 14.0	— 8.6	— 4.7	— 1.4	+ 1.7	+ 4.8	+ 8.1	+ 11.6	+ 15.6	+ 20.1	+ 25.3	+ 31.0	+ 37.5	+ 44.7	+ 52.7	+ 61.7	+ 71.1	+ 81.5	+ 93.4	+107.4	+125.1	+149.4	+180.3	+217.5
10	— 99.2	— 48.3	— 30.6	— 21.1	— 14.7	— 9.8	— 5.48	— 1.5	+ 2.5	+ 6.6	+ 11.1	+ 15.9	+ 21.5	+ 27.4	+ 34.2	+ 41.6	+ 49.8	+ 58.9	+ 68.5	+ 79.0	+ 91.0	+105.1	+122.9	+147.3	+178.3	+215.5
15	—149.2	— 78.3	— 47.3	— 33.6	— 24.7	— 18.1	— 12.6	— 7.7	— 3.0	+ 1.6	+ 6.6	+ 11.7	+ 17.7	+ 23.8	+ 30.9	+ 38.5	+ 46.9	+ 56.1	+ 65.9	+ 76.5	+ 88.6	+102.8	+120.7	+145.2	+176.3	+213.5
20	—199.2	— 98.3	— 64.0	— 46.1	— 34.7	— 26.4	— 19.8	— 14.0	— 8.6	— 3.4	+ 2.1	+ 7.5	+ 13.9	+ 20.2	+ 27.6	+ 35.4	+ 44.0	+ 53.3	+ 63.3	+ 74.0	+ 86.2	+100.5	+118.5	+143.1	+174.3	+211.5
25		—123.3	— 80.1	— 58.6	— 44.7	— 34.7	— 26.9	— 20.2	— 14.1	— 8.4	— 2.3	+ 3.3	+ 10.1	+ 16.6	+ 24.3	+ 32.3	+ 41.1	+ 50.5	+ 60.7	+ 71.5	+ 83.8	+ 98.2	+116.3	+141.0	+172.3	+209.5
30		—148.3	— 97.3	— 71.1	— 54.7	— 43.1	— 34.0	— 26.5	— 19.7	— 13.4	— 6.8	+ 0.9	+ 6.3	+ 13.0	+ 21.0	+ 29.2	+ 38.2	+ 47.7	+ 58.1	+ 69.0	+ 81.4	+ 95.9	+114.1	+138.9	+170.3	+207.5
35		—173.3	—114.0	— 83.6	— 64.7	— 51.4	— 41.2	— 32.7	— 25.2	— 18.4	— 11.3	— 5.1	+ 2.5	+ 9.4	+ 17.7	+ 26.1	+ 35.3	+ 44.9	+ 55.5	+ 66.5	+ 79.0	+ 93.6	+111.9	+136.8	+168.3	+205.5
40		—198.3	—130.1	— 96.1	— 74.7	— 59.8	— 48.3	— 39.0	— 30.8	— 23.4	— 15.8	— 9.3	— 1.3	+ 5.8	+ 14.4	+ 23.0	+ 32.4	+ 42.1	+ 52.9	+ 64.0	+ 76.6	+ 91.3	+109.7	+134.7	+166.3	+203.5
45			—147.3	—108.6	— 84.7	— 68.1	— 55.5	— 45.2	— 36.4	— 28.4	— 20.3	— 13.5	— 5.1	+ 2.2	+ 11.1	+ 19.9	+ 29.5	+ 39.3	+ 50.3	+ 61.5	+ 74.2	+ 89.0	+107.5	+132.6	+164.3	+201.5
50			—164.0	—121.1	— 94.7	— 76.4	— 62.6	— 51.5	— 41.9	— 33.4	— 24.7	— 17.7	— 8.9	— 1.4	+ 7.8	+ 16.8	+ 26.6	+ 36.5	+ 47.7	+ 59.0	+ 71.8	+ 86.7	+105.3	+130.5	+162.3	+199.5
55			—180.1	—133.6	—104.7	— 84.8	— 69.8	— 57.7	— 47.5	— 38.4	— 29.2	— 21.9	— 12.7	— 5.0	+ 4.5	+ 13.7	+ 23.7	+ 33.7	+ 45.1	+ 56.5	+ 69.4	+ 84.4	+103.1	+128.4	+160.3	+197.5
60			—197.3	—146.1	—114.7	— 93.1	— 76.9	— 64.0	— 53.0	— 43.4	— 33.7	— 26.1	— 16.5	— 8.6	+ 1.2	+ 10.6	+ 20.8	+ 30.9	+ 42.5	+ 54.0	+ 67.0	+ 82.1	+100.9	+126.3	+158.3	+195.5
65			—214.0	—158.6	—124.7	—101.4	— 84.0	— 70.2	— 58.6	— 48.4	— 38.2	— 30.3	— 20.3	— 12.2	— 2.1	+ 7.5	+ 17.9	+ 28.1	+ 39.9	+ 51.5	+ 64.6	+ 79.8	+ 98.7	+124.2	+156.3	+193.5
70				—171.1	—134.7	—109.8	— 91.2	— 76.5	— 64.1	— 53.4	— 42.7	— 34.5	— 24.1	— 15.8	— 5.4	+ 4.4	+ 15.0	+ 25.3	+ 37.3	+ 49.0	+ 62.2	+ 77.5	+ 96.5	+122.1	+154.3	+191.5
75				—183.6	—144.7	—118.1	— 98.3	— 82.7	— 69.7	— 58.4	— 47.1	— 38.7	— 27.9	— 19.4	— 8.7	+ 1.3	+ 12.1	+ 22.5	+ 34.7	+ 46.5	+ 59.8	+ 75.2	+ 94.3	+120.0	+152.3	+189.5
80				—196.1	—154.7	—126.4	—105.5	— 89.0	— 75.2	— 63.4	— 51.6	— 42.9	— 31.7	— 23.0	— 12.0	— 1.8	+ 9.2	+ 19.7	+ 32.1	+ 44.0	+ 57.4	+ 72.9	+ 92.1	+117.9	+150.3	+187.5
85				—208.6	—164.7	—134.8	—112.6	— 95.2	— 80.8	— 68.4	— 56.1	— 47.1	— 35.5	— 26.6	— 15.3	— 4.9	+ 6.3	+ 16.9	+ 29.5	+ 41.5	+ 55.0	+ 70.6	+ 89.9	+115.8	+148.3	+185.5
90				—221.1	—174.7	—143.1	—119.8	—101.5	— 86.4	— 73.4	— 60.6	— 51.3	— 39.3	— 30.2	— 18.6	— 8.0	+ 3.4	+ 14.1	+ 26.9	+ 39.0	+ 52.6	+ 68.3	+ 87.7	+113.7	+146.3	+183.5
95				—233.6	—184.7	—151.4	—126.9	—107.7	— 91.9	— 78.4	— 65.1	— 55.5	— 43.1	— 33.8	— 21.9	— 11.1	+ 0.5	+ 11.3	+ 24.3	+ 36.5	+ 50.2	+ 66.0	+ 85.5	+111.6	+144.3	+181.5
100				—246.1	—194.7	—159.8	—134.0	—114.0	— 97.5	— 83.4	— 69.5	— 59.7	— 46.9	— 37.4	— 25.2	— 14.2	— 2.4	+ 8.5	+ 21.7	+ 34.0	+ 47.8	+ 63.7	+ 83.3	+109.5	+142.3	+179.5
110				—271.1	—214.7	—176.5	—148.3	—126.5	—108.6	— 93.4	— 78.0	— 68.1	— 54.5	— 44.6	— 31.8	— 20.4	— 8.2	+ 2.9	+ 16.5	+ 29.0	+ 43.0	+ 59.1	+ 78.9	+105.3	+138.3	+175.5
120				—296.1	—234.7	—193.1	—162.5	—139.0	—119.7	—103.4	— 87.0	— 76.5	— 62.1	— 51.8	— 38.4	— 26.6	— 14.0	— 2.7	+ 11.3	+ 24.0	+ 38.2	+ 54.7	+ 74.5	+101.1	+134.3	+171.5
130				—321.1	—254.7	—209.8	—176.8	—151.5	—130.8	—113.4	— 96.0	— 84.9	— 69.7	— 59.0	— 45.0	— 32.8	— 19.8	— 8.3	+ 6.1	+ 19.0	+ 33.4	+ 50.1	+ 70.1	+ 96.9	+130.3	+167.5
140				—346.1	—274.7	—226.4	—191.1	—164.0	—141.9	—123.4	—105.0	— 93.3	— 77.3	— 66.2	— 51.6	— 39.0	— 25.6	— 13.9	+ .9	+ 14.0	+ 28.6	+ 45.5	+ 65.7	+ 92.7	+126.3	+163.5
150				—371.1	—294.7	—243.1	—205.4	—176.5	—153.0	—133.4	—114.0	—101.7	— 84.9	— 73.4	— 58.2	— 45.2	— 31.4	— 19.5	— 4.3	+ 9.0	+ 23.8	+ 40.8	+ 61.3	+ 88.5	+122.3	+159.5
160				—396.1	—314.7	—259.8	—219.7	—189.0	—164.0	—143.4	—123.0	—106.1	— 92.5	— 80.6	— 64.8	— 51.4	— 37.2	— 25.1	— 9.5	+ 4.0	+ 19.0	+ 36.2	+ 56.9	+ 84.3	+118.3	+155.5
170				—421.1	—334.7	—276.4	—234.0	—201.5	—175.0	—153.4	—132.0	—110.5	— 98.1	— 87.8	— 71.4	— 57.6	— 43.0	— 30.7	— 14.7	— 1.0	+ 14.2	+ 31.6	+ 52.5	+ 80.1	+114.3	+151.5
180				—446.1	—354.7	—293.1	—248.3	—214.0	—186.0	—163.4	—141.0	—114.9	—105.7	— 95.0	— 78.0	— 63.8	— 48.8	— 36.3	— 19.9	— 6.0	+ 9.4	+ 27.0	+ 48.1	+ 75.9	+110.3	+147.5
190				—471.1	—374.7	—309.7	—262.5	—226.5	—197.5	—173.4	—150.0	—119.3	—118.3	—102.2	— 84.6	— 70.0	— 54.6	— 41.9	— 25.1	— 11.0	+ 4.6	+ 22.4	+ 43.7	+ 71.7	+106.3	+143.5
200				—496.0	—394.7	—326.3	—276.7	—259.0	—208.0	—183.4	—159.0	—128.7	—120.9	—109.4	— 91.2	— 76.2	— 60.4	— 47.5	— 30.3	— 16.0	— 0.2	+ 17.7	+ 39.3	+ 67.5	-102.3	+139.5

5 QUADRANT ANGLE IN MILS KNOWING RANGE AND V. I. (Both in meters)

Table No. III

TARGET ABOVE GUN

Based on Experimental Firing at Springfield Armory during September, 1918—U. S. Cal. .30—Model 1906—150 grain bullet.

V. I.	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	2500	2600
1	10.	5.	3.3	2.5	2.	1.6	1.4	1.2	1.1	1.	.9	.8	.75	.7	.65	.625	.59	.55	.5	.5	.45	.45	.4	.4	.4	.4
5	50.8	26.7	19.4	16.4	15.3	15.2	15.9	17.3	19.2	21.6	24.6	28.5	32.9	38.2	44.1	50.9	58.5	67.3	76.3	86.5	98.2	112.0	129.5	153.6	184.3	221.5
10	100.8	51.7	35.7	28.9	25.3	23.5	23.1	23.5	24.7	26.6	29.2	32.4	36.8	41.7	47.5	54.0	61.5	70.1	78.9	89.0	100.6	114.3	131.7	155.7	186.3	223.5
15	150.8	76.7	52.7	41.4	35.3	31.9	30.2	29.8	30.3	31.6	33.7	36.8	40.6	45.3	50.8	57.1	64.4	72.9	81.5	91.5	103.0	116.6	133.9	157.8	188.3	225.5
20	200.8	101.7	69.4	53.9	45.3	40.2	37.4	36.0	35.8	36.6	38.3	40.9	44.5	48.9	54.1	60.2	67.4	75.7	84.1	94.0	105.4	118.9	136.1	159.9	190.3	227.5
25	250.8	126.7	85.7	66 4	55.3	48.6	44.5	42.3	41.4	41.6	42.8	45.1	48.3	52.5	57.5	63.3	70.3	78.5	86.7	96.5	107.8	121.9	138.3	161.9	192.3	229.5
30		151.7	102.7	78.9	65.3	56.9	51.7	48.5	46.9	46.6	47.3	49.3	52.1	56.0	60.8	66.4	73.2	81.2	89.3	99.0	110.1	123.4	140.4	164.0	194.3	231.5
35		176.7	119.4	91.4	75.3	65.2	58.8	54.8	52.5	51.6	51.9	53.3	56.0	59.6	64.1	69.5	75.2	84.0	91.9	101.5	112.5	125.7	142.6	166.1	196.3	233.5
40		201.7	135.7	103.9	85.3	73.6	65.9	61.0	58.0	56.6	56.4	57.5	59.8	63.2	67.4	72.6	79.1	86.8	94.5	104.0	114.9	128.0	144.8	168.2	198.3	235.5
45		226.7	152.7	116.4	95.3	81.9	73.1	67.3	63.6	61.6	61.0	61.6	63.7	66.7	70.8	75.9	82.1	89.6	97.1	106.5	117.3	130.2	147.0	170.3	200.3	237.5
50		251.7	169.4	128.9	105.3	90.2	80.2	73.5	69.1	66.6	65.5	65.8	67.5	70.3	74.1	79.0	85.0	92.4	99.7	109.0	119.7	132.6	148.9	172.4	202.3	239.5
55			185.7	141.4	115.3	98.6	87.4	79.8	74.7	71.6	70.0	70.0	71.3	73.9	77.4	82.1	87.9	95.2	102.3	111.5	122.0	134.9	151.1	174.5	204.3	241.4
60			202.7	153.9	125.3	106.9	94.5	86.0	80.2	76.6	74.6	74.1	75.2	77.4	80.8	85.2	90.8	97.9	104.9	114.0	124.4	137.2	153.2	176.6	206.3	243.4
65			219.4	166.4	135.3	115.2	101.7	92.3	85.8	81.6	79.1	78.3	79.0	81.0	84.1	88.3	93.8	100.7	107.5	116.5	126.8	139.4	155.4	178.8	208.3	245.4
70			235.7	178.9	145.3	123.6	108.8	98.5	91.4	86.6	83.7	82.4	82.9	84.6	87.4	91.4	96.8	103.5	110.1	119.0	129.2	141.7	157.6	180.8	210.3	247.4
75				191.4	155.3	131.9	116.0	104.8	96.9	91.6	88.2	86.6	86.7	88.2	90.8	94.5	99.7	106.3	112.7	121.5	131.6	145.0	159.8	182.9	212.3	249.4
80				203.9	165.3	140.2	123.1	111.0	102.4	96.6	92.7	90.8	90.5	91.7	94.1	97.6	102.7	109.1	115.3	124.0	134.0	147.3	161.9	185.0	214.3	251.4
85				216.4	175.3	148.6	130.3	117.3	107.9	101.6	97.3	94.9	94.4	95.3	97.4	100.7	105.5	111.8	117.9	126.5	136.4	149.5	164.1	187.1	216.3	253.4
90				228.9	185.3	156.9	137.4	123.5	113.6	106.6	101.8	99.1	98.2	98.9	100.7	103.8	108.5	114.6	120.5	129.0	138.8	151.8	166.3	189.2	218.3	255.4
95				241.4	195.3	165.2	144.6	129.8	119.0	111.6	106.4	103.2	102.1	102.4	104.1	106.9	111.5	117.4	123.1	131.5	141.1	154.1	168.4	191.3	220.3	257.4
100				253.9	205.3	173.6	151.7	136.0	124.6	116.6	110.9	107.4	105.8	105.9	107.4	110.0	114.4	120.2	125.7	134.0	143.5	156.4	170.6	193.4	224.3	259.4
110					225.3	190.2	166.0	148.5	135.7	126.6	120.0	115.7	113.5	113.0	114.1	116.2	120.3	125.8	131.0	139.0	148.3	161.0	175.0	197.6	228.3	263.3
120					245.3	206.9	180.3	161.0	146.8	136.6	129.1	124.0	121.2	120.2	120.7	122.4	126.2	131.4	136.3	144.0	153.1	165.6	179.4	201.8	232.3	267.3
130					265.3	223.6	194.6	173.5	157.9	146.6	138.1	132.3	128.8	127.0	127.4	128.6	132.0	137.0	141.6	149.0	157.9	170.2	183.8	206.0	236.3	271.3
140					285.3	240.2	208.8	186.0	169.0	156.6	147.2	140.7	136.5	134.5	134.0	134.8	137.9	142.5	146.9	154.0	162.7	174.7	188.2	210.1	240.3	275.3
150					305.3	256.9	223.1	198.5	180.1	166.6	156.3	149.0	144.2	141.6	140.7	141.0	143.8	148.1	152.2	159.0	167.5	179.3	192.6	214.8	244.3	279.3
160					325.3	273.6	237.4	211.0	191.2	176.6	165.4	157.3	151.9	148.7	147.4	147.2	149.7	153.7	157.4	164.0	172.2	183.9	197.0	218.5	248.3	283.2
170					345.3	290.2	251.7	223.5	202.3	186.6	174.5	165.6	159.6	155.9	154.0	153.4	155.6	159.3	162.7	169.0	177.0	186.5	201.3	222.7	252.3	287.2
180					365.3	306.9	266.0	236.0	213.4	196.6	183.5	174.0	167.2	163.0	160.7	159.6	161.4	164.8	168.0	174.0	181.8	191.0	205.7	226.9	256.3	291.2
190					385.3	323.6	280.2	248.5	224.5	206.6	192.6	182.3	174.9	170.2	167.3	165.8	167.3	170.4	173.3	179.0	186.6	195.6	210.1	231.1	260.3	295.2
200					405.3	340.2	294.5	261.0	235.6	216.6	201.7	190.6	182.6	177.3	174.0	172.0	173.3	176.0	178.6	184.0	191.4	200.2	214.5	235.3	264.3	299.2

(To face page 57)

3. Draw lines from the gun position to the target and from the gun position to the reference object. With a protractor, measure the angle formed by these lines.

4. Lay the gun on the reference object and turn off on the traversing dial an angle equal to the angle measured with the protractor. The gun will then be layed in the direction of the target.

3. To Obtain Elevation

1. On the map, measure the range from the gun to the target and note:

(a) The gun contour.

(b) The target contour.

The difference between the gun contour and the target contour is the vertical interval (V. I.)

2. Find the angle of site by the following formula:

Angle of site in mils equals

$$\frac{\text{Vertical interval} \times 1000}{\text{Range}}$$

3. From the Range Table find the Angle of Elevation corresponding to the range. Then determine the Quadrant Elevation from the following formula:

Quadrant Elevation equals Angle of Elevation $\pm$ Angle of Site.

In order to save calculating the angle of site and combining it with the angle of elevation to find the angle of quadrant elevation, the two preceding tables have been compiled.

Indirect Fire of Guns Controlled in Platoons

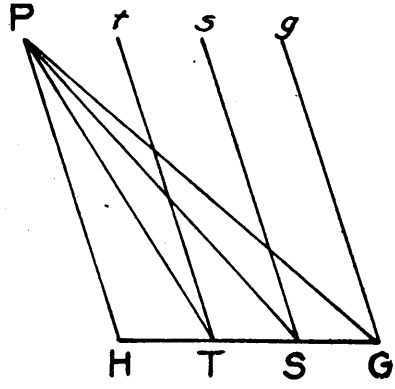
6. All the guns of one platoon are placed as nearly on a line as practicable. The guns are numbered from right to left. The position of one gun, known as the directing gun, is accurately located on the map. The left gun is usually used as the directing gun. All of the guns of the platoon are laid on parallel lines of fire initially, and zero aiming posts are placed in position. These lines are called the zero lines of fire of the platoon, and form the basis from which the line of fire of each gun is taken. The choice of the zero line is arbitrary, but if the left gun is the directing gun, it is generally the line from the left gun to the left end of the principal target.

The guns of a platoon are laid parallel as follows:

7. **By Compass.**—The compass bearing which it is desired to give the directing gun is determined. All guns are then given this same bearing.

This system is useful when it is impossible to obtain a suitable reference object or it is impossible to place the guns approximately in line.

8. **By Reference Object.**—When all of the guns are laid on the reference object the guns are not parallel unless the reference object is at an infinite distance or is in direct prolongation of the line of guns.



The figure shows the guns of a platoon:

(a) Laid on the R. O. at P.

(b) After distribution to obtain parallelism.

Parallax is the angle at any point subtended by any given line.

The angle of parallax for the platoon equals angle HPG.

To obtain the parallax for any gun, measure the angle HPG and divide it by the number of gun intervals: then multiply the result by the number of the gun from the directing gun. Thus the parallax of the gun at T is ⅓ of the angle HPG and the parallax of the gun at S is ⅔ of the angle HPG. The angle HPG may be measured on the map with a protractor or calculated by the mil formula, but the usual and more accurate way is to measure it by "reciprocal laying."

In "reciprocal laying" the flank guns lay on each other and then on the reference object, noting the angle thus swung through. This measures the angles PHG and PGH. By adding these two angles

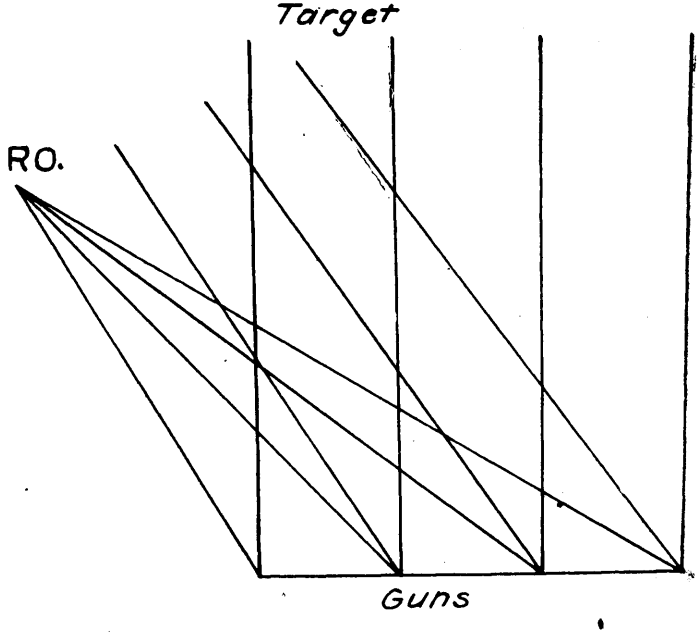
and subtracting their sum from 3200 mils the angle HPG is obtained.

Having found the parallax for each gun, the guns are then swung through these angles and parallel lines of fire are established.

9. Since the principal target, upon which the directing gun is usually laid to establish the zero line, is seldom on the line joining the directing gun with the reference object, it will usually be necessary to turn all of the parallel lines of fire through the angle which is necessary to place the directing gun on the desired line for the zero line. This angle is called the switch angle.

The following figure shows the lines of fire of a platoon:

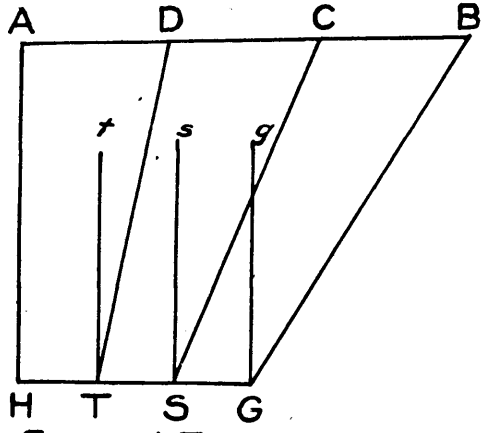
(a) Laid on the R. O.
(b) On parallel lines after the guns have been corrected for parallax.
(c) On parallel zero lines.



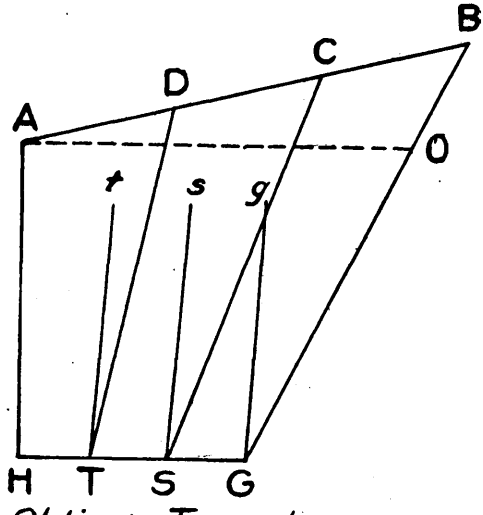
In the preceding figures the reference object has been shown in front of the guns and it has been necessary to open the lines of fire from the directing gun. When the reference object is in rear of the guns it becomes necessary to close the lines of fire toward the directing gun. The angle of concentration is found in exactly the same way as the angle of parallax with the reference object in front of the guns.

Distribution of Fire

10. Where the frontage of the target as viewed from the platoon, is greater than that of the platoon, it is necessary to distribute the fire of the guns from their parallel lines, in order to lay the fire of each gun at equal intervals along the target.



Frontal Target.



Oblique Target

The preceding figures show the lines of fire of a platoon:

(a) On their parallel zero lines with the directing gun on the left end of the target.

(b) After distribution of fire along (1) a frontal target, (2) an oblique target.

The angle BGg is the angle of distribution of the platoon for the target AB.

The angle DTt is the angle of distribution for the gun at T, and is $\frac{1}{3}$ of the angle of distribution of the platoon.

To find the angle of distribution for the target AB:

Subtract the frontage of the platoon HG from the width of the target AB. This gives gB.

Find from the mil formula what angle the line gB subtends at the range HA. This is the angle of distribution for the platoon.

Divide this angle by the number of gun intervals. The angle obtained is the angle of distribution for the gun at T.

Where the oblique target makes an angle within the line of fire that is not between 1330 and 1870 it is necessary to draw a line AO perpendicular to the line of fire and consider the length AO instead of AB in determining the angle of distribution. In the same way if the line of the platoon makes an angle with the line of fire that is not between 1330 and 1870 mils a perpendicular to the line of fire must be used instead of the length HG.

11. Concentration of Fire

Where the frontage of the target, as viewed from the platoon, is less than that of the platoon, it is necessary to concentrate the fire from their parallel lines. In that case the frontage of the target is subtracted from the frontage of the platoon. The angle is then determined as above but the parallel lines concentrated instead of being distributed.

12. Maintaining Laying

After a gun has been laid for direction and elevation by any of the means heretofore described, an aiming post is put out in order to maintain the direction and elevation. Without moving the gun, the rear sight slide is run up until the sights are aligned on the bulls-eye on the aiming post, and the laying is maintained by relaying on the bulls-eye between bursts.

In addition the elevation should be checked at least twice for each belt fired by means of the clinometer. Accurate relaying on the aiming mark between bursts is one of the most important conditions for accurate indirect fire.

13. Clearing Obstructions

In all cases where an obstruction exists between the gun and target, it is necessary to ensure that the shots will clear the obstruction before opening fire.

Case I.—When the obstruction is visible and not more than 100 meters from the gun.

Lay the gun with the correct elevation to fire on the target and look through the bore. If the axis of the bore clears the obstruction it is possible to fire on the target.

Case II.—When the obstruction is visible but more than 100 meters from the gun.

Lay the gun on the target. Without changing the laying of the gun, set the sight at the range to the obstruction. If the line of aim now clears the obstruction it is possible to fire on the target.

Case III.—When the obstruction is invisible.

Height of ordinate at obstruction equals

$$\frac{(\text{Quadrant Elevation—Tangent Elevation to obstruction}) \times \text{Range to obstruction.}}{1000}$$

This may be obtained from Table of Ordinates for positive quadrant elevation but must be calculated for negative. Having obtained height of ordinate at the range to the obstruction compare it with the height of the obstruction.

The simplest method is to use the trajectory graph.

14. Use of Trajectory Graphs

To find the quadrant elevation:

(1) Take the range to the target in meters and move up or down this vertical range line until the horizontal line is crossed which represents the height of the target above or below the gun.

(2) Take the trajectory through this point and follow it down or up until it crosses the line of zero elevation. The intersection of this line will show the equivalent range required. If the intersection falls between two vertical range lines, estimate the fractional part of the hundred meters.

(3) Look in the "Range Table" and obtain the angle of elevation in mils corresponding to the equivalent range. This angle can be obtained from the graph but for the extreme ranges not with the same degree of accuracy as from the table.

15. To find clearance of obstruction or friendly troops:

Follow the trajectory along and ascertain at what height it passes vertically above a point plotted to show distance and height (above or below gun) of an obstruction or friendly troops.

