MANUAL FOR COMMANDERS

OF

INFANTRY PLATOONS

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The following Manual for Commanders of Infantry Platoons is published for the information of all concerned.

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MANUAL FOR COMMANDERS OF INFANTRY PLATOONS.

PART I.

PRINCIPLES OF COMMAND.

CHAPTER I.

THE COMMANDING OFFICER—ADVICE TO A YOUNG OFFICER.

THE COMMANDING OFFICER.

The action of the commanding officer has a decisive influence on the morale of the command.

The commanding officer should be well trained, be an example to his men, and really "command" them.

Instruction.—The lack of knowledge in one who should create confidence among the men is a misfortune, for it causes timidity. The commanding officer "who knows his business" demands only useful efforts from his men; he does not use them prematurely or expose them to useless loss in battle.

The example.—Any organization is the reflection of its commanding officer. It is the most severe judge of him; it pays attention to his lightest word and observes all his actions. It only asks to be able to admire him and to follow him blindly. The best reward of a commanding officer is the fine behavior of his command under fire.

To command.—The commanding officer leads his organization because he knows how to be the most ardent man in it; but he

is also its master, because he always knows how to keep cool and to use good judgment. Nothing should be hidden from him and the command should give him its entire confidence. *To command* does not consist in merely giving orders. *To command* is to *give an order* and to *see that it is executed.* It also consists in being constantly on the alert; in keeping informed of everything that is going on around him; in originating orders if none are received, or in taking the initiative; in giving the necessary instructions at the proper time; and in keeping his inferiors constantly informed of existing conditions.

The authority of a commanding officer makes itself apparent first of all by the discipline of his command—execution of orders, bearing, outward signs of respect, cleanliness, good condition of arms, and correctness at drill.

In battle a disciplined command fights well, but undisciplined troops escape from their chiefs, throw away their arms, surrender, or run away.

ADVICE TO A YOUNG OFFICER.

Influence.—A commanding officer should impress himself on his command by his superior qualities. There is no single type of commander which young officers can take as a model, but each one should reflect and try to determine what natural or acquired qualities give to the best commanders of his acquaintance their influence over their commands. An officer recently promoted should not be content with thinking that he has been made a commander simply to secure obedience under ordinary daily circumstances. That would only indicate that his rank is respected. He should not be satisfied until he has patiently gained the confidence and the heart of his men; until he is certain that they have given themselves absolutely to him, and that they will obey him even to the death.

A young commander should remember that in critical times the authority that emanates solely from his own personality will always be far more efficacious than that which comes from the regulations.

Moral qualities.—A commander raises himself in the esteem of his men above all by the qualities of his character, and rightly so, for energy, initiative, will power, perseverance,

precision, judgment, self-control, sense of duty, and self-denial are qualities without which the finest gifts of intelligence remain of no value.

Among the qualities of mind, a general and extended military education is not produced in the course of a campaign; but every officer can and should possess himself of a thorough knowledge of everything that concerns his duties. If he has precise knowledge, he has confidence in himself, proper decisions will come readily to his mind, he will express himself calmly and without hesitation, and he will command the attention of the men; on the contrary, inappropriate or contradictory orders, given in an uncertain or nervous manner, inspire doubt as to their efficiency. The French soldier obeys blindly only when he has a blind confidence.

A commander is loved by his soldiers when he has a sense of justice, an absolute uprightness, is concerned with their well-being and pays personal attention to it. The soldier submits readily to all severities for which there is a reason, and, in his heart, he gives to excessive indulgence and weakness the consideration which they deserve. Justice does not consist in treating all men exactly alike, but in exacting from each the full exercise of his faculties and powers, and in rewarding meritorious actions in accordance with the efforts which they have cost.

The habitual attitude of the officer is also of importance; lack of dignity in bearing and language, vulgarity, and familiarity are never proper for an officer; everyone can be correct, simple, and dignified without holding his inferiors at a distance, and without preventing good humor and gayety, which, like hope and absolute faith in victory, are so readily and so happily imparted to others.

During bad days, when the men are discouraged, the officers and noncommissioned officers form the foundation on which the spirit of the company is rebuilt; they remember that "no matter what comes, one must never despair"; that there is no good reason why the enemy is not as badly decimated and depressed as our own troops; that in war, Dame Fortune has astonishing rewards for those who do not give up; and that complete victory belongs to him who is able to hold out a quarter of an hour longer than the other.

The spirit of precision—The importance of details.—In addition to those moral qualities necessary at all times, it is important that the young officer go deeply into the new requirements of war, which, at the present time, depend so largely on scientific qualities.

To-day every attack, every stubborn resistance, risks failure if the force engaged has not prepared its ground, its matériel, and its personnel with a minuteness superior to that of the enemy. In this preparation, where every detail is important, the least neglect must be paid for in the end.

The noncommissioned officers and the chief of platoon of infantry should realize that no matter how brave they are personally, their task will not be accomplished if they do not constantly apply themselves to the details which no other officer can attend to for them. Order, method, mechanical precision, and horror of the terms "almost" and "unfinished" have become essential qualities, the absence of which will surely expose a commander to the most serious disappointments.

Orders received and the initiative.—Command is exercised in accordance with the following principle: The superior determines the object to be attained, indicates his intentions, and defines the tasks to be executed by the subordinate elements; he leaves to the latter the choice of means for their execution. Officers and noncommissioned officers should make good use of that *initiative* in choosing the best means leading to the desired end.

Initiative does not consist, as is sometimes thought, in the right to modify an order that has been received, when it is thought that the result obtained will be better; such action is disobedience.

However, a noncommissioned officer should act on his own initiative:

First. To complete and develop an order when intentionally or otherwise the commander who has given it to him is silent on certain measures of detail which it is intended to be left to his judgment.

Second. When, for any reason, an order is not received and a decision is necessary. In this case he must give an order and report his action. He may be mistaken as to the urgency of the case, but the commander will always consider that "the only

faults which merit reproach are those of *inaction* and *fear of responsibility*."

Finally, in *very exceptional* cases, for example, when the situation is entirely changed between the time when an order was issued and the time it was received, initiative may lead one to act in an entirely or partly different way from that ordered; it is necessary then to be absolutely certain that "in disobeying the *text* of the order the *intention* of the commander is carried out," and a report of the action taken must be made without delay.

In all other cases discipline demands that orders be obeyed promptly to the smallest details which the commander has thought necessary to mention. Initiative is only exercised in regard to those details which have not been mentioned, and action on these should be in accordance with what is known of the commander's intentions and manner of thought.

Orders given.—The principal quality of an order is clearness. In war, *misunderstanding* is a more dangerous enemy than lack of discipline; more frequently than otherwise it destroys the strict execution of orders.

A subaltern officer often has the advantage of being able to explain and comment on the orders which he gives his men; their intelligence is thus brought into play, and they are more willing to carry out orders of which they understand the necessity.

But it is also necessary that the command understands that this is only done for the best interests of the service. It should be none the less ready to execute strictly, without hesitation or question, an order given without explanation. That is the very basis of discipline, and one can not revert to it too often, even if only as an exercise.

Frequently the orders of a noncommissioned officer are not properly obeyed because he gives orders to a lot of men collectively when only a few are required to do the work; each man then looks to his neighbor to carry out the order. The one giving the order should always divide the work up and assign it by name to the men who are to execute it. It seldom happens that a man who has personally received a clear and positive order will disobey it, but he will often try to evade an ambiguous order. Before formulating an order one must be sure that it can be carried out and is not capable of evasion; it must

say exactly what is desired and no more; the system of demanding more than is desired in order to be sure to have enough must be avoided. Whatever is ordered must be obtained; the difficulty is to properly estimate what is reasonable and profitable.

When a precise and correct order has been given, an immediate and severe penalty should follow its nonexecution.

It is not admissable for an officer or noncommissioned officer to fail to pay attention to a flagrant fault that he sees committed, under the pretext that the guilty person is not under his direct orders. This frequently happens, either through indolence or through fear of wounding the sensibilities of the commander of the man at fault. A noncommissioned officer is the superior of all persons in the military service who are of inferior rank. He should realize his authority and not make himself an accomplice of a man who misconducts himself in his presence. He should intervene tactfully and firmly and insist that the orders and regulations be carried out at all times and in all places. All slackness in camp and in the trenches arises from the failure to observe this principle.

In the company the noncommissioned officers should be the mainstays of their squads or sections, and they should never refuse advice to a man who asks it, or a solution of a difficulty which he brings before them. An excellent means of having little to repress in the interior management of the company is to lay down the principle that a man is never at fault when he is covered by the previous approval of a noncommissioned officer, but that he is always to blame when he has not referred to him if he has any doubt as to what he should do. On the other hand, a noncommissioned officer will be considered as unfit to command if he avoids accepting his responsibility of giving a direct reply.

Therefore the young officers and noncommissioned officers should never forget that they hold a part of the principle of authority, and that it has been confided to them with the understanding that they will not allow it to suffer under any circumstances.

Relations of officers among themselves.—Officers of the same company mess together; meal hours are hours of relaxation during which it is proper that they become sociable, but whatever

the familiarity that exists then, the deference due to experience, age, and rank must never be forgotten.

The respect shown by the lieutenant to his captain, his attention and punctuality in observing all his instructions, will be quickly observed by the command and will teach it obedience and military spirit by the best method—example.

CHAPTER II.

GENERAL RÔLE OF THE DIFFERENT GRADES IN THE COMPANY.

The company.—The company is the organization which appeals most to the soldier. It is the largest unit in which all the grades and men can be personally acquainted. It is the smallest one that can be charged with elementary tactical operation.

It has its own number, and its customs; it differs from its neighboring company. Also the captain is the real commander of his men; he is the confidant of their troubles as well as the compulsory intermediary of their requests. Nothing that concerns them is done without his advice. He has, in a way, a universal rôle, which there is no need of further defining here. He is responsible for every one in the company, and consequently has entire charge of all his subordinates.

The chief of platoon.—The chief of platoon is purely a military chief; he is the head of the strongest unit that can be controlled by the voice and kept in view when deployed. The platoon is the elementary group in battle; it engages, fires, and fights as a unit; it always acts as if its power was concentrated under a single head—that of the chief of platoon. The rôle of the latter is therefore most important.

Having under his orders only 50 men whom he never leaves, the chief of platoon is the only officer who can know in detail the character and aptitude of each one, and he is best qualified to judge of their daily morale and of the tactical situation, which he should always keep in mind (security, liaisons, observation, damage done to the enemy, etc.). On account of his other duties, he should require that the noncommissioned

officers give him full support so that he may maintain his moral and tactical rôle.

The sergeant commanding a half platoon.—The sergeant is, in practice, the first noncommissioned officer who has considerable authority, and, besides, he commands a sufficiently small number of men so that he can remember or note all the details concerning them—clothing, equipment, armament, supplies, etc. This is his rôle. His many duties can be expressed in the following words: To do whatever is necessary in order that the personnel and matériel of his half platoon shall always be present and in good condition. In a well-disciplined half platoon the officers need only make several daily inspections and do not have to do the work of the sergeant.

In battle the sergeant commanding a section has an important rôle, that of file closer. His superiors must speak to him often; tell him that fear is contagious; that the safety of the country requires that any weakness or the beginning of any confusion must be immediately suppressed; that to hesitate to kill a coward is perhaps to preserve 20 enemies or to cause the death of 20 comrades.

In the advance the sergeant does not put himself in the firing line, but sees that all the others are there.

In order that he may perform his duties in the most energetic manner it is necessary to give him much greater authority in the field than in peace time.

The corporal.—The corporal lives intimately with his men; he is their mess chief and justice of the peace.

The best corporal is the one who always has hot soup and food for his squad under all circumstances. The sergeant should not delegate to him any part of the permanent responsibilities which he should assume himself. The proper employment of a corporal consists in confiding to him the execution of successive and well-outlined tasks. From the grade of corporal those men who have shown the best qualifications for command are chosen as sergeants.

Selection of specialists in the companies.—The qualities to be looked for in selecting specialists are:

Clerks: Well ordered and accurate mind; discretion.

Liaison agents: Absolute devotion; legible writing; aptitude for making comprehensive reports; memory of terrain.

Observers and lookouts: Good sight; coolness.
Signalmen: Good sight; memory.
Riflemen: Vigor; daring.
Grenadiers: Aptitude for sports.
Stretcher bearers: Physical strength.

It is difficult to pick out specialists without diminishing the efficiency of the rest of the section. This great inconvenience will be lessened by the chiefs of platoons training or having trained numerous substitutes and observing that none of those on special duty who remain under their authority lose the qualities and fitness of the men in ranks.

CHAPTER III.

SENIORITY—RIGHT OF COMMAND.

It is important that the relative seniority of the sergeants, corporals, and first-class privates be always definitely fixed, so that, if the case arises, there will never be any hesitation on the part of the one who should automatically take command and become responsible.

The lists of seniority by rank should be made up, and the newly arrived informed.

The rule is that when two or more military persons assemble for service there is always one who is in command, the highest in rank, or if of equal grade the one of longest service; the lieutenant will thus establish the order of rank among the men of his platoon.

But in battle, when the lower noncommissioned officers have disappeared, it is necessary to take from the ranks the bravest private, and one who is not necessarily the senior. He leads the others; he is the commander.

It is necessary to impress this on the command: If the rules of seniority are correct in ordinary life, during battle they cease to exist among soldiers.

In the same grade, officers with permanent rank take command over those with temporary rank.

Between officers of the active army and officers of the new complement, of the same grade, seniority is established as follows:

Both count as active service, as regards their right to command, the time they have actually served with the colors in their present grade since the date of mobilization; those who have previously served in the active army with their present rank are credited with the seniority they had in that grade at the time they left the army.

In the same grade and with the same date of seniority, officers of the active army take command over officers of the new complement.

Seniority between sergeants and corporals of the active army is fixed in the same manner.

Exception to the rule of seniority.—The authority which orders the formation of a detachment can designate its commander, provided that no one in the military service is placed under the orders of a person of inferior rank.

"Command," properly speaking (command of a detachment, encampment, etc.), never belongs to officers who are of a corps or personnel which has a "hierarchy" of its own, even though such officers have assimilated rank (that is, medical officers, officers of administration, subintendants, etc.).

However, these officers have certain powers resulting from their special regulations, for example, a surgeon in his infirmary or in his dressing station.

PART II.

ELEMENTARY TRAINING OF INFANTRYMEN.

CHAPTER IV.

SCHOOL OF THE GRENADIER.

INDIVIDUAL INSTRUCTION—INSTRUCTION OF THE GRENADIER—INSTRUCTION OF THE SQUAD.

INDIVIDUAL INSTRUCTION.

1. Individual instruction is given to all soldiers without exception.

It includes exercises in throwing grenades and also theoretical instruction concerning the manufacture, dismounting, and manipulation of grenades.

Throwing.—The "throwing of grenades" is the basis of the instruction of the grenadier.

Accuracy in throwing is of the greatest importance, for besides the advantage it gives in battle it diminishes the risk of accidents and wasting of grenades.

The moral effect of a grenade bursting in a trench is added to its destructive effect.

The grenade should never be thrown scraping the ground or with the elbow bent. *The fire should be plunging.*

The normal method of throwing the grenade is as indicated in figures 10, 11, 12, 13, 14, and 15. This method will be modified according to the different positions from which the grenade is thrown (kneeling, lying down, from behind an obstacle).

Exercises in grenade throwing.—The men are first exercised in throwing dummy grenades over open ground and at known distances. Trenches are represented by tracing two lines on the

ground 1 yard apart, and placed at distances of 20, 25, 30 35 yards, etc. (Fig. 16.)

The "throwers" place themselves in trench A. They are exercised in throwing their grenades into trench B. They then increase the range successively to reach C, D, etc.

FIG. 10.—Pulling out the catch fuse.

The squads may be divided in half, one at the firing point and the other at the target. The second party returns the grenades to the first, and so on. Loss of time is thus avoided and the interest of all is increased.

Direction and accuracy can be developed by the employment of targets traced on the ground.

The men should be exercised in throwing grenades from standing, kneeling, and lying-down positions.

When the prospective grenadiers have acquired sufficient accuracy they are exercised in throwing grenades from one trench

FIG. 11.—Look toward the objective with the arm extended and the grenade in the right hand.

into another, then in advancing along a trench and throwing grenades over traverses.

Dismounting grenades—Manipulation.—The object of this part of the instruction is to teach the soldiers the normal working of the weapon, the accidents that are liable to happen, the

dangers that arise in certain cases, for example, in the case of failure to explode and the precautions that are necessary in handling.

It is strictly forbidden to dismount charged grenades, or even ones that are inactive but with charged detonator.

FIG. 12.—With left arm held in the direction of the objective, bring the right arm to the rear.

Consequently, the instruction will be carried out exclusively with dummy grenades made especially for that purpose.

It is absolutely necessary to prepare an instruction trench. It will be sufficient to dig two elements of trenches provided with two traverses separated by an interval of fire at 20 yards apart.

Each time that a command is at rest or in reserve the instructor should immediately prepare an exercise ground. Sunken roads, slopes, natural obstacles that can be adapted to the work in a few hours will serve as shelter for throwing real grenades.

FIG. 13.—With left arm in same position, extend right arm to the rear. Turn your eyes on the grenade and make sure that it will not be interfered with during the throwing.

INSTRUCTION OF THE GRENADIER.

In addition to the common instruction given to all soldiers, the grenadier receives special instruction and undergoes a more complete training.

This instruction includes—

The making of explosive charges.
The construction of dummy grenades.
The utilization of enemy grenades and detonators.
The handling of low-power trench mortars.

FIG. 14.—Look again at the objective. Describe an arc of a circle in the vertical plane with the right arm.

The object of the special training of grenadiers is to make the throwers quick and confident in their direction, and the instructors capable of setting the example to their comrades and of organizing the grenade combat.

Grenadiers should be especially exercised in firing rifle grenades. Continually on the lookout and prompt to seize favorable opportunities, they will inflict appreciable losses on the enemy daily.

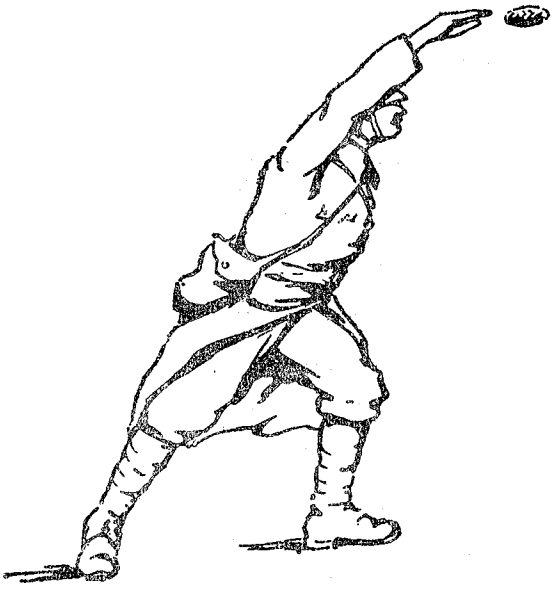


FIG. 15.—Throw the grenade, the right shoulder and the body following the movement of the right arm. The left arm follows the left shoulder, which is held back. The grenade will go in the direction in which the left arm pointed.

INSTRUCTION OF THE GRENADIER SQUAD.

The object of squad instruction is—

To teach any squad of grenadiers (particularly the first squad of each platoon) to prepare for grenade combat and to pass

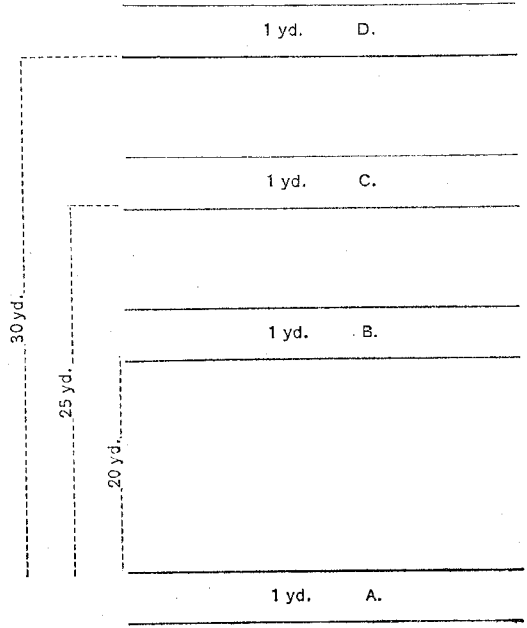


FIG. 16.

quickly to that mode of fighting whenever circumstances permit.

To teach the squad to effect a surprise attack with grenades.

As a rule, the men comprising a squad of grenadiers are divided for battle as follows:

Throwers.
Carriers.
Assistant grenadiers (formerly called riflemen).

Each grenadier being capable of immediately filling any one of these rôles upon being designated as thrower, carrier, or assistant.

The squad of 1 corporal and 7 grenadiers will then consist, under its squad leader, for example, of 2 throwers, 2 carriers, 2 assistants, and 1 spare grenadier. Or it may sometimes fight in two reliefs of 3 grenadiers each, one commanded by the corporal and the other by the most energetic grenadier.

More important groups will often be formed under the orders of a sergeant or a grenadier officer to carry a more extended point of resistance. Sometimes all the grenadiers of a company or a battalion will be grouped together.

The combat of such a group is the combination of the partial combats conducted by the groups of four or eight grenadiers, between which the grenadier officer has divided the whole objective, each being assigned to some carefully chosen point.

The instruction of the small squad is then the tactical basis of grenade combat.

RÔLE OF THE SQUAD LEADER.

The squad leader directs the combat; he distributes the men according to their qualifications, places them in the trenches or communicating trenches so that they will not be crowded, organizes the reliefs of throwers and carriers; he looks after the replenishment of grenades.

The squad leader seizes promptly every occasion to advance; if the advance becomes impossible, he prepares to defend the ground foot by foot, multiplying the barriers.

The grenadier officer, being in command of a much larger group, has two principal tasks:

First. To reconnoiter the objective; to distribute the squads or groups.

Second. To supply the squads.

This second task demands the greatest energy, discernment, and initiative.

RÔLE OF EACH SOLDIER IN A SQUAD FIGHTING WITH GRENADES.

Throwers.—The "throwers" should have their hands entirely free in order to manipulate the grenades without difficulty; they carry the rifle slung on the shoulder during combat.

For defense, they are provided in addition with a pistol and a trench knife.

The "throwers" will not always be able to carry the rifle when the fight is not to be followed up, as in the execution of a surprise attack.

Grenade carriers.—The "carriers" look after the replenishment of grenades. They replace the "throwers" if the latter are put out of action. They are armed alike.

Grenadier assistants.—The "assistants" should be chosen from among the most decided and alert men; they should be good shots and skillful in the use of the bayonet.

Their duty consists in looking after the security of the "throwers." They are sometimes called "scouts."

In a frontal attack over open ground they support the "throwers" and protect them with their fire.

In the communicating trenches they precede the "throwers" and pass around the traverses or bends, ready to stop any offensive return of the enemy. They endeavor to report the location of the fall of the grenades, to aid in correcting the fire, and signal to their squad leader the instant that advance is possible.

When further advance is impossible they notify their chief. Without waiting for orders a barrier of sand bags is thrown up as soon as possible and the "assistant grenadiers" take position to open fire.

In street fighting they watch especially the doors and windows.

FORMATION ON THE MARCH OF SQUADS DESIGNATED FOR COMBAT.

These squads usually advance in the same manner as patrols and reconnaissance parties.

The squad leader takes the place from which he can best control and direct his squad.

The "assistant grenadiers" are directed to reconnoiter the front and flanks and to protect the other grenadiers in case the enemy is encountered.

In crossing open ground the squads advance as skirmishers. The assistants are distributed in the line and are grouped particularly on the wings to support the grenadiers; in case of meeting the enemy the assistants reconnoitering the march rejoin the line.

In marching in the communicating trenches the squads form in single file in the following order: "Assistants," "throwers," "carriers."

SQUAD TRAINING.

Squad training is held on a prepared drill ground.

The command is taught to divide itself quickly into assistant grenadiers, throwers, and carriers, and they are instructed in the part that each of these should take under the different circumstances of combat, which are indicated later. (Book IV, Ch. V, 3°.)

The men should always work in complete silence, communicating as far as possible by gestures and signals.

It is much more important to have squads of grenadiers of average ability but trained to work together than to have a number of highly developed individuals. It is a great mistake to pay attention only to the individual instruction of the grenadier and to believe that the efficiency of the squad will follow naturally. Nothing is more difficult than to properly coordinate the action of the men in the same group, or of groups in the same combat.

CHAPTER VIII.

SCHOOL OF SAPPING—IMPORTANCE OF INTRENCHMENTS IN INSTRUCTION AND IN BATTLE.

Actual war has put tools in the same rank with guns.

To-day the soldier is both fighter and laborer; the one is no longer thought of apart from the other.

He makes use of his gun *sometimes*, of his tools at *all times*.

When he has gained an advantage at the price of blood, if he counts only on his gun to hold it, he will be cruelly deceived.

It is necessary, however fatigued he may be, that he attack the earth at once, that he know that every stroke of the pick is a check against the counter attack that the enemy is at this moment preparing against him.

For officers and noncommissioned officers to teach their men to shoot is relatively easy. *To get a company, fatigued and diminished by fighting, to set itself to work without rest is difficult.* It is, however, as imperative a duty as the first; the least offensive return can change success into failure, if the energy to conquer is not immediately succeeded by the energy of the pick and spade to hold the advantage won.

Officers and noncommissioned officers should facilitate the performance of this duty by inculcating in their men in advance the preceding ideas, ideas that are not always apparent to them; they should not lose an opportunity to communicate to them instances of engagements that illustrate the penalty of carelessness and the reward of tenacity in the matter of field intrenchments.

Two principles should enter into the minds of all:

1. *The construction of intrenchments ought never to be deferred under the pretext that the time necessary for its completion might be lacking.*

This principle is true in all situations, action or inaction.

2. *In combat, after an advance, the true relaxation of troops consists in laying out intrenchments for them and in imposing upon them immediately the work of constructing them.*

It is necessary that the surviving commanders have the energy to coordinate immediately every effort after the fight, *with a direct view to the operations that are to follow and to the preparation of the ground that they will necessitate.*

Otherwise, each soldier or little group will expend themselves in individual arrangements and improvisations; they dig, wherever they find them, holes and bits of trenches that are not useful for the resumption of the movement, and the battalion sometimes thus loses two or three days that might have been beneficially employed as indicated in the following paragraphs.

In order to thoroughly establish the second principle set forth above, it is necessary to prescribe that in instruction *every infantry maneuver should terminate in the laying out and construction of intrenchments on the last position attained.* Offi-

cers and enlisted men thus get the idea that maneuvers and intrenchments are one and the same thing, executed by identical commands and means. It is an error to classify maneuvers and intrenchments separately. Intrenchments are as much a part of the maneuver as are the deployment and the assault. And, whether offensive or defensive, there is no maneuver without intrenchments.

Classification of intrenchments in the manual.—The former regulations have been replaced by *Instruction in field fortification, approved December 21, 1915.* Every part of this instruction is of interest to officers and noncommissioned officers, who can not study it too much in detail. The length of the text alone prevents its entire presentation in this manual. The ideas that are extracted from it serve two different objects:

1. In Part II of the present work (Elementary infantry training) are indicated the essential elements of intrenchments that every soldier ought to know how to execute mechanically, exactly and without having to concern himself with the reason for their existence. This is the *manual of arms* for field fortification, and it is taught with the same rigor as in the case of offensive weapons.

2. In Chapter VI of Part IV (Principles of fortification) is treated the manner of putting at work these elements in an organization in conformity with a predetermined object.

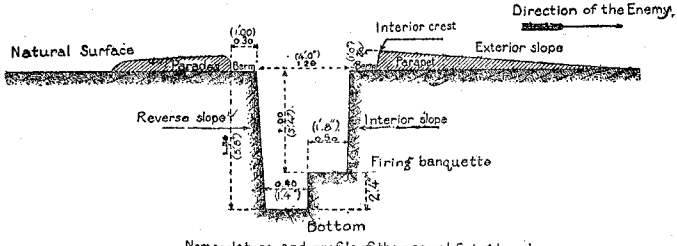
Normal types of field works.—In order to ground the education of infantry pioneers on a solid basis, there is given below but a single normal type of the following intrenchments:

1. Cover for a rifleman lying down.
2. Trench for rifleman standing.
3. Traverse.
4. Niche for ammunition.
5. Communicating trench, or approach.
6. Deep sap.
7. Russian sap.
8. Emplacement for machine gun.
9. Cave shelter (dugout).

Officers and noncommissioned officers should learn these fundamental types by heart, with their forms, dimensions, and the prescribed methods of construction.

The order to construct one of these types (communicating trench, emplacement, etc.), when it is accompanied by no modification, implies the exact construction of the normal type by the prescribed methods.

The men must be instructed in these normal types first of all. When they know them thoroughly it will then be easy to construct whatever type is taken from the Instruction in Field Fortifications, however modified by conditions of terrain, of materials, or by the time at one's disposal, etc.



Nomenclature and profile of the normal firing trench

FIG. 33.

Nomenclature of fire trenches and saps.—Excavations employed in field fortifications for firing or moving under shelter properly bear two distinct names, *dependent upon the manner in which they were made.* The name of *sap* is given to excavations executed by sappers, who advance foot by foot by extending one end of the excavation, and the name of *trench* is reserved for excavations dug simultaneously on more or less extended fronts.

In current language it has become customary to apply the term *trench* to firing trenches, *parallel* to communications located parallel to the front, and *approach* to such as are perpendicular to the front.

The words *sap* and *trench* nevertheless retain their value to indicate the method of construction employed. One can say, for instance, with precise meaning, an approach trench or an approach sap, a fire sap, etc.

Finally, among sap excavations there are distinguished:

The *sap proper*, now called approach, and in the digging of which the earth excavated is placed at the end of the excavation nearest the enemy.

The *deep sap*, which is an approach without parapets, from which the earth is carried to the rear as excavated.

The *deep covered sap* or *covered sap*, which is the same as the preceding but is hidden by a light layer of earth supported by wattling or poles.

The Russian sap, an underground passage without sheathing or casing, the roof of which is cut in the form of an arch at 10 or 12 inches below the surface of the ground.

The masked sap, a covered sap with a framework ceiling, proof against bullets and shell fragments.

The sand bag sap, when digging is not practicable, the two parapets being constructed of bags of earth piled 6 to 7 feet high.

It is improper to use the term *sap* to designate an underground work. Such works pertain to mining operations, and are known as *galleries* or *branches*.

It is important to observe these designations.

Qualities of a trench—Width.—There is better protection in a narrow trench, although movement and observation are easier in a wide one.

Depth.—A deep trench gives better protection but is more difficult to retake if the enemy captures it. It requires an elevated banquette, with special provision for rivetting this banquette and getting up on it.

Slopes.—Steep slopes do not stand so well but increase the security by diminishing the width. They permit the men to stand close to the parapet.

Relief.—If it is too slight, the view is impaired; if it is too elevated, the trench is visible from a distance.

Parapet.—A superior crest with a gentle slope, blending insensibly with the surface of the ground, lends itself to invisibility, especially if one can give it the appearance of the neighboring surface; avoid sharp changes of slope which are betrayed from a distance by the inequalities of the light.

NORMAL TYPES.

1. COVER FOR RIFLEMAN LYING DOWN.

Cover that riflemen try to make for themselves when they are under the necessity of covering themselves from fire.

FIG. 34.—Cover for rifleman lying down.

Riflemen, lying side by side, protect themselves at the beginning of the work by their packs; they dig the soil so as to form a bank of earth in front of them, working and firing as best they can.

2. STANDING TRENCH FOR RIFLEMAN.

The *standing trench* is the only one that, in modern combat, assures the soldier a sufficient protection and at the same time admits of the most efficient use of his weapons.

The profile and dimensions of the normal trench are indicated in figure 33.

The firing crest is 4 feet 4 inches above the banquette; the latter is 20 inches wide.

The bottom of the trench is 5 feet 8 inches from the natural surface of the ground, and 6 feet 8 inches from the top of the parapet.

The width of 4 feet at the surface of the ground admits of a batter to the walls.

The width is sufficient to accommodate temporarily two lines in the trench.

The elbow rests are uniformly 1 foot wide.

By stopping the excavation at 2 feet 4 inches from the surface, there results the *kneeling trench.* (Fig. 36.)

If there is also arranged a banquette 1 foot 4 inches high by 20 inches wide, a sitting trench is provided. (Fig. 37.) These two forms ought to be regarded only as steps in the construction of the standing trench, the latter being always the final objective of the work.

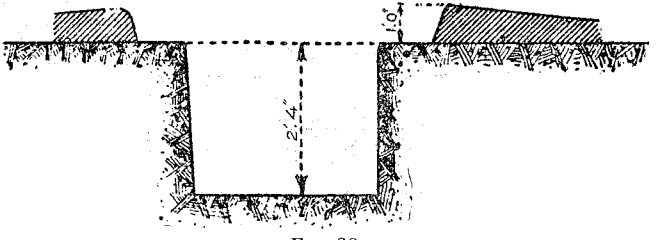


FIG. 36.

3. TRAVERSE.

Traverses are an inseparable part of the trench. Their purpose is to protect from oblique and enfilade fire and to localize the effect of bursting shells.

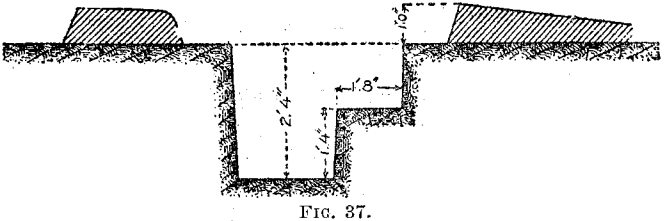


FIG. 37.

They facilitate furthermore the defense against an enemy who has gained a foothold in the trench. For this purpose these traverses should often be provided with loopholes.

Interval between traverses.—Eight yards is the maximum and 4 yards is the minimum between traverses.

Dimensions.—Traverses are made flush with the fire crest in order not to display a profile above it. In order to assure a sufficient protection, the *normal traverse* has a thickness of 8 feet at the natural surface of the ground and 9 feet at the bottom of the trench, so as to provide for batter. Its length will be 5 feet at the surface of the natural soil, so that the end of the traverse will extend beyond the rear line of the trench. (Fig. 38.)

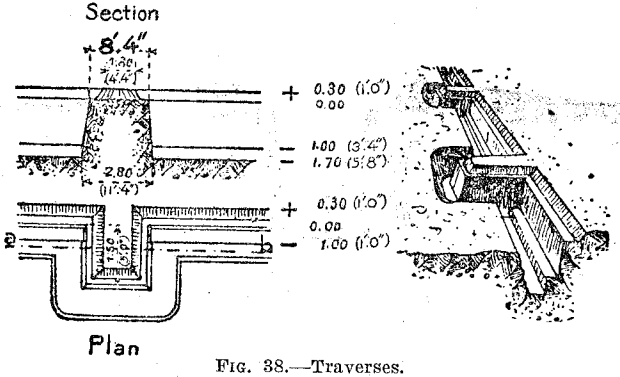


FIG. 38.—Traverses.

Traverses ought never to be hollowed out, and especially should never contain shelters.

NOTE.—If the trench has been constructed without traverses, the same purpose may be served by *splinter proofs*, arrangement having the exact thickness necessary to afford security from splinters without materially decreasing the length of the interior (fire) crest, and formed of fascines, sand bags, gabions (fig. 39 gabion splinter proof), or gravel tamped between the two plank walls.

The distinction between *traverses* and *splinter proofs* lies in their construction. The former are developed in the original soil at the time of the construction of the trench, while the latter are built in after the trench is completed.

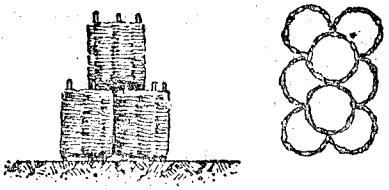


FIG. 39.

