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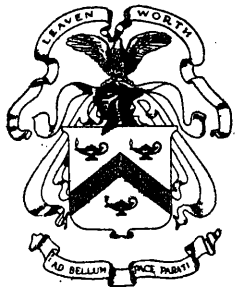
No. 4

From French and British Sources

EDITED AT THE ARMY WAR COLLEGE

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WAR DEPARTMENT,
WASHINGTON, *July 10, 1917.*

The following "Field Artillery Notes No. 4" are published for the information of all concerned,

[300.6, A. G. O.]

BY ORDER OF THE SECRETARY OF WAR:

TASKER H. BLISS,
Major General, Acting Chief of Staff.

OFFICIAL:
H P. McCAIN,
The Adjutant General.

WAR DEPARTMENT,
THE ADJUTANT GENERAL'S OFFICE,
Washington, June 19, 1917.

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BY ORDER OF THE SECRETARY OF WAR:

H. P. McCAIN,
The Adjutant General.

FIELD ARTILLERY NOTES NO. 4.

FROM FRENCH AND BRITISH SOURCES.

[Army War College, July, 1917. Secret and confidential. For official use only. Not to be taken into first-line trenches.]

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No. 7024.

I. ORGANIZATION OF ARTILLERY COMMAND.

Experience drawn from the late actions has shown the need of increasing the means of artillery command at the actual disposal of the infantry divisions. The latter have been provided in action with an artillery superior to the normal allotment. The commander of the divisional artillery alone directs the whole. But in actual practice he is absorbed in the command and the details concerning the posting of the different battalions of the field artillery regiments which he commands. This technical duty of detail necessarily separates him from the general commanding the division during the period in which the preparation and execution of a plan of action for all the artillery necessitates his collaboration with the division commander.

It has therefore become essential to provide the division with an artillery staff relieved of all direct command of troops and sufficiently strongly organized to absorb and use rapidly all the artillery which may be allotted to the divisions in the different rôles they are called upon to assume. The rank of the artillery commander of the division must allow him to take command of the various reinforcing units which may be temporarily attached to the division without confusion. Consequently, by dispatch No. 19—675 1/11, November 30, 1916, the Minister of War approved the following orders:

"In each division of infantry the artillery command shall rest with an officer of the grade of colonel. This officer will have a staff at his disposal, which will be reinforced according to the duties and the additional artillery assigned to the division.

"The commander of the divisional artillery has under his orders the commanders of the various artillery groups (field artillery, heavy artillery, trench artillery) as well as the various services of the artillery—supply, repairs, means of observation, and liaison—belonging normally to the division or temporarily attached to it."

This measure has been vigorously carried out, following the instructions given for each division by general headquarters—first bureau and bureau of personnel.

The duties of the commander of the corps artillery have been condensed in the form, and the duties of the general commanding the artillery of the army have been modified.

The table of provisional strength—of artillery staff of army, artillery staff of army corps, artillery staff of division. Staff of commander of field artillery groups (divisional or corps), and heavy artillery groups (army corps or army)—appended.

The tables following go into effect immediately, except those of the divisional artillery and the field artillery groups, which will go into effect successively with the organization of divisional artillery commands, following the instructions given for each division.

Table of provisional strength.

Elements.	Personnel.										Horses (saddle).		Draft or pack animals.	Wagons.								Bicycles.	Motorcycles.	Passenger motors.
				Gunners.												Artillery.								
	Officers.	Sergeant.	Corporal.	Master gunner.	Battery artificer.	Farriers.	Saddlers.	Trumpeters.	Gunners.	Drivers.	Officer's.	Men's.		1-horse.	2-horse.	4-horse.	6-horse.	3-horse.	8-horse.	10-horse.	5-horse.			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Staff of Artillery of Army.																								
General commanding artillery	1	....	....	....	....	....	....	....	....	2	3	....	....	....	....	....	....	....	....	....	....	....	....	....
Superior officer—chief of staff	1	....	....	....	....	....	....	....	....	1	2	....	....	....	....	....	....	....	....	....	....	....	....	....
Staff officers	[1] 4	....	....	....	....	....	....	....	....	4	4	....	....	....	....	....	....	....	....	....	....	....	....	....
Artillery information service	[2] 2	....	....	....	....	....	....	....	....	2	2	....	....	....	....	....	....	....	....	....	....	....	....	....
Anti-aircraft defense	[2] 2	....	....	....	....	....	....	....	....	2	2	....	....	....	....	....	....	....	....	....	....	....	....	....
Trench artillery	[3] 2	....	....	....	....	....	....	....	....	2	3	....	....	....	....	....	....	....	....	....	....	....	....	....
Sergeant	....	[4] 1	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....
Clerks	....	....	....	....	....	....	....	....	[5] 8	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Gunners	....	....	....	....	....	....	....	....	[6] 4	[7] 6	....	....	....	....	....	....	....	....	....	....	....	2	1	[8] 4
Total	12	1	....	....	....	....	....	....	12	19	16	1	....	....	....	....	....	....	....	....	....	2	1	4

[1] 2 captains, 2 lieutenants or second lieutenants. Occasionally a staff officer may be a major.
[2] Major or captain, a staff officer.
[3] Superior officer, lieutenant, or second lieutenant—staff.
[4] Orderly.
[5] 4 clerks (1 may be corporal), 2 clerks—A. T. S., 2 draftsmen.
[6] 2 telephonists, 2 cyclists.
[7] 1 motorcycle, 4 chauffeurs, 1 mechanic.
[8] 4 reconnoitering motors taken from the army allowance.

Table of provisional strength—Continued.

Elements.	Personnel.										Horses (saddle).		Draft or pack animals.	Wagons.								Bicycles.	Motorcycles.	Passenger motors.
				Gunners.												Artillery.								
	Officers.	Sergeant.	Corporal.	Master gunner.	Battery artificer.	Farriers.	Saddlers.	Trumpeters.	Gunners.	Drivers.	Officer's.	Men's.		1-horse.	2-horse.	4-horse.	6-horse.	3-horse.	8-horse.	10-horse.	5-horse.			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Staff of Artillery of Army Corps.																								
General commanding artillery	1	....	....	....	....	....	....	....	....	2	3	.....	....	....	....	....	....	....	....	....	....	....	....	....
Staff officers	[1] 4	....	....	....	....	....	....	....	....	4	4	.....	....	....	....	....	....	....	....	....	....	....	....	....
Service of artillery information	[2] 2	1	....	....	....	....	....	....	2	2	2	.....	....	....	....	....	....	....	....	....	....	....	....	....
Clerks	....	....	....	....	....	....	....	....	[3] 2	....	.....	.....	....	....	....	....	....	....	....	....	....	....	....	....
Gunners	....	....	....	....	....	....	....	....	[4] 4	[5] 4	.....	.....	....	....	....	....	....	....	....	....	....	2	1	[6] 2
Total	7	1	....	....	....	....	....	....	8	12	9	.....	....	....	....	....	....	....	....	....	....	2	1	2
Staff of the artillery of infantry division.																								
Colonel, commanding artillery	1	....	....	....	....	....	....	....	....	2	3	.....	....	....	....	....	....	....	....	....	....	....	....	....
Staff officers	[7] 7	....	....	....	....	....	....	....	....	7	5	.....	....	....	....	....	....	....	....	....	....	....	....	....
Clerks	....	[8] 1	....	....	....	....	....	....	[9] 5	[5] 5	.....	.....	....	....	....	....	....	....	....	....	....	2	1	[10] 3
Telephonists	....	....	1	....	....	....	....	....	5	....	.....	.....	....	....	....	....	....	....	....	....	....	....	....	....
Total	8	1	1	....	....	....	....	....	10	14	8	.....	....	....	....	....	....	....	....	....	....	2	1	3

Staff of a group of field artillery (divisional or army corps) or of a group of heavy artillery (army or army corps).																									
Colonel or lieutenant colonel commanding	1									1	2														
Staff officers	[11] 4									4	4														
Telephone service		1	[12] 2						10	2		2	4			[13] 1									
Gunners		[8] 1						1	[14] 4	[6] 5		1											2	1	[15] 3
Total	5	2	2					1	14	12	6	3	4			1						2	1	3

[1] 1 captain, 3 lieutenants or second lieutenants.
[2] 1 major or captain, 1 staff officer.
[3] Of which 1 is possibly a corporal.
[4] 2 telephonists, 2 cyclists.
[5] 1 motorcycle, 3 chauffeurs, 1 mechanic.
[6] 2 reconnoitering motors taken from the allowance of the Army Corps.
[7] 2 captains, 3 lieutenants or second lieutenants, 2 aeroplane observers detached from squadron. One observer may belong to another arm; in this event he is counted on the Division Staff.
[8] Sergeant clerk.
[9] 2 cyclists, 1 clerk, 2 radio telegraphers, besides 1 wireless operator furnished by radio telegraphic service.
[10] 2 reconnoitering motors, 1 1½-ton truck, with telephonic supplies, of 1,500 kilos. The 2 reconnoitering motors are taken from the allowance of the division headquarters, as is also the transportation for food and baggage.
[11] 1 captain, 3 lieutenants or second lieutenants, including 1 wireless officer and 1 telephone officer. In each heavy artillery group (army or army corps) there are 2 observing officers in aeroplanes, detached from an air squadron.
[12] One mounted.
[13] Telephone wagon.
[14] 2 cyclists, 2 radio telegraphers, 1 wireless operator from radio telegraphic service.
[15] 1 reconnoitering motor; 1 1½-ton truck, with food and baggage; 1 1½-ton truck, with telephonic supplies, of 1,500 kilos.

II. NOTE ON GUNS AND HOWITZERS, AND THE ORGANIZATION OF ARTILLERY.

The "Instructions concerning the offensive combat of large units" states: "The artillery opens the way for the infantry by breaking down all obstacles opposing its advance."

Guns of all caliber should be used for this object, but in different ways:

"Guns are preferably used against the exposed personnel, against batteries, against earthworks or shelters which can be destroyed by flat trajectory fire (the latter is exceptional)..

"Howitzers and mortars are used preferably against earthworks and shelters which can not be destroyed except by plunging or vertical fire (which is the usual case)."

These principles must serve as a base for the organization of heavy artillery.

The development of trench warfare has had as a result, not only to increase considerably the proportion of heavy artillery, but also to put *at the service of the infantry*, and under the orders of the commander responsible for the attack, the artillery necessary to make a breach in the enemy's defensive works.

Thus the *infantry division*, becoming the true *combat unit*, must have control of the heavy artillery and howitzers that destroy the obstacles opposing the advance of its infantry.

The army corps, on the contrary, will retain the *guns of large caliber* in order to engage the enemy's artillery in the entire zone of action of the army corps.

This apportionment, which will be completed in France during the current year, corresponds to the necessities of modern warfare. It is what is proposed for the American Army.

The best apportionment of artillery between the division and the army corps we have found to be as follows:

To a division of four regiments.

Batteries:

4 battalions of light field artillery—i. e., 12 batteries.

2 battalions of 155 mm. (6 in.) howitzers—i. e., 6 batteries (which may use mechanical traction to diminish the number of horses).

Ammunition columns:

2 columns of horse-drawn artillery ammunition.
1 column of horse-drawn infantry ammunition.
2 motor companies of 40 tons each.
1 repairing column of field artillery.

To an army corps.

(It is unnecessary to add light field artillery if each division has already 4 battalions.)

Batteries:

2 battalions of guns of about 120 mm. (4 in.).
2 battalions of 155 mm. (6 in.) howitzers.

Ammunition column:

1 motor company of 40 trucks, for light artillery ammunition.
1 motor company for infantry ammunition.
4 motor companies, of 40 tons each, for the 4 battalions of heavy artillery.
1 repair column for heavy guns and carriages.

It must be remembered that this composition can only be realized *gradually.*

We consider the French 75 mm. field gun the best of all the field guns of the belligerents. It would undoubtedly be better if its range were somewhat longer and its traverse somewhat greater, but, such as it is, with its advantages and its faults, it has stood the test and undoubtedly will not be improved upon *during* the war. We think the enemy, who fears it greatly, shares this opinion.

That is why the proposal made by France to deliver to the American Army five 75-mm. guns a day with corresponding ammunition—i. e., 1 battery and 1 spare gun a day, seems to us very advantageous. The Federal Government thus has the opportunity, if it so desires, of providing itself in a short time with field artillery which is unsurpassed, without having to transport it to the French front (which means ship economy).

It must be borne in mind that the American Army will not have guns of large caliber for a long time. Under these conditions it is *very important* to have howitzers of sufficient power to destroy the enemy's defensive works, constantly increasing in strength, and of sufficiently *long range* to take the place, under certain circumstances, of the guns of large caliber which

are lacking. The consideration of *range* leads us to recommend heartily the 155 mm. (6-inch) Schneider howitzer, which France can furnish, and which shoots farther than the 6-inch English howitzer. It is interesting here to indicate to the American General Staff how highly the French General Staff rates this piece, which attains a range of 11,900 m. The following appreciation is an extract from the course of instruction given April, 1917, to the officers of the General Staff School at the front:

"The 155 mm. howitzers, model 1915, are really capable, under conditions otherwise satisfactory, of the artillery preparation for the successive infantry attacks. They fire, in fact, a projectile sufficiently *powerful* to be effective against practically any actual defensive work, and they prepare an attack all the more easily as the *rapidity of their fire* permits them to discharge, in less time on a given objective, the number of shells necessary. Furthermore, *their range* permits them, in the battle of demolition, to prepare the attack on subsequent positions even before the attack on the first position is made. *Their mobility*, on the other hand, *is sufficient* to render a change of position fairly easy. The rôle of the howitzer is therefore considerable and *they will eventually replace completely, in the armament of our heavy batteries*, the old guns of like caliber."