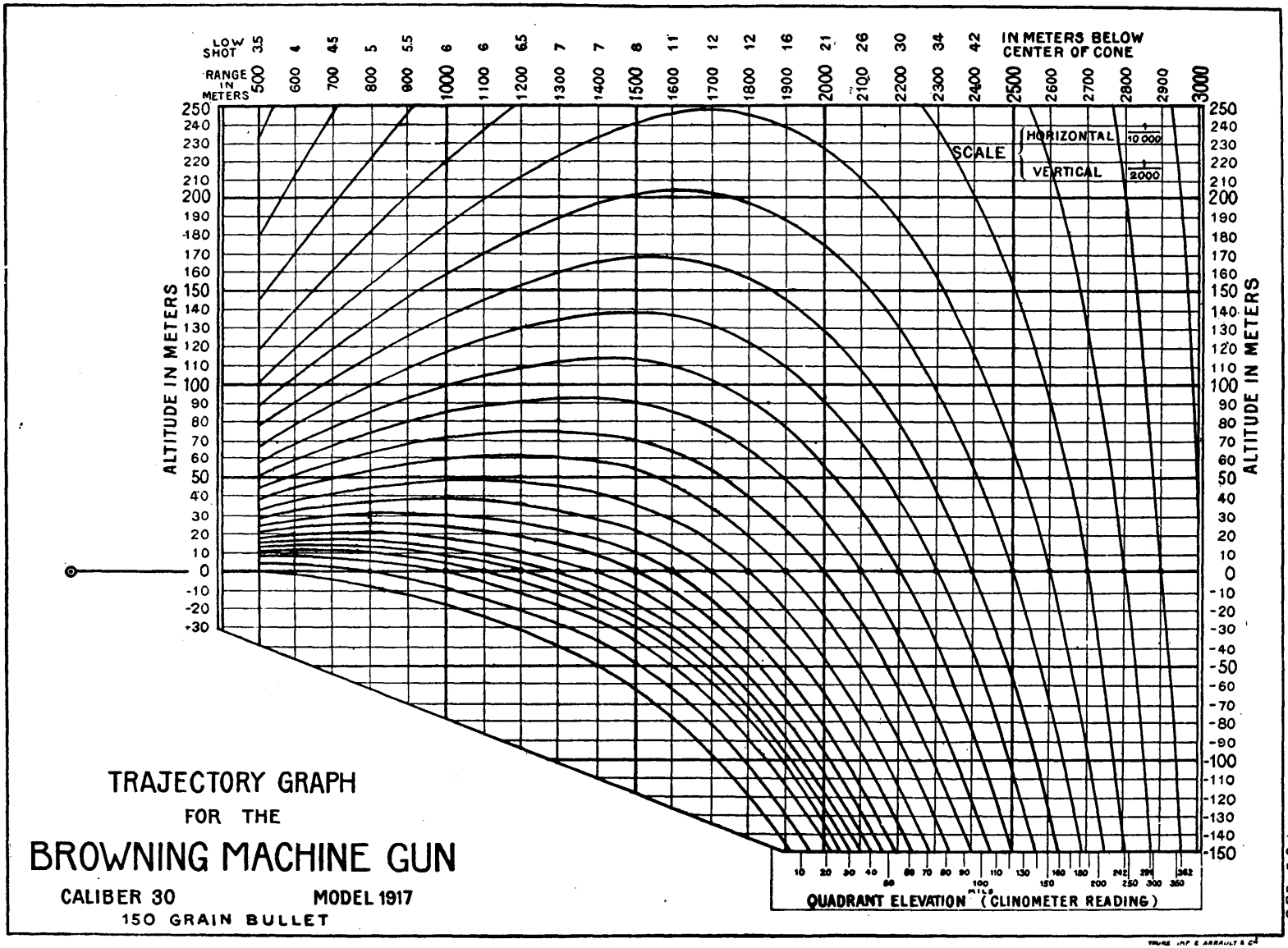
Example: Range to gun 1800 meters.
Height of target above gun 80 meters.
Obstruction 40 meters high at range of 1200 meters.

To find the quadrant elevation:

Follow up the 1800 meter vertical line until it cuts the horizontal line marked 80 meters. Take the trajectory through this point and follow it down until it crosses the line for zero elevation at 2160 meters. Reading the quadrant elevation by following the trajectory to the bottom of the graph gives the quadrant elevation 116 mils.

To find the clearance:

Follow the 2160 meter trajectory back to the 1200 meter range line. It intersects this line almost at the 100-meter horizontal line, giving a height of 100 meters. Since the obstruction is only 40 meters high at this point it clears it by 60 meters.



To face page 66.

Reference Sheets

FOR

T. T. 29, October 10, a.m., 1919.—Line Class.
T. T. 36, October 17, a.m., 1919.—Staff Class.

Conference.—Indirect Fire of Machine Guns, Part II.

References.—Supplement to Machine Gun Drill Regulations, 1917—Pages 179 to 185, 188 to 208, 48 to 58, 281 to 297.

Required at Conference:

Lesson Sheets.
Supplement to Machine Gun Drill Regulations, 1917.
Map of Fort Leavenworth and Vicinity, 1/21120.
Protractor graduated in mils.

Lesson Sheets

FOR

T. T. 29, October 10, a.m., 1919.—Line Class.
T. T. 36, October 17, a.m., 1919.—Staff Class.

Conference.—Indirect Fire of Machine Guns, Part II.

FIRE DIRECTION No. 3

Indirect Fire—Part II

1. Indirect Overhead Fire.

The clearance at any point over which fire is being directed is the vertical distance of the center of the cone above that point.

The procedure for finding clearance over friendly troops is exactly the same as that described under "Clearing Obstructions." Owing to its convenience, the graph is the usual method employed.

When indirect fire is carried out over friendly troops, the following rules must be adhered to in order to ensure the safety of the troops:

1. The following minimum clearance of the center of the cone are required:

Range to Friendly Troops	Minimum Clearance or Safety Angle	
	Meters	Mils
500 meters and under	10	
500 meters to 900 meters		20
900 meters to 1400 meters		27
1400 meters to 1800 meters		40
Over 1800 meters	Don't fire	

The safety clearances are based on:

(a) A possible 5% error in obtaining range from map.

(b) A possible 10% error in range due to worn barrel, bad holding, etc.

(c) A possible error of 11 mils, in play of the tripod.

(d) Allowance for the lowest shot of the cone.

2. Steps must be taken to prevent such extremes of traversing and searching as would violate above safety angles. This can best be accomplished by using traversing and elevating stops.

3. Calculations must be carefully checked and atmospheric conditions allowed for.

4. A rigid firing platform is essential. This is obtained by using the T base. Accuracy of clinometers should be tested frequently.

5. Elevations must be checked frequently by use of the clinometer.

6. Personnel must be highly trained in rapid and accurate aiming and relaying.

7. Maps must be accurate and the scale not smaller than 3 inches to the mile.

8. Worn barrels and tripods must not be used. Barrels that have fired more than 14,000 rounds are unsafe.

9. Friendly troops should be warned when firing is going to take place.

2. Searching Reverse Slopes

In order to search a reverse slope effectively, the gun must be placed at such a distance from the crest that the fall of the bullet is slightly steeper than the slope of the ground. If the reverse slope had no inequalities or shell holes the maximum result would be obtained when the fall of the bullet was exactly the same as the slope of the ground as in that case perfectly grazing fire would be possible. Since there are inequalities, however, the best results will be obtained when the fall of the bullet is greater than the slope of the ground. The best angle of impact is one that approximates 45 mils. Any angle between 30 and 60 mils gives excellent results and good results can be obtained with any angle between 15 and 75 mils.

There are two problems that may arise in connection with searching reverse slopes.

1. To determine the searching powers of a gun in position.

2. To find the best position from which to search a reverse slope.

The graph for searching reverse slopes enables one to meet both of these problems. See page 344, Supplement to M. G. Drill Regulations, 1917.

The graph comprises a series of curves representing various reverse slopes from 1 in 100 (10 mils) to 15 in 100 (150 mils). Ranges are represented by vertical lines. The points at which the slope curves cut the thick central horizontal line indicate ranges at which an angle of impact of 45 mils is obtained on various slopes with the gun and target on the same level. The diagonal lines represent the angle of impact when firing at any range, at any vertical interval, on any slope.

When reading the graph it should be borne in mind that the slope curves represent an angle of impact of 45 mils throughout their length, reading along the curves. Also, the diagonal lines, representing the angles of impact, give the angle when reading along the vertical range lines.

To Determine the Searching Powers of a Gun in Position

1. Find the point at which slope curve crosses the vertical range line.

2. Then if the gun is below the crest of the target, move down the range line from this point the required vertical interval. If the gun is above the crest, move up the range line.

3. The angle of impact obtained by firing at that range with that vertical interval on that particular slope can be read off along the diagonal lines.

Example: A reverse of slope of 12 on 100 is 1800 meters from the gun, the crest of the slope to be searched is 30 meters above the gun. Can the

slope be successfully searched from this gun position?

Find the 1800 meter vertical range line and note where it is cut by the "12" slope curve. From that point (the gun being 30 meters below the crest) move down the vertical line 30 meters.

The angle of impact, 50 mils, is then read off along the diagonal line. The angle of impact being within the searching limits, the target can be engaged with success.

To Find the Best Position From Which to Search a Reverse Slope

1. Find the point at which the particular slope curve cuts the central horizontal line. This gives the best range from which to engage the slope if gun and crest are on the same level.

2. From the map find the vertical interval between the crest and the gun.

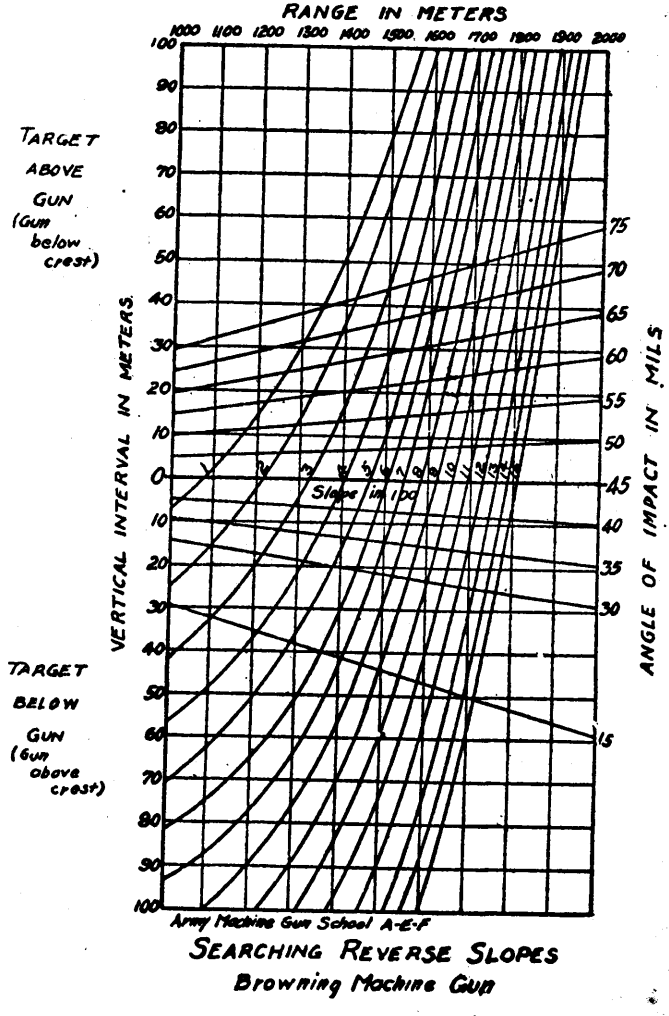
3. If the crest is above the gun move up the curve to the required vertical interval and read off the range along the vertical line. If the crest is below the gun move down to the required vertical interval.

Example: To search a reverse slope of 5 on 100.

The graph shows 1460 meters to be most suitable range from which to search the slope, providing the gun and crest are at the same level.

Assume that measuring back 1460 meters on the map, the crest of the slope is found to be 20 meters below the gun. Move down the curve to a vertical interval of 20 meters, and the final range at which the gun should be placed is found to be 1380 meters. If the contour reading at 1380 is materially different from that at 1460, this would cause a slight change of location.

Graph for searching reverse slopes.



3. Night Firing

When machine gun fire is to be carried out at night, the gun position should be located by day as it is usually impossible to locate it accurately at

night. When practicable the gun should be put in position and laid by day and aiming marks placed.

The most satisfactory aiming mark is a night firing box illuminated by a flash light that can be switched on and off from the gun position.

A flash light, covered with red paint or red cloth, is necessary for reading the traversing dial and clinometer.

Flash arrestors should be used and in addition it is absolutely necessary to screen the flash of the gun by wet canvass or sand bags, otherwise the gun will disclose its position and be destroyed.

There will be two general cases in the laying of guns for night firing:

1. The gun is laid at dusk and left in position for night firing.

2. The guns are laid during darkness.

Case I.—The gun is laid by either direct or indirect methods, depending upon whether the target is visible. In either case a record is made of the reading of the traversing and elevating dials and of the clinometer. An aiming mark is placed out, if the ground is such as to permit of its use.

As soon as it is dark the screen of wet sand bags should be put up. The night firing box, if one is to be used, should be placed in position and the rear sight adjusted for maintaining the laying.

Just before fire is opened the readings of traversing and elevating dials and clinometer should be checked to make sure that the gun has not been moved.

The above method should be followed by all guns for laying on their S. O. S. lines at night.

Case II.—Where guns must be laid during darkness only indirect methods of fire are practicable. The following preparations should be made by day:

Fire data should be calculated.

When practicable a stake should be driven marking the position of the gun and aiming post placed to show direction of fire.

When it is impracticable to place out aiming post by day, it will be necessary to lay the gun in direction by a luminous compass. Under such conditions an error of 10 to 20 mils may be expected and allowance be made for this by traversing.

By whatever method the gun is laid a record should be made of the readings of the traversing and elevating dials and of the clinometer. Laying should be maintained by use of the night firing box, when practicable, otherwise, by the dial readings and the clinometer.

4. Barrage Fire

A machine gun barrage is the fire of a large number of guns acting under a centralized control, and directed on to definite lines or areas. Barrages are classified as follows:

A standing barrage is one which is applied to a line or an area for a fixed period of time.

A creeping or rolling barrage is one which is applied progressively in distance, at indicated intervals of time to successive lines. Owing to the impossibility of searching many reverse slopes, and the difficult problem of clearance of friendly troops due to the low trajectory, creeping barrages will seldom be practicable with machine guns.

A box barrage is one applied to two or more sides of a position in such way as to isolate it.

A barrage of interdiction is one applied to a particular line, or point, to deny the use of that line, area or point to the enemy.

A protective barrage is one placed in front of a designated position to protect bodies of troops,

patrols, etc., from assault during the preparation of a position for defense or the execution of a specific mission.

Harassing fire when employed by a considerable number of guns is strictly speaking barrage fire.

Barrages are also classified as **Frontal, Oblique,** and **Enfilade,** depending upon the direction of the target from the guns.

The application of the various types of barrages will be considered under the tactical uses of machine guns. Only matters pertaining to the organization and application of barrage fire will be considered here.

5. The machine gun barrage is applied to an objective for a designated interval of time, at a prescribed time, or until the receipt of a prescribed signal. At the end of the interval of time or upon the receipt of the signal it ceases or shifts to another objective. Likewise changes of position of the guns executing the fire are provided for in a time schedule in order that the maximum number of guns may always be ready to fire. The ability to open fire quickly on new objectives not provided for in the time schedule depends upon the perfection of communications and the preparation of good fighting maps.

6. Frontage Covered by One Gun

Frontal barrage. The normal frontage for one gun executing a frontal barrage is as follows:

At ranges less than 1200 meters_____60 meters.
At ranges from 1300 to 1600 meters__50 "
At ranges from 1700 to 2000 meters____40 "
At ranges over 2000 meters_____30 "

If the objective is on a gentle reverse slope the danger space is increased and the frontage can be correspondingly increased.

Oblique barrages. For each 10 mils of obliquity 1 meter may be added to the frontages for a frontal barrage, until a maximum of 135 meters is reached.

Flank barrages. The frontage of a gun would seldom be less than the depth of the 75% zone for the particular range. Beyond the battle sight zone the frontage may vary from the depth of the 75% zone to 135 meters depending upon the number of guns available.

7. Organization of Guns for Barrage Fire

The battalion and the platoon are the primary groups in the conduct of barrage fire. The division machine gun officer assigns the general location of the different organizations, allots tasks in a general way and provides for the use of any guns outside the brigade sectors. He also makes provision for communication and for the formation of dumps of ammunition, water, oil, sand bags, etc. He provides for the reconnaissance and occupation of the orginal positions.

The machine gun battalion commanders allot in detail the different targets and provide for definite times of fire so as to conform to the movements of the infantry. They prescribe positions of the various platoons and the time for changes of positions. They make provision for the establishment of dumps and the supply of their battalions.

The division machine gun officer and machine gun battalion commanders prepare their orders in the form of plans and they are issued as **Annexes** to the division and brigade orders. These plans will usually cover not only the guns used for barrage fire, but the assignment of machine guns to assault battalions, connecting groups, etc.

The company commander issues a group organization chart. This chart allots definite tasks to the platoons, designates the number of guns to be used for each task, and the rates of fire. The company commander checks all computations of firing data by platoon commanders. He provides himself with a fighting map showing the zero lines and tasks of his platoons, the positions occupied by the various platoons and the routes to them. He is responsible for the establishment of dumps and the supply of his company.

8. Laying and Fire Control

Although machine gun barrage fire can be carried out by controlling the fire of each gun singly, experience has shown that the barrage so produced is not flexible, that calculations are laborious, much time is required, and control is difficult. The usual method of barrage fire is by guns controlled by platoons.

The details of the computations and the mechanical operations of laying are carried out as in ordinary indirect fire. Fire is directed and controlled by means **Platoon Charts** and **Gun Charts.** (See procedure in calculating data for a barrage position.)

A **Fighting Map** is also made by the platoon commander in order that he may open fire quickly on targets not provided for on the charts. When targets not given on the charts are fired upon, the fire is directed and controlled as prescribed in barrage drill. The following command illustrates the method of firing on a new target not on the chart.

1. All guns on zero. 2. All guns 60 mils right. 3. Open 3 mils. 4. Elevation 30 mils. 5. Commence firing.

Rates of Fire

To prevent waste of ammunition, to ensure time for relaying and oiling, and to enable proper amount of ammunition to be provided in advance, rates of fire must be laid down for rigid observance by each gun. The normal rates of barrage fire are:

Slow Fire.—60 to 75 rounds per minute. This is the rate used for prolonged barrage fire.

Medium Fire.—120 to 150 rounds per minute. This rate cannot be maintained for more than 30 minutes.

Rapid Fire.—250 to 300 rounds per minute. This rate is used in response to S. O. S. calls and for the first minute of two of a barrage to cover an attack. It can be maintained for only a few minutes.

Harassing Fire.—Usual rate 1,000 rounds per hour. The fire is intermittent and may be carried out at any rate.

In determining upon the rate of fire, the following factors must be considered:

Tactical requirements of the barrage.

Frontage per gun.

Length of time of the barrage.

Ammunition available.

Rate at which belts can be refilled.

Availability of spare barrels to replace worn barrels. The two most important factors in the life of a barrel is the temperature of the water, which depends on the rate of fire, and the oiling. When guns are fired intermittently, with the water below the boiling point and barrels oiled frequently, the life of a barrel is 20,000 to 25,000 rounds. Fired at a rate exceeding 3,500 rounds per hour but with frequent oiling of the barrel, the life of the barrel is 12,000 to 15,000 rounds. Failure to oil the barrel will reduce the life of the barrel by 3,000 to 4,000 rounds.

9. Procedure in Calculating Data for a Barrage Position Involving Indirect Fire From a Map

The following example illustrates the method employed in calculating fire data for successive barrages and making charts:

EXAMPLE:

Map Reference:—Topographical Map Fort Leavenworth and vicinity 1/21120.

	A	344.54—752.82
		344.72—752.82
Co-ordinates of Targets:	B	343.85—752.82
		343.97—752.85
Co-ordinates of Barrage Position:		344.70—750.68
		344.77—750.68
Co-ordinates of Friendly Troops:		343.75—752.20
		344.78—752.20
Co-ordinates of Reference Object:		345.28—751.42

Platoon of 4 guns. No. 4 directing gun.
Barometer, 31 inches.
Thermometer, 90 degrees F.
Wind 10 miles per hour at 4:00 o'clock.

TARGET A—DIRECTION

(1) Plot barrage position, targets, friendly troops, and reference object. Draw lines connecting directing gun with targets, R. O., and friendly troops.

(2) Measure ranges as follows:

From gun to targets:	Target A	1950 meters.
	Target B	2200
From gun to reference object:		870 for target A.
From gun to friendly troops:		1380 for target A.
		1500 for target B.
Platoon front:	60 meters.	
Target front A:	160 meters.	
Target front B:	120 meters.	

(3) Draw zero line of directing gun through points 344.70—750.68 and 344.54—752.82. The same in this case as to Target A.

(4) Draw line connecting right gun with reference object. Measure parallax of No. 1 gun (right gun) with protractor ---------- 60 mils.

Parallax of No. 2 gun---------- 40 mils.
Parallax of No. 3 gun---------- 20 mils.
Parallax of No. 4 gun---------- 0 mils.

(5) Measure switch angle between line from the directing gun to R. O. and the zero line 755 mils, left.

Switch for No. 4 gun		755 mils left.
Switch for No. 3 gun	755—20	735 mils left.
Switch for No. 2 gun	755—40	715 mils left.
Switch for No. 1 gun	755—60	695 mils left.

(6) Distribution for right flank gun No. 1 Target frontage—Platoon frontage 160—60 100 meters.

$$M=\frac{W}{R}\times 1000=\frac{100}{1950}\times 1000=51 \text{ mils}$$

Distribution for No. 2 gun----------34 mils.
Distribution for No. 3 gun----------17 mils.
Distribution for No. 4 gun---------- 0 mils.

(7) Correction for direction:

Drift----------2.5 mils left.

Lateral wind component

$$\frac{1950\times 10}{3600}\times\frac{7}{8}=4.7 \text{ mils right.}$$

(8) Deviation from zero line:

No. 4 0 Distribution, 4.7 mils right wind, 2.5 mils left drift, 2.2 mils right.

No. 3 17 mils right Distribution, 4.7 right wind, 2.5 left drift, 19.2 right.

No. 2 34 mils right Distribution, 4.7 right wind, 2.5 left drift, 36.2 right.

No. 1 51 mils right Distribution, 4.7 right wind, 2.5 left drift, 53.2 right.

ELEVATION—TARGET A

(9) Gun contour 840 feet.

Target contour, Nine o'clock end 900 feet.
Three o'clock end 870 feet.
Friendly troops contour 920 feet.

Vertical interval from guns to target:

No. 4 ---------- 18 meters.
No. 3 ---------- 15 meters.
No. 2 ---------- 12 meters.
No. 1 ---------- 9 meters.

Vertical interval from guns to friendly troops 24 meters.

(10) Correct measured range for atmosphere.

Barometer correction $1.5 \times 1 \times 19.5$. 30 meters to be added.

Thermometer correction $.1 \times 20 \times 19.5$. 39 meters to be deducted.

Wind correction

$$\frac{1950-400}{200} \times 10 \times \tfrac{1}{2}.$$ 39 meters to be deducted.

Net correction 30 —39 —39 —48 meters.
Correct Range 1950—48 1902 meters.

(11) Quadrant elevation from graph:

No. 4 gun ---------- 92 mils.
No. 3 gun ---------- 90 mils.
No. 2 gun ---------- 88 mils.
No. 1 gun ---------- 86 mils.

(12) Clearance of center shot of No. 1 gun (the one with lowest trajectory). Height of trajectory at 1380 meters—Vertical interval from gun to friendly troops 64—24 —40 meters.

Therefore it is safe to fire.

TARGET B—DIRECTION

(13) To obtain deviation of directing gun from its Zero Line, measure with protractor the angle between Zero Line and line from Directing Gun to left element of Target B 310 mils.

(14) Distribution for right flank gun No. 1.

$$\frac{120-60}{2200} \times 1000 = 27 \text{ mils right.}$$

No. 2 gun ---------- 18 mils.
No. 3 gun ---------- 9 mils.
No. 4 gun ---------- 0 mils.

(15) Correction for direction:

Drift ---------- 2.5 mils left.

Lateral component of wind $\frac{2200 \times 10}{3600} = 5.$ mils right.

(16) Deviation from Zero Line.
No. 4 gun 310 left, 0 Distribution, 5. mils right wind, 2.5 mils left drift, 307.5 mils left.
No. 3 gun 310 left, 9 mils Distribution, 5. mils right wind, 2.5 mils left drift, 298.5 mils left.
No. 2 gun 310 left, 18 right Distribution, 5 right wind, 2.5 left drift, 289.5 mils left.
No. 1 gun 310 left. 27 right distribution, 5 right wind, 2.5 left drift, 280.5 mils left.

ELEVATION—TARGET B

(17) Gun contour 840 feet.
Target contour nine o'clock end 900 feet.
three o'clock end 880 feet.
Friendly troops contour 924 feet.
Vertical interval from guns to target:
No. 4 gun_____18 meters.
No. 3 gun_____16 meters.
No. 2 gun_____14 meters.
No. 1 gun_____12 meters.
Vertical interval from gun to friendly troops, 25 meters.

(18) Correct measured range for atmosphere.
Barometer correction $1.5 \times 1 \times 22 = 33$ meters. add.
Thermometer correction $.1 \times 20 \times 22 = 44$ meters. deduct.
Wind correction
$\frac{2200-400}{200} \times 10 \times \frac{1}{2} = 45$ meters. deduct.
Net correction 33—45—45 —56 meters
Corrected range 2200—56 2144 meters
Quadrant elevation from graph:
No. 4 gun_____122 mils.
No. 3 gun_____121 mils.
No. 2 gun_____120 mils.
No. 1 gun_____119 mils.

(19) Clearance of center shot over friendly troops.
Height of trajectory at 1500 meters—vertical interval gun to friendly troops 110—25=85 meters. Therefore it is safe to fire.

GUN CHART

Gun No. 1, Platoon, 1st Platoon, Co. B, 1st M. G. Bn., Platoon "A"

Commander of Gun:
Corp. A. L. Smith, Platoon, 1st Lieut. A. L. Jones, 1st M. G. Bn.

Magnetic bearing of zero line 6182 mils. Date, Oct. 8, 1919.
Reference Object: S. W. Corner Burn's House. Angle of zero line from R. O. 695 mils Left.

Task	Clock Time	Zero Time	Angle from Zero Line	Q. E. Mils	Traverse Mils	Search Mils	Rate of Fire	Remarks
A	6:30 a.m. 7:04 a.m	H to H 34	53.2 Right	86	15 R 15 L	4 Up 4 Down	120	
B	7:06 a.m. 7:28 a.m.	H 36 to H 58	280.5 Left	107	15 R 15 L	4 Up 4 Down	150	
C								
D								

MACHINE GUN FIRE ORGANIZATION ORDERS

Group	Commander	Platoons	Composition of Platoons	Approximate Positions	Tasks	No. of Guns	Zero Time	Rate of Fire	Remarks
Co. B., 1st M. G. Bn.	1st Lieut. A. C. Jones, 1st M. G. Bn.	"A"	1st Platoon, Co. B, 1st M. G. Bn.	344.70—750.68 344.77—750.68	344.54—752.82 344.72—752.82	4	H—H+34	120	
					343.85—752.82 343.97—752.85	4	H+36—H+58	150	
		"B"							
		"C"							

MAP USED: Topographical Map Fort Leavenworth and Vicinity 1/21120.

DATE 10/8/19

SIGNATURE: J. K. Hall, Capt., 1st M. G. Bn.

To face page 84.

PLATOON CHART

Platoon "A"	Place, Flint's	Date October 8, 1919.
Composition 1st Plat., Co. B, 1st M. G. Bn.	Grid Bearing to R. O. 675 Mils	Tasks
Commanded by 1st Lt. A. C. Jones, 1st M. G. Bn.	Magnetic Bearing of Zero Line 6182" Grid Bearing of Zero Line 6330 Mils	A 344.54—752.82 A 344.72—752.82
Location of D. G. 44.70—50.68	Angle of Switch of D. G. 755 Mils	B 343.85—752.82 B 343.97—752.85
No. of Directing Gun 4	Platoon Parallax 60 Mils	
Platoon Front 60 Meters	Zero Line from 44.70—50.68 through 44.54—52.82.	

No. of Barrage	No. of Guns	Targets	Clock Time	Zero Time	Deviation from Zero Mils	Distribution in Mils	Range in Meters	V. I. Meters (Plus or Minus)	Q. E. in Mils	V. I. to F. T. Meters	Range to F. T. Meters	Clearance of C. S. Meters	Rate of Fire R. P. M.
A	4	344.54—752.82	6:30 a.m.	H				No. 4 18	92—				
A	4	344.72—752.82	7:04 a.m.	H 34	0	51	1950	No. 1 9	86	24	1380	40	120
B	4	343.85—752.82		H+36				No. 4 18	110—				
B	4	343.97—752.85		H+58	310	24	2200	No. 1 12	107—	25	1500	85	150
C													
D													
E													
F													
G													
H													
I													

Gun Angles — Gun Elevations

	4	3	2	1	4	3	2	1
A	2.2	19.2	36.2	53.2	92	90	88	86
B	307	298	289	280	122	121	120	119
C								
D								

This shows the angle in mils from Zero Line for each gun. From this the barrage chart for each gun is compiled and issued to the gun commanders. In addition, these angles may be shown in divisions of the scale.

Remarks

(To face page 84)

A. C. Jones, 1st Lieut., 1st M. G. Bn.

Reference Sheet

Conference.—Use of Machine Guns in Advance Guards, Rear Guard, Connecting Groups, Outposts and Combat in Woods. Employment of Machine Guns for Anti-Aircraft Defense.