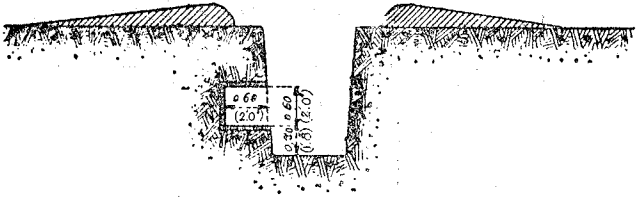


FIG. 42.—Ammunition nitch.

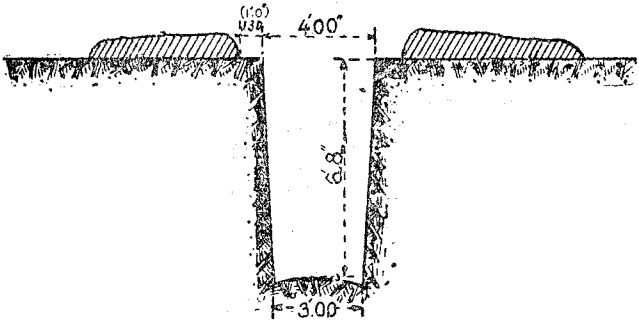


FIG. 43.—Communication trench.

The earth is carried toward the rear by assistants, by relays of shovelers (4 yards per relay), or by means of baskets and wheelbarrows (35 yards per wheelbarrow relay).

7. RUSSIAN SAP.

A gallery without sheathing, the top of which is cut in the form of an arch. (Fig. 45.) The earth is carried to the rear as in the case of the deep sap. Ventilation holes are arranged here and there, permitting the location of the arched roof in

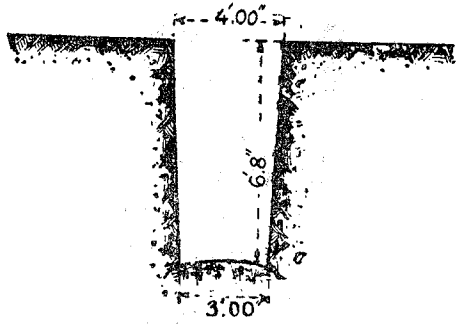


FIG. 44.—Deep sap.

relation to the surface of the earth as the work progresses. The execution is difficult, possible only in very tenacious soils. Advantages: Invisible advance toward the enemy; can be broken open at the last moment and converted into an approach or a trench the construction of which has been completely concealed.

8. EMPLACEMENT FOR MACHINE GUN.

The normal emplacement for a machine gun should be susceptible of very rapid construction without overhead cover in mobile warfare.

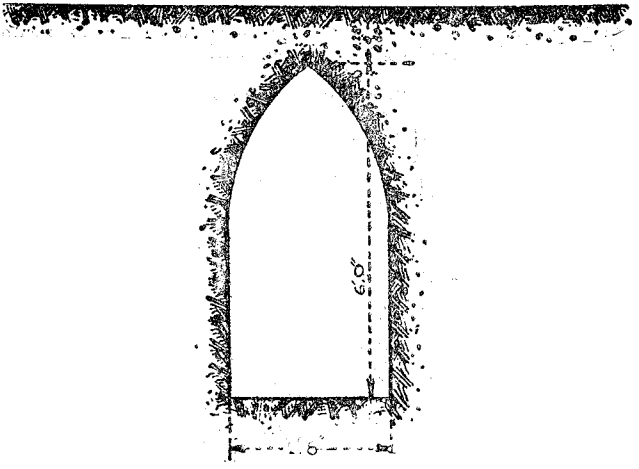


FIG. 45.

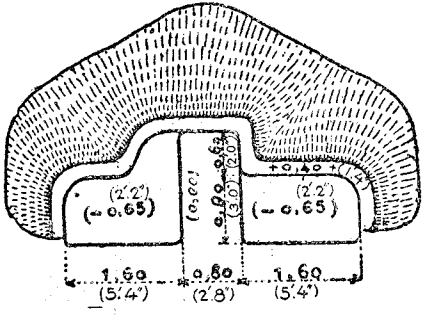
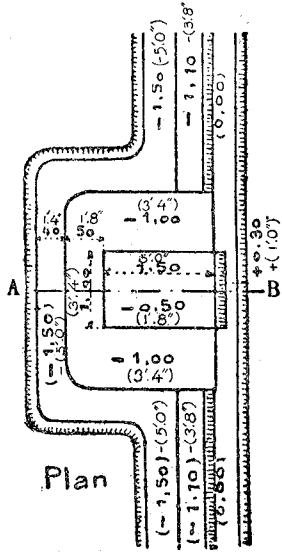
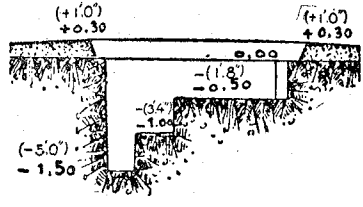


FIG. 46.—Emplacement for a machine gun fired from prone position.

The progress of aerial reconnaissance forbids its use on the parapet of trenches unless carefully disguised; this is an absolutely essential condition in its employment.





Cross section of figure 47.

FIG. 47.

Machine guns are generally installed outside of the trench, frequently concealed in a shell crater, to which access is obtained by a gallery.

The excavated earth should be displayed *near* or dumped *into* neighboring craters.

With these reservations, the emplacement indicated in figure 46 protects very well both the piece and those serving it in the

lying down position; in order to fire in the normal position the platform is lowered 1 foot and the depth of the trenches is carried down to 2 feet 8 inches (fig. 48).

It is essential that every emplacement prepared for a machine gun indicate clearly the *sector of fire* of this machine gun; this is accomplished by driving into the platform three stout stakes 2 or 3 inches in diameter and projecting about 4 inches so as to form a triangle. One of the pickets marks the

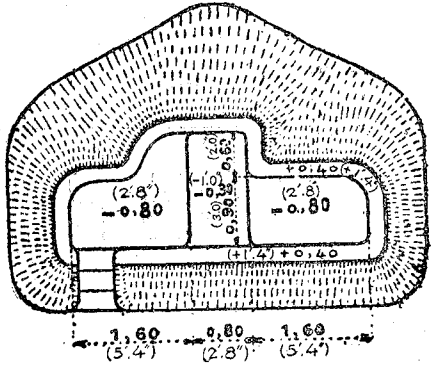


FIG. 48.—Emplacement for a machine gun fired at normal height.

vertex of the angle and the other two mark the sides of the angle within which the machine gun can and should fire. These stakes have nothing to do with locating the legs of the gun tripod, which would serve no purpose, but indicate by means that may be recognized even by groping in the dark if necessary the direction of the intended sector of fire and its extent. Reject every other means that is too fragile or that might not be understood without explanation by a new occupant.

9. CAVE SHELTER OR DUGOUTS.

There is no normal type of *overhead cover* either *light* or *reinforced.*

The models indicated in Chapter IV, Part IV, of this manual and in Instruction in Field Fortifications are only examples in which everything depends on circumstances.

A dugout is said to be "*proof*" if it can resist systematic fire from guns varying from 130 to 150 millimeters (5 to 6 inches), and isolated shots from 210 mm. (8 inches) and over.

"Proof" shelters without overhead cover (of which there will be given an example later on) are always inferior to *cave shelters*, which are to be preferred even if their construction consumes a little more time.

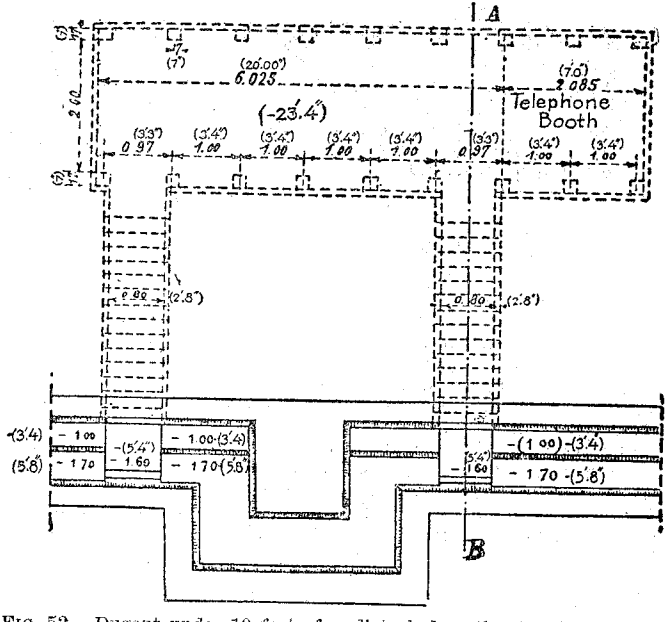


FIG. 52.—Dugout under 10 feet of undisturbed earth. Maximum depth to be executed 20 feet.

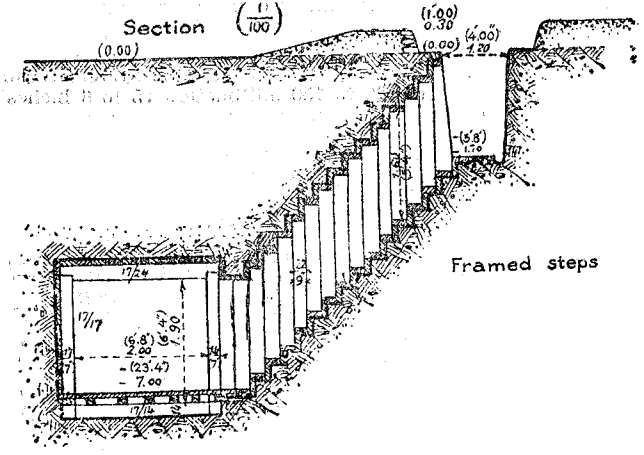


FIG. 52a.—Dugout under 10 feet of undisturbed earth. Maximum depth to be executed 20 feet.

The dugout is therefore, in the absence of some other controlling factor, the absolute rule. It ought to be undertaken *without delay* by the infantry itself, under the direction of the regimental and company pioneers, without awaiting the assistance of engineer troops. Every officer and noncommissioned officer ought to know in detail the simple normal type represented in figures 52 and 52a.

The characteristics of the normal dugout are:

1. They are located under at least 20 feet of undisturbed earth. Eighteen feet of hard compact chalk resists large mine shell and heavy shell with delayed action fuse. Figure 52 represents a shelter with only 10-foot cover; it is easy to imagine it deeper.

2. It has two entrances debouching on both sides of a traverse. These entrances are constructed either with *mine cases* or with *frames and sheeting* as half galleries.

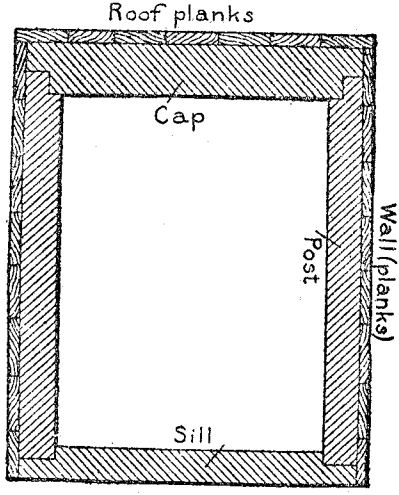


FIG. 52a.

3. It is advisable to have a third entrance opening on open ground in rear, possibly in a shell crater concealed or disguised, and that it communicate with neighboring shelter by a mining half gallery or a branch. (Fig. 52b.)

4. Entrances are united by a grand gallery capable of accommodating a section.

5. The shelter should be constructed with the greatest care: the *entire system must be rigid;* lateral bracing is indispensable. Any neglect will result in the crushing in of the woodwork.

Nomenclature of the cave shelter.—The *mine case* entrance is represented in figure 52; the half gallery in 52d. The *galleries* are composed of *frames*, *ceiling planks*, and *wall planks*. A *frame* is composed of a *cap*, two *uprights*, and a sill. (Fig. 52a.)

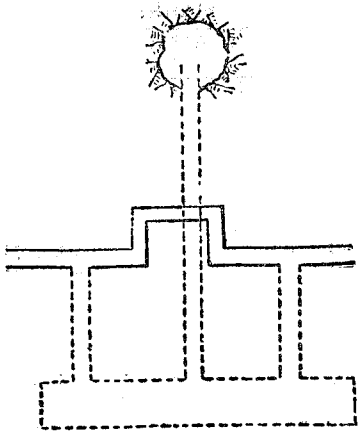


FIG. 52b.

The ceiling planks are thicker than those for the walls (about 1½ inches and 1 inch). The ordinary width is 8 inches.

The cap is always of the greater cross section and the sill of the smaller. It is necessary to guard against interchanging them.

Dimensions of frames ordinarily used by infantry.

Name of frame.	Dimensions.		Cross-section in inches.		Number of planks.	
	Height.	Width.	Uprights.	Cap.	Wall-casing.	Ceiling.
Half gallery	4½ to 5 feet	3 feet 4 inches.	4x4	4x6	12-17	5-8
Common gallery	6 feet 8 inches.	3 feet 4 inches.	5x5	5x6	13-24	5-8
Grand gallery	6 feet 8 inches.	7 feet	7x7	7x9	16-24	8-12

The *half gallery* is used for the entrances only.

The *common gallery*, to shelter men seated or a row of men lying lengthwise.

The *grand gallery*, for men lying crosswise or two rows of men lying lengthwise with a passage in the middle.

The *branches* (large branch, small branch, fighting branch) and *shafts* are employed only by sappers in mining warfare.

Various recommendations.—When there are no squared timbers available, it will be necessary to substitute round ones of equal cross section.

In all construction the heaviest timbers must be used as *caps;* the caps can never be too strong. Uprights, being subjected only to longitudinal compression, may be of slightly smaller dimensions, if they are not too long; in an improvised frame they ought never to exceed 6 feet 8 inches.

Never omit the sill, and always sink it flush in order that it may not trip up anyone, unless a plank walk is laid on the sills.

Bracing.—Bracing is for the purpose of preventing the relative displacement of adjacent timbers and to secure the rigidity of the whole.

There are always two systems of bracing—one lateral and one longitudinal. In the particular case of a mine gallery, the object of the lateral bracing is to prevent the deformation of the

frame (fig. 52c) and the longitudinal bracing gives rigidity between successive frames (fig. 52d).

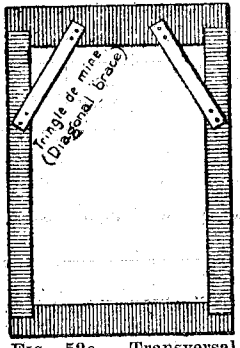


FIG. 52c.—Transversal brace of a chassis

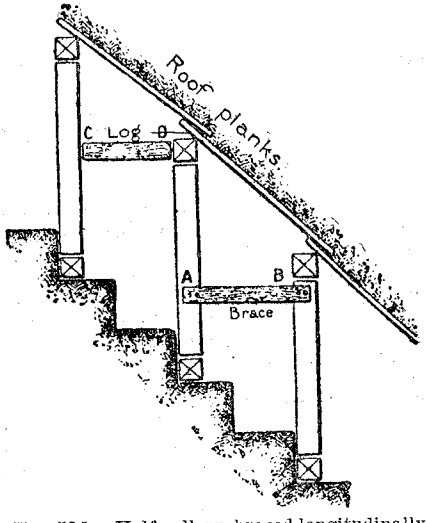


FIG. 52d.—Half gallery, braced longitudinally.

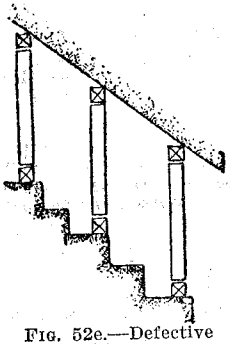


FIG. 52e.—Defective staircase.

This latter is secured by a heavy rib and strip nailed as in AB, or by a round timber securely wedged in as in CD.

Steps.—Steps should be arranged as shown in figure 52d, and not in the defective manner shown in figure 52e.

Tamping.—It is very important to tamp the earth well against the planks and not to leave any empty spaces between the earth walls and the sheeting. Such spaces may be detected by striking the walls with a stick.

NOTE.—Neither the dugout nor the entrances thereto should be termed "saps."

CONSTRUCTION OF A TRENCH.

Trace.—The officer in charge of the work traces on the ground the line of the exterior side of the excavation (tape, stones, stakes, furrow traced with a pick, etc.) and, if he fears some error, the inside border. He will use white tape whenever he can get it.

Assignment of tasks.—Taking into consideration the extent of the work, the character of the soil, the number of men and tools at his disposal, he determines the composition of the working parties and the length of the task of each. This length is, in general, about one pace per man in the working party. Each sergeant superintends several working parties. Corporals work as do other enlisted men, except those who act as sergeants. With park tools on ground easy to dig two shovels and one pick will be distributed to each working party of three or six men. The length of trench dug by each party will therefore be 3 or 6 paces.

In hard ground one pick and one shovel will be issued to a party of two men or four men, working on a front of 2 or 4 paces. When there are two men per tool as great efficiency may be secured as with one man per tool, although the task covers twice as many paces, if the tools are kept constantly at work and the men are made to work with increased vigor, since they rest half of the time.

The limit of each task is indicated in advance by lines drawn perpendicular to the trace. A sergeant divides the men into working parties and distributes the tools, behind the line. The working parties are then led in column of files or twos toward one or the other extremity of the trace, and then execute *on right or left into line*, or *front into line* of working parties, each party halting in line opposite its task and facing the enemy.

Absolute silence is preserved, and precipitate haste is avoided. The director of the work verifies the position of each working party and then commands in a low voice: *Remove equipments.* At this command each man removes his equipment and deposits it with his rifle 4 paces in rear, completes the tracing of the lateral limits of his task (by extending the furrow on both sides of the trench), and immediately begins digging. Men await their turn to work lying down in rear of the line of equipments.

Construction of a Sap.

Sap work is indicated below in the most minute detail in order that it may always be executed in the same manner.

It is forbidden to deviate in any particular from these methods, which are the result of a long experience and which secure the maximum rapidity of progress preceding an attack.

When men are left to themselves they generally work alternately with the pick and shovel, under the pretext that it is easier and quicker. When their officers constrain them to a rigid compliance with the prescribed method of work they rapidly acquire the habit and will really progress more rapidly.

The first operation consists in opening a sap head through the parapet of the trench of departure. This being accomplished, by one of the processes explained later, there is first established, 18 inches to the front, the head mask of shields or sandbags, closely packed together.

First Process: In the Immediate Presence of the Enemy.

SINGLE SAP.

Personnel and matériel.—Each sap head squad is composed of one noncommissioned officer and four sappers. The latter are divided into two reliefs, which relieve each other yard by yard, alternately working in the sap and resting in the trench. If necessary to continue the work day and night there will be required: One sergeant and 1 assistant, with 12 men, divided into three reliefs of 4 men each, each relief being eight hours on duty. If possible 1 extra man per sap head is provided.

In each working relief the men are numbered 1 and 2. They change numbers every work period, No. 1 becoming No. 2, and vice versa. No. 1 is equipped with a pick and a sort of short-handled hoe (made from a pick-shovel), and also a 4-foot measuring stick (the width of sap at the top) and one of 6 feet 8 inches (the depth of the sap). No. 2 has an ordinary shovel and a 1-foot measuring stick (the width of the berm).

The saphead squad should also be provided with the following: 1 long-handled wooden hoe, 1 ordinary long-handled iron hoe, 1 bundle of small stakes, 1 pick and 2 shovels in reserve, 1 short-handled park pick, 1 short-handled shovel or spade-shovel, 1 screen and some metal trellis for the rapid construction of defense against grenades, 1 supply of hand grenades.

Construction of the sap.—The sergeant (chief of sap) indicates by stakes the direction of the sap, and fixes with a measuring stick and stakes the task of the party. He posts his four sappers. He verifies frequently the dimensions of each stage of the work and notes the time taken by each relief in the execution of its task.

Sapper No. 1 (pick) works in front at the head of the sap. At first on his knees or crouching he attacks the earth over the entire width and at the final depth of the sap: 4 feet at the top, 3 feet at the bottom, 6 feet 8 inches deep below the natural surface. He digs first two grooves the depth of the pick-iron in the lower half of the sap in prolongation of the sides of the form, and then a horizontal groove of the same depth at the bottom of the trench, in order to mine and detach a block. He tears down the portion thus mined, commencing at the bottom. He successively drags the detached earth out between his legs by means of the short-handled hoe, being careful to clean the sap out thoroughly, so the full depth of 6 feet 8 inches will be maintained. Then standing erect he attacks the upper part of the trench, digging equal grooves on the right and left up to the surface of the soil, and then knocks down the head-block thus mined and outlined, and hoes the earth out between his legs as before. He thus advances the head from 16 inches to 20 inches or thereabouts, verifying the dimensions from time to time with the measuring sticks with which he is provided.

Sapper No. 2 (shoveler) follows immediately in rear of No. 1. He removes first with the short-handled shovel or spade-shovel,

then with the ordinary shovel, the earth dragged out by sapper No. 1, and heaps it in front to thicken the mask, then to the right and left to form parapets. The earth is thrown by No. 2 over the head of No. 1, or alternately to his right and left, onto the top of the parapet. He is careful to distribute the earth over the most advanced portion of the parapet in order to close the hole made in advancing the head mask, and over the mask itself in order to maintain it always at its normal dimensions. He arranges the berm of 1 foot between the parapet and the edge of the excavation, and he regulates this berm as necessary by means of the hoe.

Sappers Nos. 1 and 2 can change places at the middle of their task of 1 yard's advance.

Advance of the mask.—When the trench has reached the mask, sappers Nos. 1 and 2, assisted if necessary by the second relief, and also lying down as much as possible to avoid uncovering themselves, push the head mask about 1½ to 2 feet forward by means of the sap hoe, pushing the earth from below upward obliquely in the direction of the parapet or by throwing the sandbags onto the front part of the mask.

Sapper No. 1 engages the hoe against the earth of the mask and shoves on the handle. The other sappers also lay hold of the handle and together they shove it forward.

Changing reliefs.—At the signal "change," made by the leading sapper when his measuring stick indicates that the new trench has progressed 1 yard, the first relief lays aside its tools and is replaced by the second.

SECOND METHOD: IN IMMEDIATE PROXIMITY TO THE ENEMY.

DOUBLE SAP.

Personnel.—Each sap head squad is composed of 1 noncommissioned officer and 8 sappers, divided into two reliefs. Continuous work requires 1 noncommissioned officer, an assistant, and 24 men in three parties of 8 men each, relieving each other every 8 hours.

In each party the sappers are numbered from one to four, Nos. 1 and 3 being pickers, and Nos. 2 and 4 shovelers.

Number 1 is provided with rules of 4 feet and 3 feet 4 inches, No. 3 with rules of 3 feet 4 inches, 6 feet 8 inches, and 1 foot.

Construction of the sap.—Pioneers 1 and 2, equipped with short-handled tools, work at the head of the sap according to the rules prescribed in the first method and construct a first form 4 feet wide at the top, 3 feet 4 inches wide at the bottom, and 3 feet 4 inches in depth below the surface, without troubling to arrange any berm between the parapet and the excavation.

Pioneers 3 and 4, equipped with ordinary pick and shovel, remain always at 3 yards from the head of the work. They deepen the first form to 6 feet 8 inches and throw the earth over the crest of the parapet, so as to increase the width of this parapet. Facing the parapet, they push the earth from below upward with the hoe, so as to make a regular berm 1 foot wide.

JUNCTION OF TRENCH AND SAP.

(*a*) *Uncovered.*—After having indicated by a stake the point of intersection of the new sap and the trench, the sap is driven through the parapet at right angles to the trench.

The earth of the trench parapet serves as a head mask during the crossing of the parapet, and all of the excavated earth should be thrown obliquely forward to form the parapets. As soon as the old parapet ceases to afford sufficient cover for the saphead, a portion of the earth is thrown forward to constitute a new mask, behind which the saphead continues its regular progress. It is inclined in its new direction on leaving the parapet.

(*b*) *Masked.*—The uncovered driving of a sap from a trench has the disadvantage of disclosing to the enemy the starting point of the sap and of making this point, when it is very near the enemy, the object of his showers of grenades.

The covered or masked sap is resorted to when it is practicable to make the arrangements for it at the time the trench is dug.

It is then sufficient to arrange on the ground in advance, at the selected spot, the necessary covering materials (boards, planks, railway ties, etc.) under which the sap will be driven.

The covering materials are at least 6 feet wide; they are carried and put in place by a special detail of workmen and are arranged on the ground at the moment the workmen are put in the trench.

These materials are arranged horizontally on the ground at night, parallel to the trench, ends together, and are immediately

covered with earth in order to conceal them from the attention of the enemy.

Construction of a Covered or Masked Sap.

Personnel and tools.—Each saphead squad is composed of:

1. Eight sappers directed by a sergeant and divided into two reliefs that change at every yard in the advance.

2. Enough helpers to insure the removal of the earth.

Sappers 1 and 2 of the working relief are each provided with a long-handled pick and a short-handled hoe; they have also a 6 foot 8 inch measuring stick (depth of the sap), one of 4 feet (width of the sap), and one of 1 yard (the length of task of each relief). Sappers 3 and 4 are each furnished an ordinary shovel, and they also have a long-handled hoe; the helpers are provided with the appliances made necessary by the method adopted in disposing of the earth.

Manner of execution.—Nos. 1 and 2 work alternately at the head of the sap and relieve each other as often as necessary. They make the excavation under the cover provided and in the given direction. The leading sapper first makes grooves on the right and left sides of the form from top to bottom, and then a groove across the bottom; when the earth tumbles down he hoes it to the rear between his legs; he is careful to clean the bottom out well in order to preserve the proper depth. Sappers 3 and 4, immediately behind the head sapper, haul the earth back rapidly with the long-handled hoe. This earth they then throw to relays of shovelers into boxes, baskets, wheelbarrows, or handbarrows, according to the method pursued. The task of each relief, which is 1 yard long, is measured from a stake that is planted in the left wall of the trench by the sergeant in charge as soon as the relief arrives. Numbers are changed with each relief's resumption of work, Nos. 1 and 2 becoming 3 and 4, and vice versa. The direction of the sap is marked by stakes driven in the bottom of the trench in such place as not to interfere with the removal of the earth.

Removal of earth.—The removal of the earth is effected by means of assistants established in reliefs as shovelers, or forming a chain for passing out the earth in baskets, etc.

SQUAD FOR FILLING SANDBAGS.

A squad for filling sandbags comprises two shovelers, one holder, two tiers, and as many pickers as the nature of the soil requires.

To fill a bag the holder kneels and holds the bag erect and open between the two shovelers, shaking it frequently to settle the earth, and when it is full he passes it to the two tiers who are behind him. A squad fills, on the average, 150 bags per hour.

The average sandbag properly filled weighs about 44 pounds. It should be of about the following dimensions: Erect, 20 inches high by 9 inches diameter; lying on the ground, 7 inches thick by 10 inches wide.

CONSTRUCTION OF A WIRE ENTANGLEMENT.

An entanglement with two rows of stakes

aA bB cC dD

a′A′ b′B′ c′C′ d′D′

may be regarded as made up of three panels,

First. The panel A B C D / a b c d

Second. The panel in the broken line AA′ BB′ CC′ DD′ / aa′ bb′ cc′ dd′

Third. The panel A′ B′ C′ D′ / a′ b′ c′ d′

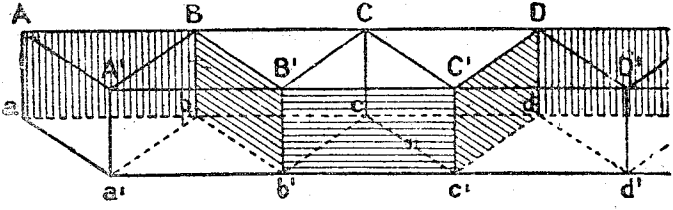


FIG. 53.

Each panel has four wires: One top wire, two diagonal wires, one bottom wire.

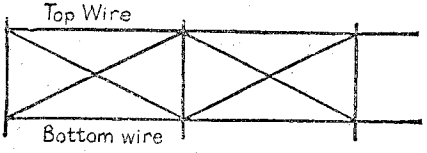


FIG. 54.

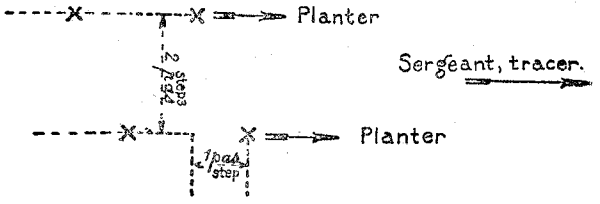


FIG. 55.

From the above is derived the methodical organization of the work.

1. *Tracing the entanglement.*—A sergeant or guide who knows the direction the entanglement is to take walks slowly toward the directing point which has been fixed in the night, followed by two stake drivers, who march on parallel paths with interval of about 2 paces, and echeloned so as to have about 1 pace distance.

These men at every 2 paces thrust lightly in the ground one of the stakes carried by helpers.

2. *Driving the stakes.*—The men are followed by two others carrying mauls. They are in turn accompanied by two assistants, whose duty it is to hold the stakes vertical and hold on top of the stake a pad or empty folded sack to deaden the sound while driving.

3. *Work of the wire squad.*—Each panel is composed of four wires, and two men are necessary to handle a roll of barbed wire.

Panel $\frac{A\ B\ C\ D}{a\ b\ c\ d}$ (*the first panel*): The first squad attaches its wire to the foot of the first stake, takes a turn around the foot of the second, and similarly continues the advance. The second squad attaches its wire to the foot of the first stake, makes a secure turn around the top of the second, then carries it to the foot of the third, and so on. The third squad proceeds similarly to the second, *starting* at the *top* of the first stake. The fourth squad attaches its wire to the top of the first stake, takes a secure turn around the top of the second, and continues similarly. Eight men are thus necessary for stringing the wires.

For the *second panel* eight men are also necessary, as follows: One squad for the bottom wire, two squads for the two diagonals, one squad for the top wire .

For the *third panel* the same work and the same number of men, so for the three panels, *24 men.*

In all there will be necessary:

	Men.
1 sergeant, 1 guide	2
2 sledge men, 2 assistants	4
24 wire men (or reel men)	24
Total	30

4. *Supply men* (helpers).—The number of men necessary to supply the tracers with stakes will depend upon the distance that they must go in search of materials. One man can carry from three to five stakes, dependent upon their weight. Eight more men are necessary, two per panel, to supply the wire men with wire.

Observations on the foregoing.—All working parties go forward at the same time. Each man has a task, not difficult, to perform, and he can not make a mistake even in the dark. The spools of wire are used to the end without the necessity of cutting them. Although a considerable number of workmen (30) are put on the ground, this method offers little danger, for the squads are moving continually; and furthermore, in dangerous places, the parties can be dispersed as much as necessary, since the panels are constructed by successive independent operations.

Remark.—From the preceding it is easy to deduce the method of constructing an entanglement with any desired number of rows of stakes.

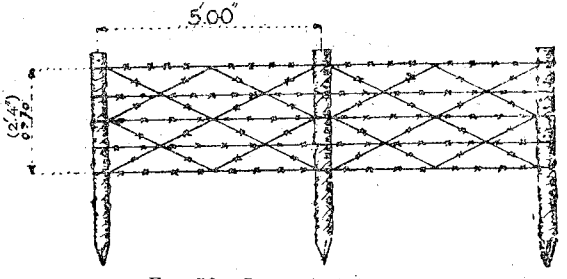


FIG. 56.—Improvised trellis.

Various uses of barbed wire or "Brun spiral."—Figures 56 and 60 show trellises or chevaux de frise that may be improvised from barbed wire or wire netting (the particular example is called "Brun spiral").

The dimensions given are variable.

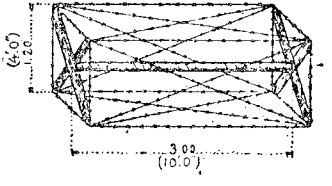


FIG. 57.—Saw-horse.

Brun spiral (invented by M. Brun).—Weight of a coil, 19 pounds. To place it, stretch it out to 30 yards to overcome its elasticity, then let it contract to 20 yards. Fix it to the ground by means of large staples (with equal branches) or hooks (un-

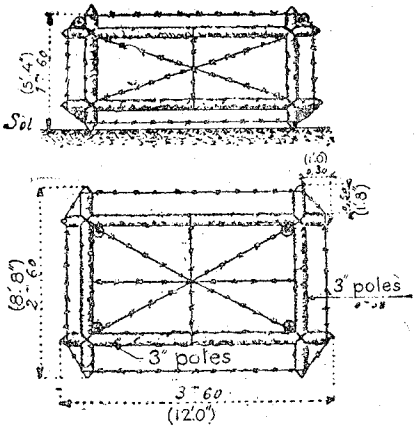


FIG. 58.—Large flattened cubes.

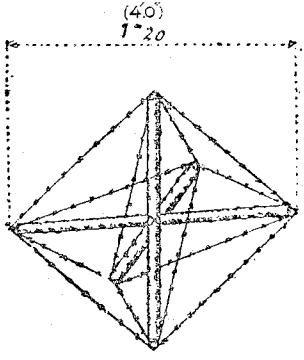


FIG. 59.—Hedgehog.

equal branches). If practicable, interlace with stakes. An excellent arrangement is to place two coils side by side and place a third on top of them, then binding the three securely

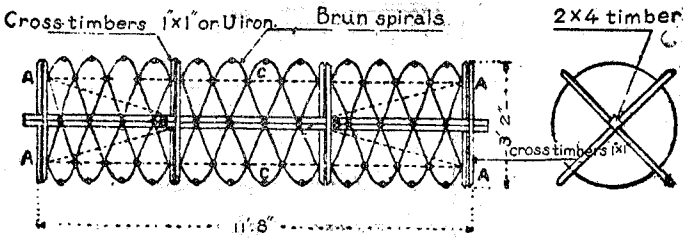


FIG. 60.—Brun spiral.

together with wire. The Brun spiral, of smooth wire, is at present almost entirely replaced by barbed-wire networks that have different names in different armies, and whose names also vary with the use made of them.

CONSTRUCTION OF FASCINES.

Troops that construct fascines should adhere rigorously to the dimensions prescribed, and remember that they are often required to be assembled like bricks in a wall; they must therefore be interchangeable.

Fascines are constructed of branches of trees or rods, pickets, and withes.

Rods.—Rods are obtained from the strongest and straightest poles that form the base of branches, or with strong withes, or with split wood. They are cut off at the small end to proper length.

Withes.—Withes are used in binding fascines, or to make the wickerwork of gabions or hurdles. They are selected from the smaller and most flexible branches, and trimmed of their branches and leaves.

Flexibility is increased by either of the following means:

I. Put the foot on the large end of the withe, twist progressively with the right hand beginning at the small end and holding the withe with the left hand. Pull the withe forward under the foot as the twisting progresses.

2. Place the small end of the withe in a cleft arranged in the end of a stake of 4 to 5 inches in diameter driven in the ground. Twist from the small end, holding the withe rigidly and winding it around the stake as the desired flexibility is attained.

The twisting being completed by one of these processes to within 8 inches or 12 inches from the large end, make, if practicable, a loop at the opposite end. One man should make 20 to 30 withes per hour. Wire of 0.09 inch diameter is used in place of withes for binding fascines, and of 0.06 inch for gabions and hurdles. Infantry should know how to make facines, gabions, and hurdles.

Construction of facines.—A *facine* (fig. 61) is a bundle of faggots 10 inches in diameter and 9 feet long; the weight varies from 35 to 44 pounds.

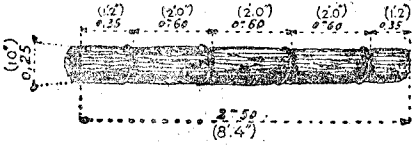


FIG. 61.—Fascine.