On the other hand, the light 120 mm. (4-inch) howitzer, the projectile of which lacks energy, is considered useless, and does not figure in the program of the artillery of France.

[French Document of October, 1916.]

HEAVY GERMAN ARTILLERY.

PROPORTION OF GUNS AND HOWITZERS AT THE START OF WAR.

The information gained during peace allows us to determine the mobilization of a certain number of regiments of foot artillery (active or reserve) and to deduce from that the matériel with which they were armed.

Active regiments, 50 battalions.—Twenty-five battalions heavy artillery of Army Corps, active, 15 cm. howitzers; 8 battalions heavy artillery of Army Corps, active, 21 cm. mortars; 13 battalions siege-garrison artillery, 15 cm. howitzers, 21 cm., 28 cm. mortars; 10 cm., 12 cm., 13 cm., 15 cm. guns; 4

battalions coast artillery, 15 cm. howitzers, 21 cm., 28 cm., 30.5 cm. mortars, 10 cm., 12 cm., 13 cm., 15 cm., 21 cm. guns.

Reserve regiments, 50 battalions.—Sixteen battalions, heavy artillery reserve corps, 15 cm. howitzers; 34 battalions, heavy artillery of siege, 21.5 cm. howitzers, 21 cm., 28 cm., 30.5 cm. mortars; garrison, 10 cm., 12 cm., 13 cm., 15 cm. guns.

Calculation based on 50 active battalions and 50 reserve battalions (400 batteries) gives the following approximate figure:

Number of batteries.

Matériel.	Active regiment.	Reserve regiment.	Total.	Per cent by caliber.	Per cent of howitzers and guns.
15 cm. howitzer	112	100	212	53	73
21 cm. mortar and heavier calibers	46	34	80	20	
10 cm. gun	12	24	36	9	27
12 cm. gun	.8	8	16	4	
13 cm. gun	12	24	36	9	
15 cm. gun and heavier calibers	10	10	20	5	
Total	200	200	400	.....	.....

It is therefore known that the mobilization of German foot artillery organization was conceived on the following basis (round numbers):

15 cm. howitzers, 53 per cent,
21 cm. mortars, 20 per cent, } 73 per cent howitzers.

10 cm. guns, 9 per cent,
13 cm. guns, 9 per cent,
Other guns, 9 per cent, } 27 per cent guns.

B. DURING THE CAMPAIGN.

German foot artillery appears to comprise, at the present time, approximately 1,580 batteries. It has been possible during the campaign to identify the caliber of a certain number by documents or prisoners' declarations.

1. *Batteries of active or reserve regiments.*—(See paragraph below.) The number has been increased during the campaign from 400 to 484. Identifications of the calibers of 290 batteries gives:

50 per cent 15 cm. howitzers,
25 per cent 21 cm. mortars, and heavier calibers, } 75 per cent howitzers.

10 cm., 12 cm., 13 cm., 15 cm. guns—25 per cent guns.

These figures conform to the estimates made during peace.

2. *Batteries of landwehr and landsturm.*—About 222 batteries. We have few identifications of caliber.

3. *Battalions and batteries (horse drawn) created during the campaign, constituting the heavy artillery of the army corps and new divisions.*—About 216 batteries. Identification of 50 batteries gives the same proportion as for the active and reserve regiments at the opening of the campaign. (Par. B–10.)

75 per cent howitzers, 25 per cent guns.

4. *Batteries of position created during the campaign.*—Numbered from 201 to 794, about 594 batteries. The caliber of 90 per cent of these batteries has been determined and divided as follows:

31 per cent 15 cm. howitzers, 15 per cent 21 cm. mortars, 4 per cent unknown howitzers,	About 50 per cent howitzers.
25 per cent 9 cm. guns, 25 per cent 10 cm., 12 cm., 13 cm., 15 cm. guns,	About 50 per cent guns.

The greater proportion of guns in this list of batteries is attributable to the presence of a large number of 9 cm. guns (the old field gun) and 12 cm. (old siege gun).

5. *Various formations, high-power artillery.*—Heavy 15 cm. guns, 13 batteries, minimum; heavy coast-defense mortars, 10 batteries, minimum; navy howitzers, 10 batteries, minimum; armored trains, 13 trains, minimum; 30.5 cm. Austrian mortars, number unknown; 42 cm. mortars, number unknown; 38 cm. guns, number unknown; 21 cm. guns (navy or new gun), number unknown.

To sum up: It has been shown that the proportion of howitzers and guns in the mobile batteries (heavy artillery of division and army corps, heavy artillery of army, heavy, siege and garrison artillery) established in peace has remained the same during the campaign. This proportion is 53 per cent of 15 cm. howitzers, 20 per cent of 21 cm. and larger caliber mortars (73 per cent of howitzers and mortars), and 27 per cent guns. This proportion applies to the units formed at mobilization as well as to those created later.)

The artillery of position, in which there are many batteries of old 9 cm. and 12 cm. guns, has an equal proportion of howitzers and guns. It is probable, from the still incomplete information that we have, that there is an equal number of howitzers and guns in the high-power heavy artillery.

III. EMPLOYMENT OF ARTILLERY IN DEFENSE.

This memorandum, drawn up by the grand army headquarters in accordance with the orders and instructions from the commander in chief, brings together in one pamphlet the methods employed by the artillery during the period of defensive fighting and sets forth the numerous details in application. It therefore systematizes the employment of the artillery in the defense and eliminates numerous detailed memoranda used in the armies, particularly in what concerns the conduct of barrages. The attention of everyone in this command is directed to the following points:

The necessity for seeking continually the destruction of the enemy's artillery.

The offensive counter preparation.

The preparation for the work by artillery in the sectors.

The prolongation of the war, the form it at present assumes, the constant and growing improvement in material among the belligerents makes more important, from day to day, the rôle required of artillery in battle. This fact has been fully brought out during the course of the operations before Verdun, and it also confirmed the principle that in order to be effective the defense must be very active.

On the offensive, the Germans, in conformity to our own principles, have operated with artillery in the following manner: Preceding each of their attacks they commenced by a bombardment on a broad front and great depth, leaving the enemy in doubt as to the point to be attacked. At the end of several hours the bombardment increased in intensity upon the point of attack without letting up on the other points. When the assault was made it continued with the same violence upon the rear and flanks of the region attacked. At the same time, or more often one or two hours after, the intensity increased upon another point of the bombarded front; the preparation being completed, it was then followed by an attack upon this new point. The tactics to be employed by the defense, which have resulted in full success whenever they could be brought into play in time, consisted in replying to every artillery preparation

by an identical action, to every increase of violence in fire upon one point by a corresponding increase upon the point confronting it, and by thus overwhelming the troops designated for the assault before the launching of their attack. At the same time we sought the destruction of the hostile batteries, or, failing that, their neutralization. But in this duel the task is very much more difficult for the defense than for the attack.

In order for the attacking side to attain these intense increases in bombardment, they must employ concentrations of fire from numerous batteries, shifting their fire successively from one end to the other of the field of battle. The defense is governed by the same obligation, but its action is, at least in detail, improvised. Its return fire can only be delivered in time if the defense has at its disposal an extremely flexible artillery, capable of grasping quickly the situation, taking advantage of it without delay, and concentrating instantly all the means at its disposal upon the successive objectives.

This flexibility, which is absolutely indispensable in order to give to the defensive action of the arm all its power, must be sought within the organization of the command, in observation and liaison, in foreseeing the requirements, and in a methodical preparation of the work, so as to reduce improvisation to a minimum at the crucial moment.

The operations before Verdun not only brought this out in artillery counter preparation but also provided an opportunity for perfecting the mechanism of certain types of service fire already in vogue (fire in a defensive form, such as barrages, reprisals; or in an offensive form, such as demolition fire and bombardment). The object of the present instruction is to indicate the means which permit of preparing and putting in operation these different methods of artillery action.

Chapter I. MISSION OF THE ARTILLERY ON THE DEFENSIVE.

Artillery is the principal arm in the active defense, because it alone permits of—

1. Reaching the enemy at all times with its full force.
2. Checking, and sometimes even suppressing, the enemy's offensive preparations before they develop.
3. Rapidly restoring, in case of attack, the equilibrium of the forces to the advantage of the defense.

These possibilities determine the missions which fall to the artillery, such as systematic destruction of the enemy's forces (batteries, defensive works, cantonments, etc.), offensive actions as a whole upon the weak points of the front, counter preparation, and barrage.

The artillery can only carry out its mission by virtue of great flexibility. This flexibility is a function of the organization of the command, of foresight as to its needs, of systematic preparation for the work, and of observation and liaison.

CHAPTER II. ORGANIZATION OF THE COMMAND.

I. The organization of the command is based upon the following principles:

(1) All the artillery placed at the disposition of a command (division, army corps, army) is grouped under the orders of a single chief.

(2) The various calibers are assigned to the divisions, corps, and armies, so that each will have those batteries which normally operate with it, and so that the higher unit will have those batteries which can range upon several sectors.

(3) Rapid reinforcement by the greatest possible number of batteries, in support of the troops requiring it, is arranged for in every particular.

II. Consequently the distribution of artillery of all calibers between the commanders of sectors, the corps commander, and the army commander, is as follows:

There are, in principle, at the disposal—

(*a*) Of the generals commanding sectors (habitually division commanders): The divisional artillery, reinforced by those groups of corps artillery which the corps commander believes necessary to place at their disposal; trench artillery; high-angle batteries of heavy artillery (for example, 155 and 220 mm. howitzers).

(*b*) Of the corps commanders: That part of the corps artillery which the corps commander believes he should keep for the occasion under his direct orders; the heavy artillery of medium caliber (95 and 120 mm. and enventually 155 and 105 mm. guns, as well as certain howitzer batteries of large caliber).

(*c*) Of the general commanding the army: The heavy artillery of long range or large caliber (100, 105, 140, 160, 155 L, 240, 270, 280, 370 mm., etc.) and the heavy railroad artillery.

III. This distribution is not fixed. It is modified according to circumstances. If the fronts are considerable, or if the tactical situation requires it, heavy artillery of the grand parks, the army heavy artillery, and the corps artillery may be respectively placed at the disposition of the corps and the divisions.

If the allotment of high-angle fire batteries is very short, these last may be kept under the hand of the corps commander.

IV. This distribution must not prevent full cooperation and mutual support between the sectors, the army corps, and the army. On the contrary, it is indispensable that, in case of need, all batteries capable of doing so should intervene on the threatened front, irrespective of the group to which they belong, the mission assigned them, or the chief under whose orders they are.

The measures intended to make this intervention proceed easily will, throughout the various units, be foreseen and studied in all their details. They will be made the object of a special chapter on the "Artillery Plan of Defense."

The corps heavy artillery will be so arranged as to pay particular attention to the divisions (sectors)—that is to say, by anticipating their wants and by being in a position to satisfy them instantly. The same method will obtain for the heavy artillery of the army in relation to that of the corps.

For this purpose the artillery of the army will be subdivided into groups, each having action over two or three corps artillery sectors. These subgroups will be connected with the corps artillery, which will be able to bring them into action directly, as they do their own batteries, whenever they have need of them. The chief of artillery of the army will only intervene in the case where several corps need assistance at the same time, in order to distribute the fire for the best general interests of the defense.

Chapter III. The Execution of the Missions Intrusted to the Artillery.

1. Demolition Firing.

Daily fire has for its object the gradual elimination of the various elements of the enemy forces, and the expenditure of ammunition must correspond with the importance of the end to be attained. The fire is directed at batteries, defensive works of the enemy (blockhouses, command posts, observation

posts, flanking works, machine guns, bomb throwers, shelters, etc.), and at elements of enemy troops of less importance (trains, reliefs, workmen, fatigue parties, etc.).

All the artillery, 75 mm. and heavy, cooperate in this systematic demolition in the zone of action intrusted to them, including the army heavy artillery, which for this purpose is directly controlled by the corps artillery commanders.

The calibers and kind of fire to be employed, the number of batteries to be brought into action, the number and kind of projectiles to be fired, are determined by the importance, the distance, the duration, and cover of the objectives (material shelter and the cover resulting from the accidents of the terrain).

In every case the fire is a "precise fire" (that is to say, it is accurately adjusted on fixed objects, and from an exact registration of the ground for moving objectives). The fire is continued the necessary time to accomplish the purpose sought, i. e., demolition.

(*a*) *Batteries.*—Their destruction is diligently sought, in cooperation with aerial and ground observers, by the commanders of the corps artillery. Targets are selected from among those batteries which are particularly aggressive, and whose emplacements are accurately ranged. The corps commanders pay very particular attention to the unremitting destruction of the enemy batteries, which is one of the primary tasks of the defense. In order to accomplish this result they prepare a plan for systematic destruction.

(*b*) *Defensive works.*—The destruction of these, in each sector, is made under orders from the commander of the sector, who decides when the opportunity therefor arises. He must consider the probable reactions and his chances of success with the means at his disposal. If he considers a demolition necessary, but has not the necessary means at hand, he refers the question to the corps commander, who may request the calibers desired and an additional allowance of ammunition.

(*c*) *Hostile units.*—These targets being generally fleeting, fire must be opened rapidly upon them. Consequently, the initiative of fire is given to the group or battery commanders in whose zones they appear. Furthermore, all important points of the terrain are accurately ranged on by each battery; the battle map and the firing notebooks are carefully kept to date; the data is compiled in advance and the range for the day is determined. These rules apply to the heavy as well as to the field artillery.

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2. Concentrated Fire.

This fire, carried out by a great number of batteries, is a genuine fire attack, wherein the artillery attains all its power by throwing a considerable mass of projectiles on a given target upon a simple signal from the commander.