T. T. 32, October 13, a.m., 1919.—Line Class.

References:

Machine Gun Drill Regulations, 1917, paragraphs 279 to 314.

Infantry Drill Regulations, A. E. F., Part II, paragraphs 852, 864, 923, 970, 972.

Field Service Regulations, 41, 56, 63.

Balck, Vol. i, Infantry, pages 293 to 295.

Required at Conference:

Lesson Sheets.

Lesson Sheets

Conference.—Use of Machine Guns in Advance Guards, Rear Guards, Connecting Groups, Outposts and Combat in Woods. Employment of Machine Guns for Anti-Aircraft Defense.

T. T. 32, October 13, a.m., 1919.—Line Class.

Use of Machine Guns in Advance Guards, Rear Guards, Connecting Groups, Outposts and Combat in Woods. Employment of Machine Guns for Anti-Aircraft Defense

ADVANCE GUARDS

1. The duties of an advance guard are:

(1) To guard against surprise and furnish information by reconnoitering to the front and flanks.

(2) To push back small parties of the enemy and prevent their observing, firing upon, or delaying the main body.

(3) To check the enemy's advance in force long enough to permit the main body to prepare for action.

(4) When the enemy is encountered on the defensive, to seize a good position and locate his lines, care being taken not to bring on a general engagement unless the advance guard commander is empowered to do so.

(5) To remove obstacles, repair the road, and favor in every way possible the steady march of the column.

2. Machine guns can assist very materially in performing the first four of these duties and should always be assigned to advance guards the size of which is sufficient to guarantee reasonable safety to the machine guns while in draft on the road. The factor that will determine whether it is practicable to assign machine guns to an advance guard is usually the distance from the point to the tail of the reserve. If this distance is as great as 700 or 800 yards machine gunners in draft on the road

will usually be able to remove the guns from the carts before coming under annihilating fire. Machine gunners cannot be expected to advance their guns by hand and keep up with a marching command all day. This will be possible for very short marches in which case a smaller advance guard could have machine guns assigned to it.

The company of infantry is the smallest unit that will ordinarily have sufficient depth when acting as an advance guard for the assignment of machine guns with carts. Where sufficient guns are available, a platoon of machine guns is a suitable number for assignment to an advance guard consisting of a company. A battalion acting as an advance guard would usually have a machine gun company assigned to it. A force larger than a battalion would usually have a machine gun company for each battalion which is likely to have to perform the duties of an assaulting battalion.

The nature of the terrain will be a large factor in determining the number of machine guns to be assigned to an advance guard. Where the country is rolling and affords excellent opportunities for flanking and overhead fire, the proportion of guns to infantry should be large. Where the country is so flat or densely wooded as to preclude the use of overhead fire, number of guns would be relatively smaller.

3. Where the advance guard consists of a battalion of infantry or a smaller force, the machine guns as a rule will form part of the reserve. Where the advance guard consists of two or more battalions, the machine guns will usually form part of both the support and reserve.

4. In addition to the necessity for providing for the safety of the machine guns there are other

reasons for not pushing the guns too far forward. Very frequently there will be high ground on the flank which will offer the most favorable opportunity for the use of machine guns. If the guns are too far forward at the time the enemy opens fire it will be impossible for them to occupy this ground as they would have to move by the flank under fire. On the other hand if they are farther to the rear they will usually be able to occupy the high ground under cover. It is a serious mistake, however, to place the guns too far to the rear as prompt action is one of the most essential factors in the work of advance guards.

5. The employment of machine guns with an advance guard will follow the general lines laid down for their employment in the offensive or defensive depending upon whether the mission of the advance guard is temporarily offensive or defensive. There are essential differences, however. Very frequently their mission will not be to seek a decision but to force a premature deployment, or otherwise to delay the enemy, or to gain a temporary advantage. For this reason machine guns should enter the action early and should make the maximum use of long range fire. Delaying the enemy long enough to permit the infantry to gain and hold important ground may be of far greater value than inflicting more serious losses on the enemy by holding the fire until he is closer.

Holding good defensive positions, bridges, defiles, or other features of the terrain essential to the success of the advance guard or main body will be some of the most important missions assigned to machine guns.

6. The advance guard on the defensive will deploy on a wider front than that ordinarily allotted to a force of its size on the defensive, so as

to secure the position, completely engage the enemy, or deceive him and force an early deployment. It will be disposed of in groups more or less detached, which will occupy those positions the possession of which will most protect the deployment of the main body. The machine guns will be placed to cover the most important avenues of approach. This will cause the machine guns to be more widely scattered than they would usually be in a defensive position where reinforcements could not be quickly expected. Advance guard work calls for great initiative and boldness on the part of the junior officers and noncommissioned officers of machine gun organizations.

7. Balck says: "Machine guns will be able to bring all their powers into play to the best advantage at the beginning of a rencontre, when, from their position as far forward as possible in the column, they are pushed to the front to occupy important points and compel the enemy to deploy his infantry. The commander should, however, endeavor to withdraw the machine guns from the fight as soon as his own infantry has deployed, in order to avoid involving the guns in a protracted fire fight necessitating the expenditure of a great amount of ammunition and in which the accuracy of their fire would gradually suffer."

Colonel Applin of the British Army expresses a similar opinion.

It is believed that the policy of withdrawing the machine guns is in direct opposition to the best thought on the use of machine guns today. It is recognized as a principle that they must exert a continuous influence in the fight and that their use must not be limited to critical stages of the action.

8. Where machine guns form part of the support the commander of the guns so assigned should remain with the commander of the support until the time for the machine guns to go into action. Where no machine guns are assigned to the support, the machine gun commander would be with the advance guard commander. Such an arrangement enables the machine gun commander to learn the intentions of the commander and to get the guns into action with the minimum loss of time, when the emergency demanding their use arises.

Rear Guards

9. The purpose of the rear guard is to protect the main body from attack in rear. In retreat, it checks pursuit and enables the main body to increase the distance between it and the enemy and to reform if disorganized. It is important to offer the greatest opposition possible to the enemy but to make good the retreat.

10. Machine guns by reason of their ability to suddenly develop a concentrated and intense fire are peculiarly fitted for compelling the enemy to deploy at long range. They also can withdraw much more readily than a body of infantry capable of developing an equal volume of fire. These characteristics make them extremely valuable to rear guards. They should habitually form a part of any rear guard larger than a platoon of infantry. A section of machine guns may be employed profitably with a rear guard consisting of a platoon of infantry. The proportion of machine guns to infantry should not be less than a machine gun company for each battalion of infantry in the rear guard and will frequently be much greater.

11. When it is not necessary to withdraw in deployed lines, the greater part of the rear guard

marches in column of route on the road, taking up a formation of an advance guard faced to the rear. When the rear guard is in this formation machine guns should as a rule form part of both the support and reserve. There is not the same danger of surprise as in an advance guard and the machine guns can safely be much nearer the rear party of the rear guard than the point of the advance guard.

12. When the rear guard retires in column of route but under menace of immediate attack by the enemy, the machine guns should retire by echelon, part of them being always in position to protect the remainder of the rear guard by fire from commanding positions on the flank or in the rear. These echelons should preferably be platoons in order that there may always be an officer responsible for the conduct of the machine guns. When guns move to the rear an officer should precede them to select the succeeding position and prepare fire data.

13. The most important points in the selection of positions are the following:

(1) A good field of fire at long and medium ranges. The question of a field of fire at short ranges will usually be relatively unimportant as the guns will withdraw, as a rule before the enemy reaches close range.

(2) Positions chosen should be on the flank of the line of march unless the ground is suitable for overhead fire.

(3) Covered lines of retreat. Only with good covered lines of retreat that have been reconnoitered by a machine gun agent will it be possible for the guns to fire up to the last moment and then safely withdraw.

14. If the rear guard becomes engaged with the enemy, the distribution of the machine guns is quite different from what it would be in a defensive position. There is not nearly so much distribution in depth. The purpose is to quickly develop the maximum fire power so most of the guns will be in the fight and very few in reserve. There will usually be two lines of guns retiring alternately, with a possible third where the time necessary to move from one position to another is considerable. Machine guns should never make short retirements. When they retire they should move such a distance to the rear as will give them time to occupy the position without haste, obtain the fire data, and prepare cover where necessary. This enables them to remain in action the maximum amount of time.

15. If the enemy is bold and aggressive so that breaking off the engagement is difficult, every effort should be made to surprise him at short range, guns being placed in carefully concealed positions commanding important avenues of approach. One successful surprise by machine guns will make the boldest adversary cautious.

16. The fullest use must be made of the carts. Machine guns carried by hand cannot possibly continue to possess the necessary mobility during a prolonged rear guard action. The question of ammunition supply will be a serious one as a rear guard action makes greater demands on the machine guns than any other.

17. Close communication with the infantry is of the greatest importance. There should always be a small amount of infantry left to cover the withdrawal of the machine guns without an infantry escort has been assigned.

18. The probable loss of guns must never deter

the machine gunners from remaining long enough to insure the retirement of the main body.

Marches

19. On good roads the marching ability of machine guns will be slightly greater than infantry as the men do not carry rifles. On bad roads or across country the machine guns will be less mobile than infantry. Whenever conditions are such that the guns must be carried by hand the mobility of machine gun organizations is very much reduced and they cannot be expected to keep up with infantry for any great distance.

20. In marches where there is no tactical situation envolved, machine guns should ordinarily march in rear of the infantry in the column. This will add greatly to the comfort of the infantry owing to the amount of dust raised by the carts.

20. Where an engagement is probable, all or a large percentage of the machine guns in the main body should be near the head of the organizations of which they form a part. A brigade machine gun battalion would therefore be anywhere from the head of the brigade to the rear of the leading regiments of infantry. Machine guns near the head of the column will be able to come into action quickly and by long range fire, protect the infantry during the early stages of its deployment.

22. The division machine gun battalion, owing to the fact that it is motorized, cannot advantageously march with infantry. It will therefore ordinarily be at the rear of the column where it can regulate its own pace more or less independently of the infantry. Its great mobility will enable it to move quickly to any part of the battle field so that its position at the rear of the column will not be a serious disadvantage.

Connecting Groups

23. Both in the offensive and defensive connecting groups are used for maintaining communication between regiments, brigades or divisions. These groups vary in size from a platoon of infantry and a section of machine guns to a battalion of infantry and a company of machine guns.

24. The mission of machine guns assigned to connecting groups is usually essentially defensive in character. The principal uses to which they will be put are:

(1) Filling a gap.
(2) Protecting the flanks of the organizations with which they are maintaining connection.

The chief offensive use of these groups will be for executing local counter-attacks.

Outposts

25. The ease with which a machine gun can be concealed, its mobility, its adaptability to night firing, and its concentration of fire on a narrow frontage makes it the ideal resisting weapon for use with an outpost for the purpose of covering roads, bridges, defiles, or other marked lines of approach.

26. A judicious use of machine guns stiffens the line of resistance and permits the employment of the minimum number of riflemen. However, the machine gun is solely for increasing the stopping power of the outpost, and in return must have the protection of the outpost.

27. The size and disposition of the outpost with the number of guns assigned to the different subdivisions thereof, depends upon many circumstances, such as the size of the main body, the proximity of the enemy, and the situation with re-

spect to him, the nature of the terrain, etc. In general the ratio of machine guns to infantry in the outposts will be greater than in advance guards.

28. The greater part of the machine guns will be assigned to the support and will be placed at or near the line of resistance. If the number of guns is sufficient, machine guns should be so placed as:

(1) To command all avenues of approach, such as roads, defiles, or favorable places for attack.

(2) To command any neighboring ground from which the enemy would be able to either view or annoy the main body.

(3) To sweep thoroughly all ground between the outguards, and to bring an effective cross-fire to bear on as much of it as possible.

29. Machine guns will not ordinarily be assigned to small outguards but may be assigned to important pickets or detached posts. Automatic rifles are better suited for furnishing the fire power for small outguards. Machine guns should be used with small outguards, only where they would cover such important avenues of approach that their usefulness would more than counter balance the danger of their capture.

30. Machine guns should usually be placed by pairs. Where natural cover is lacking, the guns should always be dug in and protection provided for the men.

31. Where the number of guns assigned to the outposts is too small to permit of the distribution indicated above, emplacements should be prepared or firing positions reconnoitered, the guns being held at a central point in rear from which they can

be moved easily and quickly to that portion of the line where they are needed.

When the outpost line is thinly held it is advisable to assign some machine guns to the reserve so that they will be available for reinforcing any part of the line. In such cases emplacements should be prepared or firing positions reconnoitered as indicated above.

32. Unless an attack is imminent, machine guns assigned to the outpost may not be mounted during the day if there is any danger of disclosing their position.

33. The night position of a gun will often be different from the one used during the day. The night position should be selected and all arrangements made for firing during the day. The gun should be mounted in its night position at dusk. It should be loaded at this time. Indirect fire data must be prepared for covering all approaches or targets assigned to the gun.

34. Machine guns assigned to pickets will frequently be used to place harassing fire at night on important roads to deny their use to the enemy beyond our outguards or patrols.

Harassing fire may also be used to cover difficult ground in front of the outpost that is not visited by our patrols.

35. The orders given section leaders or the corporal of any detached gun squad detailed for duty with any fraction of an outpost should be clear and definite and should include:

(1) Information as to the situation sufficiently complete to enable him to act intelligently upon his own initiative should the necessity arise.

(2) The exact mission of the guns and the conditions under which they are to open fire.

(3) The location of adjoining guns.

(4) The disposition to be made of carts.

(5) Where to communicate with the commander of the subdivision of the outpost to which assigned and with the next higher machine gun commander.

(6) Where to obtain rations, ammunition, and supplies.

36. The machine gun commander upon arriving at the designated subdivision of the outpost to which he is assigned ascertains the location of the neighboring infantry groups and sentinels, and the routes of patrols and hours of departure and return. He then:

(1) Selects firing positions for his guns.

(2) Arranges a system of signals for communication between himself and his guns.

(3) Studies his sector of fire, prepares range cards, and points out to the corporals all of the points shown on range cards.

(4) Marks out the limits of his sector of fire by stakes.

(5) Provides for protection of the gun and of the men.

(6) Makes preparation for night firing.

(7) Locates neighboring guns and arranges for mutual support.

(8) Provides for the necessary ammunition supply.

(9) Posts his sentinels at the gun or near the gun emplacements (one by day and two by night).

(10) Holds the other members of the gun squads at a convenient distance from the guns.

(11) Sends carts to the designated point.

(12) Explains the situation fully to his men and makes sure that each understands his duties.

(13) Arranges for communication with the subdivision of the outpost to which assigned and with his next higher machine gun commander.

(14) In general, takes every possible means to co-ordinate his work with the unit to which assigned.

37. Sentinels over machine guns on outpost duty have the same orders as in a defensive position.

Attack

38. Woods may be attacked in two very different ways:

(1) They may be enveloped and then attacked from the rear.

(2) A direct attack may be made on the woods.

39. When the woods are to be enveloped machine gun fire should be concentrated on the front and flanks of the woods. Long range indirect fire can also be used to cover the exits from the woods thus preventing reinforcements and barring the lines of the retreat to the defenders. As the attack progresses this long range fire on the exits can be replaced by fire from the flanks by machine gun organizations that have advanced considerably.

By this means fire can be kept on the exits almost up to the time the attacking infantry enters the woods from the rear.

40. A direct attack on a woods comprises three general phases:

(1) The advance over open ground to the edge of the woods.
(2) The advance through the woods.
(3) Egress from the woods.

41. During the advance of the infantry over the open ground the machine guns should bring a heavy fire, preferably flanking or direct overhead, on the front of the woods and should at the same time use long range indirect fire to cover the exits from the woods. When the edge of the woods is carried by the infantry, the majority of the machine guns should be kept in a position to repel a possible counter-attack until the infantry has reorganized for its advance through the woods. A small number of guns, usually not exceeding the number assigned to assaulting battalions, should be pushed forward to the woods to give immediate protection to the infantry during reorganization.

42. If the woods are open and the country rolling, the machine guns would support the infantry as in the attack on open ground. If the woods are dense the machine guns should follow closely behind the assaulting platoons. Their chief usefulness will be to cover the infantry during its reorganization at openings in the woods and to support it in case of counter-attack. Automatic rifles are better suited to furnish the fire power for an advance through dense woods than are machine guns. If additional fire is required to enable the line to advance, however, the machine guns will be used. Under such conditions the machine guns

will be placed in intervals in the firing line. They should open a terrific fire for a minute or two, at the end of which time they should suddenly cease firing while the infantry rushes forward as far as possible. Under cover of the fire of the infantry they should again be brought forward into the line and the process repeated indefinitely. Such a methodical advance through woods is very costly in time and ammunition and should be resorted to only when it is impossible to advance any other way.

43. Before the infantry debouches from the far edge of the woods, the machine guns should be placed near the edge of the woods prepared to cover the egress of the infantry by fire. If overhead fire is not possible it will usually be best to put the machine guns near the flank of the woods where they can longer support the infantry.

Defense

44. If a heavy artillery bombardment is probable, machine guns should be placed along the edge of the woods to fire on the approaching infantry. Some guns may be placed in trees. Fire can thus be placed in areas that are defiladed from the ground. If a long artillery bombardment is expected the guns should be placed in the open in advance of the woods, where they will suffer less from high explosive and gas. In any case some guns should be so placed as to enfilade the edge of the woods.

45. All clearings, roads and paths should be swept by machine gun fire. Where time is available it may be profitable to make narrow clearings, place wire in them and sweep them by machine gun fire. In such cases, however, only the underbrush should be cleared so that the airplanes will be

unable to detect the clearings. Arrangements should be made for flanking the edges of the woods. Extensive use should be made of strong points flanked by machine guns to ambush the enemy during his progress through the woods.

Anti-Aircraft Defense

46. In discussing anti-aircraft defense by machine guns no explanation will be made of the mathematical calculations involved in the construction of a sight for firing by machine guns, or in the determination of the correct point of aim when the ordinary sights are used. The methods used will simply be stated.

The Browning machine gun is equipped with "Sight, Anti-Aircraft, Trench, for Browning Automatic Rifle, Model of 1918." The equipment prescribed for all machine gun companies of an infantry division is four or enough to equip the guns of one platoon. A similar sight is made for use on the Browning automatic rifle.

The anti-aircraft trench sight consists of a rear peep sight attachable to the regular rear sight leaf, or other part of the breech of the gun, and a double oval shaped front sight of metal stamping mounted on a suitable support and clamped around the barrel, radiator, or water jacket, of the machine gun, and readily detachable therefrom. It is of the type known as "fixed sight." In this sight the angle of fire deflection or amount of firing ahead of the target, is primarily designed for effective fire under average conditions against a plane traveling 100 miles per hour, at 1000 feet height and 50 degrees angle of sight, or 120 miles per hour, at 200 feet altitude and 15 degrees angle of sight.

With the sights properly attached and at the correct distance apart, the gunner sights through

the rear peep at the flying target and shifts the line of the gun towards the aircraft so that it will constantly appear to be flying towards the center of the front sight.

Given the altitude of the aircraft by the observer, the gunner chooses the oval which more nearly approximates the range. He then fires when the nose of the target just touches the outer edge of the oval chosen and continues to fire in as long bursts as practicable while changing the line of aim to maintain always the same relative position of the aircraft and the front sight; that is, to have the aircraft always flying towards the center of the sight with its nose just touching the rim of the oval used.

47. When special sights are not available, the ordinary sights may be used with the sight setting and point of aim as indicated in the following table:

Direction of Flight	Sight Setting	Point of Aim
Coming	2000	At the airplane.
Coming and crossing diagonally	1700	1½ fingers to the right or left according to the direction of flight.
Crossing	600	2 fingers in front of airplane.
Going and crossing diagonally	Zero	1½ fingers at 4:30 or 7:30 o'clock according to the direction of the flight.
Going	Zero	1½ fingers below the airplane.

48. The proper zone of effectiveness for machine guns against aircraft, is generally considered to be within 2,000 feet and at 15 degrees or more

elevation. The limit of range for effective fire is 1,300 yards. Firing at longer range is ineffective and wasteful.

49. It will be exceptional where only one gun is employed. Ordinarily not less than a section and preferably a platoon should be employed against any airplane. The chances of hitting with a single gun are extremely small. It must be remembered that bringing down planes, however, is not the only purpose in firing at them, and that you have performed a great part of your mission if your fire frightens them away and prevents them from obtaining information or carrying out bombing operations.

50. When several guns are employed for the protection of towns, dumps, etc., each gun is assigned a certain sector and when the alarm is given it puts up a protective barrage in its sector. The object of this barrage is to create a danger zone for the airplane and to drive it away.

51. Tracer bullets are a great assistance in firing on airplanes. They not only enable the gunner to adjust his fire more accurately but they add to the moral effect by informing the airplane that it is being fired upon. Tracer bullets, as manufactured at present, trace up to about 700 yards. The Ordnance Department is working on a bullet to trace to 1500 yards.

52. Special anti-aircraft mounts are provided for issue to the anti-aircraft machine gun battalions. In the past machine guns belonging to divisions have used improvised mounts. The Browning Tripod, Model 1918, now available for issue to troops, is suitable for firing at aircraft.

53. The following are the important points in training machine gunners for anti-aircraft firing:

(1) To differentiate between friendly and enemy planes.

(2) To estimate distance correctly enough to know if plane is within effective range.

(3) To use the "anti-aircraft trench sight."

54. Machine guns used for anti-aircraft defense may be classified as follows:

(1) The anti-aircraft machine gun battalions, one of which is assigned to each army corps. This battalion is used for the defense of rear areas, protection of ammunition dumps, hospitals, depots, hangars, etc.

(2) Machine guns which form part of the equipment of batteries of artillery. Each battery of 75 mm. guns and 155 mm. howitzers is equipped with 2 machine guns. These guns are for the immediate defense of the guns including protection from airplanes. When mounted for firing on aircraft they should be so placed as to give protection to the guns without disclosing the position of the guns.

(3) Machine gun companies of the division.

When a machine gun company is taking part in an offensive, one platoon should be equipped with anti-aircraft sights, and should be given the mission of protecting the machine gun company and the infantry battalion with which it is operating from attacks by airplanes.

A machine gun company in position on the defensive should provide for one gun in each section

to fire on aircraft without the guns are in emplacements which make such firing impracticable.

When troops are moving by train in the theater of operations, one or two sections of machine guns should be mounted on flat cars, ready for instant firing on airplanes.

When troops move by bus in the theater of operations machine guns should be placed at regular intervals in the column, mounted and ready for instant firing.

On the march in the theater of operations, the infantry columns should have machine guns distributed along them for protection against air attacks. The regimental companies will usually be sufficient for this purpose.

Troops billeted in the theater of operations must place guns for the protection of all billets, storehouses, hospitals, etc. Troops must provide for their own protection; they cannot expect the regular anti-aircraft organizations to furnish sufficient protection.

Observation balloons will always be protected by machine guns placed in the vicinity.

Reference Sheet

FOR

T. T. 39, October 15, a.m., 1919.—Line Class.
T. T. 33, October 15, a.m., 1919.—Staff Class.

Lecture.—Machine Guns in the Offensive.

References:

Supplement to Machine Gun Drill Regulations, 1917, A. E. F.—Pages 59 to 78.

Infantry Drill Regulations, A. E. F., Part I.—Paragraphs 301, 352, 358, 361, 367, 368, 369, 373, 457, 458, 460, 461, 463, 464, 486, 498, 505, 513, 515, 517, 518, 520, 548, 550, 551.

Combat Instructions, A. E. F.—Paragraph 7.

Notes on Recent Operations No. 1, A. E. F.—Paragraphs 6 to 9.

Notes on Recent Operations No. 3, A. E. F.—Paragraphs 6 to 9.

Notes on Recent Operations No. 4, A. E. F.—Paragraph 4.

Required at Lecture:

Lesson sheet.

Lesson Sheets

FOR

T. T. 39, October 15, a.m., 1919.—Line Class.

T. T. 33, October 15, a.m., 1919.—Staff Class.

Lecture.—Machine Guns in the Offensive.

Employment of Machine Guns in the Offensive

1. In discussing the employment of machine guns I shall touch upon the use of automatic rifles just sufficiently to thoroughly differentiate between the use of machine guns and automatic rifles.

Characteristics of Machine Guns

2. A thorough knowledge of the characteristics of any weapon is essential to its correct tactical use. A confusion of ideas as to the characteristics of a weapon will lead to the incorrect use of the weapon. Such confusion will cause things to be expected of the weapon that it cannot perform, or will prevent full advantage being taken of the weapon. For this reason I shall run over briefly the characteristics of machine guns.

3. There has been a great tendency throughout the service to confuse the machine gun and the automatic rifle. The machine gun is a gun that fires infantry ammunition on the automatic principle, whose recoil is supported by some sort of a fixed mount and the direction of fire is capable of being clamped. The automatic rifle on the contrary is fired from the shoulder and the direction of its fire is not capable of being clamped. With our own literature there is at present not much danger of confusing the two terms, but in reading of German machine guns there is a very great danger. The Germans call both the machine gun and the automatic rifle machine guns, but they make two distinct classes—heavy machine guns and light machine guns. Their term light machine gun corresponds to our automatic rifle. In reading German machine gun tactics one should be extremely careful to keep clearly in mind whether the heavy machine gun or

the light machine gun is the type that is being discussed.

4. Machine guns considered from the point of view of method of operation are of two general types—the direct recoil type, of which the Browning and Vickers are examples; the gas operated type, of which the Hotchkiss is an example.

Considered from the point of view of the method of cooling there are two general types of machine guns. The water cooled, which includes the Browning and Vickers, and the air cooled, of which the Hotchkiss is an example.

5. Our army in France was equipped with three types of guns—the Browning, Vickers and Hotchkiss. The difference in these guns, that has the greatest tactical effect, is the difference in trajectory. The Hotchkiss has an effective range of 3,500 meters, the Vickers 2,900 meters and the Browning 2,600 meters. This difference in trajectory has a very great effect in determining the location of machine guns for the accomplishment of certain purposes. In studying machine gun operations in France or Belgium one should be careful to note the type with which the organization considered was equipped.

Stable Mount

6. A stable mount of the machine gun has a most decided effect upon the tactical uses of the gun. The effect of the personal factor in holding is largely eliminated. Fatigue and excitement effect the shooting to a very small extent. The shooting of our machine gunners during the recent campaigns indicates that they can be counted upon to fire almost as accurately in a fight as on the target range.

7. A stable mount also makes the machine gun suitable for overhead fire. Without a stable mount firing over friendly infantry is extremely hazardous. It should not be attempted with an automatic rifle. Overhead fire with machine guns is perfectly safe, provided the machine gunner is trained. One of the most important things for a machine gunner to know is safety angles for overhead fire. If he does not know these thoroughly he will either endanger the lives of his own troops, or stop firing before it is necessary to do so, thus failing to support the advance of the infantry by fire at the most critical stage. Just before the St. Mihiel operation I inspected the machine guns of the 3d and 5th Corps. Part of these guns were in the line and part of them waiting in the rear ready to take their place in line. Owing to the location it was impossible to hold maneuvers in most places. With the troops not actually in the line two terrain exercises were held in each machine gun battalion to determine whether the officers had correct tactical ideas of assisting the infantry advance by fire, and this was followed by an inspection of noncommissioned officers and gunners to determine whether they understood safety angles for overhead fire. In about 50 per cent of the cases the gunners did not understand safety angles and a special effort was made to remedy this and I believe that these organizations did enter the fight with a pretty clear idea as to when they could fire over their infantry.

The stable mount causes zone fire to be effective. Certain areas can be constantly covered by machine gun fire so as to prohibit their use by the enemy.

8. The stable mount has a very direct effect upon the size and shape of the shot group. It gives a long and narrow cone of fire. To get the maximum effect of this cone of fire requires a narrow and deep target. Such a target can be obtained in two ways. First—by surprise, by catching a body of troops in column. This will very rarely happen. Second—by so placing the guns as to obtain enfilade or oblique fire. This should always be sought for. On the defensive it will always be possible to obtain enfilade or oblique fire. On the offensive frontal fire will be the rule, flank fire the exception, but always much more effective when it can be obtained.

9. The rapid production of a very large volume of fire makes the machine gun a very effective weapon for surprise. The gun can be concealed in a very small space and can produce a volume of fire that would frequently be wholly impossible by the infantry owing to the limited space available. The fire power of the machine gun may be said to vary roughly from the equivalent of 30 rifles at 200 yards to the equivalent of 80 men at 1,000 yards. If the rates of fire are increased beyond 200 per minute these figures would be raised. 250 rounds per gun per minute may be taken as the maximum fire power that may be expected of any machine gun organization without the target is so large, dense and close as to almost eliminate aiming. In the A. E. F. Machine Gun Platoon Competition at Le Mans, France, in May, 1919, the average rate of fire of the winning platoon was 225 rounds per minute. More than 14,000 rounds were fired at indirect targets, direct stationary targets and moving targets. No allowance was made for stoppages.

The highest rate of fire of any platoon participating was 237 per minute and the lowest 117.

10. The all-around traverse of the machine gun makes it the ideal weapon for flanking purposes. It can immediately change the direction of its fire by 90 degrees and be quite as effective in the new direction. With infantry the changing of the direction of fire of a line is a very delicate operation.

11. The machine gunner is at least as mobile as the infantry as long as he is able to keep his guns on the carts. When the equipment must be carried by hand he loses some of his mobility and it is difficult for machine gunners to keep up with the infantry under such conditions for long distances.

Weight of gun filled with water 37 lbs.