The rods are trimmed on a block of wood and assembled on a "horse" or between stakes, the larger and straighter ones outside. The faggot is bound by means of a "fascine choker" (consisting of a rope 3 feet 8 inches long, with loops at each end, and two stiff levers); the size is verified by a cord 25 inches long. The binding withes are then put in place, the choker being applied successively 2 inches from the position for each withe. The loop at the end of the withe is fastened as a slip knot; with the withe without loop, the ends are twisted to-

gether and turned under. The knots should be on the same line. Trim off all projecting ends of rods and branches.

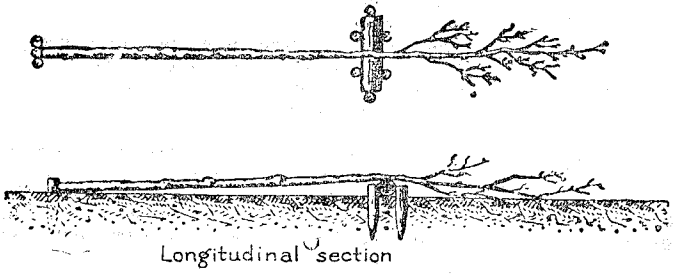


FIG. 62.—Block for trimming rods.

Construction of a gabion.—A *gabion* (fig. 65) is a cylindrical basket without a bottom, made of withes woven around vertical pickets. The weight of a gabion varies from 40 to 48 pounds.

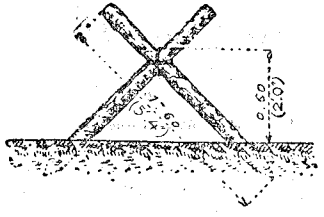


FIG. 63.—Horse for construction of fascines.

To construct a gabion, there are necessary 7 pickets and from 80 to 100 withes. Figure 66 indicates how the pickets are planted; they are inclined slightly inward. Two men place

themselves at opposite ends of a diameter and put in place two withes successively, interlacing them with the pickets and them-

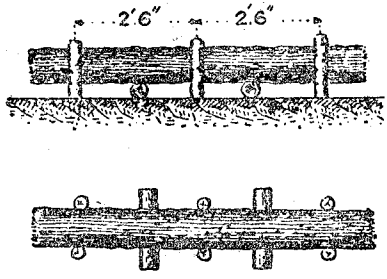


FIG. 64.—Construction of fascines between two rows of stakes.

selves as shown in the figure. The successive layers are compacted by hammering with a mallet. When the wattling is

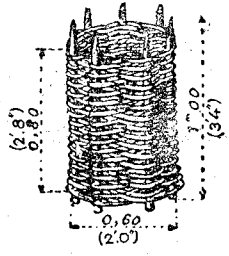


FIG. 65.

near the tops of the pickets, it is bound by four withes, each of which embraces a picket and five or six withes; then the

gabion is torn from the ground and reversed, the wattling is continued from the other end if necessary, and the final courses bound as described for the first end.

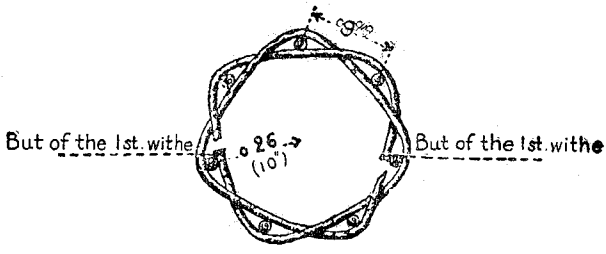


FIG. 66.—Large end of first withe; large end of second withe.

Trim the outside of the gabion, but leave the small branches on the interior.

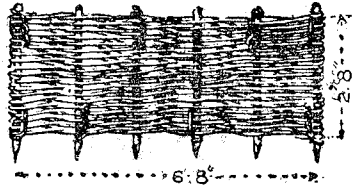


FIG. 67.

Construction of a hurdle.—A *hurdle* (fig. 67) is a wattling with a plane surface 6 feet 8 inches long by 2 feet 8 inches wide; its weight varies from 33 to 44 pounds.

To make a hurdle, there are necessary 6 pickets, and 80 to 100 wattling rods, and 8 withes. The pickets are planted in a

straight line and the operation is similar to that in the construction of a gabion. The small ends are cut off at the extremities of the hurdle, except five or six on each side that are twisted around the end pickets to bind the wattling. One withe is used to bind each corner, one at the end of each alternate interior picket at the top and the remaining two are used to bind to the other pickets at the bottom.

LIST OF DIMENSIONS TO BE MEMORIZED.

Heights of epaulement:
- Rifleman, kneeling, 3 feet 4 inches.
- Rifleman, standing, 4 feet 4 inches.
- Machine gun, lying down, 16 inches.
- Machine gun, normal, 2 feet 8 inches.
- Width of banquette, 20 inches.
- Width of excavation at surface, fire trench, parallel or approach, 4 feet.
- Bottom of fire trench, approach or parallel, without banquette, 3 feet.
- Berms, 1 foot.

Traverses:
- Thickness, 8 feet.
- Length (perpendicular to front), 5 feet.
- Average interval between traverses, 5 yards.
- Machine-gun platform, 5 feet by 20 inches.

Ammunition niche:
- Opening, 2 by 2 feet.
- Depth, 20 inches.

Cave shelter or dugout:
- Dimensions of half gallery casing (for descent), 5 feet 4 inches by 2 feet 8 inches by 9 inches.
- Inside dimensions of a half gallery, frame, 5 feet by 3 feet 4 inches.
- Inside dimensions of a common gallery frame, 6 feet 8 inches by 3 feet 4 inches.
- Inside dimensions of a grand gallery frame, 6 feet 8 inches by 7 feet.

Cave shelter or dugout—Continued.
Branch gallery connecting two shelters, 3 feet 4 inches by 3 feet 4 inches.
Fascine, 9 feet by 10 inches.
Gabion—
Diameter, 2 feet.
Length of pickets, 3 feet 4 inches.
Height of woven work, 2 feet 8 inches.
Hurdle:
Length, 6 feet 8 inches.
Height, same as that of gabion.

CONVENIENT MEASURES.

Rifle, with bayonet fixed, 5 feet.
Length of the bayonet or portable intrenching shovel, 1 foot 8 inches.
Width of blade of E. D. shovel, 8 inches.
Width of the hand, 4 inches.
NOTE.—The above will vary with different implements.

LIST OF THE PRINCIPAL TIMBERS FURNISHED BY SIEGE TRAINS.

1. BOARDS AND PLANKS.

Battens.—Thin boards, $\frac{1}{2}$ to $\frac{7}{8}$ inch; ordinarily they are $\frac{3}{4}$ inch.
Boards.—From $\frac{7}{8}$ to $1\frac{1}{2}$ inches thick; generally 1 inch, $1\frac{1}{4}$, or $1\frac{1}{2}$ inches.
Planks.—$2\frac{1}{2}$ inches thick by 8 to 10 inches wide; also planks 3 inches thick, sometimes thicker.
Heavy planks.—4 to $4\frac{1}{2}$ inches thick.

2. TIMBERS (SQUARED).

Rafters.—$2\frac{1}{2}$ by $2\frac{1}{2}$ inches or 3 by 3 inches square.
Balk (beams, girders).—Squared timbers thicker than the rafter.

Ribands.—Small pieces of timber 2 inches wide by 1 inch thick, ordinarily obtained by ripping up planks. Used in bracing mine casings. (See bracing of dugouts.)

Spars (round) are generally furnished in lengths of 3 to 4 yards.

Entanglement stakes.—5 feet 4 inches long and 2½ to 3 inches diameter.

Stakes for revetting trenches are generally furnished 8 feet 4 inches long.

PART III.

MATERIAL.

CHAPTER II.

THE AUTOMATIC RIFLE.

In this arm the reloading is automatically accomplished by the force of the recoil. Feeding is accomplished from semicircular packets (clips) each of which contains 20 DAM cartridges. A good adjustment of the extractor permits the use of the ordinary rifle cartridges (D) as well as the special machine-gun cartridges (DAM).

Personnel: One gunner, two ammunition carriers.

INFORMATION AS TO ARM AND EQUIPMENT.

(*a*) Gunner:

	Pounds.
Automatic rifle with case	20.02
2 clip pouches (4 clips)	8.80
Special pouch (4 clips and 1 cleaning outfit)	10.34
Automatic pistol, waistbelt, 3 clips	3.74
	42.90

(*b*) First ammunition carrier:

Special haversack (8 clips and 1 packet of cartridges)	23.98
Cartridge pouch (4 packets of cartridges)	17.82
Automatic pistol, belt, and 3 clips	3.74
	45.54

(*c*) Second ammunition carrier:

	Pounds.
Rifle 1886 and ordinary equipment (1 packet of cartridges in the boxes)	13.20
Ordinary haversack and 5 packets	29.04
	42.24

Each of the above carries also a haversack (for food), canteen, blanket, and tent canvas, one shovel pick at the belt.

Length of the arm	inches	41.3385
Length of barrel	do	17.7665
Weight of naked arm without clip	pounds	19.25
Weight of one clip	do	1.87

Cartridges carried:

By the gunner	160
By first ammunition carrier	480
By second ammunition carrier	384
	1,024

Summary of nomenclature.—The automatic rifle is divided into two parts: First, a *fixed part;* second, a *movable part.*

First. The fixed part comprises: (*a*) Guide sleeve; (*b*) stock; (*c*) firing mechanism; (*d*) bands, swivels, etc.

Second. The movable part includes: (*a*) Barrel, receiver and barrel recoil spring; (*b*) breechblock and breechblock recoil spring; (*c*) mechanism for feeding.

Information regarding "functioning."—To obtain the various operations necessary to the perfect "functioning" of the arm (extraction, ejection, reloading), it is necessary to secure automatically the separation of the *breechblock* and the *barrel.*

In the movements of these two parts, there are three phases to be considered:

First. Under the action of the gas: *The movable part, barrel and breechblock, is carried backward.*

The piece is cocked.

Second. Under the action of the barrel recoil spring: *The barrel returns to the firing position,* the breechblock is caught and held at the coupling.

Third. Under the action of the recoil spring of the breechblock: *The liberated breechblock is carried forward.*

To fire it is necessary to draw the breechblock to the rear, that is to say, *to cock it*, by means of the lug provided for that purpose, to snap the clip under the gun, then to press on the trigger in order to free the breechblock, which, being carried forward by the recoil spring, loads the arm and fires the cartridge.

The fire and safety lever has a *cam* that, according to its position, locks the piece, assures automatic fire, or fire by single shots.

For automatic fire: Cam horizontal (set at M), hold the finger on the trigger; if this action ceases the fire stops—barrel forward, breechblock caught in the rear position.

Endeavor to hold the line of sight on the objective; arrest the fire to repoint the piece.

Three kinds of fire: By short bursts, 2 or 3 cartridges (ranging fire). By long bursts, 6 to 8 cartridges (normal fire for effect). Rapid fire, 20 cartridges (in a crisis).

To fire by single shots.—Cam vertical and turned down (set at C). Press the trigger, and release it after having repointed the piece at each shot.

Safety.—Cam vertical and turned upward (set at S). The trigger mechanism is inoperative. The clip being exhausted, *cock* the piece; press the catch that holds the clip in place and receive it in the hand as it drops when the catch is released.

Accidents of fire.—The gunner can remedy on the battle field the following principal sources of arrest or delay of fire:

1. *Failure of the breechblock to "couple" (therefore to "cock") in the rear position.*—Draw the cocking piece (maneuver button) clear back so it will catch.

2. *Failure of barrel to return home.*—Work the maneuver button; if that does not suffice, strike the butt of the piece on the ground.

3. *Failure to extract.*—Extract the shell with the Hotchkiss hook or the cleaning rod that are in the pouch of cleaning materials.

4. *Failure to feed and faulty insertion of the cartridge.*—Do not waste time. Change the clip.

Care of the weapon.—Keep the piece in the case until it is required for firing (protection against mud, dust, etc.).

When firing.—Utilize every short suspension of fire to clean such parts as will not require dismounting the piece.

After firing.—Give special attention to *the bore of the piece, the chamber, the breechblock and the receiver, the clip and its spring.*

Current improvements—A flash and cover (to conceal flash).—A *detachable feed plate* permitting the use of the arm for single shot fired at the rate of 40 shots per minute when the clips are defective. A *sling* permitting the habitual carrying of the piece slung from the shoulder; carrying across and in front of the body in advancing as skirmishers; carrying under the right arm and firing while advancing.

Service of the automatic rifle—Position of the gunner.—The position of the gunner exercises an influence of the first importance in the proper functioning of the gun. Normal position, gunner lying down. The body is placed obliquely with respect to the axis of the piece, the *fore arms* serving as a support, the piece held by the right hand at the small of the stock (pistol-grip), the left hand at the balance. Place the right cheek in front of the bushing of the breech block in order to avoid the "kick". Facilitate the placing of the cheek by refusing the right shoulder and advancing the left shoulder. The line of sight will pass through the right eye when the body is so disposed with respect to the piece.

Observations on the position of the cheek.—The piece has three points of support: The crutch, the left fore arm, the right shoulder. Both hands exert continual pressure to bring the piece against the shoulder, to prevent getting off the target during long bursts of fire, and to avoid accidents.

Division of duties—Duties of the gunner.—Seeks objectives and estimates ranges, fixes the elevation, executes the firing and regulates its intensity.

Duties of the first ammunition carrier: Keeps at the right of the gunner to observe and secure the proper functioning of the piece, keeps the Hotchkiss hook in his hand, regulates the release of the loading piston of the clip, anticipates the exhaustion of the clip, observes the operation of the ejector, guards against accidents.

Duties of the second ammunition carrier: Serves as scout during the advance, fills empty clips at the firing point, main-

tains the supply of ammunition. Holds himself ready to intervene with fire or bayonet during the delicate moment of changing clips or in case of a jam.

To fire advancing.—The possibility of firing while advancing results in the delivery automatically of a low fire with a slight sweeping effect given almost naturally by the movement of walking.

This fire can be executed by single shots, by short bursts, by long bursts, or even by rapid fire of full clips in the unforseen contingencies of battle.

It is much easier when the piece is supported by a makeshift sling that passes over the left shoulder to the end of the barrel.

Position of the A. R. to fire advancing.—Grip the stock firmly under the right arm, seize the piece with the left hand at the balance, and press the left elbow against the body in such a way as to obtain a point of support there. The left hand should so grip the piece that the left arm acts as a firing support or trestle.

Rules for the advance.—Advance directly on the objective. Incline the body well forward and harmonize its movements with the firing of the piece. The cadenced step is convenient in firing by single shot. Each shot should be fired as the *left foot* strikes the ground.

A sufficiently rapid *flexion step* is suitable for automatic fire. The gunner and the piece should become a single mechanism, to such an extent that it is no longer the gunner who carries the gun, but is seemingly the gun that advances and the gunner who conforms to it with the movements of his body.

This result is arrived at only by daily training, comprising: Supplying exercises, progressive loading of the gunner, cross-country marches of gradually increasing difficulty, rushes from shell crater to shell crater, and finally the assault.

Practice the men in changing the clips while marching.

The maximum efficiency of the automatic rifle in battle necessitates, therefore, a thoroughly *instructed* and *trained* personnel. A thorough knowledge of this arm should be acquired not only by the gunners, but also by all officers and noncommissioned officers and the greatest possible number of privates. It is not admissible that the disappearance of a gunner should involve the cessation of fire from his gun; every weapon the operator

of which is placed hors de combat is at once seized and served by another; *the position of operator of an automatic rifle should be considered and sought as an honor.* (Called fusiliers in the Infantry.)

CHAPTER III.

MACHINE GUNS.

Machine guns in service: Machine gun, model 1907, remodeled (T.); Machine gun, Hotchkiss, model 1914.

Officers and noncommissioned officers should understand the manipulations essential to the firing of either of these models under critical circumstances. The following ideas will serve as an outline of the theories practiced, gun in hand, in evolving them. Every officer and noncommissioned officer should himself have fired one or two belts (of ammunition).

MACHINE GUN, MODEL 1907–T.

This machine gun has replaced the Puteaux gun and the M. 1907 not remodeled (N. T.).

The first utilized the force of the gas from the powder by the expansion of the gas at the muzzle.

The machine guns of 1907 N. T. and T. borrowed the gas on the way. They differed only in some minor details (motive power, sights, etc.).

They have two controls—

The *fixed trigger*, operated by the gunner, permits intermittent fire and suspension of fire.

The *movable trigger*, operated by the speed regulator through the intermediary of the trigger catch, permits automatic fire, with regulated cadences.

The *speed regulator* regulates the raising and lowering of the movable trigger. It becomes active when the *rapid-fire button* is pushed to the right; to vary the cadence, act on the *regulating lever;* it ceases to act when the button is pushed to the left.

Fire.—To put the machine gun in action—

1. *To load.*—Breechblock closed, insert a clip (belt) in the feed guide (cartridges underneath), for the metallic clip (up to the ratchet gear).

2. *To cock.*—Pull the *cocking lever* back to the catch. Open the breechblock. Carry the lever forward.

3. *To fire.*—(*a*) *Intermittent fire:* Press the trigger, release it immediately.

(*b*) *Cadenced automatic fire:* Place the speed-control lever at the division indicating the desired rapidity of fire, press the trigger, continue the action on the trigger.

(*c*) *Automatic fire with maximum rapidity of cadence.*—Push the rapid-fire button to the left, press the trigger, continue to press the trigger.

To arrest the fire.—Cease to press the trigger.

USE OF DIFFERENT FIRE AND CADENCES.

Locked fire.—Fire for adjustments or on a fixed objective of very narrow front.

Unlocked fire, without sweeping (Rare).—On very narrow objective.

Unlocked sweeping fire.—General; sweep always from left to right.

Slow cadence.—Rare; employed to adjust and to neutralize.

Medium cadence.—General; employed when not ordered to the contrary, 300 rounds per minute.

Rapid cadence.—Six hundred rounds per minute; objects fleeting, menacing, or compact.

Fire by reference stakes or marks.—Indirect fire; night firing.

To suspend or cease firing.—"Suspend firing": Release the trigger, lock, engage a clip. "Cease firing": Lock, remove the clip and breechblock, empty the carrier, inspect the chamber, uncock the piece.

Regulation of ejection.—Excessive ejection results in broken parts, and deficient ejection results in imperfect functioning.

Ejection is excessive when the shells are thrown more than 6 feet; feeble, when they are thrown less than 3 feet.

To regulate the force of ejection, turn the *graduated disk.* When the zero is at the index, the ejection is maximum. When the graduation 10 is at the index, the ejection is minimum.

Care.—Dismounting and care, and the means to be applied in case of jams, etc., are taught only to the machine-gun men.

Support.—The 1907–T uses either of the following supports: The tripod, model 1907–C, model 1907–omnibus, model 1915–omnibus; the rampart carriage, model 1907 and 1907–omnibus.

All of these carriages include a pivotal support and a tripod. The 1915 support is simpler and lighter than those of 1907.

Deflection: The pivoting support turns on a circular bed. It is immobilized for locked fire.

Elevation: By means of the elevating screw. Elevation limits are +20° and —25°. These limits may be extended by means of a movable device attached to the support.

The rampart carriage alone possesses a *sweeping* mechanism. In the other models sweeping is regulated by hand.

All carriages are provided with graduated sectors for laying the piece in deflection. A special leveling device permits laying in elevation.

All tripod supports admit of two heights of the piece above the ground: Standing, 32.67 inches; kneeling, 18.11 inches.

Ammunition.—The machine gun 1907–T fires the ordinary cartridge 1886–D. (bi-ogivale bullet of brass, powder, B. N. 3F.), but preferably the 1886 D. A. M., similar to the first, but with a special primer. It fires also the old cartridge, model 1886–M (cylindro-ogival bullet, with lead core and German silver sheath), but requires increased elevations (corresponding to an increase of range of one-third).

The cartridges are arranged in metallic strip clips of 25 cartridges each, or in flexible cloth bandoleers of 300 cartridges. The allotment is 10 of the latter per piece.

An ammunition box contains 12 metallic clips or 1 cloth bandoleer.

Boxes containing bandoleers have as distinctive mark, in addition to a red band, the letter H painted on the large face of the box, seen when the box is upright, cover hinge to the right. This serves the double purpose of distinguishing the top of the box when it is placed flat in the caisson, the base of the cartridges down, and for the convenient orientation of the box during fire.

Bandoleer boxes are inseparable from their bandoleers, and resupplying should be accomplished by changing boxes contain-

ing empty bandoleers for an equal number of boxes of full bandoleers.

Ammunition echelons:

1. With the combat echelon, 18 boxes per piece, 5,400 rounds.

2. In the C. Tn. of the M. G. Co., 3 caissons (or 24 pack mules), 25,000 rounds.

3. In the artillery park of the infantry division or corps artillery: Each small arms ammunition section has 13 caissons of machine-gun cartridges.

Transport.—Distinction is made between pack transport and cart transport. (See Organization of the Infantry Regiment, Part IV, Chap. II.) A cart can carry 1 M. G. complete, and from 6 to 12 boxes of ammunition. A pack animal carries 1 M. G. and 1 box, or 6 boxes.

	Pounds.
Weight of M. G	52.8
Tripod and support (model 1907)	72.6
Tripod and support (model 1915)	57.2
Box of ammunition	26.4
Total load of pack animal	264.0
Total load of a cart	792–836.0
Weight of a loaded caisson	4,180.0

(See "Ammunition supply," Part IV., Chap. XI.)

Hotchkiss Machine Gun, Model 1914.

Model 1914 is a modification of model 1900. The Hotchkiss utilizes gas in functioning the same as the 1907. It has a simple fire mechanism and has no speed control. It fires at the rate of about 450 rounds per minute.

Fire.—1. *To cock the piece:* Open the breechblock and pull the cocking piece clear back. Push it forward.

2. *To load:* Breechblock open. Insert a clip in the feed slot, cartridges uppermost, up to the ratchet.

3. *To fire:* (*a*) *Intermittent fire:* Press the trigger, releasing it quickly. (*b*) *Automatic fire:* Press the trigger, continuing the action.

4. *To arrest the fire:* Release the trigger.

Recoil control.—Excessive ejection is indicated by pronounced vibration and violent ejection of shells; deficient ejection, when the shells are not discharged freely.

Screw the regulator in or out in order to vary the capacity of the chamber. When set at 0 (zero) the ejection is at its maximum; at 4, minimum. The regulator is ordinarily set between 3 and 4 for mean temperature.

Support.—The Hotchkiss 1914 has one pivoting support and one tripod. Clear height: 27.56 inches to 13.78 inches. Elevation arc, 25° (+10 to −15). The supports of M. G. 1907 can be used by inserting a special cap.

Ammunition.—Same as model 1907. The use of cartridges 1886–D, which often have defective primers, should, however, be avoided. Metallic band clips of 24 cartridges or jointed steel bands or clips of 250 cartridges. Three jointed clips are issued per piece. Ammunition boxes contain 12 rigid or 1 jointed clip. Boxes are clearly distinguished by their shape. It makes no difference which side is up. Ammunition echelons, as for the 1907, to within a few hundred rounds.

Transport.—Hotchkiss sections are all carried in carts. The weights are similar to those for the 1907, given above.

MISCELLANEOUS INFORMATION.

Repairs.—For important repairs or exchange of pieces, the M. G. Co. applies directly to the *repair shop of the corps or division artillery park.*

It is there that cartridges are assembled in clips (bands); never in the company.

To disable the piece.—*M. G. 1907:* Take away the breechblock ratchet; bend the cover of the breechblock box and, if possible, break the hinge by hammering it backward, cover open.

Hotchkiss.—Remove the breechblock and the cover. Smash the feed elevator and the gas cylinder.

CHAPTER IV.

GRENADES.

Classification.—All grenades in use at the present time are provided with *time fuses* which cause explosion a certain number of seconds (average 5) after they are lighted.

Grenades for defensive action must be distinguished from *grenades for offensive action.* In combat at close quarters in

open terrain, and particularly during an assault, *offensive grenades* may be used without exposing the grenadier to danger from the fragments. The danger zone of these grenades is limited, extending not more than 8 to 10 yards beyond the bursting point. *Defensive grenades* burst in a shower of deadly fragments and are effectual at a distance of more than 110 yards from the point of explosion. They should never be thrown from a position unprotected from fragments which might fly back.

Grenades are thrown either by *hand* or *rifle*, the latter being thrown with the aid of a "discharger," a special device fitted to the rifle. Finally, there are *suffocating, smoke producing*, and *incendiary* grenades, for special uses.

Primers in use are as follows: *Metal primer* and *automatic primer, model 1916 B.* The second is intended to supersede the first.

The *metal primer* (see fig. 71) is a percussion primer. After removing the safety cap strike the grenade on the heel of the boot, rifle stock, or other hard object. This brings the primer into contact with the striker, thus igniting the slow match which in turn fires the detonator and causes the explosion. The safety cap prevents accidental puncture of the primer case before actual and intended use of the grenade.

A grenade must always be thrown immediately upon lighting and without stopping to verify its ignition.

The *automatic primer* (figs. 69b and 70) acts on a different principle. Two fuses are simultaneously struck by a percussion spring, in form of a small pincer, which is released by moving the bolt. This bolt is automatically moved by raising the lever, which is held in safety position by the pin (with ring) and, after the pin is withdrawn, by the hand holding lever and grenade.

To throw a grenade supplied with an automatic primer.—First. Hold the grenade in the hollow of the right hand, primer end up, the ring turned in and near the base of the thumb. The lever then lies in the palm of the hand and may be held firmly without effort. Second. By means of the ring withdraw the pin with the left hand (fig. 69a). The grenade is now set at "ready" and care must be taken to hold the lever down. Third.

Sight the target over the extended left arm and throw the grenade as prescribed in "Instruction for grenade fighting."

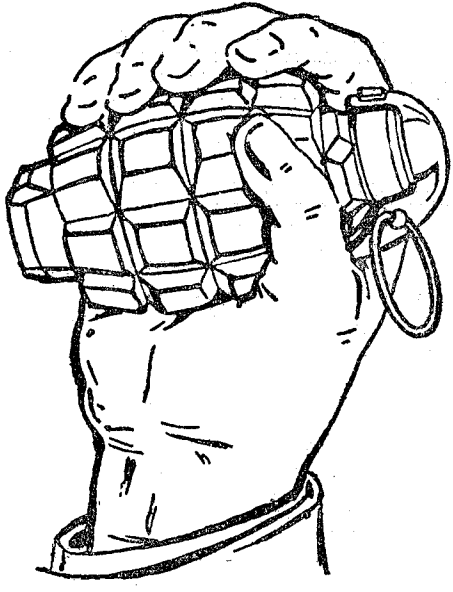


FIG. 69.

REMARKS.—Hold the grenade well up toward the primer so as to hold the lever firmly in position. Do not remove the pin until just before throwing the grenade. After removing the pin keep the hand closed but not clenched. The effort necessary to hold the lever down is slight, but must be continuous while the grenade is set at "ready."

It is forbidden to set off the fuse of a grenade before throwing under pretext that the match requires so long to burn.

The grenadier must avoid continuous holding of a grenade set at "ready," and must particularly avoid walking, as a false step might cause him to let it fall. Normally the raising of the end of the lever about 1 inch will cause the grenade to explode. In the process of manufacture this distance may be perceptibly reduced. Therefore, the hand should be kept tightly closed and no attempt made to test the working of the lever. The grenadier will soon learn that this weapon may be handled both safely and easily, provided he does not take chances.

Should the grenade fall, by accident, he must keep calm, pick it up quickly, and throw it before it explodes.

By developing the presence of mind in his grenadiers an instructor may avoid many accidents caused by carelessness. Each one should be required to practice throwing an empty grenade on the ground and then to count the seconds aloud. By the time he has counted 5 the grenade must have been picked up and thrown, and the entire personnel must be under cover.

PRECAUTIONS TO BE OBSERVED IN REGARD TO UNEXPLODED GRENADES.

Every unexploded grenade is a source of danger and should be regarded as a shell which has been primed, but not exploded. Therefore none should be left on the terrain. If proper precautions are taken and the grenade fuse has ignited properly, there can be no danger in picking up and throwing unexploded grenades. If troops are required to take a position where there are any unexploded grenades, these should be removed as soon as possible. One man, with the aid of a branch or stick, removes the grenades, while the rest of the personnel remain under cover. As a rule, failure to explode is due to nonignition of the fuse or the detonator; sometimes to an error in assembling the primer; and more rarely to failure of the percussion caps (or igniters) to operate. If the percussion bolt groove is not obstructed by mud, one can easily see if the fuses have operated, as the groove will be blackened. Such grenades are no more dangerous to handle than the ordinary grenade.

If, on the other hand, the sides and bottom of the groove are white and shiny, the fuses have not operated, and the percus-

sion spring, being in contact with the fuses, might ignite at any shock. In fact, by striking an unexploded dummy grenade violently, on any hard surface, the primer can be destroyed without striking the pin. This is due to the small mass of the striker. In any case, unless the operation of the fuses is quite evident, it is best to remove the grenades singly and by hand, without taking the eyes off them, so that they may, should they become ignited, be thrown away without delay. Unexploded grenades are piled together and fired by a petard. They may be used to advantage to charge a fougasse.

It is forbidden to unscrew the primer cap of a loaded grenade unless it is done with a special tool designed to protect the operator from the explosion.

If more than 6 per cent misfire, the fact should be reported and the mark on the body of the primer indicated.

GRENADES IN SERVICE.

The principal grenades are: (1) The *O F 1915* (offensive, fuse); (2) the *F 1915* (defensive, fuse); (3) the citron C F;

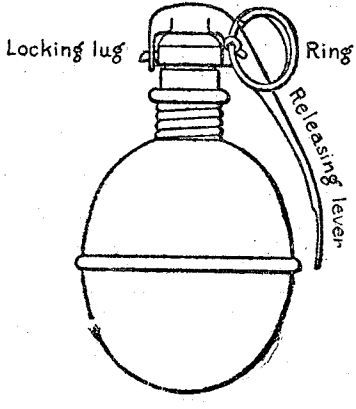


FIG. 70.—O F grenade with automatic primer.

(4) the *suffocating, model 1916;* (5) the *A B 1916* (incendiary, smoke producing, fuse); (6) the rifle *V B* (fuse); (7) the rifle *D R* (percussion).

First. Grenade O F 1915.—Fuse grenade, for offensive action. Composition metal, ovoid envelope 0.118 inch thick, filled with 5 ounces, 127 grains of cheddite. (Fig. 70.) Automatic or metal priming cap.

Shipment to the armies is made in cases containing either 200 loaded bodies or 50 priming caps. They can be *assembled* in any suitable place, after which the primed weapon may be issued to the troops. Total weight, about ½ pound.

Second. Grenade F, 1915.—Fuse grenade for defensive action. Cast iron, ovoid envelope, with exterior grooves to facilitate fragmentation. Either the metal or automatic primer may be mounted on this grenade. (Figs. 69b and 71.) Shipment to the armies is made in cases containing either 100 loaded bodies or 50 priming caps. They are loaded, primed, and assembled at Army depots before issuing to the troops. Charge 2 oz., 50.8 grains cheddite. Total weight, 1 lb., 5 oz., 70.5 grains.

Third. Citron C F.—Fuse grenade for defensive action. Simple variety of F1. Special percussion primer similar to the metal primer. This grenade can not be operated by an automatic primer.

Fourth. Suffocating grenade, Model 1916.—Fuse grenade. Leaded iron, ovoid body. Percussion primer. These devices are suffocating and tear producing, but little poisonous. They render inclosed or badly ventilated areas untenable and may be suitably used in forcing the enemy to evacuate shelters, caves, etc. The grenade, which has no explosive material except the detonator, may be safely thrown a distance of 15 yards in open country. Avoid throwing against the wind, as the suffocating gases would in that event be blown back to the thrower. Shipment to the armies is made in case of 25 grenades loaded and primed. Charge, 7 oz., 33.5 grains of special liquid. Weight, 14 oz., 47 grains each.

Fifth. Grenade A B, 1916.—Offensive, incendiary, smoke producing fuse grenade (74). Spherical, composition metal body, metal primer, and method of using the same as F. Does not

produce a dangerous explosion, but projects flaming particles within a radius of 15 to 20 yards. Should not be thrown against the wind, as the composition generates a dense smoke.

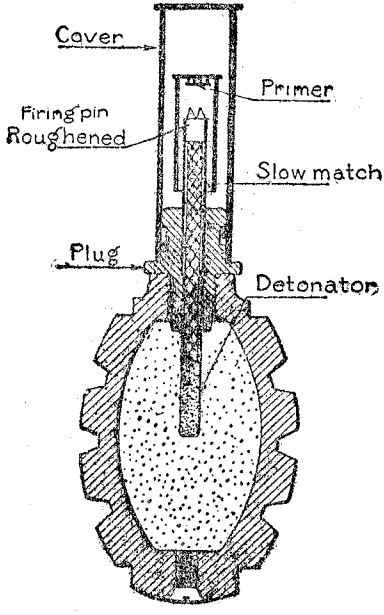


FIG. 71.—F_1 grenade with metal primer.

Twenty grenades will produce quite a thick cloud. An unexploded grenade of this type may be picked up and thrown again without danger to the user, after the primer has been changed.

Shipment to armies is made in cases of 50 grenades ready for use. Charge, 1 lb., 1 oz., 277.5 grains of inflammable composition. Total weight, 1 lb., 9 oz., 94.95 grains.

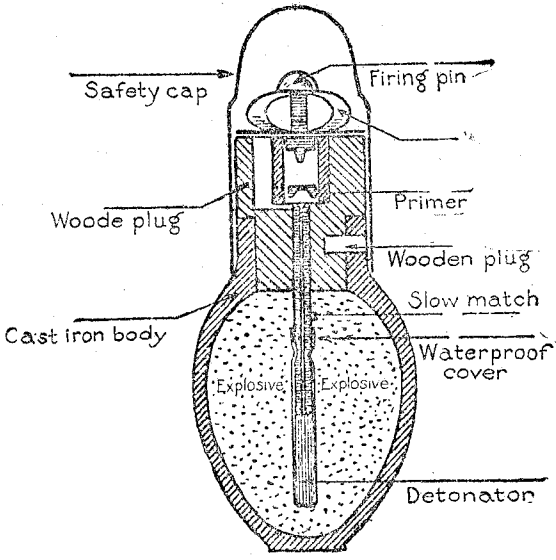


FIG. 72.

Rifle grenades.—The Vivèn Bessières grenade (V B) is thrown with the aid of a "discharger" (trombion) fitted on an infantry rifle, using the service cartridge. Another device is used on the rifle with a special blank cartridge for firing the D R grenade. This device is called a mandrel. The rifle may be fired from

the shoulder (V B), but preferably from the ground or in the position "Charge bayonets," or on a frame. The maximum ranges of the two types (208 and 383 yards) may be secured by aiming at an angle of 45°. The high angle of fall makes it possible to obtain plunging fire on the trenches.

Sixth. Grenade V B.—Cast-iron body, with interior grooves to facilitate fragmentation, grooves containing two tubes perma-

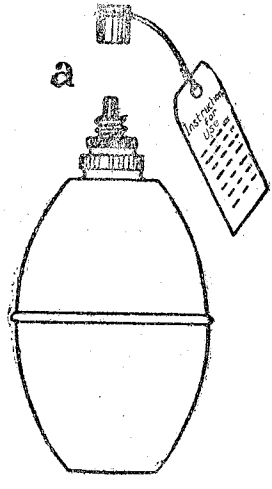


FIG. 74.

nently held in place; one lateral, which receives the igniter and detonator, and one central through which the bullet passes. The bullet strikes the primer which ignites the fuse, and at the same time, the gases of the cartridge expand into the "discharger" and project the grenade.

Method of using.—Adjust the "discharger" securely in the muzzle of the rifle. Insert the V B grenade as far as it will go,

its base resting on the bottom of the "discharger," which latter is shaped like a truncated cone. Load the rifle with a *regulation ball cartridge* and fire.