A. TARGETS.

This fire is concentrated; that is, it is either simultaneous or successive fire by several batteries on the same target or the same zone. It is delivered either on a portion of the hostile front, where aggressive intentions by the enemy are indicated (offensive works, preparations for sending out gas, drum fire, etc.); or on important assemblages of troops (cantonments, bivouacs, columns at rest or on the march); or on clusters of batteries.

B. FIRE DIRECTION.

Concentrated fire is ordered by division, corps, or army commanders, who, so far as concerns certain targets (clusters of batteries, marching columns, etc.), and in order to avoid delays may delegate their powers to their respective chiefs of artillery.

C. ORGANIZATION OF THE CONCENTRATED FIRE.

We must be able to open up concentrated fire with extreme rapidity upon any part of the front. This rapidity is a function of the speed with which everything is done in putting the powers of artillery in operation—(*a*) the celerity with which the information, necessary for the coordination of all the actions, reaches the headquarters of the principal artillery group; (*b*) quickness in preparation of the orders relating to these actions; (*c*) speed in opening fire, which requires absolute control of the fire action of batteries called to take part in it.

Quickness in writing orders is facilitated by "tables of concentrations."

Model for table of fire concentrations.

Nos.	Targets, or squares on the chart.	Batteries capable of firing upon this target (field artillery, heavy artillery, etc.).	Kind of projectile to be used.	Class of fire to be delivered.	Observing stations.	Observations made.

All artillery staffs (army, corps, divisions) must have in their possession a document of this kind, which shows, for each square on the war map, the batteries which command it. Thus they can see instantly the number and caliber of the units which can fire upon any given target. An extract from this table is sent to each group or battery commander concerned. The necessary rangings are made with every possible care, and mention of this fact is noted on the tables of fire.

Speed in seeking and transmitting information and in control of fire is obtained by the detailed organization of the system of observation. This organization, called the "plan of

observation," is the result of combined work by the staffs referred to above, and is based upon the principle of interchangeability among observing stations of all sorts, and upon the certainty of liaisons, direct and lateral (see organization of a telephone "net" for observation and adjustment).

D. RULES OF EXECUTION OF CONCENTRATED FIRE.

(*a*) Concentration by no means implies that each battery should not fire on a definite target. If concentrated fire is used upon a zone, each battery receives a perfectly definite target within the limits of that zone, the same target being often fired on by several batteries.

(*b*) The smaller the target zone the greater the number of batteries firing, and the greater judgment used in selecting the emplacements, calibers, ammunition, etc., of the batteries, the more accurate will be the concentrated fire. Each battery should use converging fire, as it is surer in ranging and more powerful in material and moral effect than parallel fire.

(*c*) The precision of adjustment to be attained varies according to the targets. Against cantonments, bivouacs, important columns, one may be content with a rough adjustment. Against batteries, as a rule, very close adjustment is necessary. When it is a question of reaching trenches or connecting trenches, the fire must be absolutely accurate.

(*d*) Batteries taking part in a concentrated fire generally fire simultaneously, in order to get the effect of surprise and to produce upon the enemy an overpowering impression. In certain cases, however, when the target is immobile (e. g., batteries) our batteries may fire successively, or the concentrated fire may be interrupted from time to time in order to control the efficacy of the fire.

(*e*) When the general commanding thinks it profitable, concentrated fire is made part of a combined action, wherein the infantry plays its rôle. This combined action of both arms is almost always necessary when the first-line works must be fired on in order to induce the enemy to occupy them.

(*f*) Infantry troops are always forewarned of anticipated fire concentrations, in order to enable them to take necessary steps for their safety.

E. EXAMPLE OF CONCENTRATED FIRE ON EXTENSIVE AND SLIGHTLY PROTECTED TARGETS.

(*a*) Target to be fired on by each battery.

(1) Heavy batteries: Zone oriented in the line of fire, and having a front of about 100 meters and a depth of a bracket and a half.

(2) Field batteries: Zone oriented in the line of fire, and having a width of about 100 meters and a depth of about 200 meters.

(*b*) Mechanism of fire.

(1) Heavy batteries: Ranges differing by one-fourth of a bracket. In deflection, fire distributed with uniform deflection differences.

(2) Field batteries: Fire uniformly distributed in deflection. In range, elevations varying by 25 meters.

(*c*) Expenditure of ammunition (for important targets), 400 rounds per hectare (320 per acre) for all the batteries executing the concentrated fire, this number divided by 2, 3, or 4 for each of the two, three, or four batteries taking part in the fire; for each battery, the rounds are equally distributed through the different elevations and different directions.

(*d*) Kind of ammunition: Fire directed particularly against personnel or material objects slightly protected must be made with appropriate projectiles.

Heavy artillery: Time-fuse shells, explosive shells with instaneous fuses, or "1. A."; special shells at the end of the fire.

Field artillery: Shrapnel, explosive shells acting on the surface, with delayed fuses for the short and middle distances, fuses 1. A. above 4,500 meters. Special shells at the end of the fire.

3. Defensive Fire.

The object of defensive fire is to check the attack of hostile infantry before they can enter our first-line trenches. All artillery capable of doing so takes part in this fire under two very distinct forms; i. e., fire to prevent an attack and barrage fire.

A. Fire to prevent an attack.

Fire to prevent an attack is intended to check an attack before it starts, by a violent bombardment of those trenches in which the enemy is seen assembling his troops for the attack.

It is carried out by all batteries of 75 caliber and by all howitzers capable of taking part in it. The fire is opened whenever signs of attack are observed (particularly in case of drum fire), or when prisoners, deserters, listening posts, etc., give information as to the intentions of the enemy. It is delivered on the sector directly threatened.

The field artillery delivers an intensive fire for a limited period (about 5 minutes) upon the enemy's first-line organizations (trenches, supports, connecting trenches). The commander decides, according to circumstances, the number and duration of the burst of fire. This fire is delivered, whenever possible, by alternate pieces or platoons, for the purpose of cooling and inspecting the material.

The high-angle fire artillery delivers a continuous demolition fire upon the same targets (particularly upon shelters, command posts, and bends in connecting trenches). (When, by reason of some formation of the ground, field artillery can not act efficiently upon the first-line trenches, the fire is delivered by 155 mm. howitzers, which then fire under the same conditions as field artillery.)

The long-range artillery independently of its mission of counter-battery fire, lays down a screen of fire on the communications behind the line (connecting trenches, trails, roads, etc.). Fire to check an attack is ordered by the corps or division commanders, and carried out according to the principles set forth above for concentrated fire. It is only effective when it is perfectly prepared. Consequently, corps commanders have a plan for this fire drawn up, wherein all the details are fixed, distinguishing, of course, between the case of general attacks and that of partial attacks upon such and such a portion of the front. Corps and division commanders will not forget that their military honor is engaged in the rapid and perfect execution of the fire to check an attack.

B. BARRAGE FIRE.

Barrage has for its object—

First. Stopping the hostile attack when it begins.

Second. Preventing the arrival of supports and reserves.

It is executed by the field artillery, using indirect fire. It is completed by the action of long-range batteries upon the rear of the enemy's position. Everything must be organized in the higher commands, groups, and batteries, so that, if required, the

barrage may automatically succeed the fire delivered to check the attack.

Field artillery barrage.—Since the barrage must have the greatest possible density, all of the field artillery, without exception, takes part in it.

Distribution of batteries.—When the fronts to be fired upon are extended, each battery has its distinct sector. When they are relatively restricted, it is permissible to superimpose the fire of several units. However, as a rule, this superposition is only for the purpose of reinforcing a barrage already in itself sufficient, or of replacing it when it fails.

Correspondence of infantry and artillery fronts.—Wherever it is practicable it is important to make the front of action of the infantry units correspond exactly with the barrage zones of the artillery units (e. g., a group of artillery for a battalion).

Barrage objectives.—The barrage must form a continuous curtain and be carried as close as possible to our lines consistent with the safety of our troops. The minimum distance consistent with the safety of our troops is given in the following tables (flat terrain):

A. FRONTAL BARRAGE.

	At 2,000 m.	At 3,000 m.	At 4,000 m.
Explosive shells	80	100	150
Shrapnel, percussion	60	80	100
Shrapnel, time	150	150	150

B. ENFILADING BARRAGE (AT ALL DISTANCES).

Explosive shells	50 m.
Percussion shrapnel	30 m.
Time shrapnel	60 m.

The barrage must fall on or in front of the first line enemy trench.

When the barrage is reinforced, the supporting batteries fire on the first line and the communicating trenches, while the normal barrage batteries form a curtain in front of our positions. The barrage then functions to the best advantage. But since all batteries must, at a given moment, deliver their fire upon the hostile trenches of the first line and their approaches, it is essential that even those which make the curtain fire in a direction corresponding to the enemy approaches that appear

in their zone, so that they may direct an effective fire on these approaches.

In certain cases the conditions required for safety force the delivery of the barrage behind the hostile trenches. It then loses almost all of its value, since the enemy is free to mass his attacking troops in the first line trenches and to leave those trenches without coming under our artillery fire. The sector commanders must seek every means possible to bring their barrages to bear upon the enemy's first line trenches (by pushing the batteries nearer, employing batteries or pieces in enfilade, using percussion shells, etc.) and, where this is impossible, they make up the insufficiency of the barrage by any means at hand (1.5-inch guns, pneumatic guns, blunderbusses, etc.).

Opening up of the barrage.—The barrage must be delivered as instantaneously as possible; that is, automatically in conformity with a rule previously laid down.

The barrage is executed either upon request from the infantry (by telephone, visual signals, etc.) or on the initiative of the battery commanders, upon notice from the observing stations (signals given by Rugierri light, releasing small balloons, unrolling a streamer attached to the car of a balloon, etc.), or when the situation apparently calls for this class of fire (e. g., at night, if a lively firing is heard; in the daytime, if it is ascertained that there is a flow of gas, etc.). But it must be remembered that patrols sent out by our infantry may provoke an enemy fusillade. In order to avoid launching a barrage in such a case, the battalion commanders of the first line must always keep their artillery informed when patrols are sent out.

Everything must be so arranged that the barrage can be made instantaneously. For this purpose those pieces which are not firing are, at all times, laid in the direction of the barrage. At night, pieces are aligned in that direction, laid upon a special aiming point near enough for its light to be seen even in foggy weather. The successive elevations and the class of fire to be employed are known to all (officers, chiefs of section, cannoneers). This information, which already figures in the firing memoranda, is also written in the notebooks of the chiefs of sections and platoons, and pasted on the piece itself. As a rule, the batteries are equipped with a system of electric lighting, for the purpose of throwing instantaneous light upon the aiming points, sights, and crosshairs, even in case of bombardment with asphyxiating shells. Those not provided with this installation must—

(*a*) Place their night aiming points close enough to the pieces to be seen at night, but far enough away, however, to be out of reach of the gas in case of bombardment of the batteries by asphyxiating shells.

(*b*) Keep their aiming points lighted throughout the night.

(*c*) Furnish each chief of section with a pocket electric lamp and have a reserve of batteries and bulbs.

Artillery commanders will not lose sight of the fact that they are responsible, and that even an insignificant delay on their part may bring about the loss of a position and the death of a number of soldiers.

The range to be used is determined each time it is necessary. It is not necessary to have this range verified by all the batteries; one piece may make the verification for several batteries in corresponding positions.

System in firing.—Systematic firing insures the greatest possible speed in beginning the barrage. It is modified afterwards according to circumstances and the needs of the first-line infantry, with whom the commander of the group or battery making the barrage must be in close touch. Advantage must be taken of every occasion to inspect the material by firing by sections or alternate pieces, so as to be able, at the critical moment, to fire the greatest possible number of pieces in good condition.

Varying the barrage.—Once a vigorous barrage is established, it may be varied in order to obtain a better result from the fire. When barrage is delivered in front of the hostile first-line trenches, the fire is extended to said trenches and the barrage kept there. Where the barrage plays upon the hostile first-line trenches, it does not change. In this case, the fire must be adjusted each day with such precision that when delivered at three successive elevations it will cover the trenches in sight.

When the barrage is thrown behind the enemy first-line trenches it is fixed, as a rule, on the support and communicating trenches. If these trenches are hidden, the fire is directed upon the places captured that day, which should, as far as possible, have been ranged upon in advance.

Finally, in case the enemy penetrates our lines, all or part of the barrage should be capable of being directed, on request of the infantry, upon those parts of our trenches occupied by

the enemy. (The positions of batteries on the terrain must in every case allow this requirement to be fulfilled.)

Cessation of the barrage.—The barrage ceases upon demand from the commander of the infantry unit in front of which it is delivered. In case all the direct and lateral communications are cut, the barrage ceases by the order, and under the responsibility, of the artillery commander in the sector, at the moment he thinks the attack is checked.

Verifying the barrage.—The commanders of all groups verify the barrage from a triple point of view, the selection of targets, the density of fire, and the rapidity with which it can be laid. In order to verify the effectiveness of the barrages when it is impossible to see the effect of the fire, use is made of the information furnished by aerial observation and photography. The commanders of the first-line infantry are always called upon to check the effect of the barrages organized on the fronts. But the artillery must avoid revealing unnecessarily the location of pieces whose positions should not be prematurely exposed.

(*b*) *Barrage by heavy artillery using high-angle fire.*—The action of howitzers and mortars is not of the same order as that of field artillery. Both of these are intended to stop the enemy's attack, but the 75s form a curtain over the entire front, while the howitzers, as a rule, fire on definite points in rear of the first line (trench junctions, command posts, lines of shelters, etc.) for the purpose of preventing the arrival of reserves. As an exception to the rule, howitzers may, and should, be employed in the first-line barrage when the density of the field artillery is too weak, or when the accidents of the terrain do not permit of effective action, etc. Howitzers are particularly necessary in order to fire on the "dead angles" of the 75s when these angles can not be eliminated by means of enfilading fire. In order to avoid undue expenditure of ammunition, the heavy artillery barrage is only begun automatically in the case where it is thrown on the first line. It is then carried out under the same conditions as with the 75 mm. guns. In all other cases, the barrage is made by order of the artillery commander of the sector, either on his own initiative or on request from the infantry.