Weight of tripod, model 1918, 47 lbs.

Weight of ammunition box and filled belt 15¼ lbs.

12. The chief unfavorable characteristic of the machine gun in the past has been the stoppages in firing. With the Browning and Hotchkiss guns the question of stoppages is not at all serious. A man does not need to be an expert to keep either of the guns functioning properly. Under average conditions you should get about one stoppage in 3,000 rounds with the Browning gun. The Vickers gun, owing to the close fitting breech mechanism, requires much more expert personnel to keep it functioning continuously. The second difficulty in the use of the machine gun is the peculiar noise of firing which tends to disclose its position. Since the infantry, however, has been so fully equipped with automatic rifles this is less of an objection.

Organization of the Machine Guns of a Division

13. In each regiment of infantry there is a machine gun company. In each brigade there is a machine gun battalion, consisting of four companies. The regimental company and the brigade battalions are animal drawn. In each division there is a motorized machine gun battalion of two companies. Each machine gun company has 12 active guns and is supposed to have four spare guns. Very few of the organizations have been provided with the spare guns.

14. **Division Machine Gun Battalion.**—The division machine gun battalion, which is motorized, will ordinarily be held as a reserve in the beginning of an engagement on account of its great mobility. This does not necessarily mean that the battalion will take no part in the beginning of the engagement. Generally it can be used for long range fire and still fulfill all the functions of a reserve as long as it is held at the disposition of the division commander.

15. **Brigade Machine Gun Battalion.**—The brigade battalion may be used in the following ways:

(1) It may be used as a unit under the machine gun battalion commander.

(2) Part of the companies may be assigned to infantry battalions and the remainder used directly under the command of the machine gun battalion commander.

(3) All of the companies may be assigned to infantry battalions.

The number of companies to be assigned to infantry battalions should depend upon the task to be performed. If in the beginning of the fight you

cannot form an exact idea as to where obstacles are to be encountered you should assign machine gun companies to infantry battalions, as otherwise in all probability your machine gun companies will never be put into action. On the other hand if you are going to make a limited advance, have a definite idea as to where you will encounter resistance and the terrain is suitable for overhead fire there is every reason for keeping all of the companies under the direct command of the machine gun battalion commander. We have two schools of thought in regard to the use of the brigade machine gun battalion. Some of our divisions wish to always assign these companies to infantry battalions; others wish to always retain all of the companies under the direct command of the machine gun battalion commander. I believe they are both wrong. By using the guns invariably in the same way, without regard to the special tactical situation, you will often fail to get the maximum result. The 1st Division has almost invariably assigned all machine gun companies to infantry battalions. The 42d Division, on the contrary, has practically always retained them under the control of machine gun battalion commanders.

16. **The Regimental Machine Gun Company.**—The regimental machine gun company may be used in the following ways:

(1) The company may be held under the direct control of the regimental commander.

(2) One or more platoons may be assigned to battalions and the remainder held under the control of the regimental commander.

(3) The whole company may be assigned to an infantry battalion.

Except where the regiment is acting alone, without additional machine gun support, the regimental company will ordinarily be assigned to a battalion as a unit.

17. **Direct Fire Should Always Be the Primary Consideration.**—This does not mean that you should undervalue the tremendous effect that you will at times obtain from indirect fire. It does mean that you must always sight your guns for an extensive field of fire so that good direct fire will be possible. On the contrary, you must always make provision for using indirect fire. Failing to do this you will frequently not be able to use your guns at all on account of fog or darkness. Indirect fire requires a concentration of guns and a centralization of command. Accurate maps of not less than 1/20000, or accurate angle measuring and range finding instruments must be available.

OFFENSIVE

18. The first essential to a successful use of machine guns on the offensive is a thorough and comprehensive plan for all of the machine guns in a division. The maximum result cannot be expected without there is a plan that contemplates the use and co-ordination of all the guns. In the first phase of a deliberately planned attack this co-ordination will be provided for by a plan which will prescribe a great many details. In the later phases of an attack or in a meeting engagement such elaborate plans are not possible, and in the majority of cases machine gun commanders will receive orders most frequently in the form of messages which will give them definite tasks at a particular time.

19. Machine guns as regards their uses may be roughly classed as follows:

(1) Machine gun companies attached to infantry battalions.

(2) Machine gun battalions used for overhead and covering fire.

(3) Reserve guns.

20. **Machine Gun Companies Attached to Infantry Battalions.**—In the approach there is just one object and that is to get the guns forward in the least possible time, with the least possible loss. The machine guns should not be required to advance by the identical route that the infantry uses. They should not be tied down to that extent. If good cover can be obtained by taking a slightly different route the route should be taken. On the other hand the guns must not make the mistake of taking such a round-about course that they would not arrive by the time they are needed. In case the route selected takes them some distance from the infantry an infantry escort should be detailed for their protection. The machine gunners must use their carts wherever it is practical. Advancing guns by hand is very fatiguing and results in the early exhaustion of the gunners. Many organizations made the mistake of abandoning their carts once that they had been forced to temporarily leave them behind. The mere fact that it becomes necessary to advance the guns by hand does not justify continuing to advance them by hand for the rest of the day. They should be replaced on the carts at the earliest possible moment that conditions justify the procedure.

In the first phase of an attack the exact route of advance, organization of dumps, etc., may be prescribed in orders when all the incidents of the

action can frequently be foreseen. An attempt to prescribe many details in later phases will usually lead to confusion and loss of initiative on the part of junior officers.

21. There has been a great difference of opinion in our organizations in regard to infantry carriers for machine guns. We have tried them out in many organizations and most of the time they have not been successful. The constant use of infantry carriers is a mistake. They should only be used where the advance is so rapid that the infantry cannot count on artillery support and it is essential to have every machine gun in the division in action.

22. During the combat the function of the machine guns is to constantly assist the advance of the infantry by fire power. The use of machine guns only at decisive points in the fight is not sufficient. They must be so used as to exert a continuous influence from the beginning to the end of the fight.

The following examples show the great improvement that was made by our divisions in the use of machine guns during the last two or three months of the fighting. At St. Mihiel the 90th Division made practically no use of its machine guns. On the contrary, on November 1st they fired over 1,000,000 rounds with the machine guns and practically all day the infantry advanced under the protection of machine gun fire. The 2d Division at St. Mihiel used only 8 out of 14 companies at the beginning of the fight. On November 1st this division not only used all of its own guns but used ten companies of the 42d Division. The 5th Division at St. Mihiel used only 8 out of 14 companies at the beginning of the fight. In the early

part of November this same division was using overhead machine gun fire to cover the advance of its exploiting patrols. These three divisions are typical examples of the great strides that were made in the use of machine guns during the last few months before the armistice.

23. Eevery assaulting infantry battalion is habitually reinforced by a machine gun company which reports to and is under the orders of the battalion commander.

The following are suitable tasks for a machine gun company attached to an infantry battalion:

(1) To support the assaulting troops.
(2) To protect the flanks of the attack.
(3) To occupy an interval in the line.
(4) To assist in consolidating the captured ground.
(5) To assist in resuming the attack.

24. The orders for use of the machine guns should be clear and concise and should assign definite tasks to them. The orders should not be simply to take a certain place in the formation, but should be to assist the advance of the infantry by fire. The control of the machine guns should as far as possible be exercised through the commanding officer of the machine gun company. He should be in the immediate vicinity of the battalion commander, thus facilitating communication. The infantry battalion commander should retain the control of the machine gun company. The fact that a platoon is detailed to support a certain company of infantry does not mean that the command of this platoon passes to the infantry company commander. In the 1st Division at Soissons on July 18, 1918, the machine gun companies were broken up and three machine guns were assigned to each

infantry company. These guns were practically all placed in the first wave of the company to which attached. Almost the only order given to the machine gunners was for them to take their places in certain waves. I talked with practically all infantry battalion commanders and machine gun officers of the 1st Division after this fight and I found no case where an order had been given for the machine guns to support the advance of the infantry with fire. The order had been invariably to take a certain place in the formation. The machine gunners had generally interpreted the order literally. They took this position in the formation and kept it. They were not interested in finding opportunities for shooting their guns nearly so much as they were in maintaining their position. The results were most serious. The machine gun companies suffered very heavy casualties and accomplished practically nothing except during the consolidation. One company lost 57 men without firing a shot. Another company lost 61 men and fired only 96 rounds. This is typical of what happened to a greater or lesser extent throughout the whole division.

25. Generally the formation of a machine gun company supporting an infantry battalion will be with one platoon on either flank supporting the two assaulting companies and one platoon in rear of the center of the battalion. This platoon acts as a reserve for replacement of guns and men to the flank platoons, does anti-aircraft work and may be thrown to either flank for flank protection. As to whether or not the platoons assigned to support the assaulting companies should be placed in rear of the assault companies or in rear of the support companies depends upon the situation. If the conditions indicate the probable early use of machine

guns and the ground is favorable for their use they should be placed in rear of assaulting companies. On the other hand if their early use appears improbable, or the ground is unfavorable for overhead fire, put them in rear of support companies where they can use their transportation as long as possible. The formation within the platoon conforms to the formation of the infantry with which they are advancing. The usual formations will be line of squad columns or line of skirmishers when dismounted: when mounted, column of squads. The purpose of the formation taken should be to make it difficult for the enemy to distinguish the machine guns from the infantry. Whether or not you will use all 12 of the guns in the company depends upon whether the ground will permit you to bring the carts up close to the positions from which the guns will be fired. If it becomes necessary to advance the guns by hand it is advisable to use only 8 guns, keeping 4 guns in support with the carts in each company. These guns for anti-aircraft work need a crew of only a corporal and one man. This makes available two sergeants and 28 privates who can be used as ammunition carriers for the other two platoons. This detail should be made responsible for the replenishment of ammunition.

26. At times some of our divisions have made the mistake of placing machine guns in the first wave of infantry. This has always been disastrous. It results in heavy losses among the machine gunners with practically no compensation. Machine guns should only be placed in the first wave of infantry when it becomes absolutely essential to reinforce the firing line and there is no other way of using the guns.

The following quotation from the German instructions issued in February, 1918, prior to the spring offensive shows clearly the German policy on this point:

"In principle, the heavy machine guns are employed in sections, apart from the infantry. Their place is only in the infantry lines when the latter require an immediate increase in the intensity of their fire, and when the co-operation of the heavy machine guns from their positions in depth (overhead or through gaps) or from a flank is impossible. They then conform to the front line and form part of the infantry company."

27. During the advance direct fire will be the rule. Indirect fire will not be possible to any great extent. The greatest value will usually be obtained by the use of direct overhead fire. If machine guns are placed in the line, or an attempt is made to fire through intervals in the line this fire is necessarily short lived, owing to the fact that the infantry mask the fire just as soon as they advance. Continuous fire is seldom possible except by overhead fire.

"Direct fire by heavy machine guns through the intervals between the first line infantry elements has not given good results, because of the fact that the infantry changes its position too frequently. The heavy machine guns will, therefore, select dominating positions from which they can fire over the infantry. From these elevated positions, the heavy guns will be able in the absence of artillery, to place a barrage in front of the front line, by direct or indirect fire, according to the nature of the ground. The exact determination of the first line is difficult; when it is not certain

the machine gun barrage will be placed well in advance.

"This fire over the infantry demands thorough individual training. The chief of the piece and the gunner must be accustomed to estimate difference in altitude by eye. All the gun crew must be familiar with the range table and know how to use it. They must know how close, on a given terrain, they can bring their fire to the infantry without danger. The infantry must, furthermore, become accustomed to machine gun fire over its head. It is therefore absolutely necessary that there be frequent exercises in which the machine guns and infantry take part, and in the course of which ball cartridges are used.

"When ground is favorable, it is possible, by concentrating all the machine guns of one company or even of several companies upon the dominating position behind the infantry, to execute actual preparatory fire. The edges of woods and villages have in this way been covered more effectively with machine guns than with artillery fire, up to the moment when the infantry attacked and surrounded the position." (Tactical and Technical Experience with Machine Gun Units during the Spring Offensive of 1918, Headquarters XVIIIth German Army.)

28. Flanking fire is the most effective but is rare on the offensive. Most of the opportunities for flanking fires come about through one part of the line advancing much more rapidly than some other part. The part of the line so advanced will at times have an opportunity to use its machine guns against the flank of the enemy who is holding up friendly troops on the right or left.

29. Machine guns should generally be advanced alternately by sections. Part of the guns should

always be in position to assist the advance of the infantry by firing over their heads. Such use of machine guns requires a very high degree of intelligence, training and initiative on the part of the platoon and section commanders. It takes a very much better trained officer to use machine guns successfully during the advance than for indirect barrages, where everything can be deliberately planned. The mistake that is most frequently made in advancing machine guns is that they advance by short bounds instead of long bounds. Very frequently a short bound does not increase the fire power of the machine gun sufficiently to make up for the time lost in changing positions. Short bounds also frequently result in the placing of guns where it is impossible to fire on account of friendly infantry.

30. The machine gun company commander should keep in constant touch with his platoons. In this manner he will be able to concentrate the fire of all of his guns upon any decisive point and can keep himself informed as to the replacements of men, guns, or ammunition that are needed by the various platoons. Platoons that are supporting infantry companies should have a noncommissioned officer and one or two agents with the company commander. Rocket signals should be arranged which would notify the machine gun platoon commander that his assistance is needed. This will often permit guns to be sent forward without the necessity for sending the messengers to the rear.

31. **The Consolidation.**—In the consolidation all 12 guns should be used. Even if losses have occurred there should be sufficient personnel to operate all guns on the defensive. Whenever the at-

tack is brought to a halt and a counter-attack appears probable machine guns should be placed in position to give immediate support to the infantry. The placing of these machine guns would follow the principles of employment of machine guns on the defense.

32. **Use of Machine Gun Battalions.**—Indirect fire has greatly increased the use of machine guns in larger organizations. It demands the concentration of guns and of command and renders the employment of machine gun battalions necessary. Direct overhead fire can often be made more effective by the employment of guns in an organization larger than a company.

33. Before the attack machine gun battalions may be used for harassing fire., They are more suitable for this purpose than the machine guns of companies assigned to infantry battalions, since they are usually located further to the rear. The purpose of this harassing fire is not only to inflict losses upon the enemy but to wear down his morale and prohibit him from using important trails, paths, roads, etc., for bringing up supplies and to prevent work on defenses. Whether or not it is profitable to use harassing fire will depend upon the situation. In the days of trench warfare, where the element of surprise was eliminated, there was every advantage in using harassing fire for a considerable period before the attack in order to wear out the enemy. Since March 21st the element of surprise has been given important consideration in all attacks. This in most cases will eliminate the use of harassing fire. The question of surprise is a matter that must always receive proper consideration. Four or five days prior to the St. Mihiel attack it was discovered that the 82d Division was

preparing to use harassing fire with its machine guns. This was stopped by orders from the corps. This attack was an example of just when harassing fire should not be used, as the purpose was to make the most complete surprise possible.

34. During the attack machine gun battalions will be used most largely for covering fire which may be either direct or indirect. At the beginning of an offensive, or in the resumption of the advance after a delay of several hours or several days, indirect barrages will be the rule. If the time which is necessary for the reconnaissance and preparation of positions for indirect fire is available, indirect fire is always thoroughly practicable under such conditions. Most frequently it is the only type of fire that is possible, owing to the fact that the jump-off takes place before daybreak. Whenever possible a detail should be sent forward the second night before the attack, to allow plenty of time for preparation of the position and of the fire data. Where details are not sent forward until the night before the attack there is usually difficulty about accurately locating positions and getting fire data.

35. Standing barrages will be placed on avenues of approach or retreat, or on positions of special importance. The creeping barrage with machine guns is not satisfactory, owing to the fact that there are many reverse slopes that machine gun fire cannot search.

36. Indirect barrages are frequently used to place neutralizing fire on woods or other difficult terrain that it is not desired to attack at the time. On Sept. 26th the 33d Division made excellent use of machine gun fire to neutralize the woods which was directly in its front near the town of Forges. The woods was perhaps two kilometers square. The

entire front of the division was five kilometers. The division neutralized the woods, passed by it without entering it and then sent a mopping up party back through it from the rear. In this manner they captured several hundred prisoners with practically no losses. Resistance in the woods was so slight that no halts were necessary in cleaning up the woods. The front of the woods was strongly protected by machine guns and the prisoners stated that they were sure they would have inflicted heavy losses on the division had it made a direct frontal attack.

37. After the advance is once begun machine gun battalions will be used for direct overhead fire wherever serious resistance is encountered. The companies that are assigned to the infantry battalions should be able to take care of any slight resistance. One of the best examples of the use of direct overhead fire by machine gun battalions was the attack of Colonel Conger's brigade, of the 28th Division, at Appremont. Having encountered serious opposition, the ground being suitable for direct overhead fire he brought up the brigade battalion and without any artillery support was able to advance with practically no losses.

38. Machine gun battalions will frequently be called upon to protect the flanks of the infantry. The progress made at different points of the line will always vary, thus leaving exposed flanks. No other arm can so well take care of this exposed flank as the machine gun. At Soissons, General Buck's brigade had its flank exposed for about a kilometer and a half, owing to the inability of the French on his left to advance. It was an ideal occasion for the use of some of the machine guns of the brigade battalion but all of these had been as-

signed to infantry battalions, some going to the division reserve, so that none was available. The result was that it was necessary to rush forward the motorized division battalion to protect this flank.

39. Owing to different elements of the line becoming slightly confused in direction, gaps in the line will frequently occur. Machine gun battalions, or parts of them, will be called upon to fill these gaps. At St. Mihiel such a gap occurred between the 5th and 90th Divisions, and the 13th Machine Gun Battalion was sent forward to fill this gap until touch could be gained with the 90th Division and the line rectified.

40. **As a Reserve.**—Machine guns make a most effective reserve on account of the great fire power, but it is a mistake to use too many of them for this purpose. Guns placed in reserve should be used for long range fire, where this can be done, without losing control of them. The division machine gun battalion will frequently be used as a reserve at the beginning of an engagement. Part of the brigade machine gun battalion will at times be held in reserve by the brigade commander but very seldom will all of it be so held. Unless additional machine gun companies have been attached to a regiment it will seldom be advisable to hold any part of a regimental machine gun company in reserve. If the necessity for the use of the reserve arises it should be used unhesitatingly. However, when such necessity has passed it should be withdrawn and again reorganized as a reserve.

Paragraph in Division or Brigade Field Order

3. (c) MACHINE GUNS

(1) Assignment of Machine Guns to Infantry Units.

Assignment of machine gun companies to assault battalions.

Assignment of machine gun companies to reserve battalions when reserve battalions are to leap-frog assault battalions or for special reasons.

Assignment of machine gun sections or platoons to connecting groups.

Time at which machine gun companies will come under the command of infantry battalion commanders.

(2) Barrage Fire.

Designation of units for barrage fire.

Hour at which command of units passes to commander of barrage guns.

General assignment of objectives.

Time of execution of fire.

Placing of division machine gun officer in command of barrage guns or giving control to brigade commanders.

Return of guns to control of brigade commanders after completion of barrage mission.

Annex C to Division or Brigade Field Order
Machine Gun Plan

1. ORGANIZATION OF THE COMMAND.

Assignment of Machine Guns to Infantry Units.

Assignment of machine gun companies to assault battalions.

Assignment of machine gun companies to reserve battalions when reserve battalions are to leap-frog assault or for special reasons.

Assignment of machine gun sections or platoons to connecting groups.

Time at which machine gun companies will come under command of infantry battalion commanders.

Barrage Fire.

Designation of commander or commanders for barrage guns.

Designation of units for barrage work.

Return of units to control of brigade or other commanders upon the completion of the barrage fire. (May include instructions for certain companies to join infantry reserve battalions as they go forward.)

2. MISSIONS PRIOR TO D DAY.

Harassing fire when situation warrants it.

3. MISSION ON D DAY.

Locations of headquarters of companies or battalions.

Assignment of initial positions to platoons and companies.

Assignment of initial and all successive targets, and rates of fire. (Note: These are usually shown in appendix in the form of a table or map.)

4. OCCUPATION OF INITIAL POSITIONS.

Details to be sent forward for preparation of fire data and emplacements.

Instructions for occupation of the initial positions, including time of occupation and route of advance to positions.

5. ADVANCE OF PLATOONS, COMPANIES OR BATTALIONS TO SUCCESSIVE POSITIONS.

A table showing old position, new position, time of departure from old position, route taken, probable time of arrival at new position. (Note: May be in the form of a Movement Table as an Appendix.)

6. AMMUNITION.

Amounts and kinds of ammunition, and location of dumps for barrage fire.

Amounts and kinds of ammunition to be carried on carts.

Amounts and kinds of ammunition to be carried by gun squads when carts are temporarily left behind. Provision for ammunition carriers. (Note: Ordinarily from support platoon of M. G. Co.)

(Note: Tracer ammunition and small percentage of armor piercing ammunition, should be provided for. Water and oil should be automatically provided for at rate of 1 gallon of water and 1 pint of oil for each 8000 rounds of ammunition.)

7. SIGNAL COMMUNICATIONS.

In barrage group, communication by telephone, visual and runners from D. M. G. O. to M. G. Battalion Hqrs., and from battalions to companies. By runners from companies to platoons.

Use of rocket signals and runners by machine gun companies assigned to infantry battalions.

APPENDIX to par. 3, Machine Gun Plan

Organization Chart

Date_____

Reference____Bn. or Co.____Commanded by____Location____

Co. or Plat.	Composition	No. of guns	Location	Targets	Time		Rate of fire R. P. M.	Remarks
					From	To		

Reference Sheet

FOR

T. T. 49, October 21, a.m., 1919.—Line Class

T. T. 43, October 21, a.m., 1919.—Staff Class.

Lecture.—Machine Guns on the Defensive.

References:

Supplement to Machine Gun Drill Regulations, 1917, A. E. F.—78 to 85, 277 to 280.

Infantry Drill Regulations, A. E. F., Part II—Paragraphs 572, 573, 574, 582, 583, 584, 588, 598, 599, 612, 619, 620, 626, 628, 644, 669, 676, 677, 679, 694, 701, 704.

Required at Lecture:

Lesson sheets.

Lesson Sheets

FOR

T. T. 49, October 21, a.m., 1919.—Line Class.

T. T. 43, October 21, a.m., 1919.—Staff Class.

Lecture.—Machine Guns on the Defensive.

Employment of Machine Guns on the Defensive

1. At medium and short ranges, the zone swept by machine gun fire is narrow and deep. The use of machine guns from flanking or oblique positions increases their effectiveness many times. While in the offensive, frontal fire will from necessity be the rule, on the defensive flanking or oblique fire will almost always be possible and should be considered the normal use of machine guns. Frontal fire should be used only against exits or narrow passages of special importance (bridges, roads, trails, streets, forest paths, communicating trenches, etc.), or to concentrate upon the one objective the fire of every weapon capable of firing on it.

2. Machine guns should be so placed as to bring oblique or enfilade fire against:

The enemy lines.
Positions where the enemy would form for the attack.
The ground over which the enemy must pass should he attack.
Our own front lines should the enemy penetrate them.

To achieve these objects, machine guns may be placed:

In a salient or reentrant in the line.
In concealed positions in front of the line.
In dominating positions in rear of the line.

3. Surprise action gives machine guns the opportunity to cause tremendous losses in a very short time, completely destroying the morale of the enemy. On the defensive machine guns must make the greatest use of this characteristic. They must not reveal their location by firing on unimportant

targets. Often the element of surprise is of greater importance than long range. This was one of the most marked features of the German method of machine gun defense.

4. In the defensive, even more than on the offensive, the effectiveness of machine guns depends upon co-operation. The perfection of this co-operation will depend upon the length of time available. When it is necessary to take up a position hastily the best that can be hoped for is the proper distribution of machine gun companies to different sections of a front. As an organization settles down in one position co-operation of the machine guns should be worked out in more detail. Sectors of fire should be assigned to all guns and the maximum use should be made of enfilade and oblique fire. The longer the organization remains in a position the more centralized should the control of machine guns become. Such centralization of control gives a greater opportunity for the co-ordination of machine gun fire where time is available for working out the detail. This is a matter that infantry commanders have frequently overlooked. Where machine guns have been assigned directly to them upon first taking up a position they have frequently resented it when they have been withdrawn from their control at a later time.

5. The disposition of the machine guns should be such as to fully co-operate with the infantry formations. Machine gun fire should be carefully co-ordinated with that of the automatic rifles. It is impossible in most cases to place a continuous belt of machine gun fire across the front of a position. For this reason only the important avenues of approach should be covered by machine guns and the less important places should be taken care of by automatic rifles or rifle fire.

6. There should be co-operation with the artillery and trench mortars for the following reasons:

(1) In planning the S. O. S. barrage it will be impossible for any one of the arms to completely cover the front. Without co-operation it will usually happen that more fire than is necessary will be placed upon certain sections of the front while other portions of the front will be neglected. There will be certain pieces of ground that it will be impossible to sweep by machine gun fire. This must be covered by artillery and trench mortars. On the other hand, where machine guns enfilade roads or important avenues of approach they will prohibit the use of these roads much more effectively than can the artillery or mortars.

(2) In planning an harassing fire a combined schedule of firing should be prepared which would include all three arms. This avoids duplication of work and renders more effective the harassing fire.

(3) The artillery has important means of information that the machine guns have not. Through co-operating with the artillery they will have access to this information which will be most valuable to them.

7. The following are suitable missions for machine guns on the defensive:

(1) Counter preparation. If the enemy indicates that he is going to attack it will sometimes be possible to break

up the attack through counter preparation before it is ever launched. Machine gun fire should be placed upon the important avenues of approach and the areas that are favorable for forming up the attack.

(2) Barrages when the enemy actually launches his attack. At the time that the enemy actually attacks in force all machine guns should be used to their maximum capacity.

(3) The support of counter-attacks. Preparation should be made for placing machine gun fire on points in our own line which are most valuable to the enemy. In such cases the machine guns can render immediate assistance to our infantry in the counter-attacks if the enemy penetrates at these points.

(4) Harassing fire. On the defensive the element of surprise has not the same importance and harassing fire can almost always be used to advantage. It is excellent training for the machine gunners in the use of indirect fire. Naturally in harassing fire you should not use your machine guns from the same emplacements that you expect to occupy in case of serious attack.

8. The distribution of machine guns depends upon the missions assigned to them and upon the distribution of the troops which the machine guns support. When the main defensive position is preceded by an outpost zone, very few machine guns will, as a rule, be placed in front of the outpost line of resistance. It will usually not be wise to have

many guns flanking the first line without they can do so from commanding positions in rear. Where the enemy has had time to bring up all of his artillery and trench mortars, machine guns should seldom be placed in front line trenches without they are protected by concrete emplacements. The trench mortar barrage will extend to a depth of not less than 800 yards. Machine guns not in concrete emplacements will in all probability be destroyed when placed in this zone if the enemy precedes his attack by a long artillery preparation.

9. When a position is first taken up a greater percentage of machine guns can be pushed forward for the following reasons:

(1) There is less artillery and trench mortar fire.

(2) The fire is much less accurate since there has not been the same chance to register and the shooting will be largely map shooting.

(3) For the first few days the information as to the exact location of the troops will not be sufficiently accurate to justify the enemy in putting down an intense barrage in extremely close proximity to his own line.

10. The number of guns assigned to the outpost zone will also depend upon the strength of the infantry assigned to the outposts and the amount of resistance it is intended to offer in this zone. Where one battalion from each infantry regiment of a division is used to garrison the outpost zone, four companies of machine guns will usually be placed in this zone. Where the infantry strength of the outposts is less, the number of machine guns will usually be smaller.

The greater part of the guns assigned to the outposts participate in the defense of the outpost zone by delivering flanking fire through intervals between supporting points or overhead fire from commanding positions in rear.

11. The greater part of the machine guns are employed in the defense of the battle zone, and are distributed throughout the battle zone and over a limited zone of depth in its rear. When employed in the defense of a zone, machine guns are echeloned in checkerboard formation in such manner that each element flanks the front or covers the flanks of adjacent elements, and when practicable, is capable of delivering overhead fire over the defensive elements in its front.

Machine guns must be echeloned in depth for the following reasons:

(1) You must be able to place a barrage in front of your front line of infantry.
(2) Some guns must be far enough to the rear to stop the enemy if he should succeed in breaking through the front line.
(3) Some guns must be so placed as to give support for counter-attacks against the most important points of the position.

12. In the placing of the guns there are two conflicting elements. There must be sufficient fire power to stop the attack, yet there must be sufficient depth to provide against a break through. The trajectory of your guns is going to have an important bearing upon the positions to be occupied. I think you can take it as a safe rule that all machine guns should be so placed that it will be possible for them to lay down a barrage in advance

of the line of resistance. You may assume then that generally speaking the Hotchkiss gun should not be placed farther to the rear than 3100 meters from the front line, the Vickers gun 2500 meters and the Browning gun 2200 meters. If the position is a highly organized one the bulk of your guns then should be in the zone from 800 to 3100 meters in rear of the front line trench. Greater distribution in depth becomes simply dispersion and is a source of weakness since the guns can be overcome a few at a time without ever being able to bring the full effect of their combined fire power against the enemy.

The distribution in depth of machine guns decreases with the improvement of the material defenses of the position. As the organization of the defenses approaches the linear, a larger number of machine guns may be placed in or near the line of resistance.