Advice and instructions.—Keep the interior of the "discharger" perfectly clean and slightly greased. Remove all rust from the body of the grenade. The primer should not project too far into the central canal, as it might be carried away by the ball without having acted on the fuse. Shipment to the armies is made in cases of 100 grenades ready to use. Weight of one case, 154 lbs. A case with handles, to contain 20 gren-

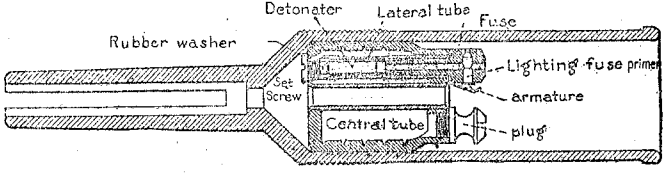


FIG. 75.—"Discharger" and V B grenade.

ades, has been adopted. Weight of "discharger" about 3⅜ lbs. Interior diameter, 1.96 in. Weight of the grenade loaded, 1 lb., 329 grains. Weight of charge, 2 oz., 50.8 grains. Period of combustion of slow match, 8 seconds with an allowance of +1 second. The gradual heating of the rifle by firing increases the range (about 20 yards at an angle of 45°). The firing table below is approximate and allows for 10 to 15 yards deviation. This table shows that if the explosion takes place 8 seconds after firing it occurs at the minimum distance as soon as it strikes the earth, and about 2½ seconds after striking the earth, if at the maximum distance.

Firing table.

Firing angle, in degrees.	Range, in meters.	Time of flight, in seconds.
45	590	5.2
50	580	5.6
55	554	6
60	512	6.3
65	453	6.6
70	380	6.8
75	295	7
80	203	7.2
85	102	7.3

Seventh. Grenade D R.—This grenade differs from the V B on the following points:

It fits onto a "mandrel" instead of being put into a discharger. It has a percussion fuse. It is fired by a special *blank cartridge*, instead of an ordinary ball cartridge. It is more cumbersome, but has twice the range and is more effective. It has a cast-iron body, elongated toward the front by a wooden ogive and a fuse and toward the rear by a swaged sheet-iron cylinder base with four vanes. This cylinder incloses the special cartridge, held in place by a pasteboard plug. Fire with the butt resting on the ground or in the position "charge bayonets," or from the special metal frame. The range is found by varying the angle at which the rifle is held, or, preferably, by maintaining an angle of 45° and regulating the volume of the expansion chamber. This is done by pushing the regulating pin into a hole corresponding with the desired distance. This pin controls the setting of the grenade on the mandrel.

Method of using.—Fix the mandrel on the rifle, regulate the angle and regulating pin; remove the pasteboard plug, extract the cartridge, and fix the grenade on the mandrel; remove the fuse safety pin; load the rifle with the special cartridge, and fire.

Advice and instructions.—Never fire with a ball cartridge. Lubricate all contact surfaces. Straighten any vanes which may have been bent. Shipment to armies is made in cases of

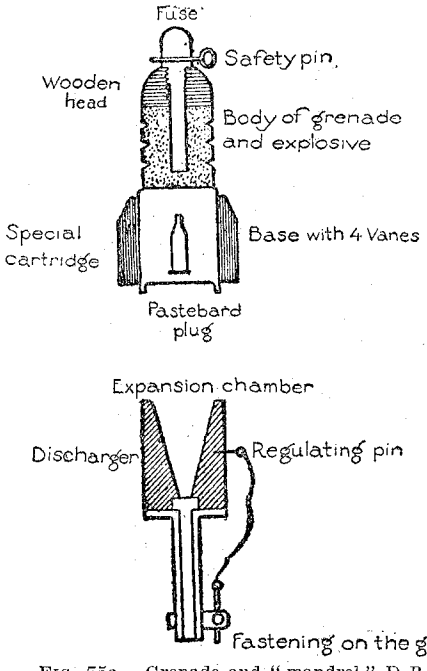


FIG. 75a.—Grenade and "mandrel" D R.

24, ready to use. Weight of one grenade, 1 lb., 4 oz., 276 grains, including 3 oz. of explosive. Maximum range, about 390 yards, to be obtained by firing at an angle of 42°, with the grenade shoved all the way down.

Eighth. Practice or blank grenades.—Distinctive colors—*Painted gray:* Loaded for service. *Painted white:* Weighted with sand, with an *active fuse. Painted red:* Filled and provided with blank fuses, or with none at all. Primers stamped with a cross: Active, to be used only with unloaded grenades. Primers pierced in several places: Inactive.

A wooden ball cartridge should be used when practicing with an active V B grenade, and, in order to insure ignition, the primer may be fixed at an angle of 45°. Never give it that angle when using a regular ball cartridge.

CHAPTER V.

THE 37-MM. (1.5-INCH) GUN.

Organization.—37-mm. gun 1916 T. R. (rapid fire). Each piece is composed of:

First. The gun, on a tripod carriage and transferable to wheels.

Second. A limber which transports the ammunition, spare parts, and accessories.

One horse can usually pull the assembled gun and limber. When near the enemy the gun and limber are separated for transportation by the gun detachment. Several guns together form a platoon. Its personnel is given under the organization of the regiment. (Pt. IV, Chap. II.)

The six men serving the piece (1 firer, 1 loader, and 4 ammunition servers) should be specialists in their duty, but each one should be able to perform any of the duties. If necessary, the gun may be served by one man.

The 37-mm. gun being an infantry arm, all officers and a sufficient number of noncommissioned officers and privates should be familiar wtih its workings.

Arms of the personnel.—The gunners, firers, loaders, and servers are armed with automatic pistols, and the remainder of the personnel with carbines and bayonets (or cavalry carbines or rifles, model 1907–1915). The platoon commander and gunner are provided with micrometric field glasses.

The firer carries the telescopic gun sight and the instrument for indirect laying.

Service of the gun.—The personnel should practice the following movements:

Unlimbering.

Pulling the gun on wheels. Two servers pull it by means of shoulder straps. The firer and loader each carry a bag of ammunition and serve as reinforcements if necessary.

Transporting by carrying. Take the gun, carriage, and wheels apart. The gunner carries the shield; two servers the tripod carriage; and each a bag of ammunition. With the aid of the rammer staff the firer and loader carry the gun. The server carries the axle and reassembles the carriage.

Butting in battery, on wheels or carriage. Change the position without dismounting the gun.

Regulating height and direction of aim by means of the telescopic sight. This should be firmly fixed on its support, the zero mark on the aiming circle being opposite the zero mark of the scale. Cock, load, fire, and suspend or cease fire.

Replace on wheels; limber up.

FIRING EMPLACEMENT OF THE GUN.

(See fig. 76.)

Fire.—First. Direct fire: Permits of the quickest adjustment and produces the most prompt results. Second. Indirect fire: Aiming at an object which is clearly visible and near the objective. Third. Masked fire: Target visible to the gunner only; aim directed at a certain point in the direction of the target.

Regulation in direction: For direct fire, adjust the aiming circle; each division on this circle corresponds to 1 mil. The deflection in mils is obtained by the gunner with the aid of micrometric field glasses or the battery commander's ruler.

In indirect fire the gunner ascertains the angle between the objective and the aiming point and lays off this angle on the aiming circle.

Adjusting the range: Try to bracket the target between a short and an over, starting with either, according to the facilities for

observation. Begin with an interval of 219 yards and gradually reduce the bracket. It is not expedient to reduce the bracket to less than 27 yards for ranges of more than 875 yards or to less than 13 yards for shorter ranges. To reduce the bracket to 54

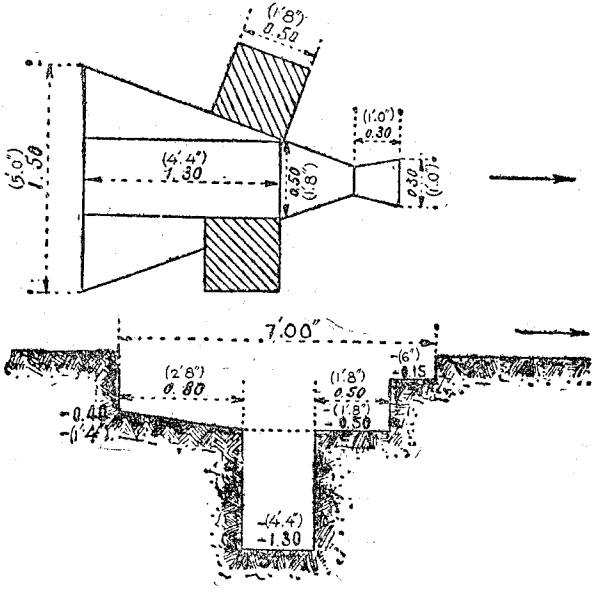


FIG. 76.

yards at least two rounds at each range should be observed before deciding whether the range is short or over. When reducing to 27 yards four rounds at each range will be necessary.

Commence fire for effect as soon as possible.

The apparatus for masked fire makes it possible to find the minimum range necessary for a projectile to pass over the mask. If that range results in overs it will be necessary to get farther back from the mask or to diminish its height.

Ammunition.—Two kinds of shell: Cast-iron shell weighing 1 pound, with percussion fuse and black-powder charge. Steel shell, base fuse, weighing 1 pound 1 ounce, 431.3 grains.

Characteristics.—Initial velocity about 400 meters (436 yards). Range 2,400 meters (2,625 yards). Average deviation: In range, from 14 to 18 yards at all distances; in direction 1 yard at 1,531, 2½ yards at 2,625 yards; in height less than 1 yard up to 1,094, 2 yards up to 1,750, and 4½ yards up to 2,625 yards range.

CHAPTER VI.

EXPLOSIVES AND DEMOLITIONS.

Allowance to one regiment of infantry.—One hundred and eight melinite petards of 4 ounces, 333 grains (in one of the tool wagons); one case containing 22 yards detonating fuse, 15 fulminate caps, and 46 detonators (in the other tool wagon). This distribution between the two wagons is because of the fundamental principle that explosives should be kept separate from the detonators. (They should never be carried together by one man, or stored in the same ammunition recess, etc.).

Sappers handle the explosives. Nevertheless, every officer must be able to recognize and, if necessary, to use properly the following explosives and devices: Melinite petard and cartridge, detonating fuse, fulminate caps, safety fuse (Bickford), igniter.

The following instructions are amplified in Instruction in Field Fortifications.

EXPLOSIVES.

Black powder.—Hard slate-colored grains of various sizes. Composition, by weight, 75 per cent saltpeter; 12.5 per cent sulphur; 12.5 per cent charcoal.

The powder is exploded either by a violent shock or by contact with a lighted body. It is a propelling explosive, to be used with tamping (when loading mines). Good powder burns without residue. Keep it dry by using water-tight receptacles. Barrels or cases of wood, zinc-lined: 50 kilograms (110 pounds). Precautions must be taken in decanting; i. e., pouring from one container to another (avoid it if possible), and transporting (use copper tools, permit no smoking, etc.).

Artillery grenades, models 1882 and 1914, were charged with black powder.

Melinite.—Melinite is a bursting explosive, and may be advantageously used for destructive purposes as a surface charge—that is, a charge placed in contact with the object to be destroyed and only slightly tamped or not tamped at all. Fused or cast melinite forms a compact straw-colored mass. It rarely responds to shock or friction. Electric sparks do not ignite it. Upon explosion it generates very poisonous gases.

Melinite must not come in contact with the alkalis (soda, potassium), especially with lead and its compounds (white lead, etc.). Its detonating quality is seriously affected by dampness, and when damp its color is bright yellow rather than straw color.

Melinite petard.—Brass envelope of elongated shape with rectangular cross section, with a welded cover carrying the primer seat, and containing 4 ounces, 333 grains of melinite. (Fig. 77.) The primer seat carries three small brass vanes, designed to hold the primer when it is introduced into the seat. It is closed by a pasteboard washer and band with a ring, which must be removed to uncover the primer seat.

Weight of petard.—About 7 ounces, 23.5 grains. Seven petards placed end to end make a charge 40 inches long and contains 2.2 pounds of melinite.

Melinite cartridge.—Cylindrical, 2.85 centimeters (1.1 inches) in diameter; charge, 3 ounces, 228 grains powdered melinite; same stopper as the petard. Petards and cartridges, being perfectly watertight, may be stored in any sort of box. Two ounces, 50.8 grains petard, model 1904, for setting off larger charges; 22 and 44 pound petards.

Chlorated explosives.—Generally used to charge bombs and grenades. These are high explosives. The principal ones are:

Cheddite.—Yellowish powder which hardens after a time, with a base of potassium chlorate and castor oil. In bulk or in paper cartridges.

Perchlorate of ammonium.—A blue explosive comprising perchlorate and *inert* paraffin.

Properties in common: They are not subject to spontaneous combustion, but ignite upon contact with a lighted body. Com-

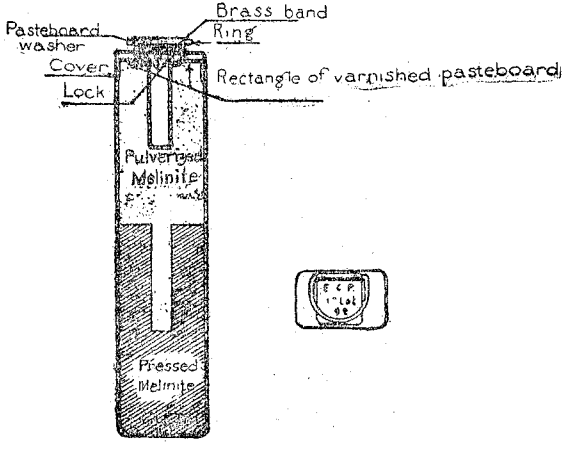


FIG. 77.—Four ounces, 333 grains petard.

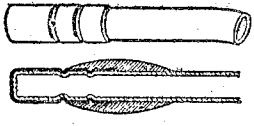
bustion can progress in a mass of either of these explosives, but will develop an explosion if the mass is sufficiently large.

Detonated by concussion (even slight) or by friction between hard surfaces. Precautions must be observed in storing and transporting. A number of small depots should be provided. The explosives should be kept separate from detonators and black powder and should not be exposed to dampness or heat. Chlorated explosives must be handled with great care. The

interior of grenades must be smooth and varnished or paraffined before filling.

Primers and fuses.—Devices for igniting, detonating, or transmitting the detonation.

Fulminating primer 1880—Detonators.—Charged with 23,145 grains of fulminate of mercury contained in the black varnished part of the small copper tube (height 1.76 inches, diameter .217 inch). Violent explosive; very sensitive to concussion, friction, or fire. To be handled with *extreme caution.* Commercial *detonators* have no black varnish. Primers and detonators are used to detonate the charge and the detonating fuse.



Capped detonating fuse, with brass abturator and joint covered with Chatterton tape.

FIG. 78.

Fuse or slow match

Junction of the fulminating primer with a slow match or a simple fuse.

FIG. 79.

Slow match (*Bickford safety fuse*).—Small thread of fine powder .118 inch in diameter, wrapped in two layers of tarred cotton. Burns slowly, 1 yard in 90 seconds (about .39 inch per second). Time should be tested with a sample from each coil. Ignited by an igniter (see fig. 83) or directly by tinder or any other lighted body, after exposing the powder train with a knife.

Detonating fuse.—Tin tube about .197 inch in diameter, filled with powdered melinite which has been compressed by drawing out the tube. Detonates by the action of fulminate or melinite and propagates the detonator at a rate of 6,550 to 7,650 yards a second. Sometimes called an instantaneous fuse. Weight, 3 ounces, 77 grains a yard. Avoid bending it at right angles or

pulling it in such a way as to cause gaps and misfire. For greater lengths the detonation may be relayed by a 2-ounce, 50.8 grains petard or by 2 petards (fig. 88) every 219 yards. Cut off 3.94 inches from the end before using.

Alternative: Detonating or trinitrotoluol (TNT) fuse.

Joints.—Spanish windlass (fig. 86) or with two petards (fig. 88).

FIG. 80.—Joint between fulminate cap and safety fuse without crimping.

Double or multiple connections (figs. 87 and 89).—May be used for the simultaneous explosion of several separate charges. The detonating fuse is called the master fuse, to which the branch fuses are joined. Never join more than two branch fuses to a 2 oz., 50.8 grains or other petard. Tie the branch fuses to the outside of the petard.

FIG. 81.—Priming the detonating fuse.

Friction igniter, model 1913.—Lighting device which acts by withdrawing a friction wire from the composition in the tube—by means of a lanyard.

To fire, hold the unpainted end of the tube between the thumb and forefinger of the left hand—taking care not to close the ventholes. Rest the hand on something steady, slack off on the safety fuse, hook the lanyard into the ring of the friction wire, and pull it all the way out with a quick jerk of the right hand. Instead of holding the primer with the hand it can be tied to something firm.

PRIMING.

Simple priming.—Join the safety fuse to the fulminate cap. Cut the end of the fuse square and insert to the bottom of the

tube without forcing or twisting. Crimp with pliers (fig. 79), or by compressing the primer (fig. 80) where it does not contain the fulminate.

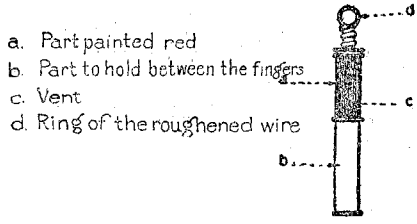


FIG. 83.—Friction primer. (Igniter.)

Priming the detonating fuse.—Prime with a fulminate cap (fig. 79) if the firing is to follow immediately. Otherwise cap

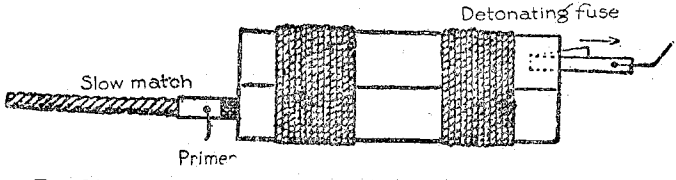


FIG. 84.—Priming the detonating fuse with a couple of petards.

the fuse with a primer, as for the Bickford, and fasten both primers together (fig. 81).

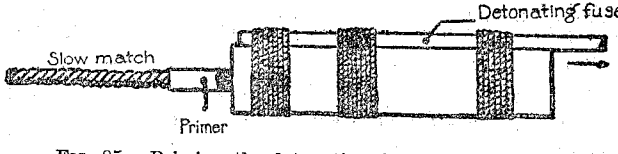


FIG. 85.—Priming the detonating fuse with one petard.

Priming a melinite petard.—First. With a safety fuse and one primer, as in figure 85. Second. With a detonating fuse like the lower petard in figure 88.

FIG. 86.—Spanish windlass joint.

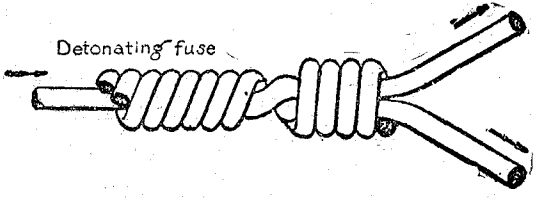


FIG. 87.—Spanish windlass branch connection.

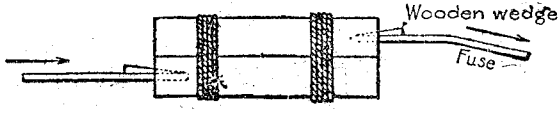


FIG. 88.—Joint with two petards.

Make the whole secure by inserting a small wooden wedge into the opening along with the primer, or by tying the primer in place.

Chatterton's Compound.—Plastic coating, which makes the joints water-tight when firing explosives under water.

MAKING UP CHARGES OF MELINITE.

1. *Concentrated charges* (fig. 91).—Packages of petards fastened together, the sockets at one end, made up as squarely as possible.

2. *Extended charges* (fig. 92).—A succession of charges placed end to end on a narrow board.

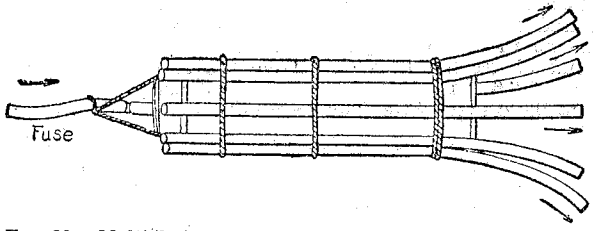


FIG. 89.—Multiple branching by use of a cartridge or a petard.

The charges are so placed that the largest surface of melinite is in contact with the object to be destroyed. A slight tamping

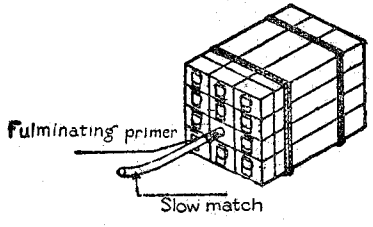


FIG. 91.—Concentrated charge.

of earth, sand, sod, etc., will augment the effectiveness by insuring contact.

Never tamp a primed petard. Tamp first, then prime.

DEMOLITIONS.

Save explosives for use in difficult demolitions, and do not expend them when the demolition can be done with ordinary tools. This will result in the majority of demolitions being made by the engineers of the division, not by the infantry.

It will suffice if officers have some idea of how to cope with the following cases:

1. *Destroying a gate.*—Set a charge of two petards on each hinge and on the lock of a wooden gate; connect them with a detonating fuse to insure simultaneous explosion. Should the lock and hinges not be visible from the outside, concentrated charges of 6.6 lbs., already prepared and primed, may be fastened to the center of the door by a nail or stick.

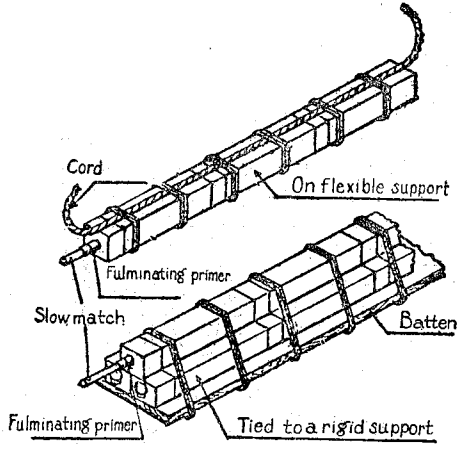


FIG. 92.—Extended charges.

2. *Disabling guns.*—A charge of four or five petards detonating in the bore near the muzzle of a gun will damage it beyond repair. Destruction will be more complete if the muzzle is plugged with earth, clay, or sod. The fuse is brought out through this plug. Unless the piece has first been covered with fascines to prevent fragmentation, move 436 to 655 yards away, after igniting the fuse, in the direction the gun points. Seven or eight petards will disable a large-caliber gun.

Another method is to slip an *incendiary hand grenade model A B* 1916, into the bore after closing the breechblock and giv-

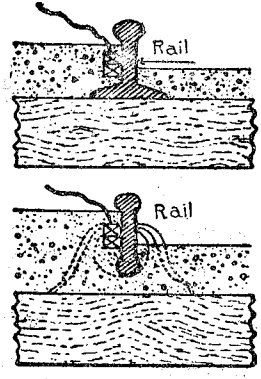


FIG. 93.—Simple fracture of a rail.

ing an inclination to the piece by raising the chase. The breechblock thereby becomes welded to the tube and the bore is ruined.

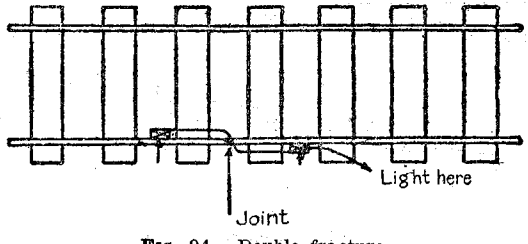


FIG. 94.—Double fracture.

Finally, in default of surer means, one can detonate a primed petard, or a grenade F_1, or bomb C F in the muzzle or against

the half-closed breechblock. But this only causes momentary damage, not always sure.

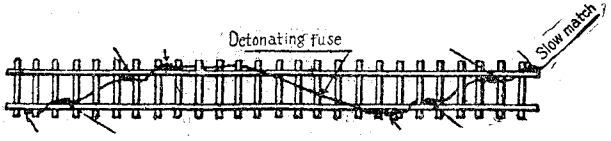


FIG. 95.—Destruction of a considerable length of track.

3. *Destruction of munitions.*—First. Cartridges: Set fire to the cases containing them with an incendiary grenade.

Second. Projectiles: The surest way is to explode two, three, or four melinite cartridges, according to the caliber of the shells, in the pile and in contact with the projectiles. Three incendiary

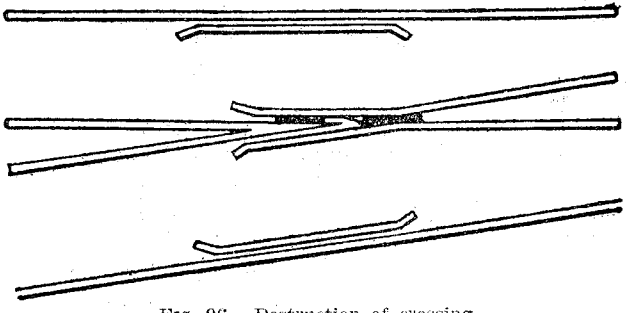


FIG. 96.—Destruction of crossing.

grenades placed on a pile of shells, even though not primed, will provoke the detonation of a certain number and putting out of service of the others.

If the shells are primed, an incendiary grenade may be lighted against one of the fuses, care being exercised to place the grenade so that the flaming liquid will not flow away from the pile. To insure the effectiveness of the latter means set fire to cases of cartridges placed at the fuse end of the pile of projectiles.

Third. Explosive grenades: Burn the cases in the same manner as the cartridges or produce detonation by igniting incendiary grenades placed on top of them. Those grenades which fail to explode will be scattered on all sides.

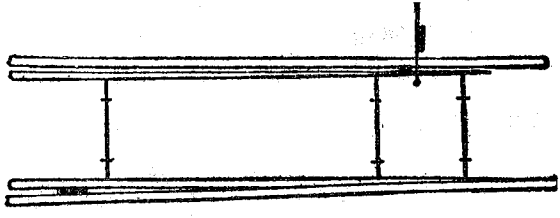


FIG. 97.—Destruction of a switch.

Fourth. Destroying railroad tracks: The quickest way is to break the rails and ties. To demolish a main-line track choose a place where the destruction will cause the greatest damage and derailments, the most serious consequences; as, for example, on curves, fills, branches, crossings, etc.

Figures 93 to 97 show the places most easily affected and the methods of applying the petards.

Fifth. Destroying an unexploded shell: Place in contact with a concentrated charge of one to three melinite petards, according to the caliber of the shell. Tamp lightly (indispensable if cheddite is used).

For the demolition of walls, iron fences, palisades, stockades, etc., see Appendix IV to Instruction in Field Fortifications.

CHAPTER IX.

ILLUMINATING ARTIFICES AND APPLIANCES EMPLOYED IN SIGNALING.

ILLUMINATING ARTIFICES.

Illuminating rockets.—Two caliber, 1.34 in. and 1.06 in. (interior dimensions of the rocket). They differ only in range and intensity of illumination.

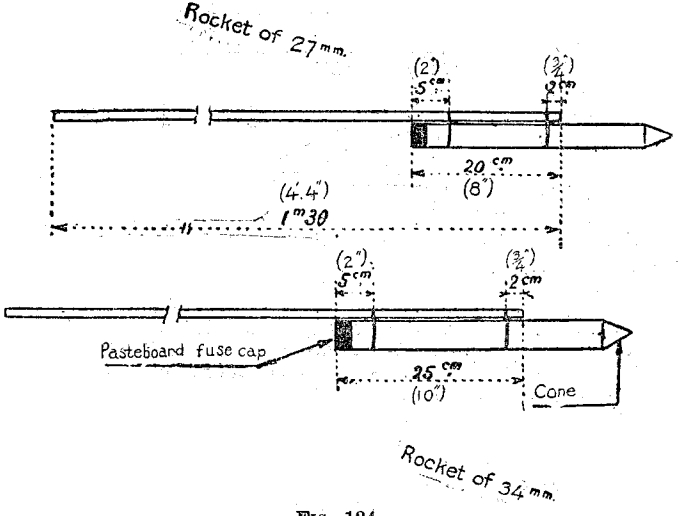


FIG. 124.

To fix the rocket stick.—The rocket stick is 4.26 ft. long, cross section 0.51 in. Attached by wires well tightened and secured, as in figure 124. The stick parallel to the axis of the rocket.

To uncover the fuse cap.—At the moment of firing, jerk sharply the loop of string placed alongside the rocket in order to tear off the cap and uncover the fuse.

To light the rocket.—The rocket being on the stand, remove the little brass cap that protects the match and brush the match composition quickly but very lightly with one of the brushes (rubbers) that accompany each box of rockets. Withdraw immediately some paces to the rear and to one side. The rocket goes off in five or six seconds after the friction of brushing.

In case of a misfire, disengage the "Bickford" (match) from the copper tube that incloses it, cut it obliquely, insert it in the wire loop that holds the copper tube, light it.

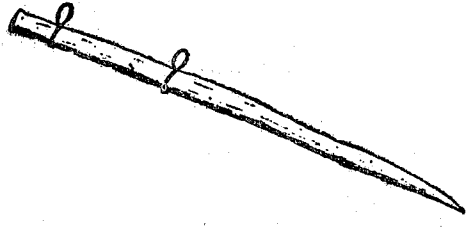


FIG. 125.—Improvised rocket firing device.

The rocket releases the parachute and star when it has traveled 273 yards (rocket 27) or 490 yards (rocket 34), about 10 seconds after its departure.

Duration of illumination, 30 seconds.

Firing stands for rockets.—The method of using this device is evident on seeing it. A fixed limb, graduated in degrees, gives the inclination of the tube guide when the pivot is vertical. The best angle is 50°. The tube guide is 4.9 ft. long; the rocket stick should enter its entire length and the rocket is turned underneath the stick. A firing stand can be improvised by arranging two collars of strong wire on any sort of a stake of sufficient length. (Fig. 125.) Rockets can even be discharged by simply sticking the rocket stick in the soft ground at a slight

inclination, but they can not in this way be discharged at an angle of 50° and there will be great variations in range and in direction.

Illuminating cartridge of 25 millimeter (1 inch) with parachute.—Long brass cartridge case, of caliber 4 shotguns of about 25.7 mm (1.1 inch) disengaging at 136 yards a star parachute that burns 30 seconds.

The illuminating cartridge is fired from a 25 millimeter (1 inch) rocket gun weighing 5.72 pounds. It is a breech-loading gun that works like a Legaucheux and that must be kept oiled. It is pointed at an elevation of about 50° in order to obtain the desired height; that is to say, such that the star will no reach the ground before it has been entirely consumed. The star possesses incendiary properties.

Illuminating star 25.—Illuminating cartridge without parachute; same caliber as the illuminating cartridge (with parachute); is fired from the same gun or from a less cumbersome special pistol. It is an expeditious lighting appliance, loosed with the least suspicious noise. It lights instantaneously and surprises the enemy. The cartridge is 3.94 inches long; the star is lighted at about 50 yards from its point of departure and illumines for six seconds while falling.

Illuminating grenade.—A cardboard pellet the size of a tennis ball, supplied with a Bickford fuse and filled with an illuminating composition. It is lighted at the end of the Bickford fuse like a Swedish match (safety match) by means of a special rubber. The ball is thrown by hand and lights for one minute the neighborhood of the point where it falls.

Illuminating bomb.—A recent appliance, intended to replace the illuminating rocket, over which it has the advantage of being invisible until the moment of lighting the star; on the other hand, the luminous train of the rocket discloses the point from which it is fired and warns the enemy that he is going to be lighted up. The illuminating bomb is a feathered metallic cylinder containing both parachute and star. Diameter, 1.97 inches. The star is lighted by a specially arranged percussion lighting device under a diaphragm, not permitting any light to escape from the base of the bomb. The bomb is projected from a special gun or by means of the V B "discharger," *but with a special blank cartridge.* Duration of illumination, 20 to 25 seconds.

DEVICES AND APPLIANCES FOR SIGNALING.

1. **Bengal lights.**—*Bengal white lights* are of three sizes, illuminating, respectively, for three minutes, one and one-half minutes, and one-half minute. Bengal *red*, *green*, and *yellow* lights are of the smaller dimensions (one-half minute illumination). They are lighted the same as the illuminating grenades. Other lights (Ruggieri, Lamarre, Coston) are also in use.

2. **Signal rockets.**—Signal rockets function the same as the illuminating rockets, model 1885 (13 white stars and 15 red stars, burning 10 seconds), and *big star rockets* (white, red, and green), which have 6 stars only, but plainly seen by day, are the two kinds most used. These rockets have the cone painted the color of the stars; big star rockets have also a band of paint around the middle of the body of the rocket. Other varieties are in course of construction: Caterpillar rockets, rockets with red or yellow smoke, flag rockets, etc.

3. **Signal cartridge 25.**—Called also "military telegraph star." The star is *white*, *red*, or *green;* it lasts eight seconds. The color of the wad indicates the color of the star. These devices must not be confused with *star illuminating cartridges* previously described, although both have the same appearance, same length, and the same caliber (length, 3.94 inches; caliber 4). The latter owe their lighting power to the brilliant combustion of aluminum, while the signal cartridges project a star that can be seen at a distance, but which does not illumine the ground. The signal cartridges are therefore fired vertically to indicate where one is, or in the direction of the post with which one desires to communicate.

A 25 caliber breech-loading bronze signaling pistol is used, weighing about 2.2 pounds and having a diameter of 1.04 inches. The same pistol can fire cartridges with three stars, cartridges with six stars, red-smoke cartridges, and yellow-smoke cartridges.

4. **Signal cartridge 35 for infantry.**—The 35 mm. (1.38 inches) cartridge consists of a base and a sheet steel case. Three models: Cartridge No. 1, 1 white star, for 10 seconds; cartridge No. 3, 3 white stars, for 8 seconds; cartridge No. 6, 6 white stars, for 5 seconds.

Distinctive marks: One, three, or six large points projecting from the end of the cartridge opposite the base; and a round vignette stuck on the base, indicating "Infantry signal No. 3." Weight, cartridge No. 1, 7 ounces, 255 grains; No. 3 or 6, 10 ounces, 100 grains. Charge of powder F.3, 69.435 grains. Range: Fires vertically, the cartridge functioning at about 109 yards high, after three seconds. Packing: Packages of 24, six packages in a box. This cartridge is fired from a breech-loading .35 caliber signal gun weighing 9.46 pounds. Cartridge No. 1 can be used for lighting or incendiary purposes. Maximum range, 219 yards.

5. **Thirty-five caliber signal cartridge for avions.**—The same as the preceding, but loaded with only 38.57 grains and fired from *signal pistol, .35 caliber,* special for aviators. Beside the three models described, there will eventually be the following: Two stars, caterpillar, red smoke, yellow smoke.

6. **Signal devices that may be used with the V. B. "discharger."**—The V. B. "discharger," using a special blank cartridge, can throw the following: Parachute stars, red, white, green; one star, three stars, six stars; caterpillar; red smoke, yellow smoke.

7. **Signal lanterns.**—Old allotment, two per company. To be replaced progressively by the *portable searchlight.*

Description.—The lantern consists of a sheet-iron box inclosing: *A projector* formed of a polished silvered mirror and an electric lamp mounted on an adjustable support; *a sighting tube* with the axis parallel to that of the parabolic mirror; *a flexible hand manipulator; a battery* (4 volts) and four extra light bulbs; *an extra battery* is contained in a bag.

Method of using.—First, draw forward the manipulator button after having opened the side door. Close the door. Second, face the party to whom signaling in such a way as to bring the party or person in the middle of the field of the sighting tube. Third, manipulate with the thumb or the index finger of the right hand. Observe during the transmission of the message that the sighting tube is accurately directed on the receiving party.

Care and adjustment.—To replace the battery open the side door and loosen the screws of the two binding posts situated under the exchange lamps; take out the used battery. Scrape

the wire ends of the new battery and slide it in the lower compartment of the lantern, the longest wire having its point of departure against the bottom. Engage the scraped ends of the wires in the binding posts and fasten the posts to the bottom.