The plan for the barrage indicates the points to be fired on, the system to be observed in firing, the rapidity of fire, the arrangements to be made in the batteries for night barrage, and the observing stations and liaisons to be established.

Everything must be organized so that the barrage may be brought into action very rapidly, by day as well as by night. The shelters of the personnel are established near the pieces. At night a guard detail is made, and the pieces are laid in the direction of the barrage. The liaisons with the infantry are always provided for.

The action of the howitzers and mortars ceases by order of the commander of the divisional artillery.

(*c*) *Action of trench batteries.*—Trench pieces in position take part in the barrages under the same conditions as the howitzers; that is to say, by firing on definite points of the German organization.

They enter the action by order of the infantry regimental commander of the sector where they happen to be, or, automatically, when the battery commander sees indications of an attack.

The plan of action indicates the points to be fired on, the rapidity of fire, the dispositions to be made for night firing, the liaisons to be established, etc.

Everything must be minutely organized so that the action may be most rapid, both by day and night.

The action of trench batteries ceases upon orders from the infantry regimental commander.

(*d*) *Action of the heavy artillery guns.*—The heavy artillery takes part in the barrage—

(1) By opposing the hostile batteries.

(2) By bombarding the enemy cantonments and bivouacs in the sector of attack.

(3) By firing upon the enemy's communications behind the front of attack (approaches, trails, etc.). (This is particularly the rôle of the 75-mm. guns, the fire of which is quite rapid and which has very great effect upon exposed personnel.)

(4) And, finally, by counter attacking the enemy first-line organizations when either the battle situations or the accidents of the terrain prevent effective fire on those organizations with a sufficient number of light-artillery guns.

The plan of barrage fixes the rôle of each battery. The counter batteries enter into action, without orders, as soon as they discover the enemy batteries in their zone of action. Those batteries designated to bombard cantonments, bivouacs, and communications open fire under orders from the general commanding the corps artillery. In each battery everything must

be arranged so that the unit can fulfill its mission in the minimum time. (See measures taken by the field artillery.)

Support of adjacent sectors by the artillery.—In the case of a partial attack, artillery in the sectors not menaced reinforces with its fire the artillery on the menaced front, at the same time keeping a certain number of batteries in readiness for any emergency. This reinforcement should be very rapid. Consequently it must be prepared for in advance in all its details by the commanders of the corps artillery and of the sectors concerned. This is made the subject of a special chapter on the "Plan of barrage."

4. Contingent Fire.

A. Harassing fire.

Harassing fire is for the purpose of checking movements of the enemy's troops and supplies. It is directed on the roads and trails most frequented by him, and also upon his narrow-gauge railroads. It is based on data gathered from the war maps, from photographs, and from the intelligence service. It is generally done by isolated pieces firing at irregular intervals, particularly at the presumed hours for reliefs or forwarding supplies. (Employ, preferably, shells with time fuses, or explosive shells with fuses 1. A. in order to obtain grazing results.) When information as to the enemy's movements is sufficiently exact, this fire is carried out by several pieces. It may become, in certain cases, really concentrated fire. The commanders of the corps artillery decide daily the harassing fire to be used the following day.

B. Fire in reprisal.

Fire in reprisal keeps up the morale of our infantry by demonstrating that the artillery is looking out for it, and convinces the enemy of our willingness to return his fire with interest. It is directed upon trenches and cantonments, following the enemy's bombardment of our trenches and cantonments. Whenever it is possible it is accompanied by a return fire upon the enemy's batteries.

(1) On trenches this fire must be delivered with rapidity. The enemy's positions in front of or in immediate proximity to those bombarded by him must be one target. We must fire

a greater number of projectiles than is used by the enemy (if possible, 2 rounds for 1).

This fire is executed by field artillery, guns of caliber 58, and, exceptionally, by howitzers. It is delivered at the request of the infantry, or upon the initiative of battery commanders charged with looking after the front, upon information furnished them by the observers. It is generally executed with instantaneous fuses, and, as far as possible, by enfilade fire, and at night with shrapnel. (As a matter of fact, there are only a few persons in the German trenches during the day, almost the total strength of the garrison being in the shelters. Consequently, one must seek to bring destruction among these shelters. In this case the instantaneous fuse gives better results than that with the delayed action. This refers only to the 75 mm. gun. With howitzers, whose angle of fall is very great, delayed-action fuses are preferable.) At night shrapnel is fired.

(2) On cantonments.—Reprisal fire on cantonments should be prepared in advance, so that every bombardment of our cantonments is replied to by a bombardment of an enemy's cantonment, preferably one containing an ammunition depot or a command post. Wherever possible the bombardment is made by field artillery; in other cases by the heavy artillery. It should sometimes be by rafales, preferably with shrapnel or incendiary shells. It is delivered upon request of the commander of the bombarded cantonment or on the initiative of the commander of the divisional artillery when his observers signal him the bombardment of a cantonment by the enemy.

Reprisal fire is especially for the purpose of keeping up the morale of the troops, who should be made to understand that when one of our cantonments is bombarded a bombardment of still greater intensity is delivered by us on one of the enemy's cantonments.

Chapter IV.—PREPARATION FOR THE EMPLOYMENT OF ARTILLERY IN THE SECTORS.

The complex missions which fall to the artillery, the necessity imposed for its acting quickly, altogether and with precision, require the commander to prepare in every detail for its employment. Consequently, by direction of the commanding general, there is filed in all the staffs of the army, army corps, and division—

A. A plan for the employment of artillery, which embraces all the hypotheses and bears upon the following subjects:

I. Organization of the command.

II. Distribution of missions among the artillery groups.

III. The rôle of the heavy artillery and the organization of counter batteries.

IV. Offensive counter preparations (indicating the measures necessary to be taken in order to pass rapidly to the barrage).

V. The plan of barrage:

(1) Distribution of missions.

(2) Targets to be fired on (with accompanying sketch).

(3) Dispositions made for letting down the barrage (liaison and organization of the service within the batteries).

(4) Firing system (rapidity, variation, cessation).

(5) Concentration to be employed in case of a hostile attack directed upon a portion of the front only.

(6) The support which may be received from or given to the neighboring divisions.

VI. The plan for reprisal fire.

VII. Table of concentrations.

VIII. The plan for observation and for liaison:

(1) Map of emplacements and observing stations (land stations for intelligence and ranging, balloons, wireless stations).

(2) Map showing plainly the parts of the terrain both seen and hidden from the intelligence observing stations.

(3) Panorama by balloon.

(4) Distribution of the observation personnel.

(5) Normal and contingent distribution of the observing stations among the artillery units. (Contingent observing stations, to be used by the artillery groups in the divers cases of anticipated concentration, are shown in a special column in the table of concentrated fire.)

(6) Map of liaisons of every nature between the observing stations, balloons, wireless antennae, command posts, and the battery groups.

(7) Instructions for observers.

(8) Equipment of the observation posts.

B. A plan for contingent reinforcement of the sector by batteries of all calibers from outside. This plan deals with the case of an important attack by the enemy. It takes into consideration:

(1) A statement of the reinforcing material to be expected. (Statement obtained from army.)

(2) The organization of the command.

(3) The assignment of missions and emplacements.

(4) Organization of command posts, observing stations, and liaisons.

(NOTE.—Battery emplacements, command posts, observation posts, and telephone communications provided for in this document, are arranged beforehand, and all the papers on fire are prepared—lists of coordinates, range-laying scales, and tables of fire.)

CHAPTER V. ORGANIZATION OF THE ARTILLERY.

A. EMPLACEMENT OF BATTERIES.

The battery sites are determined by the tactical mission imposed on them.

Field battery emplacements are primarily fixed by their barrage rôle. In order to bring the barrage to bear in front of the enemy trenches, there must be no hesitation in changing the battery emplacements, and even in moving them to the neighboring sectors, in order to obtain enfilading fire. The batteries will be echeloned in depth in order to insure the continuity of the barrage, to the best advantage and under all circumstances. In case of an invasion of our lines by the enemy they must be so arranged that all or part of them may be brought to bear on the terrain included between our first and second positions.

Moreover, all batteries must be able to participate in fire concentrations. For this, they must have an extended field of fire. The necessary steps must be taken to emplace the pieces so as to attain this object. Should there be need for it, certain batteries are provided with two neighboring emplacements whose combined fields of fire give them the desired zone of action. This doubling of emplacements to extend the battery zone of action is not to be confused with the multiplying of emplacements for the purpose of escaping the enemy's fire. Double emplacements are made necessary either by the limits available for emplacements or by the inconveniences of a too extended field of fire in a close terrain.

Emplacements for high-angle batteries are determined by the necessity for acting effectively on the enemy's first position and upon the communications in rear. Their zone of action must be as extended as possible.

Emplacements for long-range guns are determined by the necessity of being so placed as to be able to reach the hostile

batteries, even those most distant, by having their fire echeloned in depth. This may often result in having such batteries abreast and even in advance of the field artillery.

Each battery (field or heavy) should make use of several emplacements previously organized, provided with tables relating to fire (range scales, notebooks on fire) and connected directly or indirectly by telephone with the observing stations. It will thus be able to change position after the fire is adjusted without delaying the fire. In case of necessity, a certain number of these emplacements may be occupied by the supporting batteries. Emplacements must be so selected as to defilade the batteries from ground or aerial observation. They must be carefully disguised (artificially). The bottoms of valleys, where gas accumulates, must be avoided. Every abandoned emplacement will be rigged up with a dummy battery and false flashes.

(NOTE.—Notebooks on fire belong to the emplacement and not to the battery and should always be passed on to a relieving battery. If a battery is moved and not replaced by another the notebook is turned in to the artillery commander of the sector.)

B. DISTRIBUTION OF TARGETS.

The zone of artillery action is divided between the various artillery groups, and, according to their calibers, into well-defined sectors (army and corps heavy artillery and divisional artillery). A similar distribution is made within the larger artillery groups between the battalions and batteries, so that each battery, balloon, aeroplane observing station, and liaison agent may know the unit which must fire when a target appears.

This allotment of a normal zone of action to the large and to the lesser groups does not debar them from eventually firing on neighboring zones (in addition to the concentrations provided for) whenever the infantry has need of their support, whenever the commanders of near-by groups call for their assistance, or whenever circumstances permit of their action. Each battery or battalion must have a normal zone of action and one for contingencies.

C. ADJUSTMENTS.

The adjustments necessary for the fire of batteries of all calibers in their normal and contingent zones of action must be made in advance. Consequently each battery must be adjusted

throughout the entire extent of its field of action. The heavy artillery comes to an understanding on this point with the artillery commanders in the army corps concerned.

D. Obtaining, Transmitting, and Utilizing Information.

On the defensive, artillery fire, whatever its nature, must be delivered rapidly. The obtaining, transmitting, and utilization of information here plays a capital rôle. This work must be carefully organized.

(1) *Obtaining information.*—This is done in two ways:

(*a*) By means of permanent liaison agents, detached to the infantry by the field and high-angle fire batteries. An artillery officer is detailed with each infantry colonel (commandant of subsector). This officer has under his command a detachment for liaison and observation duty, comprising sergeant observers, noncommissioned liaison agents (one or two per battalion), telephone operators and signalmen with necessary equipment.

The officer in charge of the liaison, whose place, as a rule, is near the colonel, makes such inspections as are necessary to keep himself informed as to the working of the liaison and observation. He details liaison agents with the commander of each first-line battalion and keeps in touch with them (by telephone, signals, etc.).

This personnel is charged not only with calling for the barrage, but also with informing the infantry as to what is possible for the artillery, and with keeping that artillery, which is charged with supporting the infantry, posted upon the events and requirements among the first-line units. It may be employed in regulating the fire. It remains with the infantry day and night, and is subsisted with it.

The officer in charge of the liaison renders daily to his artillery commander a concise report of events.

(*b*) By means of aerial and ground observation.

All observation, whatever its nature (observation posts, balloons, artillery balloons, aeroplanes), is organized on the following principles:

(1) It is impersonal. It does not belong exclusively to any group or caliber. It may be employed by any unit whatever, pursuant to orders from the commander, based on the tactical requirements of the moment.

(2) It participates in the two operations (obtaining information and ranging). Certain stations are, however, more particularly specialized in one or the other of these functions.

(3) Stations are connected by telephone with headquarters and with the battalions or batteries, so that information or ranges may reach those concerned in a minimum of time.

(4) Stations are connected with each other by telephone, so that they may mutually complete and check their information.

(2) *Details of organization.*—Land observation: Land observation comprises two classes of observing stations:

Intelligence observing stations with a wide field of view, which are principally used in seeking targets. They generally work on gun flashes. Forming an important part of the mechanism of command, they are established by the general commanding the army upon the recommendation of the corps artillery commanders. They are connected directly with the artillery commanders of the army corps (S. R. A.) and with the commanders of the neighboring superior groups (divisional artillery, corps heavy artillery, and the heavy artillery groups of the army). Their number is determined by the lay of the land, the enemy's organization, and the observing personnel available. In every instance it is important that they should cover the most extended view possible of the rear of the enemy's position. Their personnel is absolutely specialized. Since they may eventually be used to establish ranges and to check up the results of fire, they are also in direct communication with the different groups in their sector. They are specially useful in regulating the fire of heavy artillery on auxiliary targets.

Observation ranging stations with limited fields of view are used principally for ranging and checking the results of fire. They are technical means of the highest importance. The efficiency of the matériel depends upon the judgment shown in their selection, and the rapidity with which the batteries enter into action depends upon the number of stations used and the excellence of their organization.