13. The following quotation from the report of a British machine gun battalion commander regarding the placing of his guns on March 21, 1918, at the time of the German attack, is an excellent example of the dispersion of machine guns:

The guns were disposed approximately as follows:

Between 0 and 500 yards from the firing line____ 2 guns.
Between 500 and 1000 yards from the firing line_12 guns.
Between 1000 and 2000 yards from the firing line_14 guns.
Between 2000 and 3000 yards from the firing line_ 8 guns.
Between 3000 and 4000 yards from the firing line_12 guns.
Between 5000 and 6000 yards from the firing line_12 guns.
In reserve 6000 yards from the firing line_____ 4 guns.

64 guns.

(Note:—The British division had during the war only a battalion of 64 guns.)

Twenty-eight guns or 44 per cent of the guns were so located that they would in all probability have no effect on the action until after the Germans had penetrated the line. Such dispersion unquestionably had a great deal to do with the rapid advance of the Germans on March 21st.

14. The positions assigned to machine guns should determine very largely whether or not they should be assigned to infantry battalions or retained under the control of the brigade commander and commanded by the brigade machine gun battalion commander. If the guns are placed well to the front it will be better to assign them to infantry battalions. On the other hand, those guns that are well to the rear should be kept under control of the machine gun battalion commander.

15. **Reserve Guns.**—Where two forces have been facing each other for several days or weeks, the situation is usually so thoroughly known that the defender has a very definite idea as to the probable place of the enemy's attack. Under such conditions dispositions can be made to meet his attack and it will not be necessary to keep a great number of guns in reserve. When a defensive position is first occupied or in a meeting engagement the intentions of the enemy cannot be so well foreseen and it will be necessary to hold a greater number of guns in reserve. At the beginning of a defensive action the division machine gun battalion should usually be held in reserve. The brigade commander should usually retain some part of the brigade machine gun battalion as part of his reserve. Unless additional machine gun companies have been attached to the regiment, the regimental commander will usually find it unprofitable to hold any guns in reserve.

16. The function of the reserve guns is to assist in checking the enemy where he is making most progress and to co-operate with the counter-attacks. The enemy will penetrate the line at the weak points while the strong points will hold on thus creating a series of salients. These local penetrations are not serious as long as the enemy is prevented from widening them. The infantry reserves are therefore used to reinforce the flanks of these salients since they are the most dangerous points and it also places the infantry in the logical place for a counter-attack. The machine guns on the contrary should reinforce the point of the salient as they will be able to bring flanking fire on any enemy troops attempting to widen the salient and will also be in a position to support the counter-attack with direct flanking fire.

17. The machine guns held in reserve, therefore, should be opposite the weak parts of the line. Possible positions and routes thereto should be reconnoitered so that it will be possible to occupy them rapidly as soon as the enemy discloses his intentions. For such purposes the platoon is the correct tactical unit. It is the smallest unit commanded by an officer and the task is too important to be intrusted to a noncommissioned officer. The company will usually be too large a unit for the task, as 12 guns would be required only where the penetration was on a considerable front and in such cases it would seldom be practicable for all the guns to advance by the same route.

18. **Siting of Guns.**—(1) The most effective type of machine gun fire is direct fire with the guns so placed as to create successive belts of fire. All guns should therefore be sited with the

longest possible field of fire that will enable them to carry out their mission and place their fire at the important points or on the avenues of approach. Although direct fire is always the first consideration indirect fire must not be neglected. Provision must be made for covering the normal lines of fire by indirect methods at night, during fog, in smoke, etc. As far as possible all guns that cannot fire in front of the first line by direct fire should be given an indirect fire mission in front of the front line or of the outpost line of resistance.

(2) Guns should usually be sited in pairs. The two guns should be close enough together to be readily controlled by the section sergeant. This can be done effectively if the guns are from 10 to 40 yards apart. Where practicable the two sections of a platoon should be close enough together to facilitate inspection by the platoon leader. Without excellent cover is available, however, four guns placed in a battery formation will usually disclose their location and be shelled out of position. Guns sited singly are not so reliable owing to the danger of stoppages and lack of efficient control.

(3) Gun positions must be suitable for all around defense. If this is not the case the dead space must be covered by automatic rifles, rifles, or grenades.

(4) Machine guns should be removed from visible defenses that would cause them to receive a great amount of artillery fire. Positions 100 to 200 yards in front of the edge of a woods are usually safer than the woods itself. The commanding officer, 9th Machine Gun Battalion, says in his report on the attack of the Germans at Chateau Thierry, July 15, 1918:

"Woods afford only a false protection in artillery bombardments and should be avoided due to the great length of time that gas concentrations remain in them."

(5) Guns may be sited in trenches if the terrain is such as to lend itself readily to the concealment of the emplacement, otherwise they are sure to be destroyed. With bombardment lasting several days all guns are likely to be destroyed but with the more recent bombardment of only a few hours well concealed guns have an excellent chance to escape destruction.

(6) They must be most carefully concealed and every possible step taken to avoid disclosing their location.

(7) Shelter must be provided for the gun crews. It is essential that shelter be provided for at least two members of the gun crew in the immediate vicinity of the gun. If all of the men are placed in deep dugouts very frequently the guns will never be brought into action before the enemy is upon them.

19. Before March 21st the British had sited many of their guns badly. They had become so enthusiastic over indirect fire that they had not always been careful to select positions that gave extensive fields of fire for direct fire. A considerable percentage of their guns were placed well to the rear for indirect fire and provisions had not always been made for the immediate protection of these guns. The reports from the first 20 divisions indicated a loss of 50 per cent of their guns.

20. **The S. O. S. Barrage.**—Every gun should be given a S. O. S. mission and all guns should be constantly layed on their barrage lines except when actually carrying out harassing fire, etc. Upon the completion of such missions they should immediately relay on their barrage lines. The S. O. S. barrage should be carefully co-ordinated with the artillery. The S. O. S. barrage should be fired only when the ammunition supply is ample and the hostile infantry attack is imminent.

21. **Obstacles.**—Wire should be placed so as to hold the enemy under enfilade fire. A careful location of the entanglement will often make it possible to get the enemy where a cross fire can be brought on him by two machine guns. The arrangement should not be too obvious or the enemy will avoid the trap.

22. **Emplaçements.**—Emplacements must always be constructed as it is absolutely essential to protect both the gun and crew from observation and fire. Emplacements which render guns conspicuous are more dangerous than leaving the guns unprotected. Machine gun units will ordinarily be called upon to construct only the simple types of earth emplacements. Concrete emplacements will ordinarily be constructed under the supervision of

engineers. The shell hole type emplacement can be constructed by a squad in 2 hours. It is simple, inconspicuous and efficient.

All emplacements must be carefully camouflaged not only after completion but during construction. Without the work is protected from observation of the enemy the construction should be carried out at night.

Every gun should have one or more alternative emplacements. The battle emplacement should be used only in case of an enemy attack, otherwise it will probably be spotted and destroyed during the preliminary bombardment.

23. **Withdrawal.**—If it becomes necessary to withdraw the machine guns must cover the withdrawal of the infantry. The withdrawal should be made by echelon. Agents should precede the withdrawing detachments for the purpose of selecting fire positions and the preparation of fire data. As far as practicable sectors of fire, ranges, etc., should be determined before the arrival of the guns.

The greatest possible use should be made of the gun carts and packs as speed in retiring, once the movement has begun, will always be one of the greatest factors of safety.

24. **Communication.**—It is essential that good communication be maintained not only within machine gun organizations but between the machine guns and infantry. The fullest use should be made of the telephonic communications of the infantry as the telephone equipment of the machine gun organizations is insufficient to maintain communication where organizations are widely distributed. Machine gun battalion commanders will ordinarily establish their headquarters in the im-

mediate vicinity of brigade headquarters and company commanders their headquarters at the headquarters of the infantry battalions which they are supporting. This arrangement greatly facilitates communication.

Telephones alone cannot be depended upon. Provision must always be made for the use of rockets and runners.

25. **Orders for Gun Positions.**—The squad commander is responsible for the following:

(1) That the number of the emplacement is placed outside of the emplacement where it can readily be seen.

(2) That machine guns are not fired from their battle emplacements except in case of emergency.

(3) That unless emplacements are well concealed, guns are not mounted except between evening and morning "posts," and when visibility is poor.

(4) That two men by night and one man by day per squad are always on duty at the gun.

(5) That written orders for the emplacement are posted where they can be read by all members of the squad.

(6) That a range card is prepared and posted near the gun. That in addition to the range to each objective the range card shows the clinometer reading for indirect laying on each objective.

(7) That there is a minimum of 4250 rounds of ammunition in belts and sufficient other ammunition to bring the total up to 10,000 rounds.

(8) That each man has 35 rounds of pis tol ammunition.

(9) That there is a box of grenades (48).

(10) That all machine guns, pistols, ammunition and grenades are inspected and cleaned at morning and evening posts.

(11) That there is a bolo or hatchet convenient for opening boxes of ammunition or grenades.

(12) That there is sufficient quantity of water at hand for cooling the gun and not less than a pint of oil.

(13) That there is a spare barrel and spare parts case in the emplacement.

(14) That there are 1 pick, 1 shovel and 12 sand bags in the emplacement.

(15) That traversing stops are used to limit the movement of the gun.

(16) That aiming stakes are placed to indicate to the gunner his normal direction of fire. Night firing boxes or luminous discs to be used at night.

(17) That the gun is inspected for all the points covered in paragraphs 146 and 148, Machine Gun Drill Regulations.

(18) That the camouflage is kept in good condition and that there is no movement to disclose the position to the enemy.

(19) That in addition to the flash arrestor wet sand bags are used to hide the flash of the gun when firing at night.

(20) That during the day the gun is kept covered unless it is very close to the enemy. That at night it is always loaded. That all members of the

squad know the location of and routes to any alternative emplacements assigned to the squad.

(21) That sentries know their orders thoroughly and are relieved at regular intervals.

26. The sentry at the gun will know:

(1) What to do if he sees the enemy.

(2) The sector of fire assigned to the gun.

(3) All objectives shown on the range card.

(4) What the S. O. S. signal is and what to do when it is given.

(5) What the S. O. S. barrage line is and how to lay the gun on it by either direct or indirect methods.

(6) The line of fire if the enemy penetrates our front line.

(7) When relieving another sentry the following facts will always be ascertained:

(a) Whether the gun has been fired during the relief.

(b) If fired, what the target was.

(c) If fired the emplacement from which fired.

(d) Whether any instructions has been received as to friendly patrols or working parties.

(8) The sentry will always inspect the gun when taking over the position.

(9) In case of alarm, or a gas attack, the sentry will wake the gun team.

27. Officers inspecting machine gun organization in position should cover the following points in their inspections:

(1) That all orders prescribed for the commander of gun squad and for the sentry at the gun are carried out.

(2) That there is an officer on duty with each platoon.

(3) That the 4 guns of the platoon are close enough together to be inspected readily and controlled by the platoon commander, if the tactical situation permits.

(4) That platoon and company headquarters are centrally located with reference to the guns of the platoon and company.

(5) That communication by telephone, rockets, visual signals, and runner is provided for.

(6) The following points should be noted with reference to emplacements:

Siting.
Field of fire.
Type.
Cover.
State of camouflage.
Are there tracks leading to emplacement which will give away position?

(7) Is there a deep trench, shrapnel proof or dugout for the members of the gun squad? If so,
Distance from gun.
Type.
Capacity.
Are there gas curtains and anti gas apparatus?

(8) Disposition of reserve guns. Possible disposition, one at each platoon

headquarters and one at company headquarters.

(9) Are riflemen, auto-riflemen, or bombers employed to cover dead ground that cannot be covered by machine gun fire?

Reference Sheet

FOR

Conference: Machine Guns with Cavalry.

T. T. 42, October 21, a.m., 1919.—Staff Class.

References:

Supplement to Machine Gun Drill Regulations, pages 86 to 88.

Lectures: Machine Guns in the Offensive. T. T. 33.
Machine Guns in the Defensive. T. T. 43.

Conference: Machine Guns in Advance Guards, Rear Guards, Marches, etc. T. T. 32. **Line Class.**

Balck, Vol. II, pages 133 to 136.

Cavalry Drill Regulations, **paragraph 761.**

Required at conference:

Lesson sheets.

Lesson Sheets

FOR

Conference: Machine Guns with Cavalry.

Machine Guns with Cavalry

1. For details of the organization of the machine guns of a cavalry division see Table 501 of the Tables of Organization.

The machine guns of a cavalry division consist of the following organizations:

1 Division Machine Gun Squadron, Motorized. This squadron has three machine gun troops and a headquarters.

3 Brigade Machine Gun Squadrons. These squadrons have three troops each, and a headquarters.

1 Machine Gun Troop in each regiment of cavalry.

This gives a total of 21 troops of eight guns each or 168 guns. This is exactly the same number of machine guns as are in the infantry division. The organization, however, is quite different. In the troop there are two platoons of two sections each, but in all higher organizations the number of units is three. This facilitates detaching machine gun troops for service with cavalry regiments or squadrons.

2. For details of equipment of cavalry machine gun organization see Equipment Manuals for Service in Europe, Series B.

The personal arms of the enlisted personnel consist of the automatic pistol and the bolo. Seventeen men are also armed with rifles.

The following are the chief articles of transportation of a machine gun troop:

Horses, cavalry	**150**	
Mules, draft	20	From the supply troop.
Mules, pack	38	4 for each gun squad and 1 spare mule for each section.
Cart, ration, 2-mule	1	From supply troop.
Cart, water, 2-mule	1	" " "
Kitchen, rolling, 4-mule	1	" " "
Wagons, combat, 4-mule	2	" " "
Wagons, ration & baggage	1	" " "

The following are the principal articles of macine gun equipment of a machine gun troop:

Ammunition, machine gun. Rounds per gun: On pack mules 4750 in belts; in combat train 2000 rounds in belts, 3000 in packing boxes; division ammunition train 5000 rounds. Total for troop: on pack mules 38000 in belts: in combat train 16000 in belts, 24000 in boxes; ammunition train 40000.

Belts, ammunition 250 rounds	216	152 with guns and 64 on troop combat wagons.
Boxes, ammunition	216	" " ".
Belt filling machine	8	
Belt filling machine boxes	8	
Boxes, water	32	
Covers, canvas, machine gun	8	
Devices, steam condensing	8	
Guns, machine, Browning, cal. .30	8	
Mittens, asbestos, pairs	8	
Rods, cleaning	8	
Spare barrels and cases	8	
Spare parts cases	8	
Tripods, gun, model 1918	8	
Fire Control Equipment:		
Aiming marks, luminous	16	
Aiming stakes	8	
Alidade protractors	5	
Angle of site instruments	5	
Board, plotting, 40x40 cm. with tripod and declinator attached	5	

Boxes, night firing with batteries and switches	8
Canvas carrying cases for plotting boards	5
Compasses, machine gun, lensatic	8
Graphs, Corsellis	5
Protractor, machine gun	5
Range finder with case and tripod, 80 cm. base	1
Sights, panoramic with tripod	4
Tables of fire	24
Trajectory graphs	24
Zince scales	5
Zinc rules	5

3. While the organization given in Table 501, Tables of Organization, outline of which appears in paragraph 1, is the organization that will be used in all tactical discussions and the solutions of problems, the views expressed on organization by the Cavalry Board convened in the A. E. F. and the Superior Board on Organization in the A. E. F. will be given before proceeding to a discussion of the employment of machine guns with cavalry.

4. The following is the recommendation of the Cavalry Board:

"A machine gun squadron of 18 active guns per regiment is believed to be desirable; this squadron to consist of 3 troops of six active guns per troop. It is believed desirable to have in the cavalry service a machine gun squadron with a regiment, since much of the work of the cavalry regiment may be of more or less detached nature, and better results will be obtained if the regimental commander has the control of and is responsible for his own machine guns. Where a division is so situated as to make it practicable it is believed to be desirable that the various machine gun squadrons of the division be brought together for train-

ing and tactical instruction, but that they be with their own regiment whenever the regiment is receiving tactical training which involves machine gun work."

In connection with the above recommendation it should be noted that the Board recommended a division consisting of two brigades of two regiments each, and a division machine gun squadron of twelve armored cars.

5. The following is taken from the report of the Superior Board on Organization. This Board also recommended a division consisting of two brigades of two regiments each.

MACHINE GUNS

The organization of machine guns has given rise to much discussion, the advantages and disadvantages being considered from technical and tactical points of view. Uniformity and efficiency in tactical as well as technical instruction can best be secured under supervision of an expert field officer.

Cavalry squadrons and regiments on independent missions should ordinarily have machine guns assigned to them, unless their movements are to be so rapid that machine guns would seriously delay them. For the purpose of obtaining practice in working together machine guns should be frequently attached to cavalry regiments and smaller commands during tactical exercises and extended maneuvers.

In campaign additional machine guns may be asked for from corps or army headquarters for special purposes.

It is believed that the machine gun troop should be of about the same size as the troop in the squadron, 115 men with five officers, formed into three

platoons of one officer and twenty-eight enlisted men each.

The Board recommends the assignment of a squadron of four troops to each brigade, and a motorized squadron of two troops with armored cars to a division.

The machine gun organization of a division is then as follows:

	Guns
Brigade M. G. Squadrons: 2 squadrons, each of four troops	48
Division M. G. Squadron	12
Total	60

There should be a machine gun officer with rank of lieutenant colonel on the division staff, to have general supervision over the machine gun units of the division.

In each brigade one of the troops of the machine gun squadron should be provided with anti-aircraft mounts so as to be able to protect camps and picket lines. Similar provision should be made in the divisional squadron.

EMPLOYMENT OF MACHINE GUNS

6. The division or brigade machine gun squadrons will rarely be employed as units. The cavalry brigade will as a rule operate on such a wide front that it will be impracticable for the brigade commander to use the machine gun squadron to advantage under his direct control. The troops of these squadrons will usually be assigned to squadrons or regiments whose missions are such that they need machine gun support. Should the cavalry make a deliberate, dismounted attack where considerable time was available for preparation, these battalions might be used as units for indirect fire at the open-

ing of the attack. Such actions, however, will be exceptional.

The only occasions on which the division squadron would probably be used as a unit, would be for indirect fire in a deliberate attack, or when thrown into the line as a whole to fill a considerable gap in the line.

7. A cavalry squadron on an independent missions should ordinarily have a machine gun troop assigned to it, unless its movements are to be so rapid that machine guns would seriously delay it, such as contact squadrons. All dismounted, first line squadrons should have machine gun troops assigned to them.

THE MOUNTED ATTACK

8. "The mounted combat of large bodies of cavalry is probably a thing of the past. While still possible against mounted units, modern machinery of war has become so effective, and the use of obstacles so general, that the masses affording large targets would be destroyed by fire action before they could reach their objective. Small units, however, perhaps up to a squadron, will still have opportunities for mounted action, especially against troops that are shaken by fire or are disorganized and in retreat. Instant decision is of utmost importance in such cases." (Report of Superior Board on Organization.)

In units larger than a squadron, the attack will usually be a combination of mounted and dismounted action.

9. Machine guns are used to augment, or as a substitute for dismounted fire action, thus permitting the use of a larger percentage of the cavalry for mounted shock action. The machine guns should by their fire hold up the enemy's progress,

cause him to deploy, whenever possible prematurely and in a wrong direction, and pin him to his position, while the cavalry maneuvers to get on his flank and make the mounted attack.

The functions of the machine guns in the mounted attack are:

(1) To support the attack by fire up to the last moment before the collision.

(2) To bring fire upon the supports and reserves, thus breaking up their formations. This is specially important where the enemy is also mounted, as the side having the last reserves intact will usually win a mounted action.

(3) Should the attack succeed, to immediately move part of the guns forward where they can fire on the retreating enemy, retaining the remainder in position to give protection from any possible counter-attack.

(4) In case the attack is repulsed, to cover the reorganization of the cavalry.

10. In any mounted attack, the time element is so short as to preclude the possibility of the use of indirect fire. In the attack against cavalry there would never be time for preparation of indirect fire data. Mounted attacks against infantry might be planned so deliberately that there would be sufficient time for preparation, but the time of the actual charge would be so short that it would not be practicable to continue the fire until the cavalry had almost reached its objective.

11. Overhead fire which is the most important type of fire in dismounted attack, very largely loses its value in a mounted attack. Overhead fire can

be continued until the attacking line almost reaches the enemy only when the enemy is situated on ground that rises sharply. Such ground is a very serious obstacle to a mounted attack as it greatly reduces the speed of the cavalry and therefore reduces their shock effect. However, when it is necessary for cavalry to charge across the open for a considerable distance, the machine guns will frequently be able to support them by overhead fire in the early part of the charge. Overhead fire can frequently be used to protect the supports and reserves. There may be times when it can be used to protect the charging line from a mounted attack from the flank.

12. The only position that will enable the machine guns to support the charge by fire up to the moment of collision, is a position on the flank of the charging force. If possible the position should be a dominant one from which the machine gunners can observe the progress of the attack and lift their fire from the objective at the last moment. Since the mounted attack will usually be made against the enemy's flank, such positions can frequently be obtained without difficult maneuvering as this places the machine guns in the enemy's front. It is important that the machine guns be near the head of the column so as to quickly occupy important positions.

13. Where it is possible the machine guns should occupy the position without disclosing their presence to the enemy and thus open fire by surprise. The most careful arrangements should be made for opening fire just before the charge starts. A rocket signal will usually be the most satisfactory signal. Opening fire at a definite time is not as sure as it will be difficult to calculate the exact

time necessary for the cavalry maneuver. The machine guns should fire at the maximum rate during the entire charge.

14. While concealment until the moment of opening fire is important, cover or protection for the guns and men while in action is unimportant. The guns will be in action for such a short time that they should not suffer serious losses. Guns supporting a mounted attack will rarely dig in, and then only when the attack is against dismounted troops in position and has been planned far enough ahead to give the guns time to dig in without delaying the action.

THE DISMOUNTED ATTACK

15. "Dismounted fire action is now the most important battle action of cavalry and should be frequently practiced. The principles are laid down in the drill regulations. As cavalry has not the numbers and hence not the depth of infantry, it must seek quick decisions, take advantage of its mobility and look for the enemy's flanks. Its training must be such as to enable it to deliver a determined attack on foot, and it should be especially skillful and strong in delaying actions, making use of its automatic rifles and machine guns. It must learn to find cover for its led horses and to counteract the activity of enemy airplanes by moving and scattering." (From the Superior Board on Organization.)

16. In general machine guns in the dismounted attack of cavalry are handled as in the infantry attack but there are some important differences.

17. Machine gun troops assigned to assaulting squadrons will place all 8 guns in action. In the infantry one platoon is usually held in support with the mission of reinforcing the other platoons

when needed, furnishing the anti-aircraft defense, and providing ammunition carriers for the other platoons when the guns must be advanced by hand. In the cavalry dismounted action the machine guns will seldom be advanced by hand such great distances that the gunners will be unable to carry them and bring up a sufficient amount of ammunition. The pack mules can be taken farther forward than the carts of the infantry.

18. The anti-aircraft defense of the squadron and machine gun troop operating with it should be provided for by having one gun in each section equipped with anti-aircraft sights. These guns would perform the same functions as the other guns except when actually firing on aircraft. This plan insures that one gun in each section will always be assisting the advance of the dismounted cavalry and that both guns will except for few moments at a time.

19. One platoon will usually be assigned to support each assaulting troop. This assignment of platoons to the support of assaulting troops, however, does not imply a transfer of command over such platoons to the rifle-troop commanders. The commander of the machine gun troop retains command of the entire troop. Should three troops be in the assaulting echelon, the machine gun platoons would ordinarily operate in rear of the flank troops but support the advance of all three troops.

20. During the approach march and at the beginning of the attack, the machine gun platoons will almost invariably follow in rear of the assaulting troops. It will be very exceptional to put them in rear of the support troops. The aim of cavalry is to seek a quick decision and the machine guns should always be where they can have an immediate effect on the situation.

21. After the attack has begun the guns of each platoon work in pairs. The working of platoon, use of agents, and position of platoon and troop commanders would be similar to machine gun organizations operating with infantry battalions. The action may require more boldness on the part of machine gun officers but the principles involved will be the same.

22. The brigade machine gun battalions will seldom be used for long range covering fire. Most of the troops will be required for assignment to assault squadrons and the remainder needed for protection of the flanks and led horses. The flanks are the most sensitive points of the cavalry. Machine guns on the flanks, echeloned to the rear are the best protection and some guns will usually be assigned the mission of protecting the flanks. Machine guns are the ideal weapons for protecting the led horses.

23. Should the machine guns assigned to squadrons not afford sufficient fire power to enable the line to advance, the brigade commander should use any guns he may have in reserve for long range covering fire, or call on the division commander for a part of the motorized division machine gun battalion.

24. In the beginning of the action the motorized machine gun battalion will usually be held in reserve. The brigade commander will usually hold out a machine gun reserve of a platoon or a troop and may have a larger reserve where the number of assault squadrons furnished by the brigade is less than four.

THE DEFENSIVE

25. In defense, cavalry may be required to delay an advancing enemy, to seize and hold import-

ant positions until the arrival of the infantry, to obstruct a hostile screening line, or to ward off hostile attacks of cavalry. It will seldom be called upon to fight a protracted defensive fight. The defense of cavalry will thus usually have the character of a containing action. For this reason machine guns will be employed in less depth than with infantry. They should be pushed well forward where they will exert an influence from the beginning of the fight. They should make the maximum use of long range fire. This early exposure of their positions will cause them to suffer from the enemy's fire if they remain throughout the action in the same position. Arrangements should be made for changing the position of a gun as soon as it is brought under serious fire.

26. Machine guns will be posted in pairs as far as possible. The principles of siting guns are exactly the same as with infantry on the defensive. However, the same amount of flank protection from guns in rear cannot be expected.

27. The character of cavalry action is such as not to give a great amount of time for careful reconnaissance and co-ordination of the fire of the guns in great detail. All guns to be placed in position will have to be assigned directly to squadrons. The machine gun officers, under the direction of the squadron commanders, will arrange with the guns on their right and left for mutual support, thus making possible a greater amount of flanking fire. Should the position be occupied for any extended length of time it will be possible for brigade and division machine gun officers to arrange for a greater degree of co-operation.

28. The lack of depth makes it necessary to hold some machine guns in reserve. Where addi-

tional guns have been assigned to regiments, it will frequently be advisable for regimental commanders to hold a machine gun platoon as a local reserve. The brigade commander would usually hold a machine gun troop in reserve. Both the regimental and brigade reserve would ordinarily be assigned a long range fire mission in front of the front line.

29. The motorized division squadron would ordinarily be either held as a reserve by the division commander, or parts of it assigned to brigades for use as brigade reserves. The number and condition of the roads would largely determine the course to be followed.

ADVANCE GUARDS

30. Machine guns with cavalry advance guards will act in much the same way and will serve the same purposes as with infantry. There will be minor differences, however. The offensive action of cavalry advance guards will usually be in the nature of a mounted attack or of a combination of mounted and dismounted attack. In such cases the machine guns would be used as discussed under the "mounted attack."

31. A cavalry advance guard consisting of a troop or squadron will have greater depth than an infantry advance guard of a company or battalion, owing to the fact that the distances between the subdivisions are greater. The cavalry troop or squadron can develop less fire power than the infantry company or battalion. The machine guns carried on pack mules are less conspicuous than the carts of the infantry. They are also more mobile and can more readily gain cover on coming under fire. All of these reasons make it advisable to push machine guns farther forward in cavalry ad-

vance guards than in infantry advance guards. A cavalry advance guard as large as a squadron will usually have some machine guns with the support. From this position they can come into action quickly while the reserve is maneuvering to reach the enemey's flank.

MARCHES

32. Machine guns should usually be well forward in the column. Within the regiment, not more than one squadron would ordinarily precede the machine gun troop. The brigade machine gun squadron would ordinarily not be farther to the rear than the tail of the leading regiment of the brigade. It will always be much easier to make assignments of machine gun troops to squadrons or regiments detached for special missions, when the machine gun squadron is well forward. Otherwise much valuable time may be lost in waiting for the machine gun troops to come up.

33. Where there is no tactical situation involved, it will usually be better to march the machine guns at the rear of the column as the pace of the pack mules is too slow for comfortable marching of the cavalry.

34. The motorized division machine gun squadron will march more or less independently of the remainder of the column, regulating its time of departure so as not to be restricted to the pace of the cavalry.

PURSUIT

35. In pursuit, much depends upon the initiative of squadron commanders. After the pursuit is once begun it will frequently be impossible for highers commanders to influence local actions. For this reason, as far as possible, each squadron par-

ticipating in the pursuit should have a machine gun troop attached to it at the beginning of the pursuit.

36. The machine guns with their fire will always attempt to stop the enemy and cover him with fire while the cavalry charges him.

37. One of the chief uses of machine guns will be to gain and hold defiles, bridges, or other points of vantage, that may lie on the enemy's line of retreat.

REAR GUARDS

38. The employment of machine guns is exactly the same as with infantry rear guards. Owing to their greater mobility and the greater mobility of the troops supporting them, however, they will be able to make use of positions on the flanks of the line of retreat that would be too distant from the column for infantry machine guns to occupy. Their greater mobility also adds to their ability to ambush the enemy and still make good their escape.

THE GENERAL SERVICE SCHOOLS

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TERRAIN EXERCISE No. 8

PART I

3" Topographical Map of Fort Leavenworth and Vicinity.

Prepared by Captain Walter C. Short, Infantry.