To replace the lamp dismount the glass by turning it gently until the notches correspond with the catches. Unscrew the bulb, replace with another from the reserve, screwing it well in. Replace the glass in its seat, turning it so the wards will correspond with the catches. Adjust the bulb so that the filament will be at the focal point of the mirror. To do this, turn the light on a wall at 5 or 6 yards distance, and turn the adjusting screw at the rear of the lantern until the image projected on the wall is as brilliant and as small as possible. Range by day, 500 to 1,000 yards; at night, 1,000 to 3,000 yards.

8. **Portable searchlight 14 (5.51 inches).**—Allotment, two per company, three per battalion, three per brigade, three per division. The three battalion lights are inclosed in the same box which contains 12 extra batteries, 6 extra lamps (3 white and 3 red), 2 packages of cotton wool.

The *14-centimeter (5.51 inches) light* is similar to the *24-centimeter (9.44 inches) light* described hereafter. Its use, care, and adjustment are the same. Range by day, 1,000 to 3,000 yards; at night, 2,000 to 6,500 yards.

9. **Portable searchlight 24 (9.44 inches).**—Allotment, four per regiment, three per brigade, four per division. This light is designed for signaling between two stations on the ground or between the earth and an avion or a balloon.

Description: The apparatus includes a portable projector with a cap or cover, a sighting tube, an insulated connecting wire, and a screw plug. (Fig. 126.)

A waist belt with suspender or sling, carrying two battery pockets, each inclosing four cells, and one central pocket carrying the manipulator (sending key); the current regulator; two extra light bulbs. The projector box contains eight battery cells and three extra light bulbs.

Manner of using.—Screw the connecting plug into the socket on the battery box. Remove the cover and direct the projector toward the receiving party by means of the sighting tube. Signal by pressing the manipulator with the right hand. Be sure that the sighting tube rests exactly on the receiving party

during the transmission of the message. The apparatus can be held in the hand or placed on any convenient support. To

FIG. 126.—Portable searchlight.

communicate with an avion, the projector is held in the left hand and rested against the left shoulder. To communicate with a person on the ground, the apparatus can be held in the left

hand, resting against the breast. For long messages it is preferable to rest the projector on a support.

Care.—Whenever the instrument is not in use, be careful to keep the cover firmly closed in order to protect the mirror. Do not pull on the cable fixed at the back of the projector, especially in removing it from the box. Touch the mirror as little as possible; clean it with gauze or cotton wool, washing it when necessary with clean water.

Adjustment.—The apparatus is delivered adjusted; but it may happen that, in changing lights, the source of light will no longer be at the focus. To adjust it, turn the lighted projector on a well a few yards distant and turn gently the mirror regulating screw until the spot projected on the wall is as brilliantly illumined and as small as possible. Range by day, 1,600 to 6,500 yards; at night, from 3,000 to 1,100 yards.

Red light.—The 14 and 24 centimeter (5.51 inches and 9.44 inches) searchlights can use red light when necessary to distinguish signals from certain parties or stations. Red lights are, in general, reserved for searchlights pertaining to the artillery. Red light reduces the range of the searchlight markedly.

Important note concerning lanterns and projectors.—*The lights are fed by batteries which speedily become exhausted if employed in giving a continuous light. It is expressly recommended that they should never be put to the use of fixed lights. The use of signal apparatus as a means of illumination is most positively forbidden.*

10. **Square flags for signaling.**—Allotment, 64 per regiment. Dimensions, 19.68 in. The staffs fold for transport. The two faces are half red and half white, colors disposed diagonally. This arrangement of colors is the most advantageous for all-round visibility. Observe arm signals with a field glass.

11. **Panels.**—Panels used in communicating with avions are of different types, and their significance varies in order to preserve the secret.

A. *Identification panels.*—White circular panels 5 yards in diameter are employed to identify divisions and brigades. This is accomplished by means of four strips or slats 3 yards long fastened in the middle by a bolt and terminating in a closed hook. The linen panel has eight rings that are engaged in the hooks. (Fig. 127.)

The *semicircular white panel* of 3 yards indicates a regimental command post.

The *triangular white panel* with 2-yard sides indicates a battalion C. P.

B. *Persian panels.*—These panels admit of the alternate appearance and disappearance of a white rectangle, 3.9 by 9.2 feet. By working a shutter, there is exposed either the white

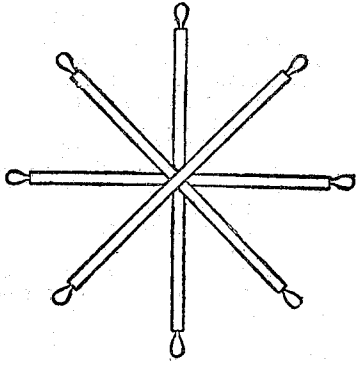


FIG. 127.—Frame of a circular panel.

face or the neutral face of seven strips (bands) of white linen, 3.9 by 1.3 feet, doubled with gray or khaki. Allotment, one per division, brigade, or regiment.

C. **Panels to indicate the infantry firing line to aviators observing for artillery.**—Panels 1.6 by 1.3 feet of waterproof linen, white on one face and neutral on the other. Allotment, 64 per regiment.

Panels are to be displayed only in the first line.—Leave them spread only until the avion has signaled "understood," *and in no case for more than 15 minutes.*

Recapitulation table.

	Signalers.		Searchlights.		Panels.		
	Officers and non-commissioned officers.	Squads of two signalmen.	24	14	Identification.	Persian.	"Marking firing line."
Reg.....	2	4	4	0	1	1	64
Bn.....	1	2	0	3	1	0	0
Co.....	0	1	0	2	0	0	0

CHAPTER X.

THE TELEPHONE.

TELEPHONE FOR INFANTRY.

Two types.—1. Model 1908, buzzer. Light, strong, works on badly insulated lines. Requires special switchboard for buzzer.

2. Type, model 1909 or 1915, with magneto and buzzer. A little heavy. Permits calling artillery equipped with special switchboard, and also rings a bell.

Batteries.—Dry nonrechargeable batteries are used. The following is necessary in order that they should run a long time: *Do not put them in a damp place.* Do not weaken them by prolonging the calls or by leaning on the pedal of the phone when not in conversation. Avoid short circuits produced by wire touching two binding posts of the same battery. A single short circuit of a few seconds ruins the cell irremediably.

When the batteries are new, a single cell suffices to operate a telephone. When it becomes weak, a second is put in.

All telephones are in wood boxes that deteriorate when exposed to moisture. Therefore avoid putting telephones on moist ground or in the grass. Under shelter be careful to attach to a shelf or a plank.

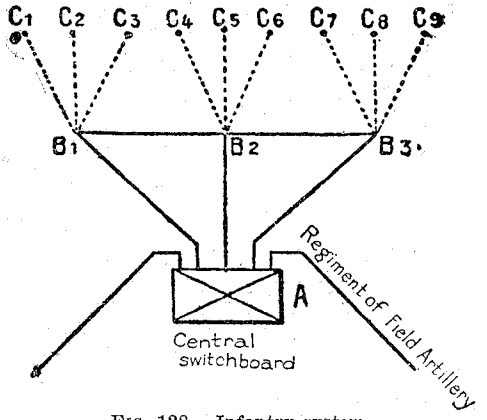


FIG. 128.—Infantry system.

FIG. 128.—A. Command post of the colonel. B. Command post of the major. C. Command post of the captain.

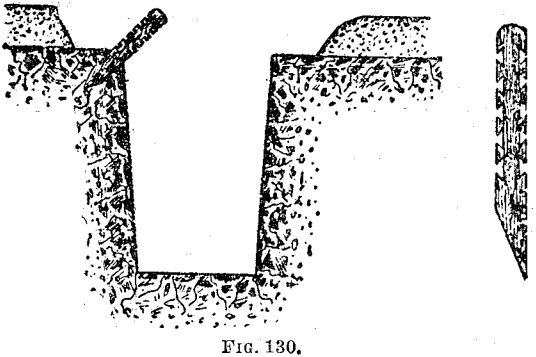


FIG. 130.

Conductors.—Infantry uses insulated wire, light cable, and, in exceptional cases, field cable, double cable, armored cable, or leaded cable.

Insulated wire is reserved for transient connections in maneuver warfare (15/10 bronze wire). *Light cable* is the normal conductor in the trenches. It should be laid with care and isolated from the ground as much as possible (hung on pulleys, stakes, etc.). *Field cable* is used for important lines. It is useful, often indispensable, to bury it so as to protec it from bombardment (in grooves in the bottom of trenches or under the macadam of roads; small trenches, 40 centimeters (15 inches) deep, covered by a light covering).

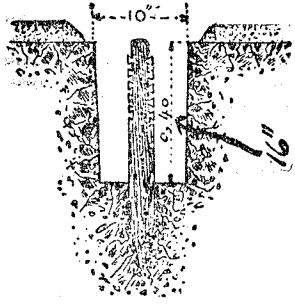


FIG. 131.

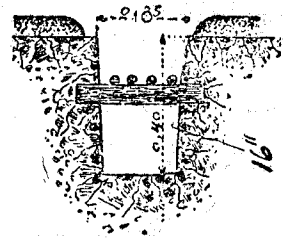


FIG. 32.

The double cable has two conductors in order to prevent the enemy from surprising communications. Its use is in the first line, or for important connections in maneuver warfare.

REGIMENTAL PERSONNEL AND MATERIALS.

A telephone party is composed of one sergeant, five operators, two telephones, one switchboard with four switches, 2 kilometers (1¼ miles) of light cable.

In a regiment of three battalions there is a telephone officer, eight workmen, a reserve of four telephones, two switchboards, and 14 kilometers (8.7 miles) of cable.

PRECAUTIONS AGAINST SURPRISE OF COMMUNICATIONS.

All teephonic liaisons in zones less than 2,200 yards from the eney are of *double wire;* that is to say, with metallic return; *ths rule is absolute.* Furthermore, it is absolutely prohibited i the first line to allude by telephone to any event or situation that might be of use to the enemy, such as hour of attack, rliefs, number of regiment, neighboring regiments, brigades, etc. *In general people telephone entirely too much during peiods of inaction.* It is necessary to impose, and to impose ononeself, the use of *messages* instead of *conversations.* The officer who sends a message is more brief, weighs his words more carefully, and avoids imprudent remarks. Furthermore, he keeps a copy of his message. Questions of "priority" must be clearly egulated.

PRECAUTIONS TO ASSURE THE MAINTENANCE OF COMMUNICATIONS.

Telephonic connections (liaisons) are of vital importance to the units of the first line. Everyone, whatever his position, should work diligently to maintain them. It is therefore strictly the duty of ayone who observes a broken line to repair it, or at least to inform immediately the nearest emergency telephone repair party. Patigue parties, reliefs, and patrols circulating at night should gie the lines the most careful attention; carry the weapon slung, ointed down. The arrangements indicated in figure 130 concrn only trenches of 2 yards depth. In other cases it is bette to plant the notched stake at the bottom of the trench againt the wall. Trench crossings should be made with great care. The best method is to pass the line under the trench in a woode conduit, using leaded cable for this passage. If the crossing isabove the trench, see that the wire is well stretched. String alongside a pole.

To repair a line,it is sufficient to scrape the insulation from the wire at both eds of the cable, knot them together, then

isolate the splice from the ground by means of a rag, a piece of paper or wood, or a bit of cardboard. As soon as possible this splice should be covered with tarred tape, which will insulate it completely.

TAGGING AND ORDERLY ARRANGEMENT OF LINES.

A means of identifying lines circulating in the same trench is very important. Care should be taken never to string lines over those already placed (duplication). Furthermore, every 50 yards of each line should have a tag firmly attached to it indicating the origin and end of the line. Every unused line should be recoiled the very day it ceases to be of use.

MEANS OF OBSERVATION AND RECONNAISSANCE.

CHAPTER XI.

SANCE.

FIELD GLASSES—PERISCOPE—COMPASS—MAPS, SKETCHES, AND PLANS.

1. **Field glasses.**—To be remembered: Field glasses of the highest power are not the most advantageous for an infantry officer, for unless considerable dimensions are given the object glass, thus rendering the instrument cumbersome, this enlargement is always obtained at the expense of *field of view and clearness*. If two field glasses have object glasses of the same diameter and one magnifies twice as much as the other, its *clearness* will be only one-fourth that of the weaker glass. A magnifying power of 6 or 7 diameters, a field of 100 to 130 mils, with corresponding clearness, gives, for the prismatic field glass, the best balance between the conflicting qualities.

2. **Periscope.**—A periscope is ordinarily composed of two mirrors, M_1 and M_2, or two reflecting prisms whose faces are *parallel to each other* and inclined at an angle of 45° to the tubular mount.

Figure 133 shows that the result is as though the eye were placed at O′ in place of at O and looked through a window of the dimensions of the opening arranged in front of M_1. The result is that with the same mirrors *the longer the periscope the smaller will be the field of view.* It is therefore not practicable to increase the length of the periscope indefinitely. Seventy centimeters (28 inches) is good height for service.

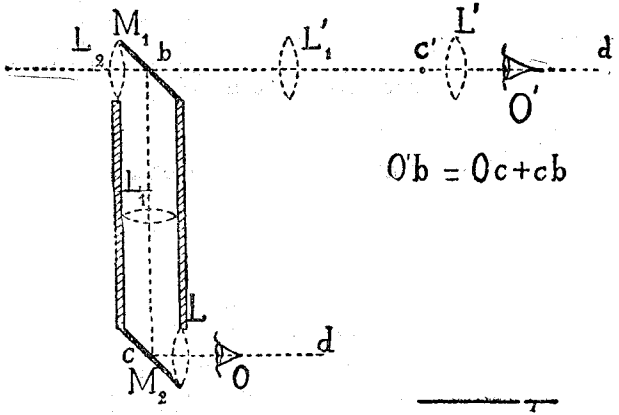


FIG. 133.—Periscope.

Again, the mirror can hardly have a width greater than $2\frac{3}{4}$ inches, in view of the danger of being seen and destroyed by the enemy. Under these conditions, a periscope 28 inches high reflects to the eye a horizontal strip of ground only 10 yards wide at a distance of 110 yards. On the other hand, the vertical field of view is almost always sufficient.

If one looks in a periscope through a field glass, the image is enlarged and clearness is increased, but the field of view is not increased.

In folding and sliding periscopes, it is necessary to carefully observe and preserve exact parallelism of the mirrors.

The *Carvallo periscope*, indicated in figure 134, is held in an inclined position, with the observer's back toward the object observed. As in the ordinary periscope, there is no inverting of objects; that is to say, one can read writing placed in the field of vision.

FIG. 134.—Carvallo periscope.

There are also *periscopes of precision*, having a field of view of 280 feet at a distance of 110 yards. They are constructed with magnifying lenses L, L_1, L_2 (fig. 133), and function as though L^1, L^1_1, L^1_2 formed a straight telescope. Their construction is expensive.

Another application of the periscope.—When one can observe in the open, the periscope permits the exaggeration of features in relief. This is accomplished by holding the instrument horizontally before *one* eye and observing the country directly with

the other eye. Slight rotations of the periscope about its axis makes possible, by groping, the superposition of the two fields. The relief of features then suddenly becomes extraordinary and different foregrounds detach themselves from each other with great clearness. Recognition of moving objects on the horizon is also facilitated.

3. *Compass.*—The blue end of the needle indicates the *magnetic north.* Compasses are graduated from 0° to 360° (or from 0 to 400 grades, or from 0 to 6,400 mils) in the direction of the figures on a clock. The line 0–180 (or 0–200 or 0–3,200, depending on the type), which generally bears the indications N. S., becomes the geographic north and south line when the blue needle point is (for Paris) 13½° (15 grades or 240 mils) to the left of the 0 of the compass. The compass most widely used is one with a needle 1½ inches long and the bottom of which, moving with slight friction on the rest of the box, carries a large black direction arrow, concentric with the magnetic needle. There is added a small copper protractor. The precision of the measurement of angles is in proportion to the length of the needle. The needle is influenced by the presence of iron (helmet).

To orient a map.—Place the compass on the map, the 0-180 line on the meridian. Turn the map carrying the compass until the blue point marks the proper declination. The map is then oriented.

If, instead of meridians being marked on the map, an arrow indicates the true north (N. G.), place the compass so that the 0-180 line coincides with the direction of the arrow. Turn the map bearing the compass until the needle indicates the declination. If the magnetic north is given, place the 0-180 line coincident in direction with it and turn the map with the compass till the needle is at 0. This dispenses with the necessity for laying off the declination with the needle, the declination varying with the locality. (Translator's note: The above will only give correct results when the declination laid off is the true declination of the locality in which the map is being used; or, in the last case, when the magnetic N, and S. line indicated on the map is the true magnetic meridian for the place in which the map is used.)

To take the direction or azimuth of a distant object (fig. 135).—Clean the face, direct the arrow on the object as accurately as possible, and turn the rest of the box so that the blue needle shall stand at zero. The object then is at 138° (from the *magnetic* north) measured in the direction of the movement

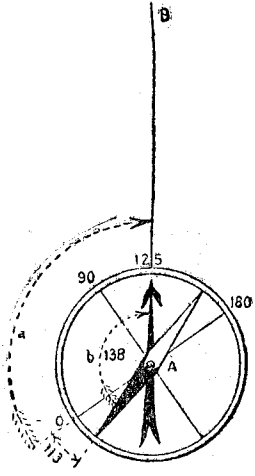


FIG. 135.

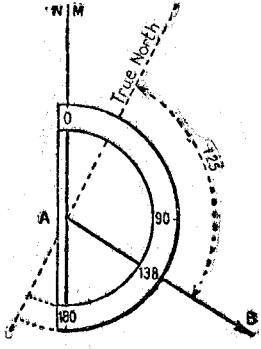


FIG. 136.

of the hands of a watch. For greater precision put the compass on a fixed support and take the mean of several readings. The angle "*b*" is called the magnetic azimuth of B.

If the compass box had been moved until the needle marked the declination (assumed at 13° in this particular place), the reading of the black arrow would have been 125° instead of 138. The angle "*a*" thus read is called the geographic azimuth of B.

Knowing the location of the observer on the map, to plot the direction of a point seen (fig. 136).—Let A represent the ob-

server's station on the chart or map. Draw through A a line parallel to the magnetic meridian; lay off with the protractor a second right line through the point A making an angle of 138° with the first, measured in the direction of the movement of the hands of a clock. The point B will lie somewhere on the right line AB.

If a line is drawn through A parallel to the geographic meridian, the same result is obtained by laying off an angle of 125°.

Knowing the location on the map of a point seen, to draw a line through this point and the observer's position (plotted

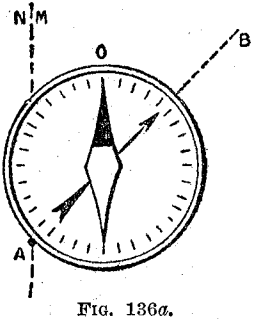


FIG. 136*a*.

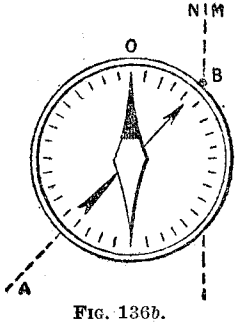


FIG. 136*b*.

(fig. 137).—Let B represent the location on the map of the point seen. Draw through B a line parallel to the magnetic meridian, apply the protractor, directing the limb toward A, draw the line B-138, the point A will be somewhere on that line.

Proceed in a similar manner using the geographical NS and the angle 125°.

REMARK.—The foregoing operations may be performed by use of the compass alone, without using the protractor. Suppose the map is oriented. Place the compass on the map in such a way that the edge of the compass corresponding to the prolongation of the feathered end of the black arrow is at A

(fig. 136-a) and pivot the compass around this point (*not* around the center) until the blue point of the needle is at zero; the compass will then occupy the same position on the map that it had in the country when taking the azimuth of B. All that remains to be done is to mark on the map a point in prolongation of the black arrow and join this point with A to obtain the line AB.

Working in reverse to the above-assumed condition, with the arrow on B as the supposed known point, the unknown point A will lie in the direction of the feathered end of the arrow (fig. 136-b).

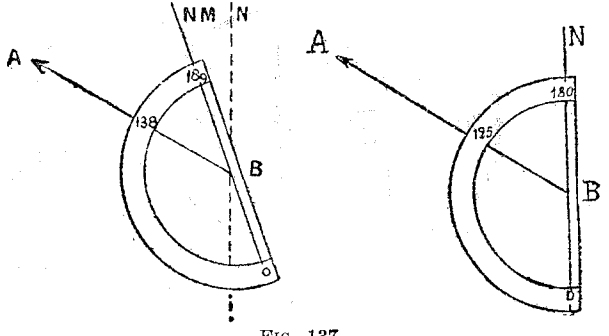


FIG. 137.

This method has a double advantage. It dispenses, first, with reading the angle; secondly, with the use of the protractor, a fragile instrument and a source of errors.

If one hesitates between two possible positions (p) of the protractor along the meridian of B (fig. 138), it will only be necessary to consider if the point A should appear east or west of the point B. Furthermore, in both positions the line 0–125° gives BA, or its prolongation.

These operations are the only two that can arise in the use of the compass and protractor.

The processes by use of location by direction and distance, intersection, bearings, and offsets are single, double, or triple applications of these two operations for establishing azimuths.

Sketching by compass.—It is beyond the scope of this Manual to insert in it an abridgment of topography. There will only be recalled the four operations that, combined with measurement by paces or tape, enable every officer and noncommissioned officer having elementary notions of geometry and drawing to execute a ground plan sketch of some value.

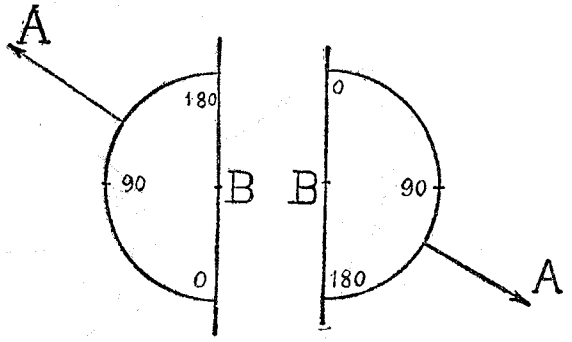


FIG. 138.

All sketches proceed from the known to the unknown. The known features constitute a skeleton, constructed in advance by enlarging an assemblage of points or lines taken from a good map of small scale; this skeleton is a sketch already established that we propose to complete or to extend beyond its present limits; it is also, if one has no anterior document, a *base* that is chosen arbitrarily, but sufficiently long, on the ground to be surveyed (on a road a right line if possible) and of which the length and azimuth should be measured with great care.

Knowing then at least two points of the terrain, their position on the sketch and the direction of the north, one of the four operations following will permit the deduction of certain others

successively from it, between which intermediate objects are sketched in from sight.

Location by direction and distance.—Knowing A, to locate B; being at A, take the azimuth of B, record it; measure AB, reduce to scale, from whence we have (b).

Intersection.—Knowing A and B, to establish c, take the azimuths AC and BC, their intersection gives (c). (Fig. 140.)

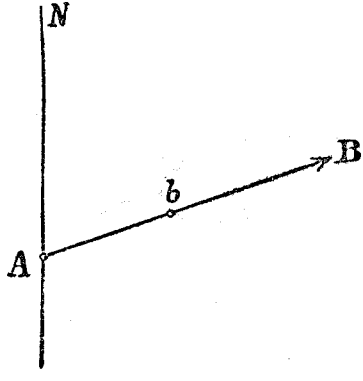


FIG. 139.

By bearings.—Knowing A and B, but being at C, to establish C, take the bearing CA and CB, plot them, their intersection will be (c). (Fig. 141.)

By resection.—Knowing that C is somewhere on the line AB, and knowing D, take its azimuth, plot DC; the intersection of DC with AB will be at (c). (Fig. 142.)

These operations require for precision that the construction lines intersect at nearly right angles. Points should be selected accordingly. Make frequent verifications by supplementary bearings or by distance measurements, and thus obtain three or

more intersections instead of two by which to locate the point sought.

The sketch completed and a fair copy made, draw the orientation arrow (N. S. or N. M.–S. M.); construct a scale, or, at least, write what it is; indicate the date of execution of the sketch, the name of the person who made it, any unusual signs or symbols employed.

State briefly the method employed in making the sketch, in order that the person using it may have an idea of its exactness.

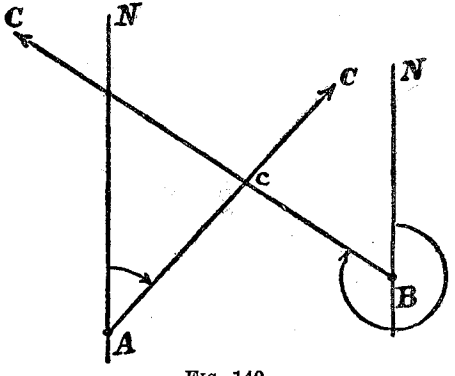


FIG. 140.

For example: Sketch by eye, distances estimated by the watch; or, plotted from paces and compass bearings, 2-inch compass; or, from map of 1/80000, enlarged and completed by sight, etc.

If it is a question of correcting an old sketch, note: "Date of last corrections, the _____."

Make the work legible. Do not exaggerate the size of conventional signs, which are always large enough when they are legible (width of roads, houses, etc.). Never forget for an instant, either in drawing or writing, that you are not working for yourself, but for others.

4. **The direction compass.**—The compass described above can serve as a "*direction compass*," as well as several different models constructed specially for this purpose (Rossignol compass, etc.). These other instruments are accompanied by explanatory notes the apparent complication of which sometimes

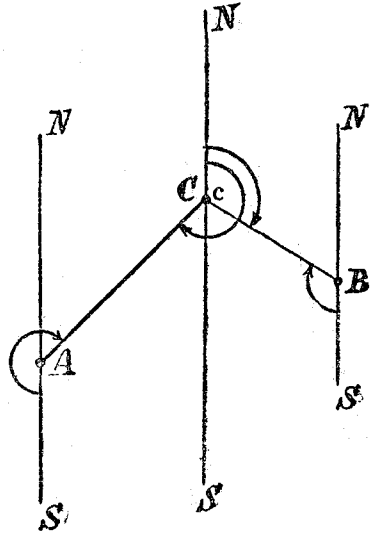


FIG. 141.

increases the difficulty. The problem can, on the contrary, be solved very simply by every officer and noncommissioned officer without having to remember anything from these notes. (Fig. 143.)

Trace in pencil the line (ab) on the map, and a magnetic meridian, if it is not already traced on the part of the map used.

Spread the map (on a table, the ground, a map case, after having folded the useless edges under). Place the compass on the map with the line 0–180 on the magnetic meridian and turn the map supporting the compass until the blue point is at 0. The map is then oriented. Without moving the map, place the com-

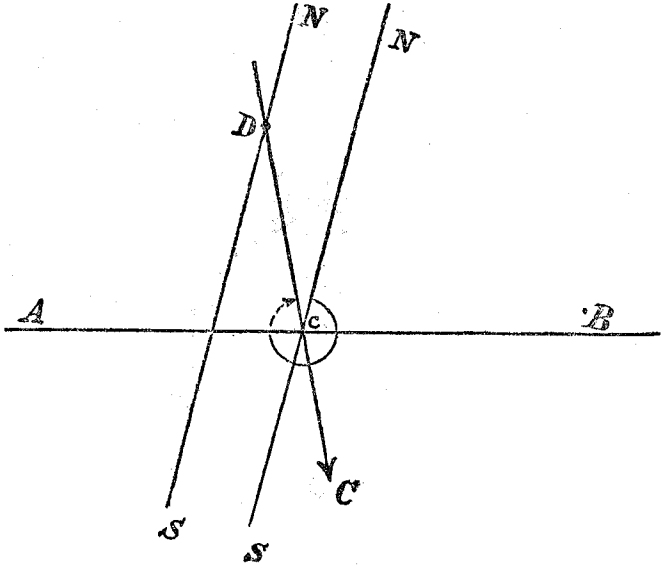


FIG. 142.

pass on the line (ab) and turn the black arrow so as to cover the line (ab), the blue point remaining at 0, and observe the compass division at which the black arrow points. In this situation it is evident that the black arrow points in the true

direction sought, at B. Now take up the map and the compass; it is evident that every time the compass is placed—no matter where, provided only that the arrow is at the same reading as before and the needle at 0—the direction sought will be again at the end of the arrow.

Similarly, the geographic meridian may be used to orient the map, in which case the needle is set to mark the declination

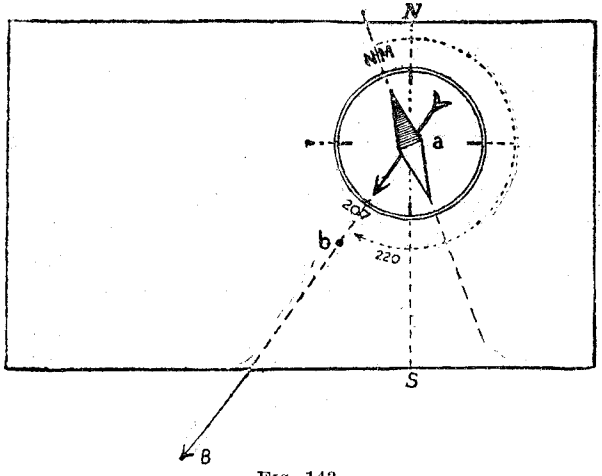


FIG. 143.

(13° to the west), and 207 is read instead of 226. The operation is therefore as follows: Without moving the compass, place the eye behind the arrow, and, if using it for determining successive points of direction, take the most distant ones possible in order to avoid needlessly repeating the operation.

5. **Maps and plans.**—A map differs from a plan in that its scale is too small for interesting objects to be represented on it

in their true size reduced to scale, for they would be imperceptible; a road 8 meters wide would, on a map of 1/80,000, be represented by one-tenth of a millimeter. Use is therefore made of conventional signs whose dimensions have no relation to the real size of the roads, houses, bridges, etc., that they represent. Scales most frequently employed for maps are: 1/320,000, 1/200,000, 1/100,000, 1/80,000, 1/50,000, 1/20,000.

On the contrary, in a plan of 1/2,000, for example, a road 7 meters wide will be represented by two lines $3\frac{1}{2}$ millimeters apart; that is, 7 meters divided by 2,000. The scale 1/10,000 marks the transition from maps to plans.

Maps and plans are executed by regular means and are based upon methodical measurements.

The term *sketch* should be applied to all representations of terrain executed rapidly and by the means at hand, sometimes even from memory and from information given without any guaranty of exactness.

The *reading of maps* can only be taught by practical instruction on the ground.

Orientation.—To orient a map is to direct one of its meridian or N. S. lines toward the true north and south. It is also to direct the line of the magnetic north of the map (when it has one) in the direction taken by the blue point of the needle. When the map is oriented all objects on the map are parallel to the real objects on the ground.

Orientation by the sun can be made (with errors of 10°) by knowing where one is, and also a distant visible point shown on the map, on which alignment is made, and by the pole star. Nothing equals a good compass.

Scales.—For any map, sketch, or chart, one should be able to determine at once its scale by the application of the following rule: *One millimeter on the map represents as many meters on the ground as there are thousands in the denominator of the scale.*

Examples:

$\frac{1}{20000}$, 1 millimeter represents 20 meters.
$\frac{1}{375000}$, 1 millimeter represents 375 meters.
$\frac{1}{2500}$, 1 millimeter represents $2\frac{1}{2}$ meters.
$\frac{1}{400}$, 1 millimeter represents 40 centimeters.

In the scale 1/80000, 1 millimeter represents 80 meters; 1 kilometer is represented by 12½ millimeters. The diameter of a 5-centime piece measures (to this scale) exactly 2 kilometers. The sheets of the map are 40 kilometers by 64 kilometers; quarter sheets are 10 by 32 kilometers.

The sides of the cadre are divided exteriorly into *degrees* and interiorly into *grades*. The *centigrades* of the vertical sides—that is to say, the meridians—are invariably 1 kilometer apart. Do not confuse with the centigrades of latitude (horizontal sides of the cadre), which vary in length according to their distance from the pole.

Finally, for rapid estimates one should be able to estimate a kilometer by means of the width of the finger, the length of a finger nail, etc., conveniently standardized.

CONVENTIONAL SIGNS EMPLOYED OBLIGATORILY ON MAPS OF SCALE OF 1/5000 AND LARGER.

(Sketches, reports, etc.)

Projected trenches or approaches.
The same, commenced and partially serviceable.
The same, finished and occupied.
The same, deteriorated and become unserviceable (partial erasure of preceding conventional sign). Trenches in red or black ink. Approaches in green or black pencil.
Subterranean communication.
Elevated trench, with gabions.
Compulsory direction of movement.
Small post; barricade or defensive traverse.
Footbridge. Steps.
Wire entanglement, attached to posts.
Brun entanglement. (Wire in collapsible spirals.)
Other accessory defenses.
Command post of a battalion commander (or colonel or general).
Command post of a company.
Telephone station.
Telephone line.
Visual signal station.
Relay of runners.

1716—17. To face page 130.

Fig. 65a.

Depot of cartridges, grenades, and bombs (trench weapons).
Depot of materials and tools.
Depot of food.
Watering place.
Dressing station.
Bomb-proof shelter No. 7, for 12 men.
Light shelter No. 4, for 20 men.
Observing station.
Machine-gun emplacement, occupied.
Machine-gun emplacement, prepared.
Casemated shelter for machine gun, occupied.
Casemated shelter for machine gun, prepared.
Trench artillery and appliances, emplacements occupied (by three 58 mm., two 37 mm., and one pneumatic).
Same, prepared (for two 240 mm.).
The corresponding works as shown above, but under construction.
Emplacement for automatic rifle.
Rifle grenade battery (of 4 V. B. rifle grenades).
Battery (two 120 mm. and four 75 mm.).
Edge of a wood.
Drain for the disposal of water.
Limits of districts or subdistricts.

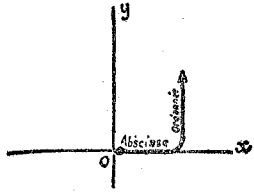
NOTE.—Demolitions are shown in yellow crayon.

Designation of objects on checkered maps.—Guide plans and maps of scale 1/50,000 which are in observation stations and command posts (C. P.) are divided into kilometer squares, the lines being drawn from a single point of origin for the entire territory. By *abscissa* is meant distances measured along the axis X, to the right or left (see fig. 144), and *ordinate* is the term applied to distances measured along the axis Y, above or below the origin of coordinates.

To describe a point on the map by means of these kilometer squares it is *necessary* to proceed as follows: First designate the square by the coordinates of its S. W. angle in the order—abscissa, ordinate:

33 28

then definitely locate the object (or point) by adding to each of the kilometric coordinates the hectometric coordinates, always



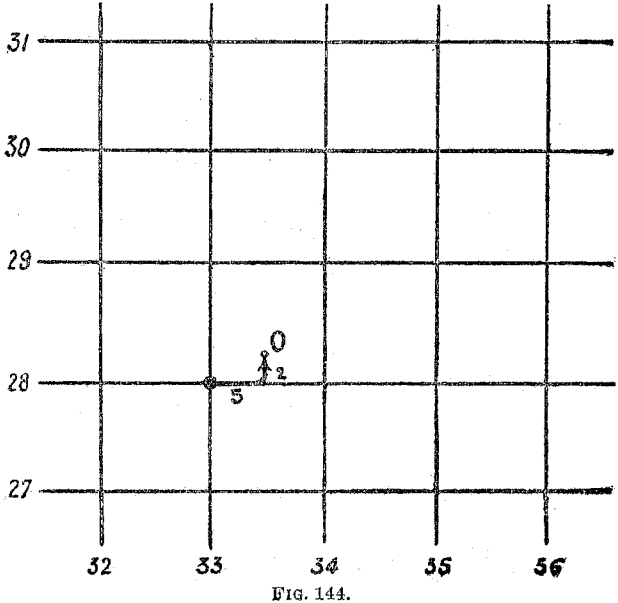


FIG. 144.

in the order—abscissa (left to right), ordinate (in the direction from bottom toward the top;

335 282

When it is not possible to make a mistake of 10 kilometers the first figure in each group may be omitted.