The selection of the normal observing stations and the organization of the telephone net for ranging pertain to those who use them. The chief of artillery of the army and the commanders of the corps artillery coordinate and complete their work with a view to eventual fire concentrations to be carried out. In order to be complete the organization of these observing stations should fulfill the following conditions:

(*a*) Those artillery units called upon to fire normally upon a portion of the front should have all the observing stations necessary for carrying out their missions.

(*b*) The artillery units called upon to fire contingently upon a portion of the front should be informed beforehand as to the observing stations they may use temporarily for that purpose. The contingent assignment of observing stations is made by the staff.

(*c*) Batteries designated to utilize an observing station normally or contingently must be in liaison with it. This liaison must be kept up whatever happens.

(*d*) The observation personnel is detailed in a quasi permanent manner to each observing station. It works for the benefit of all those units referred to it. It must be capable of adjusting the fire of heavy artillery as well as that of field artillery.

(*e*) *Balloon observation.*—The artillery balloon is an observing station, with a wide field to watch over, used for the purpose of keeping the artillery command informed, and at the same time it is an agency for ranging.

The commander of the group with which it is linked fixes its zone of action and its general mission under the conditions set forth in article 30 of the "Instructions for the employment of aerial observation." As a rule, he designates each day its task for the day following. He charges it eventually with verifying the daily ranges of those batteries which have no auxiliary targets visible from ground stations. He gets from it the meteorological information necessary in the determination of the plans for the day. The observer in the balloon keeps the commanders of the artillery and batteries posted by means of his facilities for observation.

(*f*) Observation by aeroplane: Observation by aeroplane is regulated by the "Instructions of January, 1916, G. Q. G."

(3) *Transmission of information.*—Transmission of information is carried out by means of—

(*a*) The telephone. The telephone net work comprises the artillery-infantry net, established in conformity with note No. 2073, of May 4, 1916, from the G. Q. G. (double liaison, one part set up by the artillery, the other by the infantry), and the artillery net. The latter serves to establish direct liaison between (*b*) the army artillery commander, commanders of the corps and divisional artillery, battalions, batteries, and the observing

stations; (*c*) the army artillery commander, the commanders of artillery groups, subgroups, battalions, and batteries of army artillery, and the observing stations.

The artillery net also establishes lateral liaisons between all commanders of artillery, artillery groups, subgroups, battalions, batteries whatever the caliber, as well as between all the observing stations (ground stations, balloons, wireless stations).

Visual signaling, used in connection with the telephone, doubles the liaisons between the artillery and infantry, and may, when necessary, be uniformly organized between the observing stations and batteries.

Rockets, or any other conventional means, varying with circumstances, may, as a last resort, take the place of telephonic or visual communications for the barrage.

Wireless is used between aeroplanes and batteries equipped with antennae and receiving apparatus.

(4) *Utilization of information.*—The manner in which intelligence furnished by the observing stations is utilized varies with the target reported upon. If it is a question of a transient target (such as a battery in action, small columns of infantry, an unexpected attack by the enemy, etc.), the observer warns directly the artillery group or battalion concerned. Fire is opened at once. If it is a question of an objective of real importance and which may remain in view long enough (such as long columns on the march, troops at rest, etc.), the observer reports to the artillery commander of the sector (through the intelligence officer, who, when necessary, checks the information by other stations having a view over the region observed), and the artillery commander of the sector orders the proper concentration. If fire on important targets was left to the initiative of subordinates, the artillery action would be inalterably disconnected, and the first shots would warn the enemy and would cause him to take precautions against losses.

The above rules apply to all methods of observation. In case of observation by aeroplane, the following dispositions are made: For a transient target the wireless officer of the artillery group orders the firing when the objective signaled is in his normal zone; he asks for instructions when it is in his contingent zone. For an important and fairly stationary target the wireless officer of the artillery commander in the sector gets from the latter the necessary firing orders; the wireless officer of the artillery group in the normal zone in which the target appears reports if he thinks he is unable to deliver the fire of his unit.

APPENDIX No. 1.

Organization of a telephone net for observation and ranging.—Concentrated fire can only be realized if a telephone net is prepared permitting lateral liaisons between the batteries and observing stations. It is impossible for batteries to install such liaisons with their own equipment. It is also impossible to connect up with observing stations located several kilometers to the right or left, in the sector of unknown units. It is therefore incumbent upon the general commanding to intervene and establish the entire network permitting these lateral liaisons, without which he will limit his artillery to parallel actions and give up all the advantages to be gained by concentrated fire.

This comprehensive network will also include—

(1) A large main cable laid parallel to the front and far enough away to escape demolition by shelling. (See sketch.)

(2) Several branches, leaving the main cable at intervals through centrals called "adjusting centrals," R_1, R_2, R_3, and pushed toward those points of the front where observing stations are most numerous. These branches must be constructed with every precaution necessary (multiple wires, buried, etc.) for protection from gunfire. They terminate in centrals called "observation centrals," O_1, O_2, O_3, interconnected if possible.

This entire net, main cable and branches, is constructed so as to withstand bombardment by the enemy. It is independent of the way in which the front is occupied and depends only on the terrain. It will be established and maintained by the army, and will form the army net.

The units will connect up with this net in the following manner:

(*a*) Nothing will be changed in the net of the artillery commander, the net in depth leading from the corps artillery and the divisional artillery to the observing stations, and passing through all the intermediary stations. (See sketch.)

(*b*) Observing stations will be connected with observation station centrals.

(*c*) Command stations (artillery division, heavy artillery, corps artillery), balloons, and landing places will be connected with ranging centrals. (See sketch.)

All these lines will be protected as far as possible (buried, placed in the trenches, etc.).

Thus installed, the net will function in the following manner:

For normal fire in the vicinity of its axis of fire, battery A, for example, will make use of its own observing station O_1''. But when it wishes to direct its fire upon the target B, it will call up station O_3'', or the balloon B, whence observation of target B can be made under the best conditions. The liaison will be made by the army net, through A–O_1'', O′, R^1, R^2, R^3, O^3, and O_3''. This net also makes the ranging of battery A on target B by airplane very easy. A wireless receiver, which can pick up signals in the sector B, is connected with the central B^3, and thence with the battery A. In each sector a certain number of wireless receivers, judiciously placed, are connected with the ranging central.

Such an organization allows battery A to turn its fire to the right or left by having its fire observed by its neighbors.

The establishment of this net also has the following advantages:

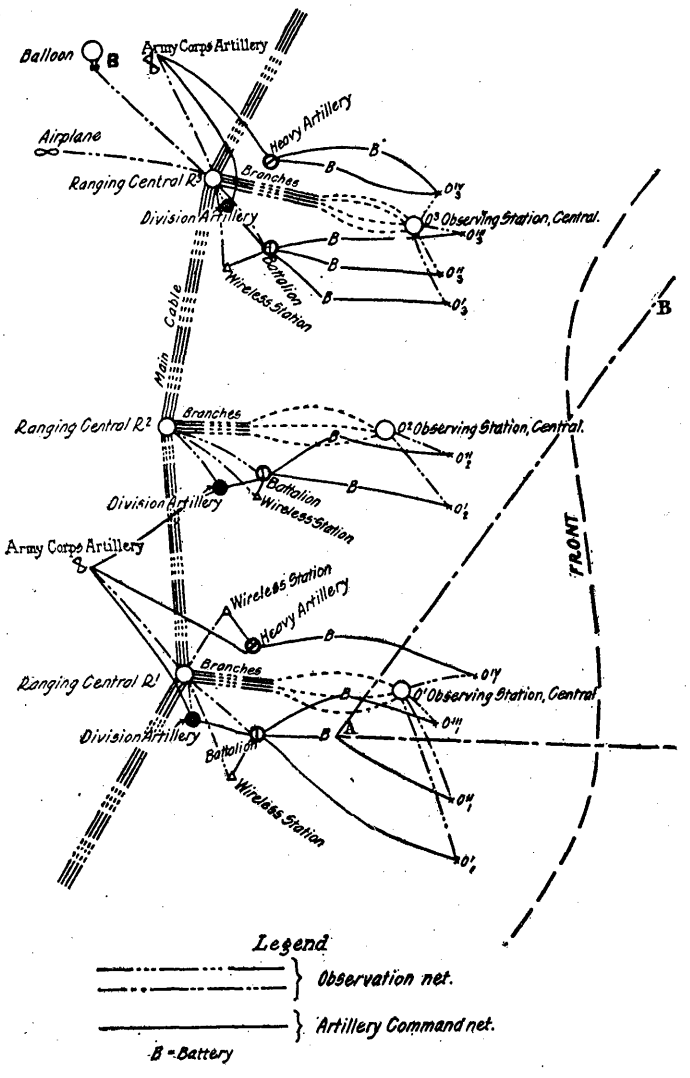
(1) It permits bilateral observation. To this end, for example, battery A will utilize either the two observing stations O_1'' and O_1^{IV}, united by the single observation station central O^1, or the more distant stations O_1'', and O_2', united by the army net O^1, R^1, R^2, and O^2

(2) It insures a double liaison between batteries and their observing stations. If the line A–O_1'' is cut, for example, the liaison will always be insured through the circuit O_1'', O^1, R^1 Batⁿ A.

(3) It permits a direct liaison between the headquarters and observing stations.

The system admits of numerous combinations. In order to function favorably, the net must be so arranged that the batteries do not wait upon the communications. The length of time necessary for communications will often be very long, for instance, between a battery and its observing station, whence the necessity for giving the main cable and branches sufficient wire for not encumbering the net with extraneous conversations and for reserving it for observation service.

OBSERVATION NET.



IV. THIRD BRITISH ARMY, ARTILLERY INSTRUCTIONS, NO. 3.

NOTES ON THE ORGANIZATION OF A BATTERY FOR ACTIVE OPERATIONS.

1. The organization of batteries is shown in war tables of organization.

If we are to get the best value out of a battery during prolonged and continuous bombardments, a system of reliefs for the personnel and a very careful organization of every detail must be thought out and put in operation in ample time before operations begin.

2. In order to assist officers the following notes are issued. Details may be changed, but the principles contained herein must be adhered to.

3. In preparing these notes the principle of always maintaining some portion of the personnel fresh has been steadily kept in view. This is of vital importance and should be always rigidly adhered to by battery commanders, even though they have at times to work with short numbers and guns. Unless this is done, it is quite impossible to get the best out of whatever personnel and matériel there is at hand.

4. The fighting depth of the artillery may be taken to be five lines. These are the same for all natures. They are the front line (liaison with infantry or F. O. O.), the observation station, the firing battery, the relief line, and the combat train (Lorry Park in case of siege).

Each line is dealt with in turn in the following paragraphs. Their composition in detail will be found in the attached Table A.

War tables of organization give the data from which Table A is compiled.

(I) *The front line.*—The whole of the personnel and matériel for this party must be provided under battalion or group arrangements. In order to meet this demand the organization of batteries should not be interfered with unless absolutely no other means of supply is available. The battalion commander's staff and any available reinforcements should be drawn upon. The duties of this line are entirely liaison with the infantry and the insuring of rapid communication of information to the group and, where necessary, to batteries.

(II) *The observation station.*—The composition of this party is the same, irrespective of the nature of armament of the battery.

As regards relief, this can not be legislated for in advance, as it depends on the nature of the fighting, the ground and local conditions, tactical or otherwise. It must be thought out by each individual battery commander.

(III) *The firing battery.*—The minimum number of all ranks necessary to fight the guns should be kept in the firing battery. Each section must include two layers and be commanded by either a sergeant or a corporal, so that in every platoon there is one sergeant or one corporal always at the guns. In the case of six-gun batteries, which are intact as regards matériel, two guns must always be kept resting; in four-gun batteries, one. The object of this is to rest and cool the gun, to feed the men, and to provide for necessary fatigues (supply of ammunition, etc.) for the other guns. Any casualties must also be made good from this source until the arrival of fresh men from the combat train.

It is most important never to draw on the party resting in the relief line except in the last resource.

(IV) *The relief line.*—This is essentially a resting place for the relief personnel of the guns. It must be close to the gun line so as to insure that men do not get tired in going up to the guns; at the same time it should not be in a place that gets consantly shelled. It must be chosen beforehand and be carefully sited according to local conditions.

As a general rule a six-hour relief is the best. It must be remembered, however, that the same men must not always be on duty by night, therefore a dog watch of three hours must be arranged for when necessary—say every third day.

(V) *The combat train.*—The combat train needs very careful organization. There is a large amount of work to be done, and often, particularly when casualties are taking place, very few men to do it. All men must do an equal share of work—e. g., officers' grooms, saddlers, storemen, etc., must all be employed in general duties. The captain is in charge of the combat train. (A major or senior captain commands the battery.)

5. *Stores to be collected.*

(I) At the firing battery—

(*a*) Food and drinking water sufficient to last over the whole period of the bombardment. The ammunition dumped indicates what this period is expected to be.

(*b*) Spare parts in their boxes.

(*c*) Water for cooling guns.

(*d*) Buffer oil.
(*e*) Cleaning oil and rags.
(*f*) Gas blankets and antigas and antismoke appliances.
(*g*) Ear protectors.
(*h*) Stretchers and shell dressings.
(II) *At the observing posts*—
(*a*) Food and drinking water sufficient to last over the whole period of the bombardment.
(*b*) Gas blankets and antigas appliances.
(*c*) Ear protectors.
(*d*) Stretchers and shell dressings.
(III) *At the relief line.*—The same as detailed for the observing posts.

6. The provision of splinter and weather-proof shelters for cartridge dumps for siege artillery is of vital importance.

7. *Cleaning ammunition* requires a system carefully thought out beforehand. This is specially necessary in the larger natures of guns and howitzers where ammunition has usually to be kept on the ground and rolled up to the guns.