General Situation:

A state of war has existed for several weeks between Kansas (Red) and Missouri (Blue). The Blues concentrated a large number of troops in Missouri to the east of Leavenworth and Fort Leavenworth, and several days ago effected a crossing at those places, driving back the Reds and forming a bridgehead covering the crossings.

Special Situation—Blue:

In a general attack by the forces forming the bridgehead, the 1st Division is attacking with four regiments abreast in the sector bounded on the north (right) by Plum Creek, on the south (left) by the D. E. F. C. Road and the Atchison Pike. The 2d Infantry Brigade is on the right and the 1st Brigade on the left. Each regiment has one battalion in the assault, one in the regimental reserve, and one in the brigade or division reserve. The 1st Bn., 1st Inf., is the left assaulting battalion of the division. On its left is a battalion of the 2d Division. The south boundary of the battalion is the south boundary of the division. Its north boundary is Wagner Point—Hund—Burns—Hill 926—Hill 1047.

The battalion is deployed with Co. A on the right and Co. B on the left as assault companies; Co. C on the right and Co. D on the left as reserve companies. The M. G. Co., 1st Inf., two Stokes mortars and two one-pounders are operating with the battalion.

The division began a general advance at 5:30 a. m. this morning. At 8:45 a. m., when the scouts of the 1st Bn. reached the Frenchman—Kickapoo Road they were stopped by automatic and rifle fire from the vicinity of Flint and the railroad cut to the northeast of that place.

As Major A reaches the top of Sentinel Hill he sees the reserve platoons of the assault companies disappearing in the woods just east of Salt Creek. A few moments later two messengers appear and hand Major A the following messages:

No. 1.

Co. B, 1st Inf.
400 yds. east H,
27 Oct., 19, 8:45 a.m.

C. O., 1st Bn., 1st Inf.,
Sentinel Hill.

Held up by heavy automatic and rifle fire from FLINTS and the railroad cut to the northeast. Will attack. Will build up firing line of 1st and 2d Platoons on the west edge of the FRENCHMAN—KICKAPOO ROAD. The 3d Platoon will work up the creek, which is 450 yards north of FRENCHMAN, until it crosses the wire fence and then attack the woods and railroad cut. Request assistance of machine guns and auxiliary weapons.

Hall, Capt.,
Commanding.

No. 2.

Co. A, 1st Inf.,
SALT CREEK, east of BURNS,
27 Oct., 19, 8:45 a. m.

Scouts encountered slight resistance south of BURNS, Am continuing to advance.

Jones, Capt.,
Commanding.

Major A received these messages at 9:00 a. m. At this time he could see the advance elements of Co. A approaching Burns. He could also see to his rear the machine gun company which with guns on carts was distributed as follows:

1st Plat. at Hill 855.

2d Plat. just entering the ravine at 346.87—750.15.

3d Plat. at 347.00—750.45.

At the beginning of the engagement the 1st Plat. had been given the mission of supporting Co. A, the 2d Plat. of supporting Co. B and the 3d Plat. retained in support. Captain M, commanding the machine gun company, with first sergeant, and two buglers, was with Major A.

Required:

Orders as actually issued by Major A.

(Order to lieutenant commanding Stokes mortars and 1-pounders to be omitted.)

Time allowed—30 minutes.

PART II

Major A gave the following verbal order to Captain M, commanding the machine gun company:

"Co. B has encountered heavy automatic and rifle fire from the vicinity of Flints and the railroad cut to the northeast of Flints. Co. B attacks at 9:25 a. m. The 1st and 2d Plats. will open fire from the west side of the Frenchman—Kickapoo Road while the 3d Plat. pushes up that creek 450 yards north of Frenchman. After the 3d Plat. passes beyond the wire fence which crosses the creek about 300 yds. west of the Frenchman—Kickapoo Road, it will execute an attack against the woods, railroad cut and Flints. A red rocket from the 3d Plat. will indicate the beginning of their attack.

"The Stokes mortars will lay down a barrage in front of the 3d Plat. in the creek valley. The 1-pounders will be in readiness to engage any hostile machine guns that open fire.

The machine guns will open fire at 9:25 a.m., covering the woods at the railroad cut, the railroad embankment 200 yds. beyond the cut, the railroad embankment just south of the Atchison Pike, Flints and the ridge just south of Flints.

"Combat train 300 yds. east of this point at edge of woods.

"I shall remain at this point."

Major A sent the following message to C. O., Co. B:

Begin your attack at 9:25 a. m. The machine guns from SENTINEL HILL will assist you, opening fire at 9:25 a.m. The Stokes mortars will open fire on the creek valley at a point 100 yds. east of the wire fence and will lift their fire 100 yds. in two minutes until the railroad is reached. The 1-pounders will assist you from SENTINEL HILL.

A red rocket fired by the 3d Plat. will be the signal that they are leaving the creek and beginning their attack.

Combat train 300 yds. east of this point at edge of woods.

I shall be on the top of SENTINEL HILL.

A, Major.

Comments:

Major A sees that the creek valley up which the 3d Plat. is to advance will contain dead ground that the machine guns cannot search but which the Stokes mortars will be able to reach effectively. This valley is narrow enough that the two mortars can cover it efficiently, thus leaving the

machine guns free to sweep all of the places from which fire is being received.

In his orders to Captain M, Major A gives the machine guns a definite fire mission but does not tell them how to carry out this mission or where to take position for firing. He, however, designated the time of opening fire and names the rocket signal to be fired by the infantry before starting from the creek bottom. He confines his orders to the assignment of missions to the various parts of his command and the co-ordination of their efforts.

Required:

The orders actually issued by Captain M, commanding the machine gun company.

Time allowed—1 hour.

PART III

Captain M, turning to his bugler, gave the following orders:

"Hill, ride as quickly as possible to the 3d Plat. which you can see about 700 yds. to the east. Tell lieutenant and section leaders to report to me here at once. You will guide the platoon to this point."

Captain M gave a similar order to the other bugler to deliver to the 2d Platoon.

Captain M then gave the following instructions to the first sergeant:

" Examine the crest for 200 yds. to the south and see if you can get gun positions with clear field of fire."

Captain M, after a few minutes' study of the ground, received the report of the sergeant indicating the exact positions selected for the two platoons. Captain M proceeded to the nearest position, inspected it and scaled the distances from the

map from the two gun positions to the targets indicated by the major.

At 9:10 a. m., both platoon leaders had reported and Captain M gave the following orders:

"Co. B has encountered heavy automatic and rifle fire from the vicinity of Flints and the railroad cut to the northeast of Flints. Co. B attacks at 9:25 a. m. The 1st and 2d Plats. of Co. B will fire from the west side of the Frenchman—Kickapoo Road while the 3d Plat. pushes up the creek about 450 yds. north of Frenchman. After the 3d Plat. crosses the wire fence about 300 yds. from the road it will attack the woods at the cut. It will fire a red rocket to indicate the beginning of the attack from the creek.

"The Stokes mortars will cover the creek valley. The 1-pounders will be in position to fire on hostile machine guns.

"You will be able to see the platoon emerge from the creek bottom. Platoon commanders will be responsible for shifting the fire so as not to endanger the infantry.

"Lieut. B, the first sergeant will show you your position about 50 yds. down the slope on the trail. Your target will be the woods at the railroad cut and the railroad embankment. Range to woods 1,100 to 1,300 meters. Range to embankment 1,450 meters.

"Lieut. C, the 3d Plat., will take position at this point. Your target will be the railroad embankment just south of Atchison Pike, Flints and the ridge to the south of Flints. Range to embankment 1,050 meters. Range to Flints and the ridge 1,300 meters.

"Combat train and carts 300 yds. to the east at edge of woods.

"Signal me when ready to fire and open fire on my signal.

"I shall be just left of the 3d Platoon."

Comments:

Captain M has at his disposal three platoons. The major in his order said nothing to indicate whether he desired all of the machine guns concentrated on the objectives in front of Co. B. Captain M must therefore decide whether to give the 1st Plat. a temporary mission to assist the advance of Co. B or to allow it to continue to support Co. A. If the 1st Plat. could assist the attack of Co. B and yet be in a position to render assistance to Co. A there would be no question but what it would be used. Its natural line of advance, however, will be up the ravine towards Burns house and from a position along this route it could not bring fire on any of the objectives without interfering with the advance of the infantry. Moreover, it is important that Co. A should have machine gun support as the continued advance of Co. A will place the 1st Plat. in a position to execute flanking fire against Flints which is the most effective of all kinds. Captain M decides therefore to use only the 2d and 3d Platoons.

The next point to be settled by Captain M is the firing positions. Sentinel Hill offers most excellent firing positions with easy control of both platoons, but it is likely at any time to be swept by the enemy's artillery or machine guns. The guns will have to be advanced by hand from the edge of the woods about 300 yds. down the hill. This will render the advance to a new position slow. The guns, however, from their present positions can reach the edge of the woods in five minutes and the buglers could be sent to guide them

to their positions which could thus be occupied very quickly.

The lower slopes to the north would possibly offer good firing positions, the guns could be brought up close to the firing positions on the carts, and the resumption of the advance towards Frenchman would be much easier. On the contrary, being on lower ground, the machine guns could not support the attack as long and could not so nearly enfilade the railroad cut and embankment. There is too, some uncertainty as to fire positions and the time is insufficient for any reconnaissance.

Captain M therefore decides to place both platoons where he can readily control them, the 3d Platoon near the northwestern corner of the plowed field on top of the hill and the 2d Platoon on the trail 100 yards to the south and about 50 yds. down the slope, and to so assign targets so as to give the maximum amount of enfilade fire. He will, however, send the reconnaissance officer to see if the route to the north of Sentinel Hill is practicable for the carts when the advance is resumed. Since the infantrymen can be plainly seen when they emerge from the creek he will place the responsibility for lifting the fire on the platoon commanders as the attack can in this way be supported longer.

PART IV

Lieut. B took his section leaders to the position to be occupied by the platoon, pointed out the exact positions to be occupied by them and gave the following order:

"You have heard the Captain's order. Place your sections into position as quickly as possible

without disclosing your position. Establish one belt filling station for each section.

"The target of the 4th section will be the woods at the railroad cut, range 1,100 to 1,300 meters. Use combined sights.

"The target of the 3d section will be the railroad embankment beyond the woods, range 1,450 meters.

"Rate of fire 250 per minute for one minute and 150 thereafter.

"Each section will designate one man to watch for the attack of the infantry from the creek bottom. Section leaders will shift their fire to the ridge south of Flint's when the infantry advances against the woods.

"Signal me when ready. Open fire on my signal."

Required:

The command of the section leader of the 4th section for carrying out the fire ordered. Section assumed to be in position at the turn of the trail about 50 yds. down the slope.

Time allowed—15 minutes.

Sergeant J's command:

Combined sights No. 8 gun 1,100, add 100.

Target: Woods at railroad cut just north of the pike.

Distribute 30 mils. Search 6 mils.

Rate of fire: 250 per minute for first minute; 150 thereafter.

Signal when ready to fire and open fire on my signal.

Part V

At 9:40 a. m. Captain M sees the enemy disappearing over the ridge just west of Flints, and the men of Co. B approaching Flints.

Required:

A statement of the detailed plan of action decided upon by Captain M.

Time allowed—15 minutes.

PART VI

When Captain M saw that the enemy was in retreat he ordered the 3d Platoon to continue firing on the retreating enemy and directed the 2d Platoon to proceed to the vicinity of Flints, guns to be carried and joined en route by carts, which proceed to the north of Sentinel Hill.

Comments:

To send the guns forward by hand and separate them from their carts is bad as a general principle. In this case, however, it is much easier for the gunners to carry the guns and equipment to Frenchman than to carry them down the hill through the woods to the carts. It will also enable the carts to start sooner and make more rapid progress.

It is yet too early for Captain M to move all of his guns forward as he must have some in position to meet a counter-attack should one develop.

Situation:

At 10:00 a. m. the last of the enemy disappeared into the woods at Mottins and Co. B, which was about 400 yards east of the woods, was stopped by fire from the woods. At the same time Major A observed that Co. A had been stopped at the railroad by fire from Hill 926. He also received a message from an aeroplane saying that a battalion of the enemy was forming for counter-attack just west of the woods at Mottin.

Major A gave the following order to Captain M:

"Co. B has been stopped 400 yds. east of Mottins by fire from woods at Mottins. Co. A is

held up at the railroad by fire from Hill 926. Aeroplane observer reports an enemy battalion forming for counter-attack west of woods at Mottins. Make your dispositions to meet counter-attack."

Required:

Orders actually issued by Captain M.

Time allowed—30 minutes.

Captain M gave the following verbal order to the platoon leader of the 3d Plat.:

"Battalion of the enemy is forming for counter-attack west of woods at Mottins.

"Continue firing on east edge of woods but increase rate of fire to 250 per minute."

Captain M sent the following written order by mounted messengers to the 1st and 2d Platoons:

SENTINEL HILL,
27 Oct., 19, 10:02 a. m.

Co. O.,
1st Plat., M. G. Co., 1st Inf.

Enemy battalion forming for counter-attack west of woods at MOTTINS. Take position near 344.4—751.7 and be prepared to bring flanking fire on attacking troops. M, Capt.

SENTINEL HILL,
27 Oct., 19, 10:04 a. m.

C. O.,
2d Plat., M. G. Co., 1st Inf.

Enemy battalion forming for counter-attack west of woods at MOTTINS. Move at fastest possible rate to vicinity of FLINTS and take position to repel counter-attack. M, Capt.

Comment:

It may have been unnecessary for Capt. M to send word to the C. O, 2d Plat. of the impending counter-attack. The platoon leader would in all probability have pushed on rapidly to Flints, but the message will cause him to precede his platoon and make reconnaissance of positions which he otherwise might not do.

Errors made in the Solution of Terrain Exercise No. 8

The following are the principal errors made in the solution of Terrain Exercise No. 8.

The chief error, and one that was made repeatedly, was infringing upon the province of subordinates. In a majority of cases Major A told Capt. M what to do with his platoons and in many cases Capt. M told his platoon leaders just how to use their sections.

Many officers failed to grasp the fact that the 1st Plat., M. G. Co., having once been given the mission of supporting Co. A would continue to carry out this mission until it received orders to the contrary.

The enemy having been driven from his position, a considerable number assumed that the action was over and took no steps to push part of the guns forward to the captured position, to hold it in case of counter attack, while the remainder of the guns remained in their firing positions until the captured position was occupied, and continued to fire on the retreating enemy.

The following numbered errors show in detail the mistakes that were made by students:

Part I

1. No orders were given to the combat trains.
2. Position of Major A was not given.
3. Major A gave his orders directly to the platoon leaders who were at a distance, when Capt. M was with him.
4. Assumed that platoon leaders were with Major A when they had not been ordered to report.
5. Allowed insufficient time for getting guns into position.

6. Ordered dispositions that would take too long to carry out.

7. Failed to notify the captain of Co. B when machine gun support would be given him.

8. Ordered fire from positions from which only indirect fire could be used. Indirect fire should not be employed by a machine gun company assigned to an assault battalion when the ground permits of direct fire.

9. Directed the employment of the 1st Plat. to support Co. B when it would have been better to continue it in support of Co. A.

10. Did not employ the 3d Plat. although guns could be brought close to firing position on carts so that the personnel of this platoon was not required as ammunition carriers for the other platoons.

11. Chose exposed routes to move guns into position.

12. Employed a reserve company when the machine guns and auxiliary weapons should have been employed.

13. Employed 1st Plat. to support Co. B and made no use of 2d or 3d platoons.

14. Employed only one section to support Co. B which was wholly inadequate.

PART II

1 A. Sent extremely long verbal messages by buglers.

2 A. Employed 1st Plat. with Co. B when it would have been better to continue it in support of Co. A.

3 A. Did not indicate firing positions of platoons.

4 A. Did not designate position of combat train.

5 A. Did not direct platoon leaders to precede their platoons and assemble them where targets could be pointed out.

6 A. Did not definitely locate positions assigned to platoons.

7 A. Did not employ 3d Platoon although guns could have been brought close to firing position on carts.

8 A. Ordered dispositions that would take too long to carry out.

9 A. Did not give position to Captain M.

10 A. Ordered fire from positions where it was impossible to use direct fire.

11 A. Chose exposed routes in moving guns forward.

12 A. Failed to cover all of the targets designated by Major A.

13 A. Ordered guns to continue firing until further orders and arranged no signal for lifting the fire so infantry could advance.

14 A. Made no allotment of targets to platoons.

15 A. Directed 1st Plat. to remain in position instead of permitting it to continue in support of Co. A.

PART V

1 B. Assumed that 1st Plat. had not been moving forward as Co A advanced during the attack.

2 B. Made no provision for keeping a platoon in position temporarily to guard against counter attack just after position had been captured.

3 B. Made no provision for immediately moving a platoon forward to the captured position.

4 B. Did not fire on the retreating enemy or on targets to the rear after Flint's was captured.

5 B. Reported to Major A for orders instead of acting.

6 B. Waited for orders instead of acting.

7 B. After the capture of Flint's gave orders for assembling the M. G. Co. when the continued support of the battalion demanded that the platoons be separated.

PART VI

1 C. Assumed that 1st Plat. had not advanced with Co. A during the action.

2 C. After the capture of Flint's, moved 3d Plat. forward before the 2d Plat. was in position at Flint's.

3 C. Sent no orders to 1st Plat. directing it to assist in repelling the counter attack.

4 C. Failed to grasp the fact that the first thing for the 2d Plat. to do on reaching Flint's was to make dispositions that would assist in holding the ridge against a determined counter attack.

5 C. Directed fire on the enemy on Hill 926 instead of against the enemy making the counter attack. With such a serious counter attack expected all energy should have been devoted to repelling it.

6 C. Ordered 1st Plat. to change position when it was already in a more favorable position to assist in repelling the counter attack.

7 C. Changed orders of 2d Plat. and directed it to go to some other position when the position in the vicinity of Flint's with its short range would have been more valuable in the final stages of a counter attack.

THE GENERAL SERVICE SCHOOLS

The Army Staff Class

1919-1920

Course in Tactics and Technique of Separate Arms

TACTICAL RIDE—*Machine Guns*

(T. T. 55)

Prepared by Captain Walter C. Short, Infantry

Map: 3″ Topographical Map of Fort Leavenworth and Vicinity.

PART I

General Situation:

A state of war has existed for several weeks between Kansas (Red) and Missouri (Blue). The Blues effected a crossing of the Missouri at Kansas City with an army corps and advanced northward. Their advance was stopped by two Red divisions about ten miles south of Leavenworth. Yesterday morning the Blue Corps made a general attack, pushing the Reds back all along the line. At nightfall the Blues had reached Five Mile Creek south of Leavenworth. This morning the general attack was resumed at 11:00 a.m.

Special Situation (Blue):

The 1st Division is attacking on the right of the line in column of brigades with the 1st Brigade in front. One Regt. of L. A., and 1 Bn. of Hv. A. are attached to the 1st Brigade. The 1st Brigade is attacking with two regiments abreast in the sector bounded on the east (right) by the Missouri River and on the west (left) by Pilot Knob, western outskirts of Leavenworth, U. S. Penitentiary, Prison Lane, Blunt Hill. Each regiment has one battalion in the assault and one in regimental reserve. The 1st Inf., on the right has one battalion in division

reserve and the 2d Inf., one battalion in brigade reserve.

The 1st Bn., 2d Inf., is the left assault battalion. It is deployed with Co. A on the right and Co. B on the left as assault companies; Co. C on the right and Co. D on the left as reserve companies. The M. G. Co., 2d Inf., two Stokes mortars and two one-pounders are operating with the battalion.

The west boundary of the battalion is the west boundary of the brigade. The east boundary of the battalion is Broadway and Grant Avenue.

In passing through Leavenworth, the brigade met with practically no resistance. When the assaulting platoons of Co. B emerged from the orchard east of the penitentiary they were met with fire from the ridge about 500 yards to the north. At the same time Co. A received some long range fire from the ridge to the north of Corral Creek.

At this time the machine guns and all auxiliary weapons were in rear of the reserve companies of the battalion.

Major A, hearing the firing, rode forward accompanied by Captain M, commanding the machine gun company, and Lieut. S, commanding Stokes mortars and one-pounders. When he rode up to the east side of the orchard at 1:45 p.m., he saw Co. B stopped just south and Co. A about 100 yards north of the wire fence running northwest and southeast about 300 yards north of the orchard. The enemy fire was coming chiefly from the ridge running northeast from the penitentiary with an occasional burst of machine gun fire from the high ground north of Corral Creek.

Required:

Orders as actually issued by Major A.

Time allowed—30 minutes.

PART II

Situation:

Major A gave the following verbal orders:

To Captain M, commanding machine gun company:

"Bring up your machine guns as quickly as possible to the vicinity of this orchard and open fire at once on the enemy along the ridge running northeast from the Penitentiary."

To Lieut. S, commanding Stokes mortars and one-pounders:

"Bring up the Stokes mortars and one-pounders at once. Put the Stokes mortars in position south of the orchard. Place the fire of the Stokes mortars on Corral Creek from the ravine running up to South Merritt Hill inclusive, to a point 300 mils to our left (west) of the ravine. Place one-pounders in position in that cornfield to the east ready to engage any machine guns appearing on high ground north of Corral Creek.

Required:

Orders as actually issued by Captain M.

Time allowed—15 minutes.

PART III

Situation:

Captain M gave the following verbal orders:

To the buglers:

"Jones, you and Smith gallop back to the company. Tell all platoon and section leaders to report to me here at once, and guide them to this place. Smith, you will remain with the company and guide it here. Tell Lieut. A to bring it forward as rapidly as possible."

To the 1st sergeant:

"Sergeant, examine the ground at the west end

of the orchard and see if it is a suitable firing position for a platoon."

The 1st sergeant having reported the ground suitable for a platoon firing position, when the platoon and section leaders reported, Captain M issued the following verbal orders:

"You can see our infantry near the wire fence about 300 yards to the front. They have been stopped by fire from the ridge running northeast from the Penitentiary. This company will go into position at once and open fire on the whole of that ridge."

Firing Positions:

The 1st Plat. at this cut, the 2d Plat. at the cut 200 yards to the west, and the 3d Plat. near the west end of the orchard.

Targets:

1st Plat. the left third of the ridge.

2d Plat. the right third of the ridge.

3d Plat. the center third of the ridge.

Combat wagons will halt on cross street 400 yards south of this point. Carts south of the orchard.

"Go into position at once and open fire when ready."

"I shall remain at this point."

A few minutes after fire was opened by the machine guns and Stokes mortars, the Reds along the ridge gave way and the Blue infantry advanced and disappeared over the ridge. Two or three minutes later shots were heard from the direction of Corral Creek just north of the ridge.

Required:

Orders as actually issued by Captain M.

Time allowed—10 minutes.

An Approved Solution

PART III

Captain M gave the following verbal order to the platoon leader of the 1st Plat.:

"Move forward at once and take up a position on the ridge from which the enemy has just retreated. Leave your carts in their present position."

Captain M then sent the following message to the platoon leader of the 2d Plat.:

No. 1. Eastern end of Orchard.
2 Oct., 19, 2:15 p.m.

C. O.,
2d Plat., M. G. Co., 2d Inf.

Replenish your ammunition and be prepared to move forward to ridge just evacuated by the enemy. Move forward when you see that 1st Plat. is in position and prepared to open fire. Leave carts in present position.

M, Captain.

PART IV

Situation:

At 2:30 p.m., Brig. General A received messages from the colonels of both the 1st and 2d Inf. that they were receiving fire from the high ground north of Corral Creek but were continuing to advance. He sent a message to the commander of the artillery attached to the brigade (consisting of 1st L. A. and 1 Bn. Hv. A.) directing him to bring the high ground to the north of Corral Creek under fire. He then rode forward to get a view of the action, accompanied by the Brigade Machine Gun Officer.

At 3:00 p.m., he reached the high ground just north of Crossroads 859. A minute or two later he received the following messages:

No. 4. Hill 862,
2 Oct., 19, 2:50 p.m.

C. G.,
1st Inf. Brig.

Stopped south of CORRAL CREEK by heavy rifle, auto-rifle and machine gun fire from POPE HILL and woods to the west of POPE HILL. Unable to advance without assistance.

D; Colonel.

No. 2. U. S. PENITENTIARY,
2 Oct., 19, 2:45 p.m.

C. G.,
1st Inf. Brig.

Held up along CORRAL CREEK just west of GRANT AVE. and in ravine southwest of SOUTH MERRITT HILL by heavy fire from MERRITT HILL. Request artillery and machine gun support.

E, Colonel.

From his position General A could see a considerable part of the infantry, the M. G. Co., 1st Inf. in action on the high ground northeast of 862, and the M. G. Co., 2d Inf. in action on ridge east of Hill 881. The regimental reserves were along the streets about 400 yards in rear of the 859—870 Road, the 2d M. G. Bn. about 600 yards in rear of the regimental reserves, and the brigade reserve on the southwestern outskirts of Leavenworth.

Required:

Orders as actually issued by Brig. General A.

Time allowed—30 minutes.

PART V

Situation:

General A dictated the following order to his adjutant and aides, brigade machine gun officer, and the artillery commander:

Hq., 1st Inf. Brig.,
200 yds. north of CROSSROADS 859.
2 Oct., 19, 3:15 p.m.

Field Order }
No. 17. }

1. The enemy has held up our advance on the line POPE HILL—SOUTH MERRITT HILL.

2. This Brig. will resume the attack at 5:00 p.m., enveloping the enemy's right.

Zones of action unchanged.

3. (a) The 2d Inf. will attack with 2 Bns. in the assaulting line. The 3d Bn., 2d Inf. is placed at the disposal of the C. O., 2d Inf.

(b) The 1st Inf. will resume the attack. The regimental reserve Bn., 1st Inf. will be held at the disposal of the brigade commander.

(c) Artillery.

The attack will be preceded by ten minutes' artillery preparation, particular attention being given to POPE HILL, SOUTH MERRITT HILL, and ENGINEER HILL. 1 Bn. of L. A. will support 1st Inf. and 1 Bn. will support 2d Inf.

(d) Machine Guns.

The 2d M. G. Bn. will take up positions on the high ground between the PENITENTIARY and the MISSOURI RIVER, to support the attack by direct overhead fire, and will open fire at 5:00 p.m.

4. No change in administrative details.

5. Command Posts:

1st Brig., 200 yards north of CROSSROADS 859.
1st Inf., HILL 862.
2d Inf., U. S. PENITENTIARY.
2d M. G. Bn., 200 yards north of CROSSROADS 859.
Artillery, 200 yards north of CROSSROADS 859.

A, Brig. General.

Copies to:

1st Inf. by an aide.
2d Inf. by brigade adjutant.

1st Div. by courier.

Required:

Orders as actually issued by Major M, Brigade M. G. O.

Time allowed—30 minutes.

An Approved Solution

PART V

Major M, after reading the brigade order, took a careful look at the positions of the troops and at the high ground north of the 859—870 Road, and then gave the following verbal order to his adjutant:

"Gallop back to the battalion and direct the company commanders to report to me here at once. Bring the Bn. forward and halt it 400 yards south of Crossroads 859. Report back to me when you have done this."

When the company commanders reported, Major M gave the following verbal orders:

"The enemy has held up our advance along the line Pope Hill—South Merritt Hill.

"Our infantry is in the ravine southwest of South Merritt Hill and along Corral Creek on both sides of Grant Ave. The machine gun companies operating with the infantry are in position on hill east of Hill 881 and on the high ground east of Hill 862.

"Our brigade will attack at 5:00 p.m., enveloping the enemy's right. The principal attack will be made by the 2d Inf. which will place 2 Bns. in the assaulting line.

"The attack will be preceded by ten minutes' artillery preparation.

"This Bn. will support the attack by direct overhead fire.

"Firing Positions:

"Co. A, Hill 862.

"Co. B, Grant Hill.

"Co. C, Cornfield 500 yards northwest of Crossroads 859.

"Co. D, ridge running northeast from the Penitentiary.

"Targets:

"Co. B, Pope Hill, inclusive, to the Missouri River.

"Co. A, Pope Hill, exclusive, to South Merritt Hill, exclusive.

"Co. C, South Merritt Hill.

"Co. D, South Merritt Hill, exclusive to Engineer Hill, inclusive.

"Combat wagons at disposition of company commanders.

"Occupy your firing positions at once, and open fire at 5:00 p.m.

"Establish communication with Bn. by telephone and runners.

"Command post of Bn., 200 yards north of Crossroads 859."

Comments

PART I

The enemy that was holding up the infantry and causing it losses was on the ridge immediately in front. The machine guns could sweep the whole of this ridge from positions which they could occupy quickly and with no losses. It was imperative that they should get into action at once as the infantry was in a very exposed position. The aim then was to get them into action as quickly as possible without any attempt to have the whole company open a surprise fire.

Should the enemy retreat to the north over the ridges, the machine guns will be able to bring an effective fire on him, but should he retreat from Corral Creek Valley to South Merritt Hill by the ravine running up to the east of the hill or by the smaller ravine about 400 yards to the west, the machine guns would not be very effective. This reason, together with the fact that the enemy in all probability has supports in Corral Creek Valley, decides Major A to place the fire of the Stokes mortars along Corral Creek between these points. They could fire very effectively on the ridge occupied by the enemy but Major A considers that the machine guns can take care of that.

The one-pounders would not be very effective against the enemy on the ridge but against the machine guns on the high ground north of the creek they will prove very effective and will leave our own machine guns free to fire on the more important target.