The objective 0 is then designated by the number 3582.

This designation indicates a region only 100 meters on a side in which the point is found, and permits its ready location on the guide chart. It is too inexact to give to artillery the exact position of a new objective precisely located by an infantry observer and not yet placed. In this case recourse should be had to a large scale plan (1/5,000 and upward), on which the position of the observed point should be indicated in pencil.

Every officer should know how: First, to locate on the guide plan any point whose coordinates are given him; second, to find the coordinates of any point whatever that is not already numbered on the guide plan. It will ordinarily be his only means of locating with some precision a point to which he wishes to attract attention.

CHAPTER XII.

TRENCH WEAPONS OF LOW POWER.

Trench artillery includes *low-power weapons* served by infantry detachments called "sapper-bombardiers," and *high-powered weapons* served by the artillery.

The principal low-power weapons in service are the *pneumatic howitzers of 60 millimeters (2.362 inches) caliber and* the *D. R. bombard.* The pneumatic howitzers include: The Brandt howitzer, model 1915; the type B howitzer, model 1916 (light Brandt); the type D. M. howitzer, model 1916 (Dormoy-Chateau).

The *note on the organization and use of infantry bombers* gives the details of the arrangements of a battery and will serve as a basis for the installation of all types of howitzers, provided they are reinforced considerably, for the protection indicated has become very insufficient.

It is especially necessary to bear in mind that *the platform is the vital part of a battery;* badly installed, it quickly becomes unserviceable. Every chief of platoon should give his assistance to the organization and solidifying of the emplacements constructed in his neighborhood. *There are never too many emplacements prepared in advance* with a view to securing to these batteries the mobility necessary to escaping reprisals and frustrating the enemy.

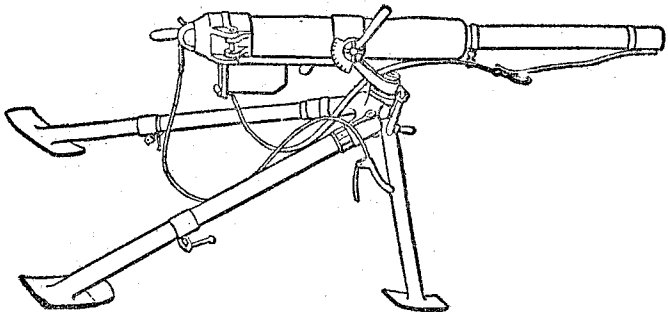


FIG. 147.—Brandt howitzer, type 1915.

1. *Pneumatic 60 millimeter (2.362 inches) howitzer (Brandt), model 1915* (fig. 147).—The compressed-air howitzer is composed of a *tube* of 60 millimeters (2.362 inches) interior diameter, the *annular reservoir*, and the *movable breechblock.*

On the part carrying the breechblock hinge are *two threaded orifices* for the coupling of air-supply tubes and also a safety plug.

Feeding is accomplished by air pumps or by tanks of compressed air. By using tanks, a rapidity of fire of eighteen shots per minute can be attained.

Personnel.—One chief of piece and observer, one gunner, one loader. Action: Give the elevation; connect the howitzer to the

pumps or tanks; take the projectile, wipe it, set the fuse, load, close the breechblock; introduce the air until the pressure gauge on the feed tube indicates the desired pressure; discharge the piece by working the sear with the finger or with the "Bowden" (pliable arrangement for controlling a bicycle brake).

Adjustment.—Variation in range is obtained by changing the elevation (angle of fire) and the air pressure in conformity with a table that is added to the equipment. The pressure varies from 4.4 to 33 pounds; the angles employed are 20°, 30°, 42°, and 60°; the angle 42° is most used. The accuracy is good. Bracketing is accomplished by changes of 2.2 to 4.4 pounds of air pressure. In enfilade fire one can almost at once get on a trench 1 yard wide up to range of 160 yards. Accuracy decreases normally with the range and very rapidly from 219 to 1,094 yards. The safety valve functions at a pressure of 33 pounds.

Recommendations and instructions.—Discharge first without a projectile to assure everything being in working order. Read very carefully the pressure gauge; if the pressure has been exceeded raise the valve or let a little air escape by slightly opening the junction of the rubber tube. Never put oil on the rubber hose joints. Weight of the piece, 48.4 pounds. Weight of the tripod, 35.2 pounds. Weight of the box of accessories with four pumps, 70.4 pounds. Projectiles, type A, model 1915, or type B, model 1916, described later.

2. *Light Brandt howitzer, model 1916.*—Same *discharge tube* and same *annular reservoir*, as the preceding, but with fixed breechblock and *loading at the muzzle.*

The piece fires at a *fixed angle* (42°) from an aluminum support to which it is rigidly attached. The entire weight is 35.2 pounds, and it is easily transportable in an attack. (Fig. 148.)

Aside from loading at the muzzle, the manipulation of the piece is the same as for the model 1915 firing at a constant angle. Assure yourself that the projectile has fallen to the bottom of the bore. Do not push it, if it has to be pushed, until you have put the pressure gauge at 0°. A graduated sector and a clamp screw assure the horizontal direction of the piece. The breechblock can be unscrewed for the purpose of extracting a projectile of improper caliber that can not be pushed to its proper seat.

3. Pneumatic D. M. howitzer, model 1916 (Dormoy-Chateau).—Light howitzer (33 pounds) having about the same characteristics as the preceding: Muzzle loader fires at a fixed angle

FIG. 148.—Carrying the light Brandt.

with variable pressure; very light-jointed chassis, but with little facilities for correction of direction. (Fig. 149.) Fires by pump or tank. The original feature of this engine is that the gas

check is at the muzzle; the air compressed in the reservoir by the pumps is forced into the discharge tube both in front and in rear of the projectile. When the desired pressure is attained, the gas check is unbolted by means of a lanyard; the pressure in front of the projectile at once falls, and the latter is expelled by the mass of expanding air behind it.

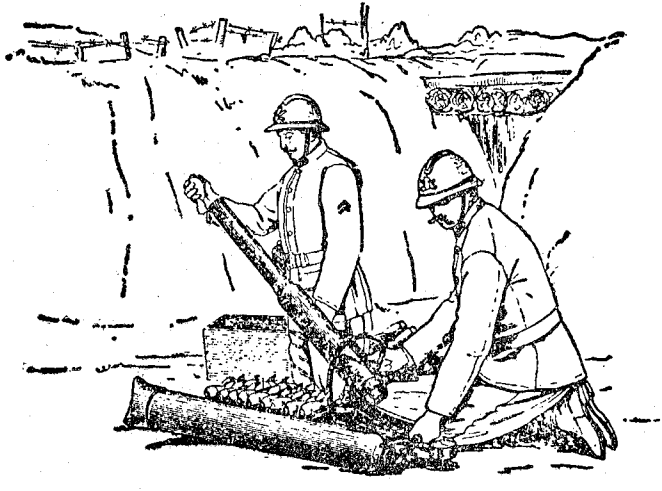


FIG. 149.—Light Brandt. Fire by tank.

The three pneumatic howitzers of 60 millimeters (2.362 inches) caliber fire the two following projectiles:

4. **Projectile, type A, model 1915.**—Cast-iron shell interiorly prepared for fragmentation, weighing 2 pounds, 1 ounce, 221 grains, of which 4 ounces, 102 grains is explosive; length, 8.26 inches; fish shape, rear feathering of four sheet-iron guide wings. Percussion fuse functioning by inertia; security assured

by a pin traversing the fuse, and that must be removed before firing. In addition, the fuse is protected by a cap that can not

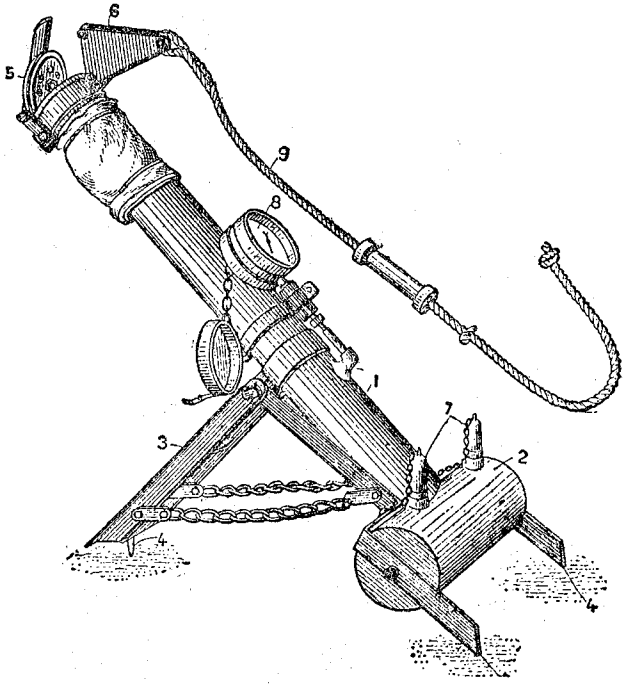


FIG 149a.—Dormoy-Chateau howitzer.

be removed, but that can be given a quarter turn after having removed the pin, in order to mask the holes in the fuse through which this pin passed. The general appearance is that of type

B (fig. 149b) somewhat elongated. Charged projectile painted blue. Practice projectile painted red.

5. **Projectile, type B, model 1916** (fig. 149b).—Shorter and lighter than type A, 1 pound, 6 ounces, 404.5 grains of which 3 ounces, 76.2 grains are of explosive. Greater range; similar effects. Safety is insured by the fact that the firing pin does not project far enough to reach the primer. But a wire is wound around the shank of the firing pin like a thread around the

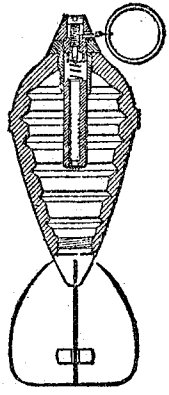


FIG. 149b.—Projectile of 69 millimeters (about 2.75 inches), type B, 1916.

spindle, and when one jerks the ring shown in the figure the firing pin turns and advances in a screw hole in the cap of the fuse and thus acquires the projection necessary to become active. Pull the ring straight so as not to break the wire. The same distinctive colors as for type A.

6. **D. R. Bombard.**—This engine is composed of a metallic base, on which are disposed 4 gun barrels, model 1874, with a breech casing. These barrels are truncated to 15¾ inches, or thereabouts, from the beginning of the chamber and close her-

metically. On each one are brazed two mandrels for the projection of the D. R. grenade. Firing is accomplished by means of a lanyard that simultaneously pulls the four triggers; eight D. R. grenades are thus projected at once. The cartridge is that of 1874, charged with smokeless powder. The range obtained is superior to that obtained by the gun (about 435 yards, as against 390 yards).

CHAPTER XIII.

VARIOUS MATÉRIEL USED IN THE TRENCHES AND IN THE ASSAULT.

1. **Wire-cutting apparatus.**

2. **Individual parapet shields** (fig. 150).—Of special sheet steel, used in the trenches either as a head shield with loophole

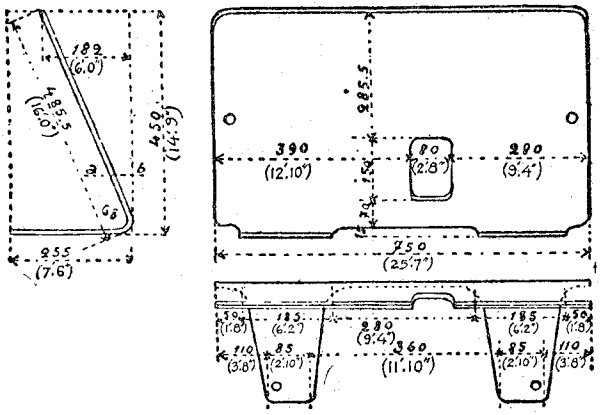


FIG. 150.—Individual parapet shield.

or as a sloping shield with the feet planted in the wall of the parapet. The type usually used has a thickness of 11½ millimeters (0.45 inch) and weighs 30 kilograms (66 pounds). It is

proof against the S. bullet at all ranges and against the S bullet inverted at 33 yards. It is not proof against the S. M. K. bullet fired at 33 yards, but this bullet is stopped when the angle of incidence exceeds 15°.

3. **Individual offensive shield** (fig. 151).—Of special sheet steel, lighter than the parapet shield. While intended to be used on the open ground it is often used in the same manner as the first. Moreover a continuous screen of these shields may be used as protection in beginning a trench. Protection against

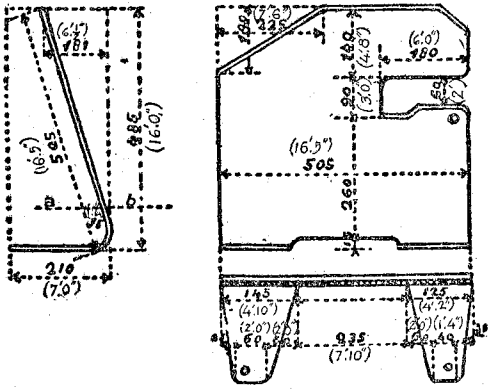


FIG. 151.—Individual offensive shield.

S. bullets at all distances; against S. bullets inverted at 55 yards. Weight, 15 kilograms (33 pounds); thickness, 7 mm. (0.27 inch).

4. **Shield of steel and sand** (fig. 152).—Proof against the German bullet at 22 yards is used to increase the protection for riflemen behind a parapet.

5. **Individual rolling shield** (Walter).—A small bombproof, mounted on two wheels, capable of being directed from inside by a man kneeling who can thus approach a shelter, wire entanglement, or an enemy's trench and fire or observe through

two holes fitted with moveable shutters. A windlass may be added, which will permit the operator to receive explosives from the departure trench and will aid him in returning. The plates protecting the head and chest furnish protection against the K. (perforating) bullet, the rest (wheels, shutters, sides, and roof) against the S. bullet, even when inverted, and against the K. bullet when the angle of incidence is under 50°. It can be transported dismounted by two men for the shield folded and one man for the wheels. (See the Instructions for the individual rolling shield, approved Feb. 20, 1916.)

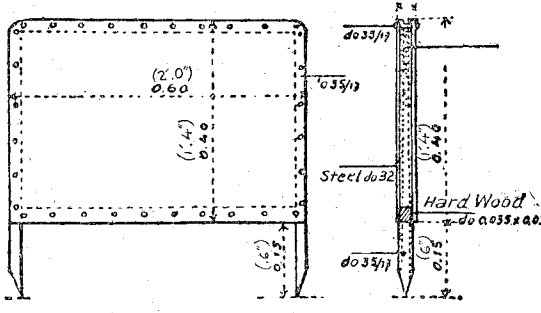


FIG. 152.—Shield of steel and sand.

6. **The Blazdix shield.**—An assemblage of two gun shields and one rifleman's shield, which will furnish protection for a machine gun and two operators. Total weight, 54 kilograms (about 119 pounds). This is completed by a wheeled truck for the machine gun, weighing 16 kilograms (35+ pounds). It is designed to become the normal means of protection for machine guns.

7. **Cired type of lookouts cover** (fig. 153).—Two models weighing 16 and 32 kilograms (35+ and 70+ pounds); plates of 8 mm. and 12 mm. thickness (0.312 and 0.47 inch).

8. **Shelter for lookouts, type S. T. G.** (fig. 154).—Three models weighing 25, 32, and 40 kilograms (55, 70+ and 88 pounds). Protection the same as for parapet shields.

9. **Demountable armored shields for observers.**—There are three types: S. T. G., Saint-Jacques, Saint-Chamond. The first two are truncated cones, made up of sides and roof clamped together. Each element weighs less than 70 kilograms (154 pounds) and is proof against the armored bullet at 33 yards and

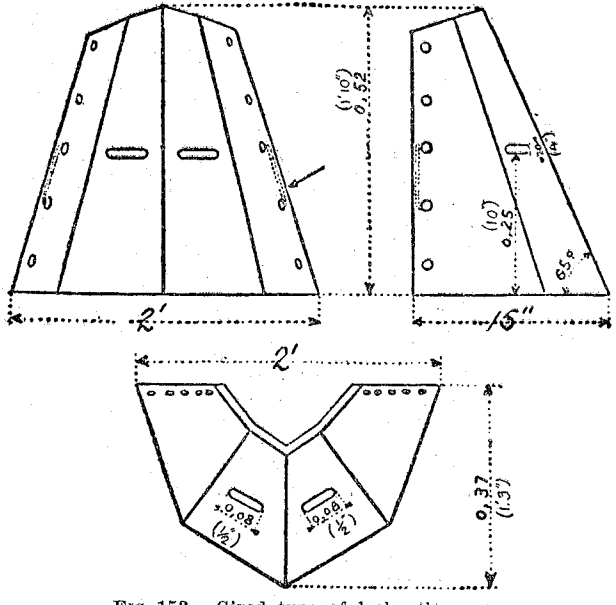


FIG 153.—Girod type of lookout's cover.

against single shots from the 37-mm. gun at 109 yards. The Saint-Chamond shield is a truncated quadrangular pyramid, the faces being joined at the edges. Each element weighs less than 70 kilograms (154 pounds) and will resist the armored bullet at 33 yards.

10. **Browning.**—See "Automatic pistols," Book III, Chapter I.

11. **Shotgun.**—The 12-gauge gun firing 0 buckshot is as formidable as the rifle up to 38 or 44 yards, and gives much

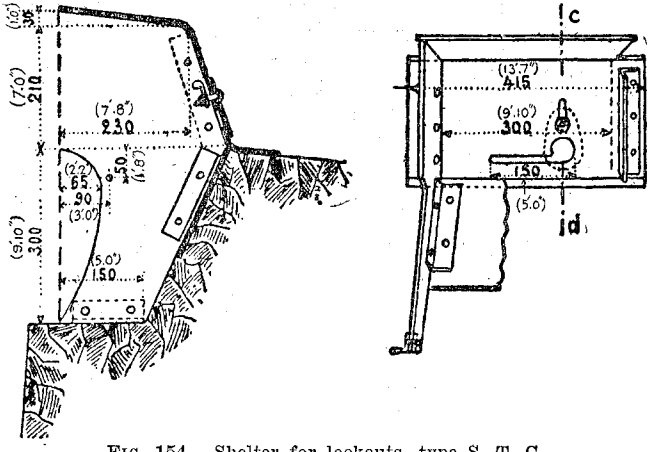


FIG. 154.—Shelter for lookouts, type S. T. G.

better chances of hitting the target in a single shot. It is the arm for night patrols and for surprises.

CHAPTER XIV.

PROTECTION AGAINST ASPHYXIATING GASES.

In the zone fixed by the commanding officer, a zone which may extend to several miles from the trenches, every one should always carry the mask M. 2 or TNH. Its use is taught

by means of frequent drills, carefully following the directions contained in the "Note of April 1, 1916, on the protection against asphyxiating gas"; this is emphasized by passing through a gas chamber; the chiefs of platoons should keep a list of all men who have not yet been through the test of the gas chamber and see that it is carried out. They should realize that they are responsible for the instruction of their men on this special point, and they should see that all the means of protection are always in perfect condition; they should insist that all their men, and particularly those who are off by themselves, should always be provided with their masks.

The following principles should be remembered:

First. The individual apparatus is the only real preventative. Its efficacy lasts several hours, after which it should be replaced.

Second. No individual apparatus is efficacious if it has not been perfectly adjusted beforehand, if it is not hermetically sealed.

Third. No apparatus is efficacious if it is not ready to be put in place quickly when the need arises. One should verify by alarms that there has been no relaxation in precaution, and that the protections prepared beforehand work quickly and properly.

Fourth. All wetting of masks is expressly forbidden.

Fifth. During a gas attack never allow the masks to be removed prematurely.

Sixth. Keep a careful watch at all times for particular manifestations on the part of the enemy indicating a gas attack (metallic noises, small balloons, etc.). When the wind is favorable redouble the attention and be ready for instant action.

The main body should be notified of any sign of unusual activity on the part of the enemy.

1. **Mask M. 2 or TNH.**—This presents the advantage of having only a single apparatus to put on to protect both the eyes and the lungs. It is made in one regular size, adjustable to the majority of heads, and two extra sizes for heads of abnormal conformation. The translucent substance does not stand washing. In the model with two separate eyepieces the translucent plate is protected by a glass plate, the inner face of which sometimes becomes covered with moisture; if it is known beforehand that the mask must be worn for some time, the glass plates should

be removed before using, after making sure that the seating of the plate that remains is sufficient to properly seal it. Every mask with a cracked plate should be replaced. The men should be warned against touching the translucent plates, which are fragile, especially after having been dampened by respiration.

2. **Draeger apparatus.**—An apparatus composed of a bottle of oxygen, a respiratory sac, a cartridge of potassium to absorb the carbonic acid expelled from the lungs, and a flexible tube with a rubber mouthpiece (two bottles and two cartridges for renewal). Breathing is done through the mouth, the nose being closed by a clip. For instructions as to use, see the note of April 1, 1916. It is serviceable for a half hour if the initial pressure of the bottle of oxygen is 330 pounds. It is forbidden to exhaust it prematurely under the pretext of testing it, or even to uncork prematurely the bottle. The Draeger apparatus is suitable for the equipment of life savers having received a special training.

3. **Eyepieces and antimoisture chalk.**—Rubber spectacles, hollowed out and forming a mask or pneumatic spectacles, are the habitual complement of the Draeger apparatus. Antimoisture chalk is employed on ordinary glass plates; it is useless on those of antimoisture glass (recognizable by being mounted in aluminum ring having serrated edges). To clean the translucent plates rub lightly the part turned toward the eye with the chalk, spread it with the finger, rub with a dry cloth, removing all signs of the chalk, until the surface becomes bright again.

4. **Tissot apparatus.**—The Tissot apparatus is a filtering apparatus and not one producing oxygen; it is a more perfect mask than the M. 2, and has no similarity to the Draeger, which it can not take the place of, and which alone makes it possible to breathe in an atmosphere devoid of oxygen. The Tissot mask is efficacious for some dozens of hours, if it has been properly taken care of. It is an apparatus of the sector, to be used in command posts, in support positions, in machine-gun shelters, in observation and signal posts; it is suitable for everyone required to remain for a long time in a noxious atmosphere not deprived of oxygen.

5. **Atomizers.**—Apparatus for collective protection: The directions for operating are generally pasted on each apparatus. For method of using, see note of April 1. Solution for the

atomizer: 9 cups of clean water, 2½ cups of carbonate solvay, or 6½ cups of crystallized carbonate, 2 cups of hyposulfite of soda. Should be prepared in advance and kept well covered and should not be poured into the atomizer until the time for using.

These apparatuses are delicate and do not work unless held properly and manipulated by men who have been exercised in their use. They will not neutralize a wave of gas, but serve during the attack and in a closed shelter to keep the canvas of the shelter wet or to absorb the gas which has filtered through the cracks; after the attack they serve to purify the air in the shelter and even in the trenches.

The solution given above freezes at a temperature of —3° The solution given below is less efficacious, but does not freeze until a temperature of —6° is reached: 15 cups water, ½ cup hyposulfite, 1 cup of carbonate solvay, 2 cups common salt.

It must be remembered that gas always has the tendency to sink, and that it is there (in hollows and low ground) that it must be fought.

6. **Protection of shelters.**—To protect a shelter, prepare in advance a panel of canvas made waterproof (parrafin, linseed oil, paint) or impregnated with hyposulfite, by which the entrance may quickly be hermetically closed. Put up as soon as possible a second canvas from 20 inches to 1 yard from the first. Keep dampened by the atomizer, worked from the interior. If nothing better is at hand, use the men's blankets.

7. **Special methods.**—The collective methods which follow give only relative protection: *Fire barrier:* The burning of dry material giving a line of high and hot flames and little smoke may, under favorable circumstances, lift the wave of gas when it arrives at the trench. If possible, two barriers close together should be prepared, one on the parapet and the other on the reverse slope. Volatile oil is more suitable than petroleum or other oily combustibles. *Isolated fires:* These can protect fairly well particular points, such as the entrance to a shelter. They are valuable for purifying the air in the trench and shelter after the passage of the wave of gas. Black-powder bombs or shells, explosive shells, machine-gun fire, throwing of incendiary grenades, etc., have no effect on a wave of gas.

8. **Protection against carbon dioxide.**—Gas from the enemy is not the only danger; carbon dioxide, produced by our own cartridges, is another in closed casemates. A single cartridge (1886) produces almost a quart of carbon dioxide. The gas escaping from the mechanism of a machine gun varies from one-sixth to one-tenth of the gas produced; the air in a shelter, 20 square meters (215 square feet), thus becomes poisoned after 250 to 300 shots, if the escape of gas takes place in the interior of the shelter.

The employment of a flash concealer also conserves gas in a shelter. It is necessary therefore to arrange the machine gun in such manner that the orifice for the escape of gas is outside the shelter or to assure a good ventilation of the shelter. It must also be remembered that the mask M. 2 and Tissot mask furnish no protection against carbon dioxide. They should never be employed as means of rescue following shell explosions or in a mine chamber; recourse must be had to the Draeger to penetrate into places devoid of oxygen or saturated with carbon dioxide.

CHAPTER XV.

EFFECTS OF PROJECTILES.

PENETRATING EFFECT OF GERMAN BULLETS.

The Germans use:

First. The S bullet, either direct or inverted; the inverted bullet is particularly efficacious when fired at short distances against homogeneous steel shields.

Second. The perforating bullet with steel core SMK, especially for fire against shields.

Table I gives the necessary thickness of different material to furnish protection against single S bullets (direct or inverted) at all distances.[1]

---

[1] Greater thicknesses are required against a prolonged and regulated fire. Complete protection requires a parapet of at least 31½ inches of earth or a brick or rubble wall 14 to 16 inches thick.

TABLE I.

Nature of obstacle.	Thickness.
	Inches.
Clay	28
Wet earth, not packed	20
Wet earth, packed	16
River sand	12
Oak wood	20
Spruce	28
Brick and rubble walls	9
Manure	40-50
Packed snow	100

Table II gives the thicknesses and composition of certain systems of simple shelters which will resist the fire of the S bullet, either direct or inverted, even at short ranges.

TABLE II.

Character of protections.	Total thickness in inches.
Ordinary soft steel, in one plate or several plates placed together (S direct only)	½+
Ordinary soft steel, three plates of ⅛ inch separated by intervals of ¾ to 1¼ inches	[1] 2.362-2.786
Ordinary sheet iron and wood, oak planks, 1¾ inches thick between two plates of ½ inch	[2] 2.16
Pine planks, 2.36 inches thick, between two ¼-inch plates	[2] 2.75
Two oak planks 1.06 inches each between two plates, the front one 0.093 inch and the rear one 0.157 inch thick	[2] 2.375
Ordinary sheet iron and sand, 1.575 inches of sand or fine gravel between two plates, the front one 0.098 inch and the rear one 0.157 inch	[2] 1.83
Wood and sand, 3.937 inches of sand between two oak planks 1.06 inches each, or a pine plank of 0.984 inch in front and one of 2.36 inches in rear	6.30-7.87

[1] One-half being metal. [2] About.

NOTE.—When a shelter is composed of several plates of metal, with or without a filling between, the thinner plate must always be placed in front.

Experiments made firing against special steel armor plate have given the following results:

S bullet, direct: Plate of .197 inch can be perforated up to 174 yards; plate of .275 inch resists penetration beyond 27 yards; plate of .315 inch resists at all distances.

S bullet, inverted: Plate of .275 inch can be perforated up to 55 yards; plate of .315 inch can be perforated up to 27 yards; plate of .394 inch can be perforated up to 22 yards.

SMK perforating bullet: To resist the SMK perforating bullet at 55 yards, under the normal angle of incidence, a thickness of .55 inch of special steel is necessary. But the resistance of steel plates increases rapidly with the angle of incidence of the bullet. Table III gives the angle of incidence beyond which protection is obtained, for different thicknesses, against perforating bullets fired at a range of 33 yards.

TABLE III.

Thickness of plates of special steel.	Angle of incidence.
	°
.275 inch to .2945 inch	40
.315 inch to .3345 inch	30
.394 inch to .4135 inch	20
.433 inch to .473 inch	15

These conditions are practically satisfied with the different types of individual and parapet shields.

EFFECTS OF ARTILLERY FIRE.

TIME-FUSE PRACTICE.

(*a*) *Shrapnel.*—The sheaf of shrapnel balls (fig. 155) is a solid cone with a small dispersion of only about 15° to 20°. The penetration of the bullets in different materials is much less than that of rifle bullets.

In the waiting position the defenders close up to the interior slope of the parapet of a trench have nothing to fear from shrapnel.

In the firing position the upper part of the body is exposed. In order to be able to fire while under shrapnel fire, it is necessary to furnish the parapets with special arrangements which protect the head and shoulders of the firers, but which will not reveal the presence of the trench at a distance.

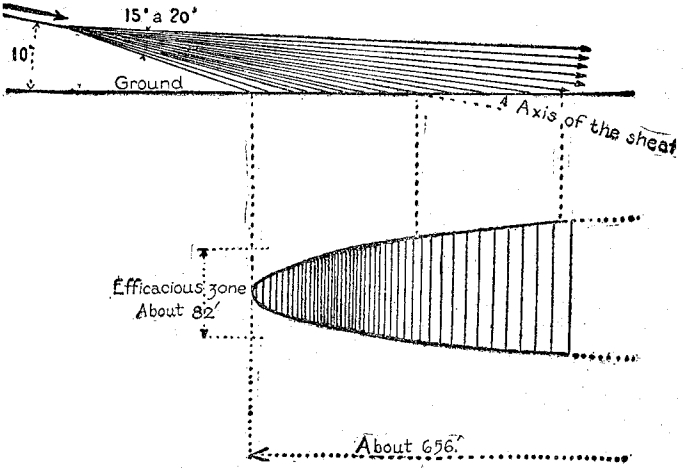


FIG. 155.—Sheaf of shrapnel bullets.

(*b*) *Explosive shells.*—These shells give a hollow and very open sheaf. The fragments are numerous and irregular; they have a high initial velocity but lose it rapidly; their penetration is slight.

When the shell bursts at a good height the result is a sort of vertical blow, like that of an ax, the effect being considerable but of small extent.

The explosive shell of a German field gun can reach men defiladed up to 60° by the crest of the cover. (Fig. 156.)

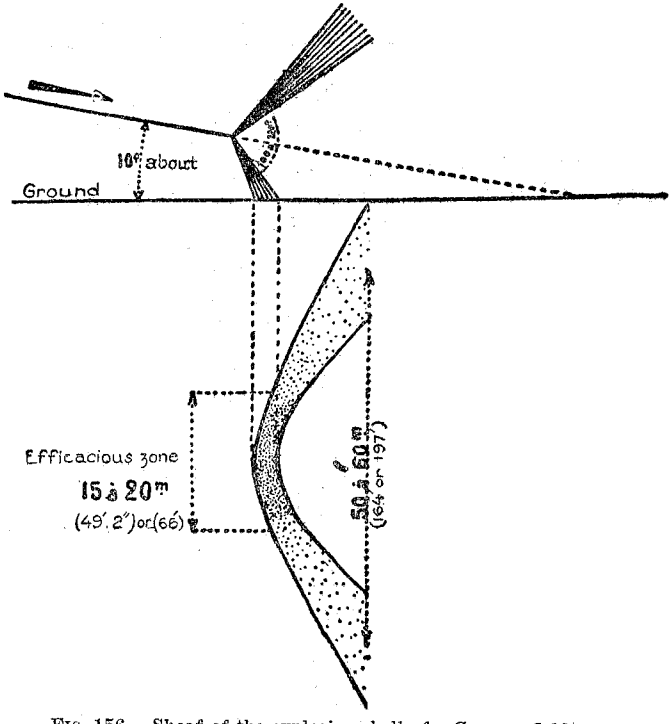


FIG. 156.—Sheaf of the explosive shell of a German field gun.

The projectile of the light howitzer of 105 mm. (4 inches), whose sheaf is even more open and whose trajectory is more curved, even sends fragments to the rear. (Fig. 157.)

As a result, even in the waiting position, the defenders of a trench may be reached by this fire if they are not protected by some overhead cover.

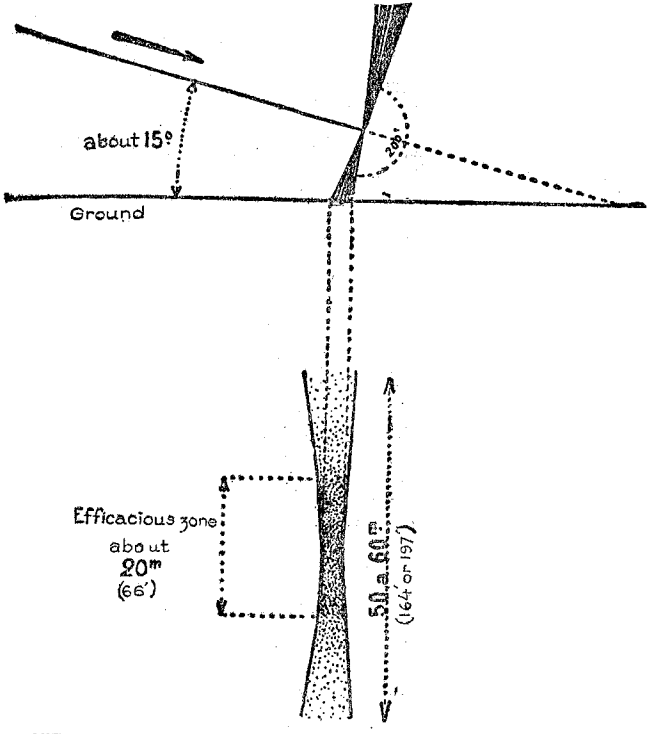


FIG. 157.—Sheaf of projectile of the light 105 mm. (4-inch) howitzer.

Moreover, every trench should be provided with a parados against the fragments flying to the rear. However, it must be remarked that to be efficacious, the fire requires great precision in range and elevation and consequently good observation of the shots, without which, to obtain appreciable effects, a great expenditure of projectiles will be required.

PERCUSSION FIRE.

A thickness of 2½ to 3 meters (8½ to 10 feet) of ordinary earth is sufficient to withstand a prolonged fire with percussion shell from the German field gun.

Field artillery can certainly open breaches in trench parapets, but the complete destruction of any considerable length of parapet is only possible with an enormous expenditure of ammunition.

The action of the shell of the 105 mm. (4 inches) and of the 15 cm. (6 inches) is more powerful; it is sufficient to perforate up to about 2,000 meters (2,188 yards) the covering of a light shelter (layer of logs 0 m. 20 (8 inches) covered with 0 m. 30 (1 foot) of earth; but it is not efficacious against the roof of a reinforced shelter composed of two layers of logs and two layers of earth of the above thickness

Table IV indicates the thickness necessary to resist field artillery fire:

TABLE IV.

Kind of fire.	Earth.	Brick masonry.	Wooden roofing.
Field gun:			
Bullets and fragments	16 to 40 inches	9 inches	3 inches.
Percussion shell	3 feet 4 inches to 6 feet 8 inches.	3 feet 4 inches	Do.
Light howitzer:			
Bullets and fragments	3 feet 4 inches	9 inches	6 inches.
Percussion shell	10 feet to 14 feet	6 feet 8 inches [1]	Do.
		3 feet [2]	Do.

[1] Direct fire. [2] Plunging fire.

ARTILLERY FIRE AGAINST WALLS AND HOUSES.

In walls of usual thickness percussion shrapnel and explosive shell make a hole of about 0 m. 40 (16 inches) and burst after having gone through the wall. The first, on account of its narrow sheaf, causes less loss than the second to the defenders behind the wall. Men behind a second wall are safe from danger. The destruction of a considerable length of wall requires a large expenditure of ammunition and an accurate fire.

The heavy 15-centimeter (6 inches) howitzer and the heavy caliber guns cause considerable damage to houses. Besides the material effects produced by the shock of the projectile or by the bursting of the shell they are susceptible of destroying by the blast the upper stories of houses, but the cellars generally remain uninjured.

ARTILLERY FIRE AGAINST WIRE ENTANGLEMENTS.