8. *Means of communication.*—From batteries forward, these want carefully thinking out and organizing prior to active operations. The following are some of the means available:
(*a*) Several lines of telephones. Well laddered if in the open. (Tapping-in stations must be arranged for.)
(*b*) Visual (including electric lamps and Helio).
(*c*) Runners.
(*d*) Light signals.
(*e*) Pigeons.

As many as possible of the above must be organized beforehand and used simultaneously, in this way messages generally get through. Speed is vital.

In addition to the above all units supplied with wireless receiving sets should make arrangements to tap any message sent by infantry contact aeroplane patrols, so as to obtain the latest information regarding the position of our advanced infantry. All group and brigade headquarters must pass on the information so gained as rapidly as possible to those headquarters and batteries not provided with wireless-receiving sets.

9. *Battle headquarters or telephone dugout* must be safe and have communication to each gun either by speaking tube or telephone.

10. *Equipment.*—In action, box respirators must always be carried so as to be readily available. On the move all equipment must be worn on the person.

11. *Testing of guns for wear.*—This must be done by the inspecting ordnance officer before operations begin, and periodically when possible afterwards.

12. *When starting to organize* always prepare for the worst; that is, calculate on the number of men who will probably be available and not on what ought to be available. Equalize out your good and bad men. When reinforcements arrive use them up gradually—not all at once.

13. *Before the bombardment starts* a careful program must be made out as to the rate of fire and all details that can be thought of.

It is much easier to amend a carefully prepared program than it is to so suddenly have to make arrangements for something that has never been thought of.

14. The rates of fire to be continuously maintained throughout a bombardment are as follows:

18 pounder or 4.5 inch howitzers, 3 rounds per battery per minute.

6-inch howitzers, 1 round per battery per three-fourths minute.

8 or 9.2-inch howitzers, 1 round per battery per 1¼ minutes.

60-pounders and 4.7-inch guns, these being neutralizing counter-battery guns for bombarding trenches during the intervals when the siege batteries are employed on counter-battery work; for bombarding communication trenches and avenues of approach.

The rate of fire will be varied as required.

Superheavy howitzers and guns, as required.

The above rates of fire refer to a bombardment. The rate of fire for Field Artillery barrages covering Infantry attacks must be such as to give a really dense barrage. Four rounds per gun a minute for short continuous periods not exceeding 15 minutes is permissible. For longer periods the rate of fire must be proportionately reduced.

15. *The duties of the various officers in all natures of batteries are as follows:*

(*a*) The battery commander must be absolutely free to go wherever his presence is most essential. The principle is that the battery commander should be where he can best deal with the tactical situation. So long as communications hold this will be the O. p. where he can see. Consequently the O. p. is his normal place to begin with.

(*b*) The captain organizes the combat train; when operations begin he is responsible that no supply of anything is ever wanting at the guns or at the O. p. He must also relieve the

battery commander at intervals, so that the latter can obtain necessary rest.

(*c*) The subaltern at the O. p. assists the battery commander to observe and shoot the battery, and is in tactical command of the battery when the battery commander is not at the O. p.

(*d*) The executive at the gun line is responsible for the drill and fire discipline of the battery. He must also make and apply the corrections of the day as necessary, and also the calibration corrections.

(*e*) The subaltern at the relief line is responsible that the men rest.

16. *Preparations in case of an advance.*—These must be made beforehand and are as follows:

(*a*) The battery commander must reconnoiter the routes leading to the advanced positions selected in so far as they lie within our lines. He must organize the positions to be occupied. This organization should include digging gun pits for the guns, deep narrow trenches for the detachments, recesses for ammunition, methods of communication. Routes should also be selected (from the map) for advance to positions within the German lines and arrangements made for crossing our own and the hostile trenches.

(*b*) The captain is responsible for arranging for supply of ammunition, water, food, and forage; he must also see that camouflage material, digging tools, sand bags, timber for strutting trenches, electric torches, lamps, and candles are packed ready.

A careful system of packing the vehicles must be evolved and practiced beforehand by all concerned.

(*c*) The battery first sergeant must have the battery staff organized and horses ready to go up at once in case of an advance.

(*d*) In any form of moving warfare the relief system of organization must be adhered to just the same as in a bombardment. There will, of course, be variations made necessary by the varying changes of the battle and local conditions. As an example, on arrival at a new position the "resting relief" would have to dig and prepare the new position instead of resting, and consequently might have to go 24 hours or more without rest.

17. Organization must be started at once so that the system may be thoroughly understood and tested before operations begin. This does not refer to the front-line liaison duties arranged by the group or brigade, which only come into full operation during a battle.

TABLE A.—*Distribution.*

Armament.	Disposition.	Major.	Captains.	Subalterns.	First sergeants.	B. Q. M. S.	Sergeants.	Corporal.	Bombardiers.	Gunners.	Drivers.	Servants.	Grooms.	Farr. sergeant.	Horseshoers.	Smiths.	Fitters.	Wheelers.	Saddlers.	Trumpeters.	Cooks.	Telephonists and linesmen.	Clerks.	Sanitary orderlies.	Sentry—Gas and aeroplanes.	Salvage, A. S. C., etc.	B. C. A.	Storeman.	Telephones.	Directors.	Helios.	Flags, signaling.	Rifles.	Signaling lamps.	1½ Very pistols.	
18-pr. Q. F. or 4.5″ Howitzer.	In front line											As detailed by							Group																11	
	At O.P.		B.C.	1								1										4							2	1	1	2	5	1	11	
	At guns			1			3		26			2					1				2	4		1	1				4	1	1	2	3	1	11	1 surgeon atd.
	Relief line			1			3		26			1					1				2	4		1	1										
	Wagon line		1		1	1	1		14		64	1	5	1	4				2	2	2	4	1	1		6						2			1 veterinary atd.
60-pr	In front line											As detailed by							Group															11	
	At O. P.		B.C.	1								1										4							2	1	1	2	5	1	11	
	At guns			2			24	3		36		3					1				2	4		1	1		1		4	1	1	2	3	1	11	
	Relief line			1			3	24	1	36		1						31				4		1	1		1								
	At wagon line		1		1	1	1		6		74	1	2	1	4	1		1	2		2	4	1	1		3						2			
6″ Howitzer	In front line							(Sig)				Detailed by							Group															11	
	At O. P.		B.C.	1				1				1										4							2	1	1	2	5	1	11	
	At guns		1	2	1		23	2	3	32		5				2		1		1	3	14	1	1	2		2		4	1	1	2	3	1	11	
	Relief line			1		1	2	3	3	31		1								1	2	4					1									
	Detached																									1									

| | | |

V. THE USE OF ILLUMINATING 75 MM. SHELLS IN FIRING ON AERIAL TARGETS.

The illuminating 75 mm. shell is furnished with a fuse 22/31, which causes it to explode in the area to be especially illuminated.

It burns about one minute. A few hundred meters of space are sufficiently lighted for practical purposes.

To illuminate a target every effort is made to explode the shell a few hundred meters above and in front of it.

As a rule shells should not be fired at a low height, as this has the disadvantage of illuminating the ground for the enemy.

There are two cases to consider:

(*a*) When the target is visible;

(*b*) When the target is invisible.

(*a*) *Visible target.*—One of the guns of the platoon fires illuminating shells, while the second gun tries to reach the target with tracer or time-fuse shells.

Illuminating shells are fired like any other, with the sole difference that, in order to counteract the reduction of velocity, the fuse is set for half again its distance.

At this rate for an auto-mounted light gun half the height of the objective would be added, and for a platform the given distances would be increased.

Corrections of site and deflection should correspond to the fuse setting thus increased.

If the illumination seems too low in relation to the target, increase the site correction to the maximum and diminish it should the contrary be the case.

(*b*) *Invisible target.*—Await the moment to open fire until the noise of the motor indicates the approximate location of the adversary.

Illuminating shells are then fired from both guns so as to illuminate the zone toward which the adversary is supposed to be moving.

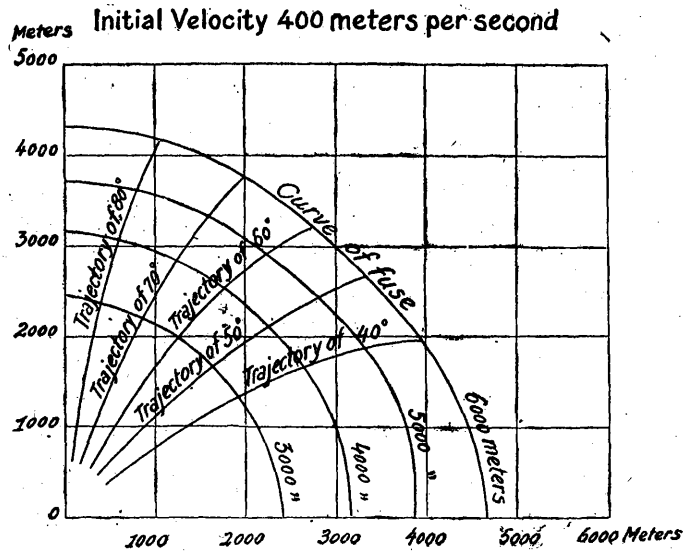
The angle of the gun and the setting of the fuse are recorded on the diagram of trajectories.

The guns could, for example, be echeloned in the direction of 100 mm. on either side of the presumed azimuth and could fire by successive trajectories of 5 degrees.

Once the target is illuminated, fire is commenced as indicated above.

Trajectories and curves of equal fuses for illuminating shells of 75 mm.

Initial Velocity 400 meters per second



VI. NOTES ON THE TECHNICAL RECONNAISSANCE OF AN ARTILLERY POSITION AND THE TRAINING OF THE HEADQUARTERS OF A BATTERY.

1. General Instructions.

The reconnaissance work of an artillery officer can be grouped under two headings—(*a*) tactical, (*b*) technical.

(*a*) Covers the reconnaissance of all artillery tactical commanders, whose duty it is to find out the situation, and includes the personal exchange of views with the infantry with whom they are working; also the study of the ground and the enemy's dispositions, to enable them best to cooperate with and support the action of their own infantry.

This is primarily the duty of the divisional C. R. A., who often may employ one of his staff officers or a specially selected regimental officer for the duty.

Brigades R. F. A. are, however, frequently "grouped with" infantry commands, and the entire responsibility may fall on the lieutenant colonel commanding a R. F. A. brigade, or even upon a B. C.

(*b*) In the actual selection of the battery position and observing stations necessary to carry out the rôle of the guns in supporting and cooperating with their infantry.

The two reconnaissances *may* be carried out at one and the same time by either the O. C., the brigade, or the O. C. battery; but as a general rule the latter is the work of the O. C. battery.

In (*a*) the officer who makes a personal reconnaissance of the ground and the enemy's dispositions (keeping in view the plans and intentions of his own infantry) does not require a large staff. He should not be accompanied by more than one other person. A large staff would be dangerous and wrong.

In (*b*) the B. C. should delegate work, under his guidance, to subordinates, in order that no time should be lost in the selection and occupation of the position.

It is impossible to dogmatize or to lay down an absolute standard, as circumstances alter each individual case, and the following suggestions are only put forward as a general guide for the training of batteries:

2. Composition of a Battery Headquarters.

Battery headquarters.—The detail of the battery headquarters can not be definitely laid down; 15 horses are allotted to them in the war establishment, excluding 2 trumpeters or horse-holders (for the B. C. and captain) and the B. S. M., but including the 4 other mounted men who always accompany the B. C. and R. O. in their reconnaissances.

The R. O. (reconnaissance officer) is the officer who accompanies the battery commander in his reconnaissance.

The B. L. (battery leader) is the officer who is in voice or signal command of the guns, either in action or on the march.

The R. O. may become B. L. at any moment, or vice versa.

T. T.=telephonists, who should be trained as signalers as well; L. O.=men who are likely to be required as lookout men or patrols; R. T.=range taker; and H. H.=horse holder.

All members of the battery headquarters should, as far as possible, be trained as telephonists, whether they are specialists, such as range taker or lookout men, or not; and as many of them as possible should be passed signalers as well. It is important that the trumpeters or horse holders for the B. C. and captain should be signalers. (In addition to the mounted headquarters, there should be at least one dismounted telephonist, with an instrument on a firing battery wagon.)

Signalers should be normally used in a moving fight to open up and maintain communication between the O. P. and the battery.

A suggested detail for the battery headquarters might be as follows:

(1) B. C.'s assistant and mounted orderly, 2 men.

(2) R. O.'s assistant and horse holder, 2 men.

(3) "A" group signalers, 3 men, each with a telephone and wire, and 1 horse holder, 4 men.

(4) "B" group, signalers, 2 men, with telephones, etc., and 1 horse holder, 3 men.

(This group can be kept spare during the occupation of the first position, but can be organized by the B. S. M. to take the place of "A" group should a move take place, or to accompany a flank, or forward observing officer.)

(5) One range taker with instrument and 1 horse holder, who also takes the B. S. M.'s horse, 2 men.

(6) Two mounted men (trained as lookout men in action and patrols when the battery is moving), 2 men.

When marching on a road the battery headquarters should march in half sections.

When halted on a road they should back their horses into the hedge (heads toward the road).

When moving across open country they can be in groups, or threes, or any formation to save room and their horses.

When on the line of march, before the B. L. leaves the battery, section commanders, whether R. O., B. L., or third subaltern, march in rear of their sections, to be able to see all that goes on in them.

The captain, B. Q. M. S., assistant Q. M. S., farrier, and shoeing smith should ride in rear of the battery, until "Prepare for action," when the first line wagons separate from the battery. The captain then rides at the head of the first line wagons with his horse holder, and the remainder behind.

Before B. C. goes out on technical reconnaissance, the battery headquarters would be as follows:

B. C.
Tpr. and B. C.'s assistant.
B. S. M.
R. O.'s assistant and H. H.
2 T. T.'s.
1 T. T. and 1 H. H.
1 R. T. and 1 H. H.
2 L. O.
2 T. T.
1 H. H. (for "B" group telephonists) and 1 mounted orderly. (See diagram 1.)