PART II

Captain M wished to look over the ground and select firing positions, decide upon the assignment of targets, etc. The buglers could return to the company and guide the company to the position as well as he.

Speed was important, so he directed all platoon and section leaders to precede the company so there would be no delay whatever incident to the occupation of the positions.

The way the enemy's line ran he saw that he could enfilade the center of the line from the position on the left, and almost enfilade the right of the line from the center position, while his right platoon would have an oblique fire on the left of the line. This arrangement would greatly increase

the fire effect over an assignment of targets directly in front of the platoons.

Getting fire on the enemy as rapidly as possible was more important than surprise, so Captain M directed the platoons to open fire when ready and did not attempt to have all of the guns open fire simultaneously.

There was plenty of cover at the orchard for both the carts and combat wagons but Captain M preferred to separate them by a short distance as there was a possibility of the enemy shelling the orchard.

PART III

As soon as the infantry passed beyond the ridge, Captain M wished to occupy it, for his present position afforded him no immediate opportunity to fire on the enemy. However, he wished to keep the greater part of his guns in position for any emergency until one platoon was actually in position on the ridge. Should he move all of his guns at once and the enemy should make a counter-attack, he would leave his infantry with no support.

PART IV

The resistance of the enemy had become so stubborn, that General A realized that the only chance of driving him from his position was by a concerted attack, using the full power of his infantry, machine guns, and artillery. To renew the attack without making a concerted effort would be to incur losses without getting any result.

A glance at the ground showed General A that he would have more opportunity to use his reserves by enveloping the enemy's right and that there would also be more chance of cutting off the enemy's retreat. He observed that there was high ground

in rear of the attacking troops all the way from the Penitentiary to the river which afforded suitable positions for overhead fire by the machine gun battalion.

Owing to the length of time necessary for putting the reserve battalion of the 2d Inf. in a position to attack General A did not believe that an attack could be made before 5:00 p.m. He therefore ordered the attack for that hour, considering that this would give the artillery and machine guns ample time for their preparation.

PART V

Major M wishes to continue in observation of the situation and also wishes to issue his orders to the company commanders where he can point out the positions and targets to them. For these reasons, he sends for the captains to come forward instead of himself returning to the battalion. He does not wish to lose any time, however, so he directed the adjutant to bring the battalion as far forward as it can come advantageously as a unit before being separated for its different missions.

In assigning firing positions Major M was influenced by the ground offering favorable positions and giving the maximum amount of enfilade fire and at suitable ranges. He crossed the fire of Companies A and B, as in this way he could get a greater amount of oblique fire. He placed the greater part of his fire on the enemy's right as it was at this point that the principal attack was to be made and he wished to have a decided fire superiority.

There was ample time to connect up the companies to battalion headquarters by telephone and he directed that this be done. At a later stage quick communication might prove important in the movements of the companies.

THE GENERAL SERVICE SCHOOLS

The Army School of the Line

1919-1920

Course in Tactics and Technique of the Separate Arms

Map Problem No. 5, Part II—*Infantry*

3″ Topographical Map Gettysburg-Antietam, Kingsdale Sheet.

Prepared by Captain Walter C. Short, Infantry

PART I

General Situation:

Two hostile armies (Red—north and Blue—south) have been in a stabilized situation for two months on the general east and west line through Silver Run.

On the front between Silver Run and Big Pipe Creek the opposing lines are located as follows:

Reds:

The Red front line runs from west to east along the line Hill 586, 363.2—731.3, Hill 581, Hill 582, Hill 621, 364.6—732.7, 364.8—733.0, Hill 722, Hill 744.

His main line of resistance is on the general line Hill 566—Hill 621—Hill 742—Hill 726—Hill 744—Hill 767—Hill 742.

Blues:

The Blues are holding the ridge from Green Valley School House to the town of Silver Run, with outposts along Silver Run Creek.

Special Situation (Blue):

Oct. 20, 1919, a general Blue advance was ordered for D day at H hour which will be within the next four days.

The 1st Division holds the front from Silver Run to 496 Road Junction, both inclusive, as follows:

1st Brigade from Silver Run, inclusive to 365.4—732.1.

2d Brigade from 365.4—732.1 to 496 Road Junction, inclusive.

Co. A, 3d M. G. Bn. is occupying emplacements along the ridge to the west of Crossroads 655 and in the woods to the northeast of the crossroads.

Co. B, 3d M. G. Bn. is occupying emplacements in the woods south of Crossroads 496 and in the woods east of Green Valley S. H.

Co. C, 3d M. G. Bn. is in the vicinity of Hill 651 and the woods to the east and north.

Co. D, 3d M. G. Bn. is in the vicinity of Hill 624 and Hill 647.

M. G. Co., 3d Inf. is in rest billets at farm house 800 yards east of Arter's Mill, and M. G. Co., 4th Inf. in rest billets at farm house 600 yards southwest of Arter's Mill. M. G. Co., 4th Inf. suffered heavy casualties the night of Oct. 17th from artillery fire and had to be pulled out of the front line for recuperation. Its present strength is only 140 enlisted men.

1st F. A. Brigade is in the woods in the vicinity of the following points: 367.3—731.3, 366.85—730.2, 366.7—729.2, 363.4—730.2, 366.0—728.1, 364.6—728.2.

The Division Machine Gun Battalion is in rest billets at farm house at 365.9—728.8. It had been placed at the disposal of C. G., 1st Brig. from H. to H plus 2 hours for barrage fire.

Division Summary of Intelligence for Oct. 20, 1919, contained the following important information:

Headquarters, 1st Div.,
ARTER'S MILL.

Summary of Intelligence

From 12:00 o'clock noon, 19 Oct., 19.
To 12:00 o'clock noon, 20 Oct. 19.

1. Enemy order of battle:

No new identifications.

2. Location and movements of enemy's troops:

Airplane reports that a company of machine guns was observed moving up the north slope of Hill 742 at 7:00 p.m., Oct. 19th.

3. Enemy Infantry, Artillery, and Aerial activity:

Prisoners captured near Hills 581 and 709 about 10:00 p.m., Oct. 19th state that the enemy has one battalion in the wood west of Hill 709 and one battalion south of Hill 706 in the woods. These battalions furnish the garrisons for the strong points on Hills 581, 582, 622, 621. They state also that there is a battalion on Hill 742 and one battalion holding the woods in the vicinity of 364.4—734.3, and Hill 727 and woods to west, two companies being in each position. That the rest of the brigade is in rest billets in KINGSDALE and GEORGETOWN.

Deserters who came in and surrendered the night of Oct. 19th corroborate the above statements.

4. Enemy works.

Airplane photographs taken the morning of the 20th show new wire on Hills 621 and 622, and in the vicinity of 364.85—733.05.

5. Enemy morale.

Enemy's morale is bad, all indications are that he will not offer serious resistance to a determined attack.

F. F. Jones,
Lieut. Col., G. S.
A. C. of S. G-2.

Distribution A.

On Oct. 20, 1919, Major M, commanding the 3d M. G. Bn. is handed the following advanced copy of the Brigade Field Order for the attack with instructions to submit recommendations for the employment of all of the machine gun companies of the brigade, recommendations to be in the form of a sub-paragraph of paragraph 3 of the field order.

Headquarters, 2d Infantry Brigade,
ARTER'S MILL,
20 Oct., 19, 2:00 p.m.

Field Order
No. 40.

Map: 3" Topographical Map Gettysburg-Antietam, Kingsdale Sheet.

1. (a) For the past week the enemy has been strengthening his defenses along the whole of his line. The last three nights prisoners have come in and surrendered to our outposts. They all state that the morale of the Red forces is bad and that they are nervous over a possible attack.

(b) The 1st Corps will attack at D day, H hour, with the 3d Div. on the right, 1st Div. in the center, 2d Div. on the left.

The 1st Div. will attack with 1st Brigade on the right and 2d Brigade on the left.

Boundaries of 1st Division.

Right (east): SILVER RUN—MT. PLEASANT S. H.—TOLLGATE—PLEASANT HILL S. H. ROAD, inclusive.

Left (west): 496—698 ROAD, 361.6—736.8, 360.9—738.3, 567—557—526—527 ROAD, all inclusive.

Objective of 1st Division:

BALTIMORE TURNPIKE.

2. This brigade will attack at D day, H hour.

Boundaries:

Right (east): Creek east of HILLS 621 and 709 (center branch)—Creek west of HILL 744—ROAD-CROSSING 557 (west of GEORGETOMN), HILL 664, 361.65—740.15, 361.7—740.7, all inclusive.

Left (west): Same as left boundary of 1st Div.

Center (between regiments):

Creek west of HILL 621, 679—704—669—602—528 ROAD, 361.5—739.0, 361.1—740.8. The 3d Inf. will be responsible for creek and road.

Objective:

Same as the objective of 1st Div.

3. (a) The 3d Inf., on the right, will attack with one battalion in the first line and two in reserve. The rear reserve battalion will be held at the disposal of the brigade commander.

(b) The 4th Inf. on the left, will attack with two battalions in the first line and one in reserve.

One company from the reserve battalion, 4th Inf. with_____of machine guns will act as a connecting group between 1st Div. and 2d Div.

(c) Artillery:

(1) The artillery preparation will commence at H-15 minutes and will consist of heaviest possible concentrations on the enemy's front line, and on all sensitive points.

(2) The artillery support. A battalion of light artillery will be assigned to support the advance of each infantry regiment. One 75 mm. gun will be assigned to each assaulting battalion as an accompanying gun. One battalion of heavy howitzers will also support the brigade. Regimental commanders will call on brigade headquarters for howitzer support.

A rolling barrage by all available light guns will commence at H minus 5 minutes and precede the infantry as far as the 665—669 ROAD.

A smoke screen will be placed in front of the woods south of HILLS 706 and 709 from H minus 15 minutes to H plus 24 minutes, and in front of HILL 742 from H minus 15 minutes to H plus 81 minutes.

For Details see Annex "A."

(d) Machine Guns.

* * * * * * *

(x) Jumping off line of infantry is SILVER RUN CREEK.

The infantry will advance at the rate of 100 yards in 3 minutes, and will be preceded by a barrage as far as the 665—669 ROAD.

4. See Administrative Order No. 56.

5. (a) Plan of signal communications unchanged.

(b) Axis of signal communications:

HILL 582—HILL 622, 679—720—704—669—528 ROAD.

(c) Command Posts:

1st Div. ARTER'S MILL.

2d Brig. Farm House south of 51.

3d Inf., 200 yards southwest of ROAD-CROSSING 655.

4th Inf., eastern edge of woods north of GREEN VALLEY S. H.

Barrage Guns_____

A,
Brigadier General.

Distribution A.

Required:

The sub-paragraph submitted by Major M.

Time allowed—1 hour and 30 minutes.

PART II

Special Situation (Blue):

(Continuation of Part I.)

Brigadier General A after looking over the paragraph as prepared by Major M, amended it to read as follows, and directed Major M to prepare the Machine Gun Plan:

3. (d) Machine Guns.

(1) Assignment of machine guns to infantry units.

The M. G. Co., 3d Inf., will be assigned to the assault Bn. of the 3d Inf.

Two M. G. Cos. of the 3d M. G. Bn. will be assigned to the assault Bns. of the 4th Inf. One

Plat. of M. G. Co., 4th Inf. will be assigned to the connecting group, maintaining contact between 1st and 2d Divs.

Machine gun organizations will come under the command of the infantry unit commanders at 7:00 a.m., D minus 1 day.

(2) Barrage fire:

The following units are designated for barrage fire:

3d M. G. Bn. (less 2 Cos.).

M. G. Co., 4th Inf., (less 1 Plat.).

The barrage guns will be under the command of the Brigade Machine Gun Officer. They will come under his command at 7:00 a.m., D minus 2 days but will not move from present positions before 7:00 a.m., D minus 1 day.

Standing barrages will be placed on the following positions:

Hills 621 and 622, woods south of Hills 709 and 706, 364.9—733.1 to 364.75—732.95, Hill 726 (west of Hill 744), Hill 742, Hill 727.

The barrage guns will open fire at H hour. The barrage mission will cease when the infantry reaches the 665—669 Road.

Upon completion of the barrage mission, the barrage guns will remain in their final barrage positions until further orders.

(3) For details see Annex "B."

Major M prepared the following machine gun plan as an annex to par. 3 (d), Field Order No. 40:

Hq., 2d Inf. Brig.,
ARTER'S MILL,
20 Oct., 19, 2:00 p.m.

Annex to Field Order No. 40, 2d Inf. Brig.

The Machine gun plan:

1. Organization of the command.

(a) Assignment of machine guns to infantry units.

M. G. Co., 3d Inf. is assigned to the assault Bn., 3d Inf.

Cos. C and D, 3d M. G. Bn. are assigned to the assault Bns., 4th Inf.

1 Plat. of M. G. Co., 4th Inf. will be assigned to the connecting group, maintaining contact between 1st and 2d Divs.

These machine gun organizations will come under the command of infantry unit commanders at 7:00 a.m., D minus 1 day.

(b) Barrage fire.

Major M, Brigade Machine Gun Officer, is designated as commander of barrage guns.

The following organizations are designated as Barrage Guns, 3d M. G. Bn. (less 2 Cos.).

M. G. Co., 4th Inf., (less 1 Plat.).

These organizations will come under the command of Major M at 7:00 a.m., D minus 2 days but will not move from their present positions until 7:00 p.m., D minus 1 day.

The barrage mission ceases at H plus 1 hour and 48 minutes, but all guns will continue under the orders of the Brigade Machine Gun Officer, and will remain in the positions they occupy at that time, until further orders.

2. Missions prior to D day.

No harassing fire will be carried out prior to H hour.

3. Missions on D day.

For positions of companies and platoons and assignments to targets, see Appendix No. 1.

Times of fire given in Appendix No. 1 are general guides for the firing of the platoon or company. Company and platoon leaders will check the clearances of friendly troops by each gun. Following data to be used in calculations:

Jumping off line of infantry is SILVER RUN CREEK.

Rate of advance of infantry is 100 yards in 3 minutes.

4. Occupation of initial positions.

The machine gun units designated for barrage fire will have initial positions as follows:

Co. A, 3d M. G. Bn. in the vicinity of 365.45—731.7.

Co. B, 3d M. G. Bn. in the vicinity of 364.1—731.25.

M. G. Co., 4th Inf. (less 1 Plat.) in the vicinity of 364.55—731.2.

Company and platoon commanders and 4 men per platoon will reach the vicinity of their positions at 6:00 p.m., D minus 2 days for reconnaissance of positions, preparation of fire data, and construction of emplacements. Excavations will be made after dusk and work carefully camouflaged. Companies will occupy their positions at 8:00 p.m., D minus 1 day. M. G. Co., 4th Inf. (less 1 Plat.) will march to its position by the 530—GREEN VALLEY S. H. ROAD. Cos. A and B, 3d M. G. Bn. will proceed to their positions as directed by their respective captains.

5. Advance of platoons and companies to successive positions.

See Appendix No. 2.

6. Ammunition.

Companies will establish dumps in the vicinity of initial positions as follows:

Cos. A and B, 3d M. G. Bn.

80,000 rounds of ordinary .30 cal. ammunition.

3,000 rounds in belts with 1 tracer bullet and 1 armor piercing bullet in each ten rounds.

M. G. Co., 4th Inf.,

60,000 rounds ordinary .30 cal. ammunition.

2,000 rounds in belts with tracer and armor piercing bullets as noted above.

One gun in each section will carry 2 boxes of tracer ammunition on carts for ranging. Platoons designated for anti-aircraft work will carry on the carts 12 boxes of ammunition loaded with tracer and armor piercing bullets as noted above.

The 4th Infantry will detail 32 men to act as ammunition carriers for M. G. Co., 4th Inf.

7. Signal communications.

Communication by visual, rockets and runners as provided in General Plan of Division.

Companies will connect their initial positions with initial command post of barrage guns, and their second position with second command post, by telephone.

Command posts of barrage guns.

From H to H plus 60 Farm House south of 51.

After H plus 60 in woods north of CROSSROADS 718.

By Command of Brigadier General A:

B, Major,
Brigade Adjutant.

Official:

M, Major, Brig. M. G. O.

Required:

(a) Preparation of an "Organization Chart" as Appendix No. 1 to par. 3 of the Machine Gun Plan. This chart will show assignment of targets at the initial position and at successive positions, and the times of fire and rates of fire for all targets.

(b) Preparation of a "Movement Table" as Appendix No. 2 to par. 5 of the Machine Gun Plan. This table will show all movements of platoons or companies, giving the location of the organizations both before and after the movement, time of movements, and routes followed.

An Approved Solution

PART I

3. (d) Machine Guns.

(1) Assignment of machine guns to infantry units.

The M. G. Co., 3d Inf. will be assigned to the assault battalion of the 3d Inf.

Two M. G. Cos. of the 3d M. G. Bn. will be assigned to the assault battalions of the 4th Inf.

One Plat. of M. G. Co., 4th Inf. will be assigned to the connecting group, maintaining contact between 1st Div. and 2d Div.

Above machine gun organizations will come under the command of the infantry unit commanders at 7:00 a.m., D minus 1 day.

(2) Barrage fire.

The following units are designated for barrage fire:

3d M. G. Bn. (less 2 Cos.).
M. G. Co., 4th Inf. (less 1 Plat.).

The barrage guns will be under the command of the Brigade Machine Gun Officer. They will come under his command at 7:00 a.m., D minus 2 days, but will not move from their present positions before 7:00 a.m., D minus 1 day.

Standing barrages will be placed on the following positions:

Hill 621 and 622, woods south of Hills 709 and 706, 364.9—733.1 to 364.75—732.95, Hill 726 (west of Hill 744), Hill 742, Hill 727.

The barrage guns will open fire at H hour. The barrage mission will cease when the infantry reaches the 665—669 Road.

Upon completion of the barrage mission, the barrage guns will remain in their final barrage positions until further orders.

(3) For details see Annex "B."

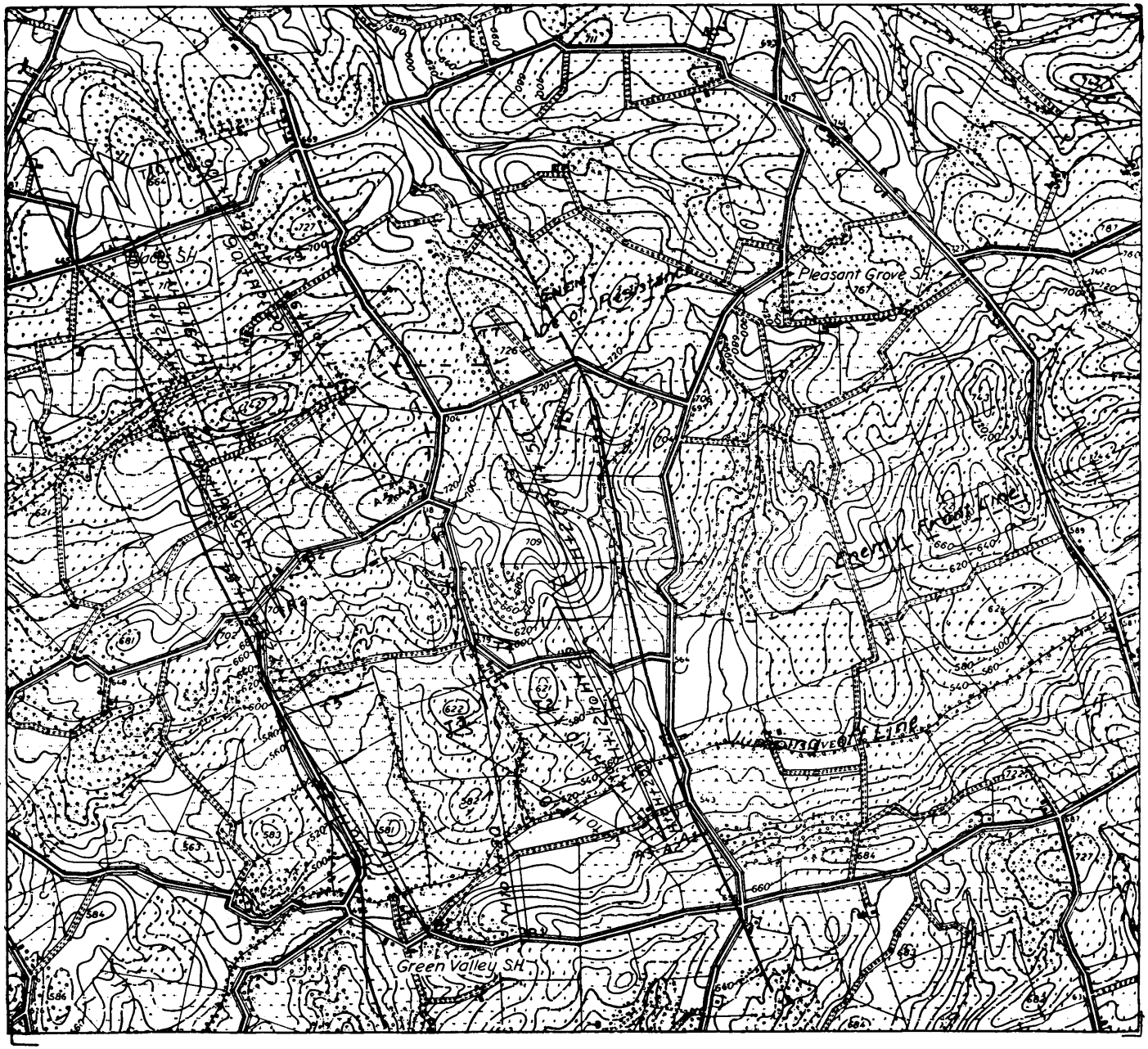
Requirement (a) PART II:

ORGANIZATION CHART OF BARRAGE GUNS

Appendix No. 1 to Machine Gun Plan.

Reference: 3" Topographical Map of Gettysburg-Antietam. Date October 20, 1919.

Plat or Co.	Composition	Guns.	Approximate Location	Target	Time From	Time To	Rate of Fire	Remarks
	Plat. Co. A,							
A Plat.	3d M.G. Bn.	4	A 1	T 1	H	H+ 25	125	
		4	A 1	T 7	H+ 27	H+ 50	75	
		4	A 5	T 12	H+102	H+106	150	
B Plat.	Plat. Co. A	4	A 2	T 2	H	H+ 10	125	
		4	A 2	T 1	H+ 12	H+ 25	75	
		4	A 2	T 6	H+ 27	H+ 50	75	
		4	A 5	T 12	H+102	H+106	150	
C Plat.	Plat. Co. A	4	A 3	T 3	H	H+ 10	150	
		4	A 4	T 9	H+ 77	H+ 94	125	
		4	A 4	T 12	H+ 96	H+106	150	
	Co. B. 3d							
Co. B	M.G. Bn.	12	B 1	T 5	H	H+ 24	125	
		12	B 1	T 8	H+ 26	H+ 54	75	
		12	B 2	T 10	H+ 91	H+108	150	
M.G.Co. 4th Inf.		8	R 1	T 4	H	H+ 20	125	
		8	R 2	T 8	H+ 56	H+ 70	75	
		8	R 2	T 11	H+ 72	H+108	75	



To face page 211.

Requirement (b) PART II:

MOVEMENT TABLE

Appendix No. 2.
To Machine Gun Plan.

Plat. or Co.	From	Time From	To	Route	To
Plat. C, Co. A	A 3	H+12	H+72	543—564—679—718—Road	A 4
Co. A (less Plat. C)	A 1 & A 2	H+52	H+97	543—564—679—718—Road	A 5
M.G. Co., 4th Inf.	R 1	H+22	H+52	496—698—Road	R 2
Co. B	B 1	H+56	H+86	496—698—Road then across Hill 706 to position	B 2

Comments

The following comments are for instructional purposes. These comments were not required in the solution.

PART I

The M. G. Co., 4th Inf. had suffered severe losses in the last few days and these losses had not been replaced. For this reason General A does not assign it to an assault battalion as this is the hardest duty that any machine gun company is called upon to perform. In the matter of acting with assault battalions there is no difference between the companies of the machine gun battalion and the regimental companies. The duty should be so rotated that all of the companies will get an equal amount of work with assault battalions.

General A designates by number, not by letter, the companies from the M. G. Bn. which are to act with the 4th Inf. It is better to leave this detail to the battalion commander. The captains of the companies so designated by the battalion commander will get in communication with the headquarters of the 4th Inf., and make arrangements for reporting to the battalions.

It should be noted that General A provides a definite mission for all of his guns. In the initial stages of such an action every machine gun should be employed. It is entirely unnecessary to hold out a reserve which takes no part in the barrage. The position of the barrage guns will always be far enough to the rear and the control over the guns such, that General A can interrupt their barrage mission and assign them a new mission. It would be a mistake to hold out reserve guns which would take no part in the firing.

General A is making a surprise attack as is indicated by the short artillery barrage. For this reason he provides that the machine guns will not open fire until H hour.

General A does not assign a rolling barrage mission to the machine guns as they are not suited for such work. He directs that they place standing barrages on known strong points and on the woods where the enemy is known to have troops. While machine gun fire on strong points on Hills 581 and 582 would be an advantage, they are so close to the front line that it is impracticable. They are more suitable targets for the Stokes mortars.

General A places the barrage guns under the command of the Brigade Machine Gun Officer on D minus 2 days as he wishes him to have time for the reconnaissance and preparation of the positions. He states specifically, however, that they shall not be moved from their present positions until D minus 1 day as he wishes to continue his present scheme of machine gun defense until it is absolutely necessary to place the guns in position for the attack.

General A decides that the machine gun barrage cannot be planned beyond the 665—669 Road and provides that the barrage mission ceases at that time. He, however, continues all companies under the command of the Brigade Machine Gun Officer which means that they will become a brigade reserve. He directs that they shall not move until further orders. It would be a mistake to concentrate them upon the completion of their mission when their future mission cannot be foreseen. At the end of the barrage mission they will be in excellent positions for repelling counter-attacks and it is better to leave them in these positions until General A knows what the situation is.

PART II

In making the selection of Cos. C and D for work with the assaulting battalions of the 4th Inf., Major M was guided by the positions that the companies now occupy. These companies are well to the rear where they can be readily moved to join an assault battalion without interfering materially with the plan of defense. Similar reasons led him to assign Co. A to Positions A1, A2, and A3, and Co. B to Position B1. The companies are now so close to these positions that they can reconnoiter them and move to them with minimum of exposure.

In designating the times of fire for different targets it is Major M's aim to always have a heavy fire on the target that is most likely to hold up the infantry at a particular time. He intends to open fire on the target as soon as possible and to continue firing on it until the safety angle forces him to cease firing or until the infantry is 1,800 meters in advance of his guns when it is necessary to cease firing. He also wishes to have a part of his guns that are firing on any target, at medium range. This fact together with the possibility that something may retard the advance of the M. G. Co., 4th Inf., causes him to assign the whole of the target at Hill 742 to both Co. B and the M. G. Co., 4th Inf., instead of dividing the target between them.

In providing for the forward movement of the various organizations, Major M directs them to use the roads. At this stage of the game there is no danger of the roads designated being congested with traffic. The only thing that would be going forward so early would possibly be a few trucks with engineer material for road construction. The roads may be heavily shelled but it is unlikely. The enemy will be busy moving his division artillery to

the rear and the artillery farther to the rear will be neutralized to a great extent. The smoke screen on Hill 742 will deprive the enemy of his best observation station so direct fire on the carts is improbable. To send the carts across country will greatly delay their advance. It is better to take a chance on the shelling and trust to subordinate commanders to use their judgment and get off the roads if they are heavily shelled. There will be some difficulty in advancing over the roads and Major M has taken this into consideration. The first organizations to advance over any road will not be able to advance as rapidly as the later ones as they will have to cut wire and possibly fill in or bridge some trenches.

This accounts for the difference in the rate of advance shown in the Movement Table.

In assigning times of fire on any target Major M makes the statement that these times are to be taken only as guides. He has made only one calculation for a platoon or company and that with the position known only approximately. If his figures were followed rigidly the infantry might be endangered by some one gun in an organization. For this reason, platoon and company commanders are always responsible for looking out for the safety of the infantry regardless of the time shown in the table.

Major M does not tell his command what kind of fire they will use. He considers it unnecessary for they have been trained to always use direct fire when possible, including barrage work, but to always be prepared to use indirect methods.

In providing for the ammunition dumps Major M does not indicate what part of the ammunition will be in original packing boxes and what part in

belts. He does not know what is available and must leave it to his supply officer to get the greatest quantity in belts that is possible. The supply of oil and water would be provided automatically by Bn. S. O.

Major M directs that reconnaissance be made and emplacements prepared on D minus 2 night. This is always much better when time is available. It insures that the position can be occupied deliberately and the fire data accurately calculated. When machine gunners have to locate their positions and lay out their lines of fire after dark errors will usually creep in.

It may not have been necessary for Major M to state that excavations would be made only after dark and all work carefully camouflaged but he is on the safe side in so ordering.

Ammunition carriers are provided for M. G. Co., 4th Inf. on account of the shortage in personnel. Where companies are not depleted they should furnish their own ammunition carriers, using men of the platoon that is usually held in support if it becomes necessary to advance guns by hand for any great distance.

It is unnecessary for Major M to go into detail as to the various methods of communication as that is provided for in the General Plan of the Division which is a matter of drill in the organizations. He does consider it necessary to give some instructions about the telephones, however, as he does not want the first organizations that move forward to try to connect back to the first command post.