About 150 explosive shells from a field gun are sufficient to make a breach of 5 to 10 yards in length in a wire entanglement 20 to 25 yards wide at 3,800 yards. The same effect is produced by 75 shells of the 155 mm. (about 6 inches). At 6,600 yards double the number of shells are required to produce the same result. An explosive shell of the 75 mm. (3 inch) gun destroys from 10 to 12 square yards of the Brun spiral.

CHAPTER XVI.

INFORMATION CONCERNING THE "75."

Rapid-fire gun, caliber 75 mm. (3 inch) for light batteries and horse batteries. Gun is handled by six cannoneers. Carriage with shield, immovable during fire. Has a hydropneumatic recoil brake which brings the gun back to its original firing position. Weight of gun alone, 460 kilograms (1,015 pounds). Piece in battery, 1,140 kilograms (2,514 pounds). Weight of caisson (96 rounds), 1,200 to 1,300 kilograms (2,646 to 2,866 pounds), according to the kind of ammunition carried (shell or

shrapnel). Capacity of limber, 24 rounds. Supply for each gun of the battery, 312 rounds. Limit of graduation of the sight, 6,000 yards. Extreme range, 9,300 yards.

Front covered by a battery at medium ranges: Firing with time fuse without sweeping, 110 yards; firing with time fuse sweeping, 220 yards; firing with percussion fuse, width of obstacle of 27 yards.

To set and release the brakes.—When firing (in firing position) the carriage is secured on the ground by the trail spade and the wheel brakes, which consist of two metal plates or shoes, fitted on their underside with a spade parallel to the axis of the carriage. Before firing it is necessary to place these plates on the ground and mount the wheels on them by moving the piece slightly to the rear. An arrangement of a pivoting lever, engaging with the teeth of a rack placed under the carriage, allows the raising and lowering of the trail. This operation is called setting the brakes. It is then secured to the ground at three fixed points and is ready to fire. When the piece is in the firing position, in order to move it it is necessary to release the brakes. Circumstances may arise when an officer or a noncommissioned officer of infantry will have to move a piece by hand, or even to remove it and join it with its limber or other vehicle. He will not be able to do this unless he has learned how to *release the brakes;* the immovable piece will resist all his efforts and ingenuity. Every officer should take advantage of the presence of a battery near him to learn practically—first, to release the brakes; second, to dismount and to disable a "75."

To disable.—A strong steel bolt called a key unites the piece and its recoil check. If this key is removed, the piece becomes useless. If, besides this, a projectile is fired, the gun, not being held securely, is torn from the carriage under the influence of the recoil and is thrown to the ground some distance to the rear. An officer or a noncommissioned officer of infantry may have to take this action at a critical moment. Another method of disabling a piece has been explained in the chapter on explosives.

PART IV.

MISCELLANEOUS INFORMATION WHICH THE CHIEF OF PLATOON SHOULD POSSESS.

CHAPTER I.

PRINCIPLES.

The military education of the commander of any grade is based upon a few principles, which should be known to all. These principles are as follows:

ENERGY.

Energy is the most important of soldierly qualities. From it spring bravery, fortitude, self-sacrifice, discipline, and devotion to duty. It is the energy of the leader and of his men which enables them to carry a fight to a finish and which brings forth the highest acts of heroism. When the leader is considering various courses of action he will be sure to be right if he decides upon the most energetic.

UNITY OF ACTION.

In order to defeat the enemy we must strike hard, as hard as possible and all together. One can never be too strong, either in attack or defense. A good chief of platoon gets all of his men into action and leaves none of them idle during critical moments. If he loses touch with adjoining troops and has no orders, he will go wherever fighting is going on and place his platoon at the disposition of the commander.

SURPRISE.

An attacking force will attain the greater results in proportion as its action is unexpected by the enemy. The advantage of surprise should always be sought for. Surprise is obtained by a combination of two essential conditions—*secrecy* in preparation and *celerity* in execution.

SECURITY.

On the other hand, we must avoid being surprised. It is a fundamental duty of the commander to provide for the security of his men in every direction in which the enemy may appear.

The above principles have been true in all ages. It is difficult to follow all of them, but when, in exceptional cases, we are compelled to violate one of them, it should be done only for the purpose of applying the others more perfectly.

CHAPTER II.

NOTES ON ORGANIZATION.

THE ARMY CORPS.

An army corps consists of the general headquarters, the troops, and the administrative departments. The headquarters includes the general officer commanding the corps, staff, an artillery staff, an engineer staff, and the commanders or heads of the various administrative departments (supply, sanitary, veterinary, pay, post office, provost, and judge advocate). The troops include the infantry divisions, the corps artillery (which includes trench artillery, light artillery, and heavy artillery), the corps cavalry (a regiment), some companies of corps engineers, an aero squadron, and a balloon company.

The administrative departments are those of the following organizations and services: The artillery park, including the artillery and the infantry ammunition trains; the engineer train, including the corps engineer park, the searchlight sec-

tion, and the bridge train; the military telegraph unit; the supply train (including the motor transport company for the supply of fresh meat and the herd of live animals); the sanitary train (one group of corps litter bearers, two sections of motor ambulances, and four ambulances); the pay department; the post office department; the military police; the department of military justice; and the veterinary service and remount depot.

THE INFANTRY DIVISION.

An infantry division also consists of the headquarters, the troops, and the administrative departments.

The headquarters includes the general officer commanding the division, his staff, the general commanding the infantry, the artillery commander, the commander of the engineers of the division, and the chiefs of the administrative departments, viz, supply, sanitary (one group of divisional litter bearers and two ambulances), pay and post office, military police, and military justice (court-martial of the division). The troops are: Three regiments of infantry or two brigades of two regiments each, the divisional artillery (including one regiment of light artillery, heavy artillery, and trench artillery), the divisional cavalry and some companies of divisional engineers. The division has a motor department (where bicycles also are repaired); a divisional artillery park, including a department for repairing machine guns; a telegraph unit; a supply train; a department for the supply of fresh meat and a park of beef on the hoof. It also includes the depot of the division, which has one infantry company for each battalion in the division. These are the fourth companies of these battalions, which remain behind with their officers, noncommissioned officers, men, and vehicles, but which continue to form part of their organizations, from which they are regarded as detached. The command of the group of companies pertaining to each organization is ordinarily exercised by the senior captain present.

THE INFANTRY BRIGADE.

The infantry brigade is not an administrative unit. It includes a general officer commanding the brigade, a military

staff, and two regiments of infantry. It does not exist in a division of three regiments.

THE INFANTRY REGIMENT.

The infantry regiment includes the regimental staff, one headquarters company, three battalions (normal organization), one platoon of 37-mm. (1.5-inch) guns (one gun for each battalion) attached for rations only to the first machine-gun company, the combat trains, and the field train.

The regimental staff.—The regimental staff includes the colonel, 1 lieutenant colonel or major (assisting the colonel), 1 captain (adjutant), 1 telephone officer, 1 lieutenant commanding the platoon of sappers and grenadiers, 1 color bearer, 1 utility officer (who commands the combat trains when they are assembled), 1 supply officer (who commands the field train of the regiment), 1 regimental surgeon (chief of the sanitary service), 1 chief musician, and 1 information officer (who is detached from a company).

The headquarters company.—The headquarters company includes the colonel's clerks and cyclists (one of whom is messenger for the regimental surgeon); the assistants of the supply officer, including 1 warrant officer; 1 sergeant major, 2 sergeants, 1 sergeant and 5 men (butchers), cyclists, and teamsters; the assistants of the quartermaster, including 1 sergeant major artificer, 1 corporal clerk, some clerks and teamsters; the assistants of the telephone officer, including a telephone detachment of 3 sergeants, 8 corporals, 40 privates (8 stations); a signal detachment of 1 sergeant, 1 corporal, and 8 signalmen; 1 platoon of sappers and grenadiers, viz, 1 noncommissioned officer (commanding the section), trained sappers, including 1 corporal and 12 privates, the pioneer detachment, including 2 sergeants, 4 corporals, and 48 pioneers, the bombing section of 1 sergeant, 3 corporals, and 24 grenadiers; 1 assistant chief musician, 1 drum major, and 38 musicians; 1 chief armorer and 3 armorers; 1 veterinarian (for each brigade), 1 farrier corporal, 5 farriers and 2 saddlers; 1 litter-bearer sergeant; the postmasters (1 postmaster and 1 assistant for each battalion); the mounted scouts (2 sergeants, 2 corporals, and 8 troopers); the noncommissioned officers belonging to the headquarters company; the

cooks; laborers; the orderlies of the officers of the regimental staff; 1 tailor; 1 shoemaker.

NOTE.—The sergeant major is a company noncommissioned officer almost the equivalent of the first sergeant in the United States Army.

THE INFANTRY BATTALION.

A battalion consists of a staff, a noncommissioned staff, three companies, and one machine-gun company. The fourth company is usually detached and remains at the depot of the division.

The staff includes the battalion commander, 1 captain (adjutant), and 1 surgeon.

The noncommissioned staff is rationed with the first company of the battalion. It includes 1 sergeant (assistant of the battalion commander); 1 cavalry sergeant (attached); 1 assistant surgeon; 1 artificer sergeant (commanding the combat train of the battalion); 1 chief bugler (a corporal); 1 chief litter bearer (a corporal) and some litter bearers; 5 signalmen (one of them a corporal); 3 cyclists (one of whom is the surgeon's messenger or liaison agent); the drivers of the 3 wagons belonging to the battalion (baggage wagon, medical-supply wagon, and caisson); and the orderlies of the 3 officers.

The litter bearers number 16 or 28, depending upon whether the regiment has or has not a band.

THE INFANTRY COMPANY.

The company consists of a captain; 3 lieutenants or second lieutenants; 1 warrant officer (adjutant); 1 first sergeant (sergeant major); 1 quartermaster sergeant; 8 sergeants; 1 quartermaster corporal; 16 corporals; 4 drummers or buglers; 1 soldier of the medical corps (in the first company he is a corporal); 1 cyclist; 1 tailor; 1 shoemaker; the drivers of the three wagons of the company; 4 sappers and pioneers; 4 orderlies; 2 signalers; and the soldiers of the company (grenadiers and riflemen), divided into 4 platoons.

MACHINE-GUN COMPANY.

Machine-gun companies are of two types, either on wheels (gun carriages and caissons) or alpine type (all pack mules).

A company consists of the captain; 2 lieutenants; a sergeant in charge of liason; a noncommissioned officer accountant; a supply corporal; a range finder; an armorer corporal; a medical corps private; a cook; 3 or 4 firing platoons with their ammunition; and the company combat train.

Firing platoon.—Each platoon has a lieutenant or a sergeant in command; a noncommissioned assistant to the platoon commander; 2 corporals, each commanding a machine gun; two gunners; 2 loaders; 2 assistant loaders; an armorer; and a liaison agent.

Ammunition supply.—Two supply corporals; 4 ammunition carriers for each platoon, the carriages or mules for the machine guns and ammunition. For a company of 4 platoons there will be 16 light carriages, 8 for the guns and 8 for the ammunition, or 36 pack mules.

Company combat train.—Two corporals, and, theoretically, 1 caisson or 6 mules for each platoon. But since the adoption of 8 automatic rifles per company the combat train of the machine-gun company has been reduced to 2 caissons for 3 sections and 3 caissons for 4 sections. As soon as every infantry company has been supplied with 16 automatic rifles, the machine-gun companies will lose another caisson apiece. The caisson holds about 25,000 cartridges on rigid strips and a few spare ammunition cases.

The 37-mm. gun platoon.—This platoon is rationed with machine-gun company No. 1. It includes 1 lieutenant and 1 liaison agent (both mounted on bicycles), and has as many guns as there are battalions in the regiment. Each gun has a detachment consisting of 1 sergeant, 1 corporal, 1 gunner, 1 loader, 2 ammunition carriers, 3 cannoneers (2 with ammunition cart and 1 teamster, not mounted). The combat train of one gun or of one platoon of two guns is one caisson with 2 mounted drivers; for a platoon of three or four guns, 2 caissons and 4 mounted drivers.

The combat train.—The combat train is commanded by the regimental supply officer and includes:

For the regiment, 2 light tool wagons; 3 wagons of materials (telephones, wire, sandbags, and bombs); 6 water wagons; 1 ambulance; 1 medical supply wagon (carrying wheel litters

and gas masks); 2 forges; 2 ration and baggage wagons; 1 kitchen; and the led horses.

For each battalion, 1 medical supply wagon; 1 ration and baggage wagon; and 1 four-horse ammunition wagon carrying 25,000 rounds of small-arms ammunition and 48 haversacks. The ammunition wagon of the detached company at the depot of the division carries 14,000 rounds of small-arms ammunition and 24 haversacks. The ammunition transport is doubled when each company has 16 automatic rifles.

For each company, 1 ammunition wagon, 1 ration and baggage wagon, and 1 rolling kitchen.

For each machine-gun company, some ammunition wagons; 1 ration and baggage wagon; 1 rolling kitchen; and the ammunition wagons belonging to the 37-mm. guns.

The combat train may be divided into two echelons:

The first echelon is commanded by the artificer sergeant major, and includes the medical supply wagons, the filled ammunition wagons, the wagons of tools and materials, and the led horses.

The second echelon is commanded by the utility officer, and includes the ration and baggage wagons, the water wagons, the kitchens, the forge, and the empty ammunition wagons.

The field train.—The field train is commanded by the supply officer and consists of three sections. Two sections of 5 wagons each bring up and distribute alternately one day's rations to the regiment (each of these sections is commanded by a sergeant). One reserve section of 3 wagons is commanded by the sergeant major of the field train. The field train also includes 2 forage wagons, 2 wagons or 1 three-horse van carrying oats, 3 fresh-meat wagons, and 6 led horses.

MISCELLANEOUS DETAILS OF INFANTRY ORGANIZATIONS.

The medical corps detachment of the battalion is ordinarily with the battalion medical supply wagon, but when a company is detached its quota of the medical corps detachment goes with it.

The chief litter bearer (corporal) is with the medical-supply wagon of the battalion.

Litter bearers are ordinarily with the companies to which they belong, but when the battalion goes into action they are assembled by the chief litter bearer.

The drummers and buglers ordinarily act as liaison agents of the captain.

The artificer sergeant (of the battalion) is in charge of the ammunition wagons of the battalion so long as they are full. When they are emptied and sent to the rear he joins the artificer sergeant major (of the regiment) in order to supervise the ammunition supply from the ammunition train. (See "Ammunition supply," Book IV, Chap. XI.)

The mounted orderlies are assembled with their horses, by battalion or by regiment, in rear of a designated unit.

The specialists of the company: In addition to those already mentioned, the companies provide the following specialists:

Liaison to the company commander. See "Company formations," Part II, Chapter VI.

Liaison to the battalion commander. Each company sends to the major a supply sergeant or supply corporal, and generally also a squad of messengers composed of one corporal and four riflemen. The machine-gun company sends the sergeant in charge of liaison.

Pigeon caretakers, when they are necessary, are also detailed from the companies.

Observers and signalers: There are two signalers in each company. For substitutes they have two observers (riflemen), who, like themselves, are trained by the telephone officer. In addition, in each company 1 officer, 2 sergeants, the liaison agents, and at least 6 substitutes must be able to send and receive the Morse code.

Specialist officers: The company may include in its effective strength the grenadier officer of the battalion, the automatic rifle officer of the battalion, or the intelligence officer of the regiment. The two first-named remain in charge of their platoons. A sergeant is detailed to accompany the battalion commander as intelligence sergeant.

CHAPTER III.

DISTINCTIVE INFANTRY TACTICS.

The principal characteristics of infantry are the following:

1. *Infantry, unsupported, can not attack lines of obstacles covered by fire and provided with accessory defenses.*—When an attacking line is checked by defensive lines which are intact and occupied by the enemy, reinforcing it by reserves has no chance of success, and the attempt to do so will only increase the losses. An attack should never be launched unless it is preceded and accompanied by effective artillery fire. Men can not fight machines.

2. *Infantry can hold ground tenaciously.*—Intrenching tools enable the soldier to protect himself against attacks. The power of modern arms (rifle, automatic rifle, grenade, rifle grenade, and machine gun) gives an almost complete certainty of stopping an attack which is not prepared by artillery fire. The employment of obstacles which hold the enemy under frontal and especially under enfilading fire enables us to be satisfied with reduced fields of fire. Infantry can hold, close to the enemy, positions which appear at first sight to be unfavorable. If a few hours are available for entrenching and placing obstacles, it can be sure of holding ground which it has gained.

3. *Infantry becomes exhausted quickly.*—The advance in a war of position is subject to all sorts of difficulties. In the first place the cutting up of the ground by trenches, communicating trenches, tunnels, etc., makes it extremely difficult to keep troops in hand. And besides the incessant shocks produced by artillery fire, machine-gun fire, grenades, etc., contribute to the disorganization of units. We should avoid, both at the beginning and during the course of an attack, making the firing line too dense. When gaps occur in it they should be filled carefully, avoiding the "bunching," which increases disorder and losses. When a body of troops has been hammered hard, they should, if practicable, when a fresh effort must be made, be relieved by a body of fresh troops. In this way their complete disorganization, with no compensating gain, can be avoided.

4. *Infantry must not maneuver in dense formations.*—In the zone swept by artillery fire columns of squads and lines of platoons are absolutely prohibited.

5. *The morale of infantry is extremely important.*—An operation can not be prepared solely from the material standpoint. A moral preparation is indispensable. This preparation is secured by the commander in the visits which he makes daily to his men.

CHAPTER IV.

RIFLE FIRE.

The conduct and execution of fire differ according to the tactical situation of the troops who are delivering it, depending upon whether they are defending an entrenched line, attacking an entrenched position, or engaged on open ground either in attack or defense. Objectives differ in character, in the manner in which they appear, and in vulnerability. Consequently the manner of delivering fire continually changes. Each new condition should be met in an appropriate manner.

However, there are certain characteristic features which may be regarded as the *principles of rifle fire:*

1. The fire is always delivered by *groups.* The platoon is, as a matter of fact, too large a unit and possesses too many kinds of arms to be well controlled throughout by its chief directly. Intermediaries are necessary to transmit his orders. The leaders of sections and of squads perform this function and actually direct the fire in accordance with the orders of the platoon commander.

2. The fire is always *from the magazine.* In a fire fight of any kind the targets show themselves for short periods only, and during these periods it is important to deliver as great a volume of fire as possible in order to obtain the maximum of effect.

3. *Fire discipline* is a necessity of the first importance. Fire discipline permits the concentration of fire and secures surprises. It prevents waste of ammunition and permits sustaining the fight. It preserves the morale of the men and keeps them in hand for subsequent efforts. It consists essentially in securing

an immediate opening or cessation of fire at the command of the leader. All officers and noncommissioned officers, especially the file closers, must exert themselves to attain it. Volley firing is an excellent means of steadying a body of troops whose fire has weakened or become disorganized.

4. The results obtained depend above all—

(*a*) *Upon the coolness of the commander.*—It is only by remaining cool that the commander can obtain the highest degree of fire discipline among the riflemen of his platoon; that is, to be able to break off and resume firing at will. Fire discipline can not be maintained except by a leader who is master of himself.

(*b*) *On the steadiness and skill of the men.*—Collective fire is effective only when it is an aggregation of accurate shots delivered with correct sight adjustment. It is dependent upon the individual training of the men firing.

FIRE OF THE PLATOON IN DEFENSE OF AN ENTRENCHED LINE.

The chief platoon organizes beforehand squads of riflemen under command of sergeants or corporals and assigns to them parts of the trench best adapted to its defense. All dispositions are provided for in advance by orders given to be followed in case of alarm. *In daytime* the fire usually employed is "fire at will." However, volleys are frequently used, as they shake the morale of the enemy and give confidence to our own men. *At night volley firing is the rule.*

THE PLATOON IN A GENERAL ATTACK AGAINST AN ENTRENCHED POSITION.

In an action of this kind the rule is to fire but little, as its purpose is to gain as soon as possible the objective designated. Nevertheless, the advance may be impeded by local resistance from certain points (by groups of riflemen, machine guns, etc). This resistance must be crushed as quickly as possible, and the chief of platoon will direct a rapid fire by his entire platoon upon such points in order to be able to resume the advance.

RIFLE FIRE IN WAR OF MANEUVER.

In defense.—Acting defensively in open country, the platoon is not required, except in rare cases, to deliver fire at long ranges; distant targets are more effectively taken care of by automatic rifles and machine guns. Moreover, it is often better to delay opening fire in order to obtain later a more effective fire upon an advancing enemy. The effect of fire is greatly increased if it comes *as a surprise.* In order to obtain this effect it is necessary that the preparation (the designation of the target and of the range) should be as complete as possible in order that the first burst of fire shall be certainly destructive. The chief of platoon has the sights set, conducts his men to the firing position, and does not open fire until all the men have seen the target and have had time to take accurate aim.

The range.—In a defensive action the chief of platoon seeks to obtain while waiting a knowledge of the ranges to prominent objects in the foreground, in order that he may avoid making considerable errors in the designation of the range when his target appears. He makes use of the map or has the distances paced, or makes inquiries of neighboring troops who have range finders.

Designation of the target.—In order to designate a target which can not be described easily, the chief of platoon selects a reference point which is plainly visible and which can be indicated without danger of mistake. He then states how many fingers' or hands' breadths the desired target is to the right or left of the designated reference point.

In the attack.—Targets can seldom be seen clearly; we guess where the enemy is rather than see him. We must watch closely and try to discover him, and must notice every movement in the general direction of the designated objective. The absolute rule in the attack is to alternate firing and advancing. The platoon does not fire except to prepare for a rush, or, if it can not advance, it fires to cover the movement of a neighboring unit.

However favorable the opportunities may be for firing, we must not fire if we can advance. Fire whose effect is not immediately utilized is wasted.

Fire is ordinarily conducted by sections, rarely by squads. The opening of fire should be instantaneous.

Rate of fire.—The normal rate of fire is eight shots per minute.

Effect of the ground.—A shot group G will have beaten zones AB, AC, and AD of different extent, depending upon the angle of slope. And the zone of grazing fire which precedes the beaten zone is greater on AD than on AC or AB.

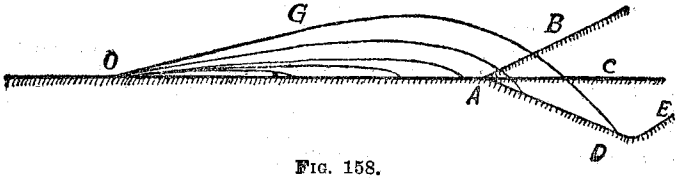


FIG. 158.

It is apparent that reserves posted on the *slope* AB may, if they can find concealment, be in a less dangerous position than if they were on the *reverse slope* AD and screened from the view of the enemy. The occupation of a second slope E unites both advantages with respect to fire from O.

FIRING ON AEROPLANES.

Firing on aeroplanes is prohibited in the case of individual riflemen and of troops who have been assigned an objective to reach or to fire on, which they should not lose sight of. It is done only *under the orders of an officer.*

Fire should not be opened until it is certain that the aeroplane is a hostile one and it is known that there are no groups of our own troops between the distances of 1,100 and 4,400 yards (zone of the fall of bullets) in the direction of fire. The fire is conducted by platoons and with deliberation. In a column of troops and in the supports of the first line platoons are designated beforehand for this purpose and these platoons keep a constant lookout for hostile aeroplanes.

Rules can only be given in the case when the aeroplane passes directly overhead or nearly so.

Rules for firing on aeroplanes.—(Note: This rule as given applies to French rifle.) While the aeroplane is approaching use an elevation of 2,600 yards. Face toward the approaching aeroplane and open fire when it appears to be at a vertical angle of 45°, aiming directly at it. Continue firing with the same elevation until the aeroplane is just about to pass the vertical. Then face about toward the aeroplane and lower the sight leaf forward. After the aeroplane passes use an elevation of 300 yards, aim at first about 10 aeroplane lengths in front of the aeroplane, and keep this up for about 30 seconds, then aim directly at it and continue firing until it reaches an apparent vertical angle of 45°. An application of these rules will bring the sheaf of bullets upon the aeroplane once while it is approaching and twice after it passes. It is useless to fire on an aeroplane which covers a visual angle less than 8 mils. It is forbidden to fire on an aeroplane which is landing.

ESTIMATION OF DISTANCES.

Pacing.—Everyone should know the number of strides he takes in pacing 100 yards. Fewer mistakes are made in counting strides (that is to say, the number of times the left foot comes to the ground) than in counting single paces. After counting the number of strides corresponding to 100 yards, a mark is made on a piece of paper or a pebble is placed in the pocket and counting is commenced again, 1, 2, 3, etc. To turn into yards the number of strides over the last hundred recorded it will be close enough to double them. For instance, if we have 6 pebbles and 36 strides over, it may be put down as 672 yards. This method is useful in making sketches of positions or road sketches.

Estimating distances by eye.—By *personal* observation we learn, for example, that at about 400 yards we can not make out a person's face but can still distinguish his arms, that at 650 yards we can distinguish the files of a column, and that at 1,100 yards we can distinguish a horse from the wagon which he is pulling, etc. We must be on our guard against errors which come from changes of light, from the character of the background, from dust, from the different appearance of uniform and variegated ground, from folds in the ground, etc. This method

is not very accurate, but we can get better results by having a number of trained observers estimate the range and taking the mean of their estimates.

Estimating distances by sound.—Sound travels about 1,100 feet or 366 yards per second. By training ourselves to count in a regular cadence, say, up to 10 in three seconds, we have a means of gauging the interval which elapses between seeing the flash of a gun and hearing the report and consequently of computing its distance from us. This method is unreliable when the projectile travels faster than the sound.

CHAPTER V.

TACTICAL EMPLOYMENT OF MACHINE GUNS, AUTOMATIC RIFLES, GRENADES, TRENCH WEAPONS, AND 37-CALIBER (1.5-INCH) GUNS.

The chief of platoon has some men armed with automatic rifles and some grenadiers under his immediate orders; his work is intimately associated with that of platoons of machine guns and batteries of low-power trench weapons in his vicinity; and he may even have one of these platoons or batteries placed under his orders to enable him to fulfill an offensive or defensive task assigned to his platoon. It is necessary, therefore, that he should know the best methods of using these weapons.

1. Machine Guns.

Characteristics.—Machine guns are preferable to infantry whenever fire alone is sufficient for the purpose. Infantry is indispensable when both fire and movement are required.

The machine gun delivers a very effective grazing fire up to 900 or 1,100 yards; its fire is effective upon important targets at ranges over 1,100 *provided the range is accurately estimated.*

The two chief uses of machine guns are in *flank fire* and *surprise fire.* The sheaf of bullets is dense and deep but narrow; its maximum effect will be obtained upon a target having a

narrow front and considerable depth—for example, *a thin line taken in flank.*

It should be the rule to employ machine-gun fire in a direction parallel to the probable front of the enemy; that is to say, in flanking positions.

The sweeping movement should be employed in firing frontally on a thin line, but its density then becomes insufficient and its effectiveness is small. (See fig. 280.) The machine gun is easily concealed; it should be kept out of sight and neglect targets of little importance; it should deliver bursts of fire which will come *as a surprise;* in this manner it may gain important results.

Any commander who has a machine gun and who uses it only to reinforce his firing line makes use of only part of the power at his disposal. He will use his machine gun to the best advantage in *flanking positions,* and he should select in advance several positions from which the machine gun can be used under various conditions, depending upon the probable course of the action.

Use of machine guns in trench warfare.—In trench warfare machine guns are ordinarily grouped in platoons, detached from the company and posted in strong positions. If the enemy is preparing for an attack he will make special efforts to destroy the machine guns. We should then fortify them strongly, screen them from view, and echelon them in the direction of depth. Machine-gun positions without overhead cover are to be invariably rejected, unless we have succeeded in concealing them from the commencement of the operation of entrenching.

Gun pits with strong overhead cover can not be used, on account of their relief, unless they are screened by favorable conditions, such as being on a second slope, by woods, underbrush, etc. We should instead prepare positions of low relief and well concealed, and nearby should dig deep shelters from which the men of the gun detachment can come quickly to the gun. The gun positions may be pits dug in the form of howitzer shell funnels, in front of the trench, and connected with the shelter by a tunnel.

We should increase the number of these positions and provide access to them by sheltered and concealed trenches, and should avoid firing frequently from positions which are to be

used in repulsing attacks. We should not expose all of our machine guns at one time to the danger of being destroyed by placing them all in the first line. We should echelon them beforehand and distribute the greater part of them between the line of supports and the line of reserves, in order that they may be able to crush an enemy who has penetrated the first-line trench at the conclusion of a bombardment or of an attack with asphyxiating gas.

Study in advance all sections of the foreground and mark their boundaries in order that every wave of an attacking enemy which appears in our front may receive machine-gun fire, and do not require machine guns to sweep long sections of the front. The *sector of fire* of each machine gun should be marked by three wooden stakes as explained in the instructions for digging trenches. (Fig. 47.)

In no case should a machine-gun detachment abandon its post; if need be it will permit itself to be besieged there and will defend itself to the last. The tenacity and heroism of a few machine-gun men has often enabled us to retake lost positions. To make it possible for them to do this, place the machine gun in a small earthwork, surrounded by well-hidden wire entanglements, and provided with several firing positions and furnished with food and water and an abundance of ammunition. For remarks on the subject of the ventilation of machine-gun shelters see paragraph 8, Chapter XIV, Book III.

Machine guns in maneuver warfare.—In maneuver warfare the machine-gun company often fights as a unit and is frequently placed near the head of the column behind the security detachments in order to support the infantry at the beginning of the action. When it has no special independent mission the machine-gun company should be placed at first under the orders of a battalion commander, who may assign one or more platoons of it to companies. In maneuver warfare machine guns are used in pits without head cover, as shown in figures 46–48.

The principal tactical rôles of machine guns.—On the offensive they deploy with the advance guard and cover the deployment of the main body; they reinforce lines temporarily halted; and gain time for a preparation for continuing the advance; they assist in the artillery preparation with rapid and concentrated fire, and take the place of artillery in a very rapid pur-

suit or in completing a victory; they advance on the flank of a body of troops in an attack, and cover their flank from the counter attack which will probably be made against it; and they cover with fire intervals which have been left intentionally or accidentally between two units of the attacking line.

On the defensive they provide along the front several successive barriers of flanking fire, which can be opened instantly by day or by night.

To sum up, we should (1) use machine-gun fire liberally to save the infantry, (2) always try to use it from flanking positions, (3) conceal the machine guns in order that their fire may come as a surprise, and (4) echelon them in depth and shelter them to prevent their being destroyed early in the action.

2. Automatic Rifles.

The characteristics of the automatic rifle are: (1) Great mobility; (2) destructive efficiency at short ranges; the fire is kept low automatically; (3) a certain efficiency at mid ranges; it is as accurate as the machine gun up to 700 or 800 yards, and has considerable dispersion beyond that range; (4) a great elasticity of action; its sweeping fire is easily handled and its fire can be shifted from one target to another instantly; (5) it can be fired while advancing, which keeps the enemy in his trenches during the last advances of the attack and allows our grenadiers to come up and do their work.

This weapon does not possess either the steadiness or the rapidity of fire of the machine gun and can not entirely replace it. However, its fire produces a similar moral effect. And it is at the disposal of small infantry units at times and under conditions where the use of machine guns would be impossible.

The automatic rifle is an excellent arm to accompany the infantry, to hold ground which has been gained, and to repulse counter attacks. This is due to the dense fire which it can instantly deliver and to its mobility. The automatic rifles make it possible, after studying and reconnoitering the position taken, to conduct the machine guns without loss of time directly to the positions most favorable for them, especially those from which they can obtain a flanking fire. In short, the auto-

matic rifle is the advance guard of the machine gun, which is chiefly a defensive weapon.

The combat efficiency of the automatic rifle requires a detachment of well-instructed and well-trained men, who should be of sturdy build on account of the weight of the ammunition. Its mechanism is sufficiently strong, provided the gunners are familiar with its action and know the cause of its jamming, and if they take care to protect it from mud and dampness, which are its chief enemies. On this account it should never be taken from its cover until it is to be used. A rectangular piece of oiled cloth should be fastened by its four corners over the lock and ejector; in firing two corners are unfastened and the cloth hangs by the other two.

The automatic rifle is less cumbersome than the rifle, although it is heavier. A sling should be improvised by means of which it can be carried while advancing or can be supported while firing during the advance; for accomplishing the latter purpose the sling passes over the left shoulder.

Rapidity of fire.—Firing single shots, a well-trained gunner can fire 60 to 80 well-aimed shots per minute. This is the most effective mode of firing, and it can be maintained for a considerable period. It is conducted in series of 20 shots, firing one shot at a time and keeping the weapon to the shoulder. A man can fire 1,000 shots in succession in this way without fatigue, aiming each shot. The eight automatic rifles of a company, firing single shots, have an intensity of fire equal to that of 60 to 80 ordinary rifles.

Automatic fire may be delivered in short rafales of two or three shots at a time or in longer rafales of seven or eight shots. A trained gunner can fire in this way 140 shots per minute, but this fire is not well directed and fouls the gun rapidly. The fire must be stopped after 300 to 400 rounds, or after two or three minutes, and the rifle must be taken apart and cleaned.

In firing while advancing several clips may be fired in succession; the clips may be changed without halting.

In the attack automatic riflemen and grenadiers form the leading element of the attacking line; they also compose the contact patrols sent forward after gaining the objective, with a view to exploiting to the utmost the success attained.

In occupying the captured position the automatic rifles form the skeleton of the new line. They can sweep the communicating trenches leading in the direction of the enemy and the probable routes of his reserves. It is well to employ a preventive fire at this time to shake the morale of the enemy and cause his counter attack to miscarry. The crater of a howitzer shell forms a sufficient shelter. Automatic rifles are placed, when practicable, in flanking positions; in occupying a broken line the grenadiers are placed in the salients and the automatic rifles in the reentrants, where they may flank the salients.

Organization.—It has been found necessary to group two automatic rifles together under the command of a noncommissioned officer. By using them in pairs a continuous fire upon a designated target can be maintained for the desired length of time; the two guns fire alternately. The squad of two guns is assigned a sector of the foreground to cover; the captain arranges the overlapping of the sectors in such a way as to cover the entire front.

Four to eight automatic rifles may be grouped together with either an offensive or a defensive mission; the important point is that they should be well commanded. Larger groups run the risk of becoming a target for the hostile artillery and being destroyed by it. The number of automatic rifles assigned to a company will soon be raised to 16.

Comparison of the powers of machine guns, automatic rifles, and ordinary rifles.

	Weight (pounds).	Shots per minute.
Machine gun	57	300
Machine gun with mount	120	300
Automatic rifle	20	140
Rifle with bayonet	11	11

Twenty-seven men will serve one platoon of 2 machine guns (equipped with 10,800 rounds of ammunition), or 9 automatic rifles (equipped with 9,200 rounds), or 27 rifles (equipped with 3,240 rounds).

3. GRENADES.

Characteristics.—The offensive and defensive powers of hand grenades have been described in Book III, Chapter IV. A trained grenadier can throw a grenade 35 to 45 yards with an error of 2 or 3 yards at the outside. His rapidity varies, depending upon whether he is using the metal fuse, which needs only a blow before it is thrown, or the automatic fuse, which has a protective covering to be removed. Under the most favorable conditions he can throw about 10 grenades per minute. The use of the O. F. (offensive fusante) grenade is becoming the rule in attacks over open ground. The F. 1 grenade is a trench grenade and is dangerous for men not protected by shelters of some kind within a radius of 165 yards. The O. F. grenade is frequently preferred to it, as it is quite effective and twice as many can be carried by the same number of men.

Rifle grenades can be fired to a distance of from 35 to 220 yards; but they can not be handled as rapidly as the hand grenades, and their tactical employment is therefore different.

ORGANIZATION.