3. Disposition of Officers and Battery Headquarters During a Reconnaissance.

F. A. T., section 192, lays down that a B. C. in his reconnaissance should be accompanied by as few of his staff as possible; the remainder of the battery headquarters follows at the head of the battery until they are required by the B. C. These instructions cover both the tactical and technical reconnaissance, but there are undoubtedly occasions during the technical reconnaissance when it is advantageous for a B. C. to order

his B. S. M. to come forward, ahead of the battery, with some telephonists and others of the headquarters, when he starts out on his reconnaissance.

It is also generally accepted that the captain must have early information of the battery position and the intentions of the B. C.; but he should not leave the battery sooner than is necessary for him to do his own work in the technical reconnaissance.

So that, leaving the B. S. M. at the head of the battery till sent for, the members of the battery staff who will usually be required to accompany the B. C. in his technical reconnaissance may be divided into three parties: (1) B. C.'s party; (2) R. O.'s party; (3) Captain's party (when the actual position is about to be selected).

(1) B. C.—

Trumpeter (or H. H.).

B. C.'s assistant (with rifle, director, and telescope, etc.).

Mounted orderly (with rifle), used for communication purposes and can be used for digging at the O. P., or as linesman when the guns are in action.

(2) R. O.—

Assistant (trained telephonist, signaler, director man, penciler, etc.).

H. H. (with director).

(3) Captain.—

H. H.

Assistant Q. M. S. (or other understudy).

These should take care not to ride together in a solid phalanx, but should be split up into groups of not more than two or three, to attract as little attention as possible, each group well behind the one in front, and keeping themselves concealed from view as much as possible. Each group should keep the one in front in view, and when the one in front stops they should take advantage of any available cover.

All officers and members of the battery headquarters should have their definite instructions, given verbally by the B. C. before he leaves the battery, and the B. S. M. should, if the B. C. has left him in charge of headquarters at the head of the battery, know how orders will come to him. (If the B. C. is not with his battery when he starts out on his technical reconnaissance and there is no signal communication between the B. C. and the B. L., it is advisable to send back written instructions.)

4. Duties of the Officers in a Reconnaissance.

It is essential in any reconnaissance that all those taking part in it should have a clear idea of what their duties are to prevent unnecessary overlapping of work, and the following are suggested as duties for the various officers, and points to be attended to by them.

The battery commander should have a thorough grasp of the tactical situation. Should he have had definite instructions from the map or otherwise, as to the area his battery is to occupy, the zone he has to cover, the action of his own infantry, a careful study of the map before he sets out will more than repay him in time saved eventually.

The actual area available for the selection of his gun position will probably be limited by his instructions, by his knowledge of the power of his guns, and the necessity for concealment; and he should, in flat country, obtain a general knowledge of the compass direction of his zone from any likely gun positions.

The positions selected for the battery and for the observing station will be chosen on their own merits—neither need be subordinated to the other.

If he has a clear knowledge of the situation, the battery position may be selected first, otherwise the O. P., or both at the same time.

The considerations which guide his choice of the battery position are:

(1) A clear field of fire over all the zone he has to cover. (This is absolutely essential).

2. Concealment for his guns both from the ground and from the air. (Concealment is better protection for the gunners than any temporary field entrenchments.)

(3) Good platforms for his guns. (This is important for accuracy of shooting and quickness switching.)

(4) Facilities for ammunition supply.

The B. C. should have in his head a fairly accurate idea of what ground he may be required to shoot onto, so that he may know the elevation at which he must clear obstacles in front of his guns.

An angle of sight instrument, and an intimate knowledge of the range table of his gun will enable him to find out the lowest elevation at which he can shoot, and to see if his position fulfills consideration (1).

The considerations in the selection of an O. P. are:

(1) A good view of the enemy's zone.

(2) A good view of our own infantry (for cooperation by view).

(3) A position that will not be obvious to the enemy as a probable O. P.

(4) The position should, if possible, have a covered line of approach.

The distance from the battery position is of minor importance. The B. C. must push on until he is stopped by bullets or has found a suitable position.

When the battery position has been selected first, the B. C. can, as a rule, give the general direction in which he is going to look for his O. P. to his R. O., and he must realize that if he changes his direction and plans, this must be made known as soon as possible to the B. S. M. (who is supervising the opening up of his communications) by sending back his mounted orderly to the battery position, as a guide to the B. S. M. and staff.

The directions to the B. L. as to the battery position are sent back by the R. O.

The B. C.'s trumpeter and horse should be left at the point beyond which it is not advisable to ride; he can act as a guide to the B. S. M. and telephonists, and, if necessary, as a sentry to prevent other members of the battery headquarters from proceeding mounted beyond that point.

The B. C. should give definite instructions to his B. L.; the order "Keep Touch" is a poor one, and unfair to the B. L.

The B. L. should, if possible, be given the definite road or direction (on the map), the point beyond which he should not take the battery without further orders, and the pace of the advance.

The B. C., whenever possible, should, before leaving the R. O., give him a point or direction (map or otherwise) on which to lay out his lines. This need not be considered as anything more than a means to enable the R. O. to get on with his work without having to wait for orders from the O. P., but map work and measurement of angles can be done more carefully and accurately at the battery position than in an uncomfortable O. P., and the line thus laid out can be used as a temporary zero line by the B. C.

The captain.—The special points for which the captain is responsible are the following:

(1) The direction of the movement of the first line wagons. If the captain wishes to take the Q. M. S. on with him when he goes forward to find out the situation, the actual leading may be deputed to the farrier or another N. C. O.

The first-line wagons conform to the movements of the firing battery; orders must be sent to them by the captain when he has selected his wagon line.

(2) The selection of the wagon-line position; dependent, of course, on the battery position.

In a "moving" fight, tactical considerations and accessibility are paramount, but the wagon line should never be so close to the battery position that the same "searching" fire which is directed at a battery (from the map or otherwise) is likely to endanger the wagon line. If directly behind the guns this distance should not be less than 500 yards. A position to a flank is generally of little advantage for reasons of safety and may be claimed by another battery coming into action on that flank, but there are occasions when tactical considerations and concealment make a flank wagon line desirable. At all times the concealment of the wagon line from aircraft is most important.

When fighting develops into a stationary action, as in trench warfare, the comfort and safety of the men and horses in the wagon line are the essentials, and distance from the battery position is of minor importance.

(3) To see that the limbers and teams are directed back to the wagon line when the battery comes into action. This includes the improvement of the inlet and outlet from the battery position, cutting gaps in wire, etc., arranging that outgoing teams will not foul incoming ones, and that, if possible, the route should not come under fire.

The A. Q. M. S. will often be busy guiding the first-line wagons to the wagon-line position so that the captain will generally have to see to the above personally, and he may use the farrier and shoeing smith to assist him.

(4) To open up communication between the battery and the wagon line. Semaphore signaling or orderlies are generally used in a moving fight, but telephones are more often used in trench warfare.

(5) To make plans for a possible change in position. This includes the selection of positions of assembly, etc., and the consideration of all probable moves.

(6) To reconnoiter and select alternative wagon lines and routes to and from the battery.

(7) To understudy the B. C. He must pay frequent visits to the O. P. in order to learn the tactical situation, and he must realize that should the B. C. become a casualty he takes his place.

(8) To make plans for the supply of ammunition and replacement of casualties, after the battery has come into action.

The captain's arrangements and the position of assembly should be communicated to all.

The R. O.—1. He is responsible for the actual selection of the gun platforms, according to the instructions given him by the B. C. The method to be used in occupying the position and the "marking" of it in such a way that the B. L. may see how to bring up his guns. As soon as he has satisfied himself that the battery position is definitely fixed, he will despatch his assistant to the battery rendezvous—

(*a*) To inform the B. L., by means of a marked map, or otherwise, of the position chosen for the battery.

(*b*) To lead to the battery position the B. S. M., "A" group telephonists, and those members of the battery headquarters required by the B. C. at the O. P.

2. If he intends to use an aiming point, he should make certain that all the guns can see the A. P. by actually kneeling on each selected gun platform in turn.

3. He selects the position for his director, and the method of laying out the line of fire.

4. He selects a position for the telephone which should be conveniently placed for voice command.

In order to avoid the line being cut by the teams the telephone is usually first set up in front or to one flank of the position. As soon as the teams are clear the telephone is moved to the selected position, and care must be taken that sufficient wire is kept in hand for this purpose.

5. He insures that the battery is not kept waiting on or near the position a moment longer than is necessary.

5. Duties of N. C. O.'s in the Occupation of a Position.

The B. S. M.—1. Commands the battery headquarters and sees that no one who is not actually required by the B. C. goes up to or near the observing station.

2. Supervises the establishment of communication (telephone or otherwise) between the O. P. and the battery.

3. Arranges that a sufficient number of rifles are with the observing parties (B. C.'s or F. O. O.'s).

4. Arranges for the digging necessary for the protection of the O. P. party.

5. Arranges for the position of the horses of the B. C. and those of the headquarters who are at the O. P.

In a moving fight the B. S. M. would usually remain at the O. P. In trench warfare he will often be better employed in the wagon line.

The Nos. 1.—1. They will select the best platforms available and see that their guns are halted on them.

2. That their guns are pointed in, or approximately in, the line of fire immediately the trail touches the ground.

3. That they get their wagons up and the teams away as quickly as possible.

In nearly every case it should be possible, with a little common sense, for a No. 1 to obtain the direction of the line of fire from the method used in marking the position. This should enable him to get his gun in the line at once, and his wagon up and the team away.

6. The Procedure to be Adopted in the Occupation of Positions.

(I) *When selecting a position under cover.*

If the B. C. is still with his battery when he receives definite orders from his brigade commander to select and occupy a position, he should, before he leaves his battery, give verbal instructions to all concerned and a brief outline of his intentions. He then sets off on his technical reconnaissance with the party as laid down on page 7.

If the B. C. has been sent for to receive instructions and to have the tactical situation explained to him by a senior officer, he should leave the captain and B. L. in charge of his battery and proceed with his trumpeter, assistant, and M. O.

The B. C. having received his orders, and if it is not advisable for him to return to his battery, may then proceed as follows:

While he is still with the officer who is explaining the situation he can send his M. O. for the R. O. and R. O.'s party (and also for the captain), with a message to the B. L. (preferably written), containing definite orders as to the road and the place to halt while the preliminary arrangements are being made.

The B. C. and R. O. proceed to make their technical reconnaissance, and, having selected the approximate battery position, the B. C. leaves the R. O. with the R. O.'s party and rides on with his own party to find a place from which to observe.

While the assistant is away the R. O. proceeds to arrange the details of his work as laid down on page 13.

The B. L. now sends on the B. S. M. and party required by the B. C. to the battery position and leads the battery there.

On the return of the R. O.'s assistant to the battery position the position is marked as arranged.

When the B. S. M. and the "A" group telephonists arrive at the battery position they start laying out their line from the spot indicated by the R. O. One signaler (who is joined later by a dismounted man when the battery comes up) remains at the battery end, the other two, under the directions of the B. S. M., proceed to lay out the line on foot, in the direction of the O. P. Their horses are taken away to the wagon line, and the B. S. M. reconnoiters the way to the observing station; the M. O. may be detailed by the B. C. to guide him.

To save time it may be desirable for the B. S. M. to arrange for a coil of wire to be taken to the O. P. by the M. O. or a telephonist, who will then commence to lay out a line from the O. P. to meet the telephonist who is laying the line from the battery; or the laying of the line may be started from some central point. Speed in opening up communication is essential, and common sense and experience should dictate the quickest way of doing so.

On arrival at the O. P. the B. S. M. sees that the horses of the B. C.'s party, including the M. O.'s, are sent back to the wagon line or disposed of as ordered by the B. C. The M. O. will then patrol the telephone line on foot and improve its position in places where the telephonists had failed to lay the line to the best advantage.

Diagrammatically:

O. P. ———		——— Battery.
B. C. and assistant.	M. O. patrolling line.	B. L.
B. S. M., 2 T. T and 1 R. T. (Possibly 1 L. O., or the B. S. M. can act as L. O.)		Assistant. 2 T. T. (1 dismounted T. T. who came up with the battery).

(II) *When selecting a position in the open.*

The B. C. starts with his party as before, but, on approaching the position, he must take care that the staff with him do not come out from the nearest cover until he has reconnoitered the ground and made his plan. He would generally leave the parties in charge of the R. O., reconnoiter the ground on foot, and arrange that on a given signal the R. O. only should join him and receive his instructions on the following points:

(1) Members of the battery headquarters required at the position.

(2) How the position is to be "marked."

(3) Any instructions regarding its occupation.

(4) Target, or how the guns are to obtain the line of fire (i. e., reference point or A. P., method of laying, etc.).

(5) Position from which B. C. is going to observe (protection limber if required).

(6) Any other instructions that will tend to quickness in opening fire or the concealment of the battery up to the last moment.

The R. O. returns to the battery with the instructions for the B. L. and the battery. He sends up the B. C.'s assistant with director (if required) and usually takes over the duties of B. L.

Under these conditions the staff at the O. P. would consist of the B. S. M., B. C.'s assistant and range taker. The position is marked by the B. C.'s assistant, with director, and the B. C. or B. S. M. (if up in time).

The director is clamped on the reference point or target, and the B. C.'s assistant will give the section commander furthest from the B. C. all the information required.

(III) *In a rear-guard action.*

In a retirement the B. C. must remain with his battery and see it out of the old position and well on the way to the new before he can leave it. The selection of the new observing station and battery position must devolve on one of the other officers, generally the captain. The captain, having received definite instructions from the B. C. at the O. P., rides back accompanied by the B. S. M. with the necessary staff.