The following are the principal errors made in the solution of Map Problem No. 5, Part II:

PART I

1. Form given for "Par. 3 ( ) Machine Guns" was not followed.

2. M. G. organizations assigned to infantry units were not placed under the command of the infantry commander early enough to permit them to receive instructions and move into the jumping off position without undue haste.

3. Machine guns assigned to barrage fire were not placed under barrage commander early enough to permit them to make proper reconnaissance of positions.

4. Distribution of targets to companies was made in the field order. That should be done in the machine gun plan.

5. Fire was lifted when infantry was 500 yards from the target instead of on a time schedule. Irregularities of the ground make this method uncertain.

6. Did not use all guns. All guns not assigned to assault battalions or connecting groups should be used for barrage fire.

7. A rolling barrage was employed. This is not practicable with machine guns.

8. Regimental M. G. Cos. acting with their regiments were not mentioned. They should be since they frequently do not act with them.

9. Targets were designated too generally.

10. Time when barrage mission ceased was not shown.

11. Too many guns were assigned to the connecting group.

12. All of the organizations were not accounted for.

13. Passage of lines was provided for when it had not been ordered.

14. Only one platoon of machine guns was assigned to an assault battalion.

15. Objectives well to the rear were frequently not covered.

16. Machine guns assigned to assault battalions were given missions after H hour by commander of barrage guns.

17. No machine guns were assigned to assault battalions.

18. No machine guns were assigned to connecting group.

19. No guns were designated as barrage guns.

20. Connecting group between brigades was provided for when it had not been ordered by brigade commander.

21. Information not necessary to the command was placed in field order.

22. Barrage guns were placed under command of D. M. G. O. instead of Brig. M. G. O.

23. Known strong points were not fired on.

24. Firing was ordered that would endanger the infantry.

25. Machine gun plan was submitted instead of a paragraph for the field order.

26. Reasons for action were put in the order.

27. All of the barrage guns were assembled at one place.

28. Failed to make assignment of M. G. Cos. to assault battalions.

29. M. G. Cos. were assigned to reserve battalions without any special reason.

30. Successive positions for machine gun organizations were shown in the field order.

31. Harassing fire was provided for when the attack was planned as a surprise.

32. Other objectives than the Baltimore Turnpike were assumed.

33. Provision was made for the adjustment of the barrage fire under conditions where adjustment was impossible.

34. Matters that were a question of training were placed in the order.

35. A barrage was placed on the jumping off line.

36. Sufficient information in regard to the barrage guns was not placed in the order.

37. M. G. Cos. assigned to assault battalions were relieved from such assignment during the action. They will always be needed during the consolidation.

38. Forward movement of the guns was shown in the field order.

39. The machine gun barrage was begun before the artillery preparation.

PART II

40. More guns were assigned to certain targets than were necessary to cover the target effectively.

41. The machine guns did not continue to support the infantry as long as possible before lifting their fire from a target.

42. No time interval was allowed for in switching from one target to another.

43. Firing was carried out over friendly troops at a greater distance than 1800 meters.

44. Provision was not made for supporting the infantry up to H plus 1 hour and 48 minutes which

was the time announced in the machine gun plan for the barrage mission to cease.

45. Movements were made across country when roads could probably have been used and they would have been much faster.

46. Rates of fire were too rapid.

47. Rear targets were not covered.

48. Bounds in moving the barrage guns forward were too short.

49. The commander of the barrage guns assumed control over guns which had been assigned to assault battalions.

50. Fire was continued so long on certain targets that the friendly infantry was endangered.

51. Times of advance were not shown.

52. All of the guns assigned to the barrage fire were not employed.

53. Times for lifting the fire were not given but a general statement made that guns would lift their fire when the infantry masked them.

54. Firing was carried out at ranges greater than 2600 meters which is the limit of effective fire with the Browning.

55. Times of fire for two or more targets were shown together.

56. Order to open fire at H hour was violated.

57. A rolling barrage was provided for although standing barrages had been ordered.

58. Movement table showed movement to initial positions instead of movements from initial positions to successive positions.

59. All of the prescribed targets were not covered.

60. Changes of position were shown for only part of the organizations.

61. Failed to prescribe rate of fire.

62. Rate of fire was too slow.

63. Exact time of movement was not shown.

64. Fire of the companies was split up more than necessary.

65. An attempt was made to cover all targets from the initial positions.

66. Positions were occupied before the infantry had advanced to that point.

67. Fire was made unnecessarily complicated by having a platoon from several organizations fire on a target when one organization could have delivered all of the fire on the target.

68. The time was incorrectly expressed.

69. Emergency missions were assigned to barrage guns. These can usually be handled better by guns with assault battalions.

70. Positions shown in the movement table did not agree with ones shown on the organization chart.

71. Targets were not fired upon just before the infantry assault.

72. Barrage guns were moved forward practically together instead of by echelon.

73. Fire was ordered from certain positions before the machine guns reached the positions.

THE GENERAL SERVICE SCHOOLS

The Army School of the Line

1919-1920

Course in Tactics and Technique of Separate Arms

TACTICAL RIDE No. 3

Map Reference: Topographical Map Fort Leavenworth and Vicinity 1/21120.

Prepared by Captain Walter C. Short, Infantry

Situation:

A state of war exists between Kansas (Red) and Missouri (Blue). October 1st the 1st Division (Blue), with very little opposition, crossed the Missouri at Leavenworth and Fort Leavenworth. The 1st Infantry Brigade camped at Fort Leavenworth the night of Oct. 1st and the 2d Brigade at Leavenworth. At 9:00 p.m., Major A, commanding the 1st Bn. 1st Inf. received the following order:

Hqrs., 1st Brig.,
FORT LEAVENWORTH, KANSAS,
1 Oct., 19, 8:00 p. m.

FIELD ORDERS }
No. 17. }

1. Only slight resistance from small detachments was met with in crossing the Missouri today. Reliable reports indicate that there is a company of infantry at KICKAPOO and a regiment at HAWTHORNE where a considerable quantity of supplies has been collected.

Our Division will remain at LEAVENWORTH tomorrow.

2. This brigade will march tomorrow towards HAWTHORNE.

Troops:

(a) Advance Guard:
Major A.
1st Bn., 1st Inf.

M. G. Co., 1st Inf.
Batry. A, 1st F. A.

(b) Main Body (in order of march):
1st Inf. (less 1st Bn.).
2d M. G. Bn.
1st Bn., 1st F. A. (less btry. A).
2d Inf.
1st F. A (less 1st Bn.).

3. (a) The Advance Guard will start at 7:00 a.m. tomorrow and march by the B-C-D-E Road, ATCHISON PIKE, FRENCHMAN—KICKAPOO ROAD, 23—77—57—HAWTHORNE ROAD.

(b) The Main Body will follow the Advance Guard at 800 yards.

(c) The Outposts will remain in position until the vanguard has crossed the line of supports.

4. The field train will follow the Main Body at 1 mile.

5. I shall be at the head of the reserve.

A,
Brig. General.

Required:

Statement of Major A giving the subdivision of his Advance Guard and the distribution of the machine guns to the various subdivisions and their places in the march. Reasons for distribution of machine guns.

PART II

Major A and the vanguard commander made the following division of the Advance Guard:

Advance Party:
2 Plats. of Co. A, 1st Inf.

Support:
Co. A, 1st Inf. (less 2 Plats.).
Co. B, 1st Inf.

Reserve (in order of march):
1st Bn., 1st Inf. (less Cos. A and B).
M. G. Co., 1st Inf.
Btry. A, 1st F. A.

Combat train following immediately behind units.

Distances between the various subdivisions were as follows:

Point to Advance Party, 200 yds.
Advance Party to Support, 400 yds.
Support to Reserve, 600 yds.

Just as the point reached the bridge over the creek 300 yds. east of Roberts it was fired on from the vicinity of Roberts. At the same time the advance party received rifle, automatic and machine gun fire from along the ridge for 300 or 400 yds. north and south of Roberts.

Required:

(a) A statement as to the approximate locations of:

Head and tail of Advance Party.
Head and tail of Support.
Head and tail of Reserve.
Head and tail of M. G. Co.
Major A, commanding Advance Guard.
Captain M, commanding Machine Gun Co.

(b) What detail was with Captain M?

(c) A statement of the detailed plan of action decided upon by Major A.

(d) Orders as actually issued by Major A to Captain M.

PART III

(a) At the time the point was fired upon:

The head of the advance party was about 50 yds. down the west slope of the ridge just east of the bridge and the tail was coming over the crest of the same ridge. Depth 50 yds.

The head of the support was just west of road crossing 23 and the tail was about 100 yds. east of 23. Depth 150 yds.

The head of the reserve was at 29 and the tail was 100 yds. north of 816. Depth 1,230 yds.

The head of the M. G. Co. was 200 yds. north of 45 and the tail 100 yds. north of the south houses at Kickapoo. Depth 420 yds.

Major A, anticipating trouble in the vicinity of Kickapoo, was riding at the head of the support.

Captain M was with Major A.

(b) The 1st sergeant and 2 buglers were with Captain M.

(c) Major A decided to attack at once enveloping the enemy's right. To support the attack by artillery from the vicinity of 345.2—755.1 and by machine guns from the ridge just west of 23 and the high ground in the vicinity of 344.2—756.3.

(d) Verbal order of Major A to Capt. M., Capt. of Btry. A, Capts. of Cos. A and B.

Message to Capts. C and D to report to him at once when verbal orders would be given to them.

The enemy is holding the ridge running from northwest to southeast at Roberts. He appears to be holding about 400 yds. each side of the road.

We attack at once enveloping the enemy's right.

Co. A will attack south of the road, Co. B north of the road.

Co. C will envelop the enemy's right, attacking from about 600 yds. south of this point towards 344.—755.1.

Co. D will be held in position on the road 500 yds. south of the crossroads at 23.

Btry. A will take up a position in the general vicinity of 345.2—755.1 to support the attack concentrating on Roberts house at beginning of action.

M. G. Co., will support the attack from this ridge (just west of 23) and from the high ground in the vicinity of 344.2—756.3.

Combat train of infantry 200 yds. south of crossroads at 23. Combat trains of the artillery and machine guns at disposal of respective commanders.

I shall remain at this point.

Required:

(a) Captain M's actions.

(b) Orders actually issued by Captain M.

PART IV

Captain M studied the country before him for a few minutes and then said to one of the buglers:

"Smith, the 1st Platoon will go into position on this ridge just south of where we are. Their target will be that part of the enemy's line south of the road. Take a good look at the target and the position so that you will be able to point them out to Lieut. A."

Captain M. with the 1st sergeant and buglers galloped rapidly back towards the reserve and joined the machine gun company just as it reached 33. He halted the company and said, "Officers fall out and join me. Smith, guide the 1st platoon toward the ridge we just left. You will remain with the platoon. Turn over your horse to Lieut. A now. 1st sergeant, turn the remainder of the company north and then west at the first road and halt upon reaching the north and south road about 600 yds. from here."

To the assembled officers Captain M gave the following verbal orders:

"The enemy is holding the ridge that runs from northwest to southeast of Roberts. He is occupying it for about 400 yds. each side of the road.

"The 1st Bn. attacks at once enveloping the enemy's right.

"Battery A supports the attack from the vicinity of 345.2—755.1.

"The 1st Platoon will support the attack from the ridge west of 23 and will have as a target that part of the enemy's line south of the road. Bugler Smith can point out the position and target.

"The 2d and 3d Platoons will support the attack from the vicinity of 344.2—756.3.

"Combat train 200 yds. south of 41.

"Lieut. A, rejoin your platoon.

"Lieut. B and C, you will follow me in advance of the company to make a reconnaissance of the position. Bring your section leaders with you.

"Lieut. D, take charge of the company and conduct it under cover towards 344.2—756.3. Have the 1st sergeant join me as I pass the company.

"Lieut. E, halt the combat train 200 yds. south of 41."

Captain M with platoon and section leaders, 1st sergeant, and bugler proceeded to the vicinity of 344.2—756.3, assigned firing positions, assigned that part of the enemy's line north of the road to the 2d Platoon, and that part of the enemy's line south of the road to the 3d Platoon but directed it to reserve the fire of one section temporarily, prepared to fire on the woods 300 yds. southeast of Roberts.

Required:

Orders actually issued by Lieut. A, commanding 1st Platoon.

Part V

Lieut. A, upon coming up with his platoon directed the section leaders and Bugler Smith to proceed with him, and the platoon sergeant to bring the platoon to the crossroad at 23.

Upon reaching the crest of the ridge Smith pointed out the position and target to Lieut. A.

Lieut. A scaled the ranges from his map and gave the following order:

"You have seen the position and target pointed out by Smith.

"1st section will occupy the right of the position, the 2d section the left. Mount your guns under cover and drag them into position.

"Belt filling stations 50 yds. down the slope. Carts 100 yds. north of the crossroad at 23. Combat train 200 yds. south of crossroad at 41.

"Combined sight No. 4, Gun Range 600, add 50.

"1st section, take the right half of the target, 2d section the left half.

"Rate of fire 150 per minute.

"Signal when ready and open fire on my signal."

Required:

Orders actually issued by Section Leader, 1st Section and Corporal of 1st gun squad.

THE GENERAL SERVICE SCHOOLS

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1919-1920

TERRAIN EXERCISE No. 22
T. T. 67

Prepared by Captain Walter C. Short, Infantry

Map: 3″ Topographical Map of Fort Leavenworth and Vicinity.

PART I

General Situation:

War has been declared between Kansas (Red) and Missouri (Blue). The 1st Division Blue with 1st Cav. and two machine gun troops is advancing from Plattsburg to seize the bridges at Leavenworth and Fort Leavenworth and establish a bridgehead. The night of the 6-7th of Nov., the 1st Cav. camped at Platte City and the infantry brigades at Woodruff and Dearborn.

A Red infantry division has been mobilized at Valley Falls and a cavalry division at Kansas City, Kas. Reliable reports received by the Blue commander at 10:00 p.m., Nov. 6th, stated that Leavenworth and Fort Leavenworth were not occupied by the enemy but that a squadron of Red cavalry had gone into camp at Lansing about 9:00 p.m., Nov. 6th.

Special Situation (Blue):

Colonel A, commanding 1st Cav. and two machine gun troops, was ordered to start at 6:00 a.m., Nov. 7th, to seize the bridges at Leavenworth and Fort Leavenworth, and to hold the high ground to the west and south until the arrival of the infantry. Colonel A decided to himself lead two squadrons and a machine gun troop against the bridge at Leavenworth. He directed Major A to take command of

the 1st Squadron and M. G. Troop, 1st Cav., to start at 6:00 a.m., Nov. 7th, to seize and hold the bridge at Fort Leavenworth, Sentinel Hill and the high ground from Southwest Hill to Bell Point.

At 8:00 a.m., Nov. 7th, Major A's command was disposed as follows along Augur Avenue and the A—B—C—D—E Road. The advance guard consisted of Troop A (less 3d Plat.). The point of the advance guard was halted in observation at the southwest corner of the National Cemetery. The advance party of one platoon was 400 yards in rear of the point. The support was about 100 yards east of B. The head of the main body was at the Post Exchange. The order of march of the main body was 3d Platoon, Troop A, M. G. Tr., Troops B, C, and D (less 3d Platoon). The 3d Platoon, Troop D, had been dropped off as a bridge guard for the immediate protection of the bridge. All wheel transportation had been left with the 1st Division.

Major A, with Captain M, commanding M. G. Troop and commander of Troop A, was riding at the head of the support.

When the head of the support was 100 yards east of B, a messenger from the advance party handed Captain A the following message which he read and turned over to Major A:

Advance Party, Near C,
7 Nov., 19, 7:58 a.m.

C. O.,
Advance Guard.

About a troop of enemy cavalry in advance guard formation is advancing north on PRISON LANE. Point is 1000 yards north of the PENITENTIARY and tail just north of PENITENTIARY.

X, Lieut.

Major A immediately galloped to the top of the hill at B. He could see a troop in advance guard

formation with the point about 1500 yards, and the tail about 600 yards north of the penitentiary. On the north and south road along the east side of the penitentiary he could see what appeared to be the remainder of a squadron. All elements of the enemy were moving at a walk. The enemy had apparently observed nothing.

Required:

A statement of the detailed plan of action decided on by Major A.

Time allowed—30 minutes.

Part II

An Approved Solution To Part I

Major A decided to have the advance guard cover his right flank and be prepared to seize the Gap at E.

To place the M. G. Troop in action on Engineer Hill with the 3d Platoon, Troop A, providing the immediate protection for the machine gunners.

To lead Troops B, C, and D to South Merritt Hill by way of Grant Avenue and the unimproved road south of Merritt Lake. To have Captain B, with Troops B and C in the charging line and Troop D echeloned 200 yards to the left and rear, charge the support of the advance guard and the head of the main body. To himself remain on South Merritt Hill where he can signal all parts of his command.

Major A decides to have the M. G. Troop and Troop A hold their fire until the charge is launched. He intends to permit the enemy point to almost reach the M. G. Troop before charging so as to bring the enemy's main body in a position where it can be charged.

Required:

The orders as actually issued by Captain M, commanding the machine gun troop, to carry out the plan of Major A.

Time allowed—30 minutes.

PART III

An Approved Solution To Part II

Upon receiving instructions from Major A, Captain M gave the following verbal order to his 1st sergeant who was with him:

"You see that radio tower on the hill in front of us. Gallop back to the troop and direct the platoon and section leaders to report to me at that tower as soon as possible. You will remain with the troop and guide it to the same place at a trot. Turn it off the main road when you reach the west end of the barracks. Take Smith with you to guide the officers to the radio tower."

Captain M, with one bugler then proceeded at a gallop to Engineer Hill. When the platoon and section leaders reported, Captain M gave the following verbal orders:

"You can see just over the crest a squadron of enemy cavalry marching north on Prison Lane, with one troop in advance guard formation.

"Troops B, C, and D will make a mounted attack from South Merritt Hill. Troop A (less 3d Plat.), will cover the right flank. It is now just west of the cemetery.

"Third Platoon, Troop A, will provide immediate protection for the machine guns.

"The M. G. Troop will support the attack opening fire when the charging line emerges from the woods on South Merritt Hill.

"Firing positions along the crest from here to the National Cemetery. The 1st Platoon will occupy the right half and the 2d Platoon the left half.

"Targets: 1st Platoon, all elements of the enemy advance guard.

2d Platoon, the enemy main body.

"Mount your guns under cover and drag them into position without disclosing the position. Occupy your positions at once. Animals in ravine in rear of your positions.

"Signal me when ready and open fire on my signal.

"I shall remain here."

Situation:

The charge was executed as planned. The advance guard and the head of the main body of the enemy gave way and fled southward pursued by the Blue cavalry. However, when the Blue cavalry reached Corral Creek they encountered heavy rifle and machine gun fire from the high ground just north of the penitentiary, the first Red squadron having been followed by a machine gun troop and a second squadron which hastily dismounted and went into action. The Blue force broke under this fire and fell back in disorder toward South Merritt Hill, protected by the machine guns on Engineer Hill. Just before the fleeing troopers reached South Merritt Hill, Major A received the following message:

Hq., 1st Cav.,
BRIDGE over MISSOURI at LEAVENWORTH.
C. O., 7 Nov., 19, 7:40 a.m.
1st Sq., 1st Cav.

Encountered heavy resistance just after crossing the bridge. Still fighting in streets of LEAVENWORTH with result in doubt. Have learned from reliable reports that a brigade of cavalry detrained at LANSING at 6:00 a.m., today.

Take up a defensive position and hold the FORT LEAVENWORTH BRIDGE at any cost. Assistance should reach you at 10:00 a.m.

Y, Col.

Major A sent the following verbal order to Captain M by his adjutant, and immediately devoted his entire energy to the reorganization of his scattered troops:

"A brigade of enemy cavalry is engaging our squadron and the remainder of our regiment in Leavenworth.

. "Our regiment holds the bridge at Leavenworth.

"This squadron will defend the position Pope Hill—South Merritt Hill—National Cemetery. The position will be held at any cost. Assistance is expected at 10:00 a.m.

'Troop A will occupy the section National Cemetery, inclusive, to South Merritt Hill, exclusive.

"Troop B will occupy the section South Merritt Hill, inclusive, to Grant Avenue, inclusive.

"Troop C will occupy the section Grant Avenue, exclusive, to Pope Hill, inclusive.

"Troop D will form on Hill 868 as a general reserve.

"You will make a disposition of your machine guns at once to cover the position. The troops will make their dispositions conform to the machine gun positions.

"Major A will be with the reserve."

Required:

The orders actually issued by Captain M, commanding M. G. Troop.

Time allowed—1 hour.

An Approved Solution to Part III

Captain M assembled his officers and section leaders and gave them the following verbal orders:

"A brigade of enemy cavalry is engaging our squadron and the remainder of our regiment in Leavenworth.

"Our regiment holds the bridge at Leavenworth.

"Our squadron will defend the position Pope Hill —South Merritt Hill—National Cemetery. The position will be held at any cost. Assistance is expected at 10:00 a.m.

"Troop A will occupy the section National Cemetery, inclusive, to South Merritt Hill, exclusive.

"Troop B will occupy the section South Merritt Hill to Grant Avenue, both inclusive.

"Troop C will occupy the section Grant Avenue, exclusive, to Pope Hill, inclusive.

"Troop D will form on Hill 898 as a general reserve.

"The cavalry will make their dispositions conform to the machine gun positions.

"The 1st Platoon will place one section in position at the saddle on South Merritt Hill, flanking the front of the defensive position from South Merritt Hill to Grant Avenue, and covering the ravine from Corral Creek to South Merritt Hill. The other section of the 1st Platoon will take position in the southeast corner of the National Cemetery, flanking the front of the defensive position from the Cemetery to South Merritt Hill. This section will have an interior line of fire south of Merritt Lake.

"The 2d Platoon will place one section in position on Pope Hill so as to cover the bridge over Corral Creek at Grant Avenue and the ravine between Grant Hill and Hill 862.

"The other section of the 2d Platoon will take position west of Grant Avenue so as to flank the section on Pope Hill and cross fire with the section on South Merritt Hill.

"The section to take position in the cemtery will remain in its present position until South Merritt

Hill is occupied by the other section. All other sections will move out at once and occupy their positions. Notifications will be sent to me when positions have been occupied.

"Animals will be placed in the vicinity of the sections.

"I shall be at Hill 868."

Comments

These comments are given for purposes of instruction and were not required in the solution of the problem.

PART I

The situation was one demanding instant action on the part of Major A. His mission required him to gain possession of the Gaps at E and at Hill 1054. This could only be done by defeating the enemy. From what he could see the enemy had a squadron of cavalry. He knew that a squadron of cavalry had reached Lansing the night before and he immediately arrived at the conclusion that this was the force in front of him.

The enemy was apparently unconscious of his presence. This gave him an opportunity to defeat the enemy quickly and decisively by a combination of mounted and dismounted action. Engineer Hill directly in front of him was an excellent position for the machine guns and South Merritt Hill offered an excellent position from which to launch the mounted charge. The latter could be reached under cover before the enemy point reached Engineer Hill by taking a rapid gait.

Engineer Hill was excellent in every respect for the machine guns. It was a commanding position on the flank so that the fire could be continued almost up to the moment of collision. South Merritt Hill

was in plain view so that the machine gunners could see the cavalry emerging from the woods for the charge. Since the enemy had not discovered their presence they could thus hold their fire until that moment thereby adding the element of surprise and making the confusion in the enemy's ranks greater.

The advance guard of two platoons was perhaps greater than Major A needed to protect his right flank but it was already in a position to perform that duty and there was not time to give a part of it another mission.

It is always best to have a small force assigned to the immediate protection of the machine guns. Otherwise, in case of the mounted attack meeting with a reverse, a small party of the enemy might penetrate the machine gun position and seriously interfere with the machine guns just at the time that they would be needed most to cover the reorganization of the cavalry. The 3d Platoon, Troop A, was sufficient to furnish such protection and was in a position where it could be readily used without delay.

Major A considered that it would be best to lead the charging troops to South Merritt Hill himself and then turn the command over to the senior captain. This will give Major A a better chance to influence the action at a later stage by the employment of the machine guns or Troop A.

Part II

Captain M wished to remain in observation of the enemy and to have a few minutes to decide upon the employment of his guns before the arrival of the troop. It was important, however, that the troop should not expose itself in coming forward and for that reason he sent the 1st sergeant back for the troop instead of trusting to an orderly.

The position to be occupied was an easy one to go into with the ravine affording excellent cover for the animals so that the only thing involving serious consideration was the distribution of his fire. Fire must be placed on both the advance guard and the main body. The advance guard although smaller is a more difficult target on account of being so widely scattered. For this reason Captain M decides to assign one platoon to the main body and one platoon to the advance guard. Captain M does not announce a range or a method of fire as the range cannot be determined at this time and the methods of fire will vary in the two platoons.

There is a possibility that the enemy will discover the presence of the Blue force and that it will be necessary to open fire before the mounted attack emerges from the woods on South Merritt Hill. For this reason he tells the platoon commanders to open fire on his signal. He will remain in observation and will open fire at any time that the situation demands.

Part III

You were told that the cavalry dispositions would conform to the machine gun positions in order to give you a free hand in determining upon the location of the guns.

Captain M faces a situation that will very often exist with cavalry, that of having to cover a very wide front with a few guns but having to hold the position for only a limited time before the arrival of assistance. Such a situation demands that all guns shall be so sited that they can have an influence on the action from the beginning. There can be little thought of distribution of guns in depth. There may be opportunities to assign missions to certain guns to be carried out in case the line is penetrated

but these missions must be secondary to flanking the main defensive position.

Captain M has no time to make a reconnaissance of the whole position but must issue his order from the map. He may be able to make changes later if necessary. He has an excellent view of the west part of the position so he can issue more definite orders for that part.

Engineer Hill where his guns are now located is a good position for a section but not as good as the corner of the cemetery. The field of fire is much better at the cemetery as South Merritt Hill cuts off the southern portion of the position from his present location. Guns located at the cemetery would also have a grazing fire which is a decided advantage. The walls of the cemetery are solid masonry and will offer perfect protection from small arms fire except at very short ranges.

Guns placed in the saddle at South Merritt Hill would be protected by riflemen on the western half of the Hill and would have a much better field of fire than if placed on the highest part of the hill as in addition to flanking the front of the position as far as Grant Avenue they can enfilade the ravine leading up from Corral Creek.

The effectiveness of the guns of the 2d Platoon will depend largely upon the judgment of the platoon commander in selecting the exact positions for the guns. Captain A can see from the map that it is important to cover the ravine between Grant Hill and Hill 862 and to cover the bridges over Corral Creek at Grant Avenue. The best position on Pope Hill for doing this can only be determined by an inspection of the ground. The location of the guns west of Grant Avenue can only be accurately determined after the guns have been located on Pope Hill.

Owing to the buildings and trees it is going to be quite difficult to place these guns so they can flank the gun on Pope Hill yet it is quite essential that they should be able to flank this position. They can cross fire with the guns on South Merritt Hill from almost any position as the country to the west is quite open.

The character of the ground is such that places for the animals can be easily found in the vicinity of the guns and there is every advantage in having them there.

Captain A gives his command post as Hill 868 as he is sure that the Major will want him where he can keep in touch with him and receive early information that the guns have all been posted.

Errors in the Solution of Terrain Exercises No. 22

The following are the principal errors made in the solution of Terrain xercise No. 22:

PART I

1. Made a dismounted attack although the mounted attack promised more decisive results with a possibility of a complete surprise.

2. Provided no protection for machine guns.

3. Provided no covering detachment for the flank opposite the attack.

4. Ordered dispositions that it would take too long to carry out.

5. Did not make the maximum use of the element of surprise.

6. Sent a platoon of machine guns with the mounted attack where the guns would have delayed the attack and been of little use.

PART II

1 A. Placed part of the guns east or south of the wireless tower. The position to the west of the

tower permitted the guns to fire longer during the charge.

2 A. Gave no information to the platoon leaders that the advnace guard would cover the right flank.

3 A. Announced ranges to platoon leaders. Since ranges were constantly changing it would have been better to leave their determination to platoon leaders.

4 A. Did not give the disposition of the animals.

5 A. Did not announce the position of Captain M.

6 A. Gave orders to combat wagons which had been left back with the division.

7 A. Assumed carts to be part of the equipment of a machine gun troop.

8 A. Captain M returned to the troop instead of remaining in observation of the enemy and sending for the troop.

9 A. Did not cover Red Advance Guard with fire.

10 A. Assumed that the machine gun troop had three platoons.

11 A. Made no attempt to open surprise fire and launch the charge at the same moment.

12 A. Did not assign firing positions to the platoons.

13 A. Made no assignment of targets to platoons.

PART III

1 B. Did not inform platoon leaders that the cavalry dispositions would conform to the machine gun positions.

2 B. Placed all of the guns in one position instead of providing for the flanking of the whole position.

3 B. Did not give the disposition of the animals.

4 B. Did not give platoon leaders sufficient information of cavalry dispositions.

5 B. Did not provide for the maximum amount of flanking fire.

6 B. Delayed the placing of guns in position in order to make a reconnaissance instead of posting guns immediately and making changes where necessary.

7 B. Placed a whole platoon of guns in one position in spite of the fact that the number of guns was inadequate to properly defend the position. On the defensive machine guns are usually posted by section.

8 B. Did not tell platoon leaders that line must be held at any cost.

9 B. Did not inform platoon leaders when assistance could be expected.

10 B. Did not give position of Captain M.