The selection of a suitable observing station will be his first consideration, as the battery position will probably have to be

subordinated to this. It will generally be inadvisable to lay out and maintain a lengthy communication between the O. P. and battery position in a rear-guard action unless the retirement is in the nature of a preconceived one to a prepared position; in the latter case a complete reconnaissance and plans would have been made beforehand.

Having selected the O. P. and battery position the primary duty of the captain will be to send a reliable man back to the B. C. to give full information and to guide the battery to the place. The difficulty in a retirement is to keep touch between the reconnoitering party and the battery. The captain should be responsible for this. The first-line wagons must precede the firing battery, but it is often advisable to keep them in close touch with the firing battery, and for the B. C. himself to control their movements, and not allow them to withdraw in the direction of the new position under the guidance of the farrier. The B. C. himself must superintend the move from the old position, and must remain with the portion of his battery nearest to the enemy, until the battery is well on its way to the new position, when the B. C. can go on and take over the arrangements made by his captain for the new position.

[Bodies of troops in England move on the left of the road, in France on the right.]

DIAGRAM (1).—*Battery on the march on the road (after prepare for action).*

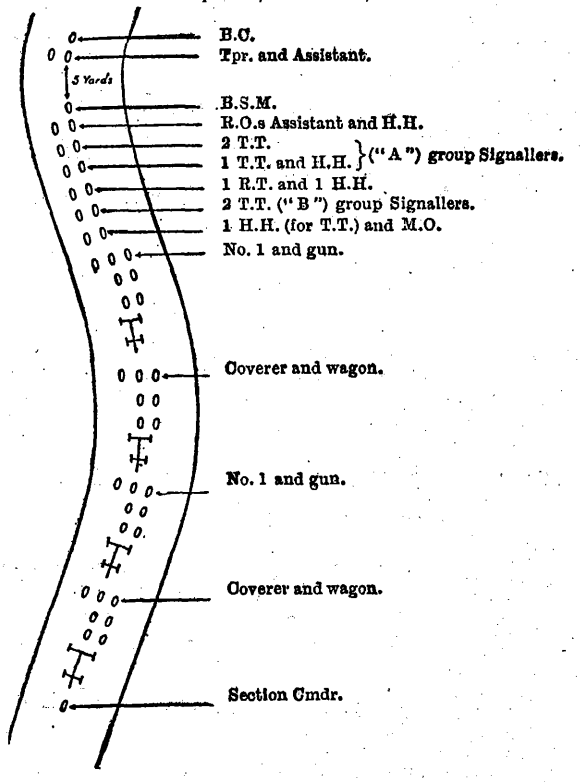


DIAGRAM (2).—*B. C. has been sent for to receive orders from bde. comdr. or staff officer.*

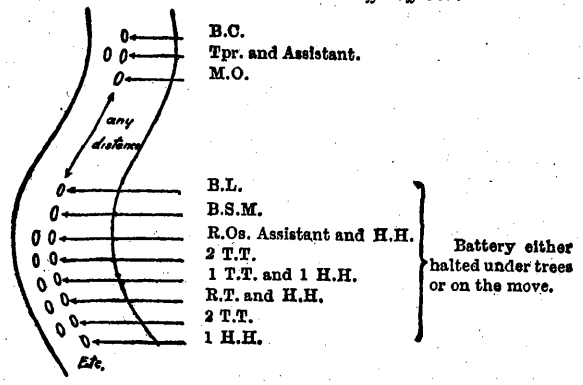


DIAGRAM (3).—*The B. C. and R. O. starting on their technical reconnaissance (after the M. O. has brought up the R. O. and captain and their parties).*

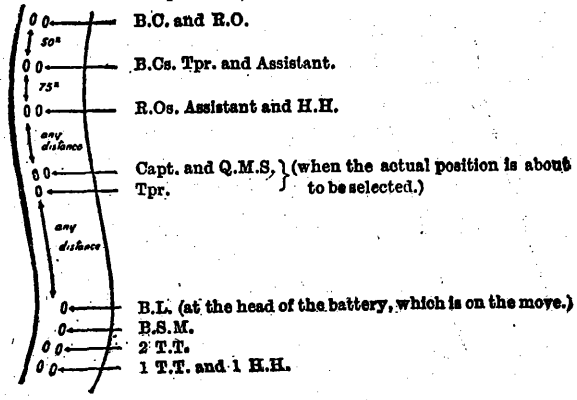
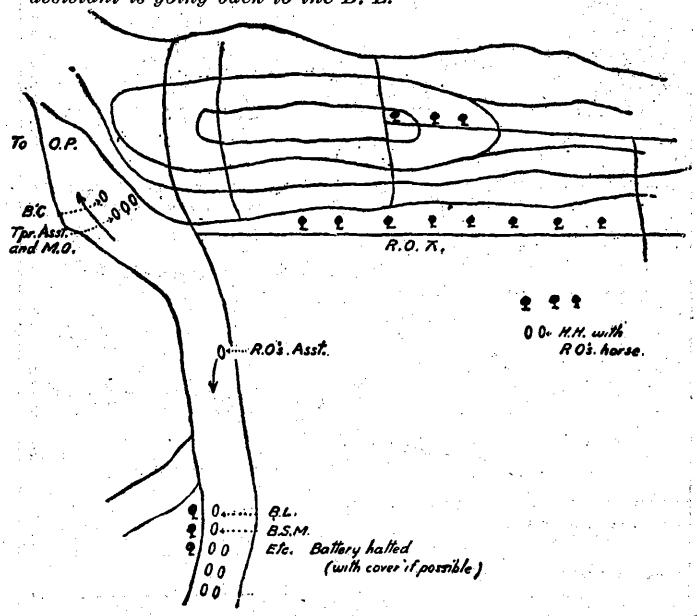
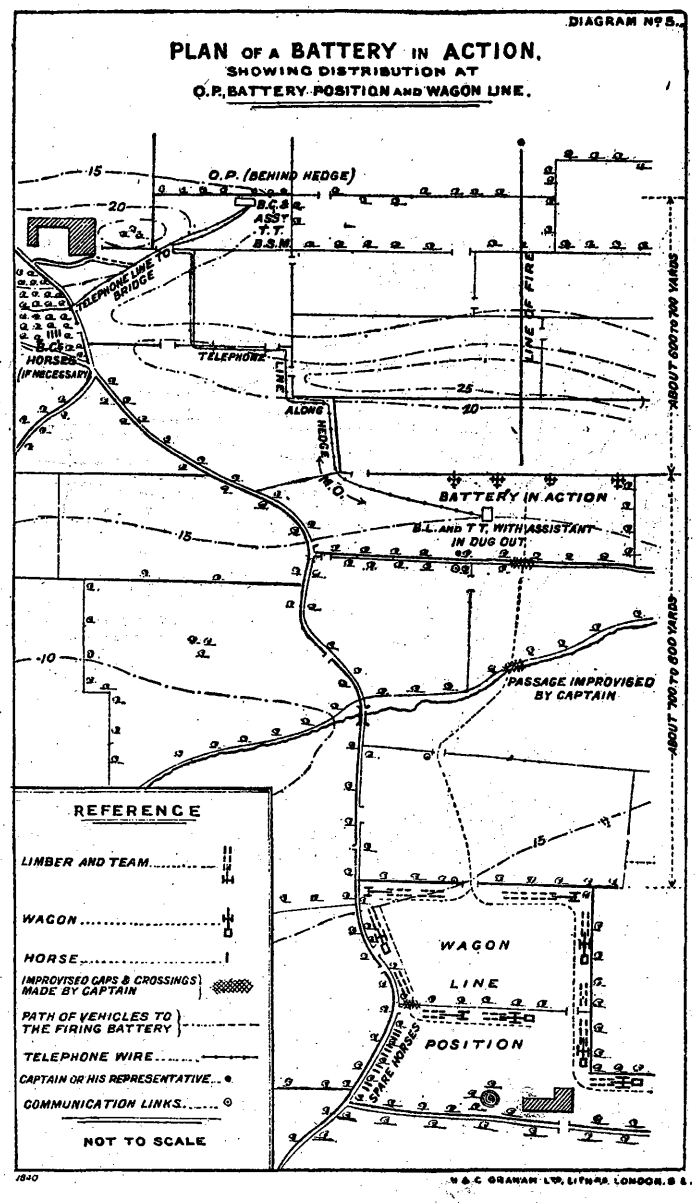


DIAGRAM (4).—*R. O. has just selected a battery position along the hedge. B. C. is going to look for O. P., and R. O.'s assistant is going back to the B. L.*




DIAGRAM No 8.
PLAN OF A BATTERY IN ACTION.
SHOWING DISTRIBUTION AT
O.P., BATTERY POSITION AND WAGON LINE.
O.P. (BEHIND HEDGE)
B.C.S. & ASST. T.T.
B.S.M.
TELEPHONE LINE TO BRIDGE
B.C.'s HORSES (IF NECESSARY)
TELEPHONE LINE ALONG HEDGE
LINE OF FIRE
SERVICE OF GUNS
SERVICE OF AMMN.
BATTERY IN ACTION
B.L. AND T.T. WITH ASSISTANT IN DUG OUT
M.O.
PASSAGE IMPROVISED BY CAPTAIN
WAGON LINE
POSITION
4 DRIVERS WITH SPARE HORSES
REFERENCE
LIMBER AND TEAM
WAGON
HORSE
IMPROVISED GAPS & CROSSINGS MADE BY CAPTAIN
PATH OF VEHICLES TO THE FIRING BATTERY
TELEPHONE WIRE
CAPTAIN OR HIS REPRESENTATIVE
COMMUNICATION LINKS
NOT TO SCALE
1910
W. & C. GRAHAM LTD, LITHOGR. LONDON, S.E.

7. Notes on a Drill for the Occupation of a Position.

(a) *The Occupation of Covered Positions by the Ordinary Method.*

1. *Marking.*—As positions are often in cramped surroundings, it is generally advisable to mark the *flanks* of the position on the line that the guns will occupy, and for the battery to approach from a flank in order to gain the greatest concealment possible during the occupation.

One end of the position is marked by the R. O. and his director.

The other end by the R. O.'s assistant, kneeling in the line of fire.

2. *Procedure.*—When the R. O. has chosen the approximate position he marks it on a map, which he sends by his assistant back to the B. L., with instructions as to how the position will be marked. The R. O.'s assistant brings up "A" group signalers, B. S. M., and those members of the battery headquarters required at the O. P.

On arrival at the position the signalers (if communication is to be by telephone) set up the battery end of the wire in the place indicated by the R. O. and the remainder of the headquarters proceed to the O. P.

The R. O.'s assistant hands his horse over to the R. O.'s horse holder, who must be able to be found, and marks as in paragraph 1.

The B. L. rides well ahead of the battery and decides from which flank he will approach the position, unless the R. O.'s instructions have already legislated for this.

He then leads the battery on to the position, completing all maneuvers as far from it as the ground will allow.

When the guns are moving on to the position the B. L. orders "Action Right" or "Action Left," and points R. or L. groundward.

This command *warns* the Nos. 1 that they should, when at their correct interval and on a good platform, bring their guns into action and get their wagons up.

It is *not* an order to the guns to come into action.

The B. L., as soon as he has given this signal, hands his horse over to the lead driver of one of his subsections and either continues to act as B. L. or takes command of his section.

3. *Formation.*—The most convenient formation is column of subsections, wagons being right or left according as guns are to be brought into action left or right.

Notes.—(*a*) If the cover is limited the column of subsections may have to be at close interval, in which case the No. 1, as soon as he orders "Halt, action right (or left)" also orders "Unhook wagon team," as it is impossible to drive wagons into position from close interval. In such a case the wagon has to be manhandled into position.

(*b*) When moving into a position through a narrow entrance, such as a gate into a field, it may sometimes be advisable to bring subsections into action one at a time. The method adopted would depend on traffic facilities.

(*c*) In inclosed country, when occupying a position along a hedge, it may often be necessary to combine the ordinary and special methods.

In this case the B. L. would bring the Nos. 1 on well ahead of the battery, indicate the general alignment of the guns, and order each No. 1 to select his own gun platform. The battery meantime continues its march along the road and is brought on to the position by the B. L. when the Nos. 1 are ready.

The B. L. must decide whether he will bring the battery in by a subsection at a time, or as a whole.

(*b*) *The occupation of an open position.*

The B. C. chooses the position and sends the R. O. back to bring on the battery. Before leaving the position the R. O. decides how he will occupy it.

Marking.—The B. C. marks one end and his assistant the other end of the position, placing themselves in the line on which the guns will rest when in action.

The battery is usually driven up in line.

As the battery approaches the position, the Nos. 1 canter forward (about 80 yards), dismount quickly and form up in line between the B. C. and his assistant to select their gun platforms.

As the center drivers pass them, the Nos. 1 hand their horses over and when the trail eye reaches them they order "Halt, Action Front."

N. B.—The battery leader must be careful to give the order "Walk" in sufficient time to prevent the guns overrunning the

position. This procedure is also applicable to a covered position, the approaches to which afford cover for maneuver.

In the occupation of all positions it is important to adhere to a regular system of drill, which should be carried out in the following order:

(1) The R. O. (or B. C.) selects and marks the position.

(2) The R. O. sends back as much information as possible to the B. L., or the B. C. sends the R. O. back with as much information as possible, and on reaching the battery the R. O. becomes the B. L.

(3) The B. L. rides ahead of the battery and reconnoiters the position himself, deciding exactly how to occupy it. In an open position the R. O. has done this before rejoining the battery.

(4) The B. L. (or R. O.) having completed his reconnaissance, returns to his battery and maneuvers it in accordance with his plan, assuming the final formation sufficiently far away to avoid maneuvering on, or close to, the position itself.

O