(*a*) *Hand grenades and the grenadier's equipment.*—The first squad of each platoon includes 1 grenadier corporal and 7 grenadiers. It may fight as a unit (1 corporal, 2 throwers, 2 carriers, 2 assistant grenadiers, and 1 connecting file) or in two groups (1 leader, 1 thrower, 1 carrier, and 1 assistant). All members of the squad should be trained in throwing grenades. In each battalion one officer, detailed from one of the companies, has charge of the instruction and training of the grenade squads; he should be prepared, if necessary, to take command of all of the grenade squads of the battalion and handle them in action as a unit. The squads are assembled for instruction or combat at the order of the company or battalion commander; otherwise the grenadiers remain with their platoons.

The equipment of the grenadier includes the rifle and bayonet, the trench knife, and the automatic pistol. The throwers are not always required to carry their rifles when the attack is not to be followed up, for example, in a trench raid. With this

exception, the tendency of grenadiers to get rid of their rifles and to lay them aside during a combat must be firmly opposed. The grenadier should take a pride in his specialty, in the fact that he is an advance-guard soldier, and in the effective work which he can accomplish in cases where the rifle fails. But he should understand also that a grenadier who is out of grenades must not think that his work is done; he must fight with his rifle until more grenades come up. Attacks with limited objectives do not give an idea of what the supply of grenades will be during an advance of several miles or of several days' marches. It would be a mistake not to foresee that there will be a shortage in the supply for several days in succession and to separate the grenadier from his rifle at a time when the attack should be pushed to the utmost, with or without the grenades.

Grenade squads are furnished a number of baskets for carrying grenades or are equipped with belts for carrying them. A grenadier can carry, in addition to 6 boxes of cartridges, 10 F. 1 grenades or 20 O. F. grenades.

(*b*) *Rifle grenades.*—Grenadiers should be trained in the use of rifle grenades. V. B. (Viven Bessières) grenade tubes are issued to two men of every infantry squad. They are carried on the belt in a leather case. V. B. grenades are carried by these two men and by one carrier for each two firers. They have the advantage of being a very small encumbrance. The supply of grenades, relatively easy in the defense of a position, will be hard to keep up on the offensive, until the approach trenches have been constructed. The men equipped with the grenade tubes and their carriers must, on this account, be furnished at the outset with as many grenades as they can carry.

TACTICAL EMPLOYMENT OF HAND GRENADES.

Grenade fighting may have for its object: 1. The defense of a trench in close-range trench fighting. 2. Taking possession, step by step, of a trench or an approach occupied by the enemy. 3. Preparation for an assault on a hostile trench. 4. Close-range fighting within a hostile position and "mopping up" the trenches and bomb proofs. 5. A trench raid.

1. *In the defense of a trench.*—Some positions for grenadiers and for accumulations of grenades should be provided for in

advance in arranging the defensive sectors of the company and the battalion. Grenadiers are distributed in groups along the line; the number is increased on exposed fronts (in salients and parts which are very near the enemy's trenches). It is better, in the latter case, to double these portions of the trench by other lines very close to the first, so as to form substantially two ranks of grenadiers in these places.

All soldiers who have had any training in this work should be able to take part in forming a barrier with grenade fire at a distance of 30 yards; this can be done by one grenadier to 12 yards of front using O. F. grenades, and by one grenadier to 30 yards of front using F. 1 grenades. In order to avoid continual losses in places where the hostile trenches are very close to our own, a decided superiority should be seized in the throwing of grenades and the hostile trenches rendered untenable.

Some grenadiers' positions and grenade depots should be provided in the covering trench, at the entrance of the approaches, at the angles of long communicating trenches and in the cave shelters, in order to cover exit from them when the trench is invaded by the enemy, and also behind barricades. The different squads should be trained to make counter attacks with grenades quickly, to retake any part of the trench which may have been taken by the enemy.

2. *Step-by-step progress in a trench or communicating trench.*—In the dispositions taken in the communication trenches bunching up is always to be avoided. Only the minimum of men actually needed for the work should be exposed to the enemy's grenades, and they should not be so crowded as to prevent free movement. This form of fighting is very severe and frequent reliefs should be provided for; and the squad leader should be able to replace immediately an injured man, and to reinforce, if necessary, the leading group by fresh riflemen or throwers.

A profound silence should be maintained, so that all sounds coming from the direction of the enemy, and which might serve as an indication as to what he is doing, can be heard; communications should therefore be, as far as possible, by gestures and signals. Figure 159 shows the ordinary disposition of the men.

The throwers are constantly kept supplied by the carriers. They keep up their grenade throwing continuously; one throwing at the nearest group of the enemy, the other throwing as far as he can to the enemy's rear to block his supply of grenades.

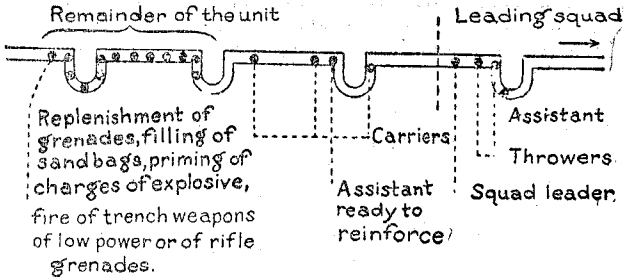


FIG. 159.

Barriers of sandbags are torn to pieces as much as possible by explosive charges. When the leading group has reason to believe that the enemy has been overwhelmed (by a slackening or discontinuance of his grenade throwing or by significant sounds)

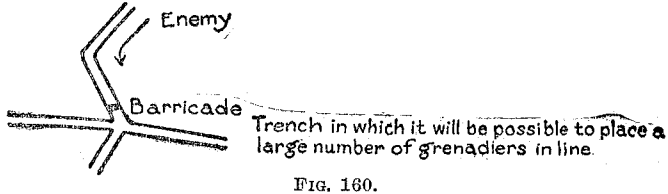


FIG. 160.

the grenade thrower's assistant should creep under cover of the smoke to a point from which he can see into the next angle of the trench and signal to his comrades; and progress is made in this manner from one angle of the trench to another or from one traverse to the next.

When the assistant perceives the entrance of a lateral trench he makes a signal to the throwers. Grenades are thrown into it, and it is then reconnoitered in order to avoid surprises. If ground is not to be gained in the new direction, a barrier of sandbags is constructed far enough from the main trench to be out of the range of grenades and a guard placed upon it. A squad is specially detailed to fill sandbags so that barriers can be put up without delay.

It is a good plan to make use of rifle grenades or trench mortars of low power to block the enemy's supply of grenades.

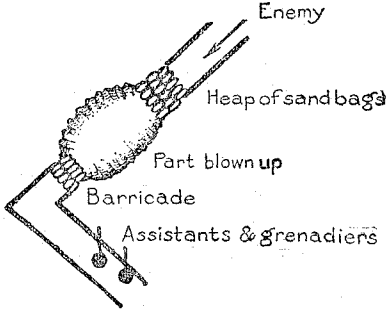


FIG. 161.

If the enemy gains a momentary superiority, his advance should be contested step by step until the superiority can be wrested from him. For this purpose the number of sandbag barriers should be multiplied to retard his progress, the trench should be obstructed by heaps of sandbags, or should be blown up so as to compel the enemy to show himself in the open before our rifles. (Fig. 161.)

The enemy may be drawn to a point where we are able to get into action a greater number of grenadiers than he possesses. The cries of wounded men may be simulated to draw the enemy under rifle fire and surprise him.

3. *Preparation for a grenade assault on a hostile trench.*—An assault is usually a combined action executed under cover of a powerful artillery fire. But sometimes a part of our line comes very close to the enemy and artillery preparation can not be made. An attempt is then made to overwhelm the enemy with grenades before rushing on him with the bayonet.

The throwers approach the enemy, taking advantage of all cover afforded by the ground; the remainder of the squad awaits under cover the moment for making the rush. The throwers overwhelm the enemy with a shower of well-directed grenades and compel him either to vacate the trench or to take cover in his bombproofs; the assault is then made.

4. *Close fighting in the enemy's position and "mopping up" trenches.*—An assault is followed by a struggle within the hostile position. Preparations may be made in advance for this struggle by a reconnaissance of the enemy's defensive organization. Certain groups of grenadiers can then be assigned to definite tasks; for instance, mopping up the trenches and bombproofs, or gaining ground through the communicating trenches toward the enemy's second or third line. The units which are assigned these tasks are required to rehearse them before making the attack.

Mopping up trenches requires two kinds of work which are quite distinct and which should not be assigned to the same units: (*a*) The crushing of hostile units which continue the resistances at certain parts of the trench, and (*b*) the mopping up proper; that is to say, searching the trenches and bombproofs with a view to making sure that none of the enemy are left in them.

The units which overcome the final resistance of the enemy are composed for the most part, if not exclusively, of grenadiers. They advance with the first or second wave; they are continually on the alert and seek out the points of resistance, skirting the trenches in order to approach them on their weakest side.

The units charged only with mopping up the trenches have a definite task; they skirt the trenches and approaches rapidly and arrange their work in such a way that no part of the hostile position shall be neglected. In order to lose no time the moppers up do not go down into the trenches and approaches; they shower grenades along their route and they give especial

attention to bombproofs whose openings may have been covered up by the artillery bombardment so completely as to hide them. Prisoners are collected and taken to the rear under the charge of the officers or noncommissioned officers of the moppers up or by units specially detailed for this task.

5. *Trench raids.*—Grenades are freely used in trench raids. Trench raids are executed (*a*) by small groups of selected men, who have confidence in one another and are specially trained in handling grenades, or (*b*) by a selected unit, sometimes reinforced by additional officers or noncommissioned officers, leaving the unreliable element behind.

The object of trench raids may be to throw grenades into an occupied portion of a hostile trench, to attack the head of a sap, to seize and hold an excavation, or to capture an outpost or small trench in order to obtain prisoners. The success of operations of this kind depends chiefly upon the preparations which have been made beforehand in the way of careful reconnaissances and by rehearsing in rear all phases of the operation under conditions as nearly like the real ones as possible.

Preparation for trench raids.—Meticulous care should be exercised in preparing for trench raids. The special preparations which an officer who is to conduct a trench raid should make are as follows:

(*a*) To make and have made all necessary reconnaissances (of the ground, of the obstacles, hostile trenches, etc.). The terrain should be studied with the object of selecting the routes of approach and of finding cover for grenade throwers within reach of the hostile position. The organization of the enemy's position may be studied from photographs taken by aviators.

(*b*) To select the best conditions for the operation (weather, hour, etc.).

(*c*) To assign to each group or squad of grenadiers a definite task.

(*d*) To arrange the best possible system for keeping up the supply of ammunition and grenades.

(*e*) To acquaint the infantry and artillery units which are to support the operation thoroughly with his plans for executing it.

The officer who commands the trench raid should personally direct the units performing the main task. One of his subordi-

nates should be specially detailed to supervise the replenishment of grenades.

Execution of trench raids.—The troops making the trench raid approach the hostile trench silently; if preparation has been made by artillery fire the approach should be rapid. When they reach the points selected for crossing the obstacles (which are supposed to have been destroyed) a volley of grenades is thrown into the hostile trench; as soon as they burst the grenadiers rush the trench.

Similar tasks are performed by two units, which, on reaching the hostile trench, proceed to mop it up, one going to the right and the other to the left. Every care should be taken to avoid being caught under a discharge of hostile grenades; a position a few yards in rear of the trench which has been attacked may have been prepared for this purpose by the enemy. Sometimes it is better to select a very dark night or very bad weather for the raid. An understanding should exist between the groups of grenadiers and the garrison of the trenches from which they start. A few rifle shots fired under conditions agreed on beforehand warn the raiders that an illuminating shell is to be fired. The raiders lie down and take advantage of the light by examining the ground in their front. As soon as the light dies out they make a rush and then halt, if necessary, for another illuminating shell. During the mopping up of the trench the throwers' assistants provide for security in accordance with instructions given them before the start.

Supply of grenades.—Keeping up the supply of grenades should be a constant source of care to all commanders. The most careful provisions should be made to prevent the grenadiers being short of ammunition, and these provisions should be established on the basis that for every two grenades sent up from the rear only one arrives at its destination. Instructions for ammunition supply are given in Book IV, Chapter IX.

4. Rifle Grenades.

Tactical use of rifle grenades.—Rifle grenades efficiently handled may demoralize the enemy and inflict upon him greater losses than are caused by the artillery bombardment. The hostile trenches should be minutely studied and the points at which

the enemy may be taken at a disadvantage should be reconnoitered (sentinels' posts, the entrances of bombproofs, crossings of approach trenches, etc.). The rifles, on their supports, should be directed continuously on these points, in order to be able to fire a grenade at the least indication of movement. The fire of rifle grenades upon selected localities will be kept up night and day.

In spite of the fact that the enemy is seldom seen, that his first line is thin, and that he is sheltered in bombproofs, it is possible to cause him considerable losses by keeping up a continuous hail of rifle grenades on well-chosen localities.

V. B. GRENADES.

The Viven Bessières rifle grenade is a part of the infantry equipment. All of the men should be trained in its use. The number of grenade tubes issued is limited by their weight and the limitations of ammunition supply. The V. B. grenade has the advantage that it is not very cumbersome and that it is fired by means of the ordinary ball cartridge.

Employment on the defensive.—Fire for effect on the defensive by the V. B. grenade is employed to inflict constant losses upon the enemy, to demoralize him, to hinder his trench work. The barrage defensive fire is used to repulse attacks. The 16 grenade tubes of a company can fire 150 grenades per minute, and can make, at a distance of from 90 to 165 yards, an impassable barrier. It is often a good plan to group the grenade firers of the company in groups of from 2 to 4, commanded by a noncommissioned officer.

Fire for effect is based on knowledge of the routine in the enemy's trenches. An especially well-organized observation service is indispensable. By a combination of observation, study of photographs taken by aviators, study of the map, and information from all sources, the targets and the hours for firing which will give the best results may be arrived at.

POSITIONS FOR RIFLE-GRENADE GROUPS.

Barrage fire is made by combining the use of rifle grenades and hand grenades for the purpose of repulsing hostile attacks.

This kind of fire is important when our communication with the rear has been broken or when the proximity of hostile trenches renders artillery barrage fire ineffective. *Example:* Figure 161a is a part of a plan, scale 1 : 5000. The captain traces upon it the hachured line K K as the line upon which he wishes to bring a barrage fire with the rifle grenades. This done, he notices that

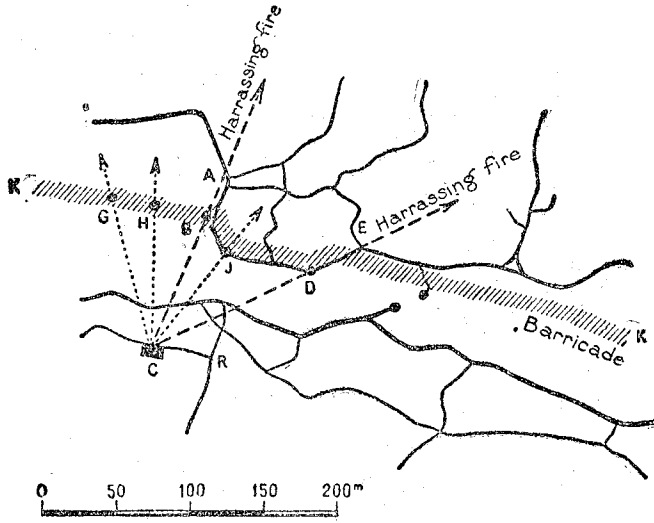


FIG. 161a.

a part of the hostile trench A B will be enfiladed by a group of rifle grenades posted in the covering trench at C. The plan shows that C is 45 yards from R, a thrown junction. He also observes that from C the part of the trench D E can be enfiladed. This will form a second target. Other groups of the company will be posted in view of similar considerations.

The part of the barrage which falls to four grenade firers posted at C, calculated with reference to the front of the company G J, gives 33 yards for each firer to cover. The captain then marks the points G, H, B, and J 6 millimeters (one-fourth inch) apart. He then measures with his scale the distances C G, C H, C B, C A, C J, C D, and C E and ascertains the azimuth angles of their directions. He makes in this way a sketch containing complete firing data for the rifle grenade group at C. It includes:

(*a*) For all of the grenade firers, for their first fire, a common azimuth C A; all ranges from 100 yards to 150 yards, in order to bring fire upon the whole line B A.

(*b*) For the second fire, a common azimuth C E; all ranges from 120 to 175 yards, in order to cover B A.

(*c*) For each firer, an individual barrage fire with a given range; for the firer on the left it would be azimuth C G and range 110 yards. For the others, azimuth C H and range 100 yards, azimuth C A and range 100 yards, azimuth C J and range 80 yards.

The rifles are placed on supports and laid with a compass and plumb in the desired direction and elevation. Each firer should understand clearly what he is to do at the command, "first fire," "second fire," or "barrage fire."

EMPLOYMENT ON THE OFFENSIVE.

The V. B. grenade is used on the offense to extend the radius of action of the hand grenades, in reaching an enemy under cover at a greater distance. In many local combats, where it is not practicable to obtain artillery support, it takes the place of this support by accurately bombarding the strong points of the hostile line. It isolates hostile groups attacked with hand grenades, cutting off their retreat, and preventing reinforcements from reaching them. It is very effective in repulsing hostile counter attacks. In any situation, but especially on the offensive, it is better to concentrate the fire of V. B. grenades.

D. R. GRENADE.

In comparison with the V. B. grenade, the D. R. grenade or shell has twice the range and much greater power; but it is a

more cumbrous projectile, and its supply requires more men for the same number of grenades. So it can not replace the V. B. grenade in offensive action, but it is useful in consolidating the occupation of a position.

In defense the D. R. grenade can supplement the artillery support; it is useful in harassing the enemy and for quick concentrations when an assembly is ordered.

In the attack it can strengthen a line which has been taken and can replace artillery in the preparation of an attack against a nucleus of resistance which has been isolated or left behind in the progress of an attack. It supplements or creates alone the destructive effects of field-artillery fire. It is well adapted to the preparation and support of trench raids, to the isolation and capture of small objectives, to covering the retirement of attacking troops when they have accomplished their mission, etc.

5. Low Power Weapons (Trench Mortars).

These weapon are described in Book III, Chapter XII. Their range is from 55 to 330 yards. They are effective especially against the personnel of the enemy on account of their curved fire, which the rifle can not achieve. Their chief use is in defense; however, the new weapons are light enough to accompany an offensive and can be brought into action quickly in a newly taken position.

Location.—The best effects are obtained from oblique fire and when the effects can be observed easily.

Positions are prepared for them both in the vicinity of the advanced trench and near the trenches of the supports, and the same pieces are ranged from one or the other of these positions according to the results which are desired.

Fighting in the communicating trenches.—Pneumatic mortars and D. R. grenades are advantageously employed in impeding at considerable distances the enemy's supply of grenades and in blocking his lines of retreat.

Additional positions are prepared for them further in the rear, so placed as to enable them to fire on our most important communicating trenches and upon portions of our first line which are most open to attack by the enemy. If the mortars

are placed in the rifle trenches they should be separated from the positions of the riflemen by traverses.

The utility of trench mortars consists:

In demolitions.—They are effective only in destroying small advanced works, such as listening posts and small earthworks

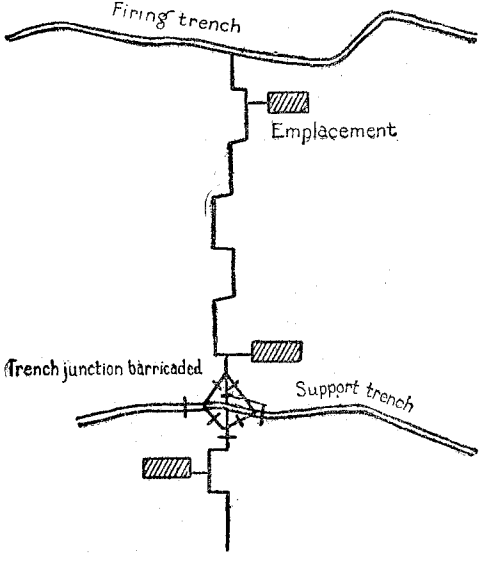


FIG. 162.

in process of construction. For this purpose the fire should be delivered rapidly. One hundred and fifty to 200 small shells can demolish a listening post and about 16 yards of the trench leading to it.

In offensive fire action.—They are used during the artillery fire preparation for the attack against portions of the hostile

line which appear to be neglected by our artillery and high-power mortars. After the attack has been launched they are used against parts of the enemy's line which our infantry can not reach and which must be prevented from taking in flank portions of our line which have advanced.

In defense.—When the enemy is evidently preparing to attack, the trench mortars which can not assist in repulsing the attack should not be left in exposed positions near the first line. They should be taken to the positions which have been prepared for them in rear, where they can bombard the trenches and approaches which the enemy may occupy.

In causing losses to the enemy.—During lulls in the fighting rapid fire should be opened unexpectedly in order to harass the enemy during the heat of the day, during a rainstorm, on dark or still nights, when the enemy is changing reliefs, at the hours for meals, etc. Fire for this purpose may be combined with that of rifle grenades, whose functions are very similar to those of trench mortars.

6. 37-Caliber (1.5-Inch) Guns.

The tactical characteristics of the 37 gun are: Its mobility and the lightness of its ammunition permit it to accompany infantry in all phases of the combat. It can be hidden easily, can be dug into the ground with little labor, and can be used for masked fire. It can be laid easily. It is very accurate. It can hit individual targets up to 1,300 yards, and has an effective range up to 1,600 yards. It is a rapid firer, and, for short periods, can be fired as fast as 20 rounds per minute. Its percussion-explosive shell is used against personnel and materiél, and its steel shell is used against screens and shields. Its effectiveness is similar to that of a grenade, but its shell can pierce, before bursting, two or three thicknesses of sandbags, a wooden barrier, or a steel shield. Its fire has very little effect upon earthworks. *It can, by direct fire, destroy hostile machine guns which show themselves.* Its fire is very effective against troops upon which it can bring an enfilading fire.

In offensive action.—The 37 guns are generally under the orders of the battalion commanders, but in some cases they are kept at the disposal of the regimental commander. They are

used for preparing and supporting attacks, for crushing hostile resistance during an assault, and for assisting in consolidating the occupation of a captured position.

For the purpose of preparing and supporting an attack the 37 gun must be placed, before the attack is started, in a position from which it can fire effectively to destroy the positions of machine guns which disclose themselves at the last moment, to fire upon positions which menace the flank of the attacking line, or to fire on the second or third lines of the enemy. In order to avoid having them destroyed prematurely by hostile artillery fire it is better to keep them out of the action till the last moment.

Use during the assault.—During the assault the 37 guns are brought forward as soon as they can no longer fire effectively from their first positions or when the infantry need their assistance in crushing a hostile resistance. This change of position should be provided for in the order for the attack. On account of their vulnerability the 37 guns should never accompany the first waves of the attack; they should follow the reserve of the battalion or of the regiment. They are used in destroying machine-gun positions and in sweeping hostile trenches and approaches which can be fired on from enfilading positions. They should not be used at very short ranges when it can be avoided. They should use masked fire as far as possible.

Occupation of the captured position.—In consolidating a captured position the employment of the 37 guns is similar to that of machine guns. They are placed so as to be able to fire on positions from which it is thought that the enemy will launch a counter attack; positions for oblique fire are looked for. It is always advisable to provide a number of masked positions to avoid being spotted by the hostile artillery.

In defense.—Attempts are constantly made to shell hostile firing positions and observation points reported by our information service. A number of positions should be prepared along the line assigned to the battalion and in rear of it. During the violent bombardment preceding a hostile attack the 37 guns should not be kept in the first line. By putting them in action near the line of supports, or a little in rear of that line, they can assist in making a barrage, especially by enfilading fire. They should fire on portions of our front where our artillery barrage is uncertain (on account of natural obstacles, dead angles, etc.).

Finally, the 37 gun is well adapted to masked fire; it can register on important approaches, trench crossings, etc. But the range should be checked at each shot, for, although it is a very accurate weapon, its range will change considerably during the course of one continuous firing if the atmospheric conditions change.

CHAPTER VI.

PRINCIPLES OF FIELD FORTIFICATION.

The purpose of the use of field fortification by troops engaged in battle is to lessen the deadly action of hostile fire and also to afford the means of holding a position strongly with weak forces. The second mission is fulfilled by arranging the trenches so as to take advantage of the machine guns, machine rifles, grenades, and trench weapons with which the infantry is now armed.

In battle the numbers engaged are so great, and the effects produced or suffered are so tremendous, that *continuous* lines of trenches occupied by *continuous* lines of combatants are necessary. These lines succeed each other or are constructed successively in the direction of depth in sufficient number to shelter the firing line, the supports, and the reserves during the most important halts in their general movement to the front. They are joined together by a system of communications, which must be *as complete as possible*. The continuous line includes *strong points*. But these must be concealed in a network of trenches, zigzags, and dummy trenches. Isolated strong points spotted by photography (hostile aeroplane) become traps under hostile bombardment. Moreover, breaks in the continuity of the line of trenches permit the enemy to drive wedges into our lines. The continuous trench also takes away from the defenders that feeling of isolation they would feel if in a work separated from the general line.

After the battle, on the contrary, upon a front being consolidated, the problem is one of very effectively occupying the terrain and doing it with a much smaller number of men than during active combat. This is the general case; it is no longer per-

missible to occupy constantly a continuous line. Finally, to this purely defensive organization must be added all of the necessary arrangements for making an offensive upon part of the front. *It results from this that the organization of a sector, therefore, in each particular case is a problem depending upon the military situation and upon the terrain* (Flanders, Champagne, the Vosges, etc.). It also depends upon the weather and the amount of labor and kind and amount of material available. The principles which follow are those which would govern in the defensive organization of a position under the conditions usually found.

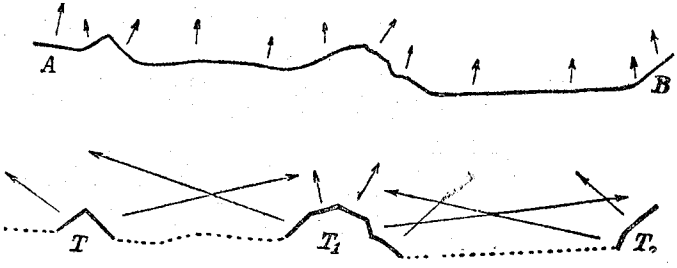


FIG. 163.

1. It is unnecessary to have a *continuous line of fire*, provided the terrain in front is completely swept by fire either *from the front* or *from the flank*, or, better still, *from both front and flank*. *The line with intervals* will generally be the rule. Figure 163 shows how a portion of the terrain may be entirely swept, either by a continuous line of fire AB or by a line with intervals composed of the elements T, T_1, T_2.

2. In a line with intervals it is, however, essential that the *obstacle be continuous* and, moreover, that the intervals appear to the enemy just like the parts that are adjacent (fortified), in order that the enemy may not be able to make out our plan of occupying the position. For this reason join up the trenches and strong points by means of dummy trenches and zigzags.

Everything must be arranged in such a manner that a photograph taken from an aeroplane shall be absolutely illegible to the enemy and shall reveal nothing as to our method of occupation and intentions.

3. The rapidity of fire of modern arms permits us to get along with narrow fields of fire.

4. *The location of good flanking defenses is the guiding factor and must dominate every fortification trace.* The flanking defense assures the convergence of powerful fire upon points attacked. It permits the employment of a line with intervals, with the resultant economy in men exposed to the dangers of the first line.

5. The true method of diminishing the vulnerability of a body of troops lies in *putting in the line only such numbers of men as are strictly indispensable.* The inherent strength of the position is found in the skill with which the *trace is laid out*, in the excellence of the *flanking defenses*, and in the *determination* of the little groups of defenders, which, while each has its work cut out for it, are still coordinated with the rest of the defense.

6. Men thus economized constitute strong reserves and work to *improve* and to *increase the communications* to the rear. The latter permit the rapid and certain arrival of *supplies* and *reinforcements.* They also permit the bringing up of troops for *the counter attack* and are consequently the *vital element* of a position and can not be too much developed.

7. It is necessary to *deceive* the enemy by all kinds of devices and to put the personnel in bombproof shelters in order to escape premature destruction.

8. Finally, it is necessary to organize the defense against surprise and to make provision so that the defenders, sheltered during the bombardment, arrive in ample time at their firing positions.

Active and passive sectors.—It is very rare that the trenches nearest to the enemy have been methodically laid out and fulfill the idea of a line with intervals, provided with flanking defenses. They are much more likely to be a continuous but pieced-together line, such as the events of the combat have made necessary. Nevertheless they must be occupied in accordance with the announced principles. It is the duty of the commanding officer

to divide these continuous trenches into *active sectors* and *passive sectors*, only the former being provided with a garrison and fulfilling the rôle of a distinct element (strong point) in a succession of such elements that go to make up a line with intervals, the latter being held only by the *fire of the flanking defenses* of the active sectors, which form the framework of the position, or by the frontal fire of active sectors of the

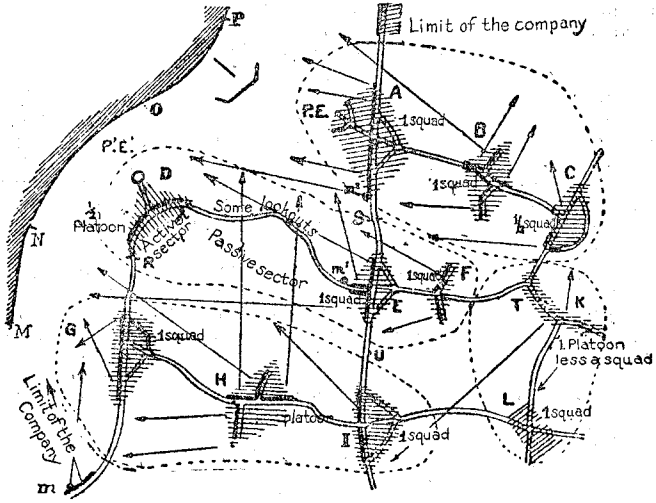


FIG. 164.

trench in rear. The passive sectors serve generally as *communications* between the active sectors. In case of attack they may, depending upon the *plan of defense*, be reservoirs for reinforcements, or serve as *outlets for counter attacks*, explained below. The active sectors may be considered as "isles of resistance," having a front of from 25 to 50 yards in length, and the passive sectors as lines of prolongation of from 45 to 110

yards. Figure 164 shows an example of the occupation of a position of this nature.

DEFINITIONS.

Element.—The simplest of the distinct "isles of resistance" may be called *elements* or *active sectors.* They are generally made up of a small collection of trenches and barricades, and receive as a garrison a *complete unit*, from a squad to a platoon, having special orders to fit their location.

Strong points.—The joining together of several of these elements, grouped together in depth as well as from right to left, forms a *strong point* or a *work*, the garrison of which is a company or a fraction of a company. This work may be constructed as a *redoubt.* In rear of the *strong points of the firing line* others are constructed, the purpose of which is to limit the success of the enemy.

Supporting point.—The grouping together of several strong points, both in length (side to side) and in depth, is called a *supporting point* and is limited in strength to a battalion or several companies, under the orders of one commander, who furnishes the garrisons for the *strong points* and also the *reserves* for executing a counter attack. The supporting point may be a redoubt, and sometimes artillery is assigned to it.

Sector.—Finally, the joining together of several supporting points under the same commander is called a *sector.* A sector is generally held by a division, and is divided into *subsectors* of brigades and regiments. The force assigned to defend a sector has its own separate reserve, distinct from the reserves of the supporting points. To reserve for the words *sector* and *subsector* the meanings which have just been given them, sometimes the ground occupied by a *battalion* is designated as a "*quarter*" and that occupied by a *company* as a "*subquarter.*"

Position.—The first position is therefore composed of a *line of supporting points* grouped according to the judgment of the commander into sectors. Every defensive system has as a minimum two positions, the second constructed at a certain distance (say, 6,500 to 8,750 yards) from the first, so that it can not, simultaneously with the first position, be brought under the fire of the heavy batteries of the enemy nor of his guns used

to throw asphyxiating shells. Between these two positions other intermediate positions—as many as may be considered necessary—are organized, depending upon the terrain and the means available.

The dividing up and assigning of the terrain.—One must not get the idea that a position is simply a line of supporting points, with narrow intervals, placed side by side, thus forming an uninterrupted line of defense. Just as the lines of successive trenches (first line, supports, reserves, intermediate trenches) divide up the ground in a frontal sense, the supporting points are often made up of groups of active elements, little works, isles of resistance, etc., which form zones perpendicular to the front, separated by other zones less well defended. The former zones, strongly defended, divide up the terrain. Their location is generally fixed by the inequalities of the ground and the existence of natural strong points (ridges, crests, woods, villages, etc.) Figure 165 is an example of dividing up the ground which gives the main features of one of the sectors of a position.

The zone of resistance which encircles the sector is intended to deny to the enemy access to the interior of the sector. It comprises the line of observation, the first line, and the line of supports. The line of redoubts and the defensive works, supported both by the line of supports and the line of resistance, are intended to inclose an enemy who has taken the offensive and penetrated to the interior of the zone. They overwhelm him with frontal and flank fire ,and at the same time our counter attacks are launched from both the reserve trenches and the intermediate defenses which still remain in our hands. Thus a breaking through by the enemy of our zone of resistance ought to have no other result than to lead to his annihilation. These explanations are necessary in order to understand the plan of defense and the mechanism of counter attacks. (Part VII.)

CHARACTERISTICS OF THE DIFFERENT TRACES.

The ideas which follow are based upon the standard types of works (coupure, redan, bastion, redoubt) the geometric forms of which, rarely perfected, facilitate the laying out and the

explanation. It is then easy to apply their principles to any trace whatever.

The straight line trace—Coupure—Advantages and disadvantages.—The simplest trench is the right-line trench, called "*the coupure*" (special case, the barricade). It is the one which can be most quickly made and the one which a line of

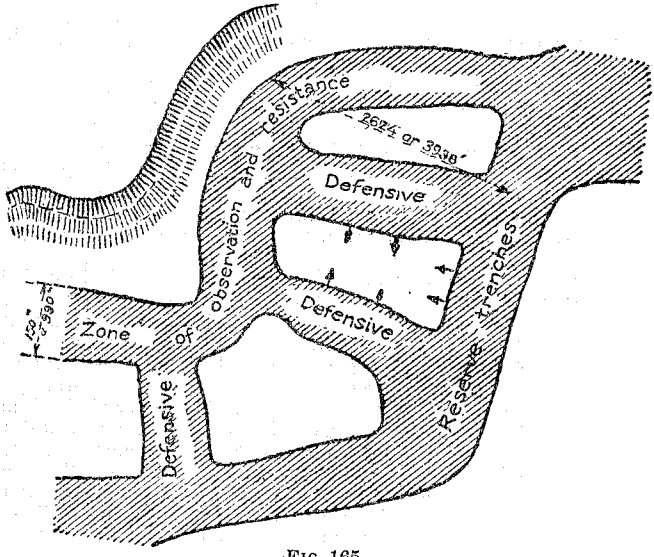


FIG. 165.

skirmishers (firing line) instinctively constructs when brought to a halt in the course of a battle. It is disadvantageous in that it gives a field of fire only to the front or an oblique fire which does not exceed an angle of 30°. Men fire perpendicular to the parapet instinctively. Attacked in flank, a coupure is enfiladed and becomes untenable.

The broken-line trace.—The disadvantages of the straight-line trench just mentioned make the broken-line trace preferable,

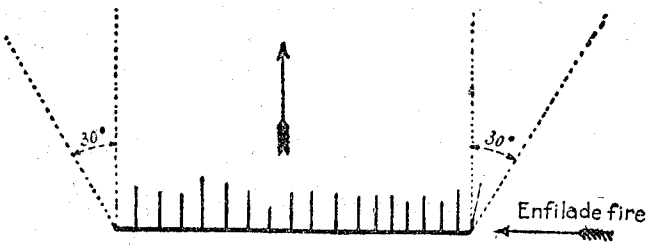


FIG. 166.—Limits of oblique fire.

and it is, moreover, better adapted to the terrain unless the country is absolutely flat. (Fig. 167.)

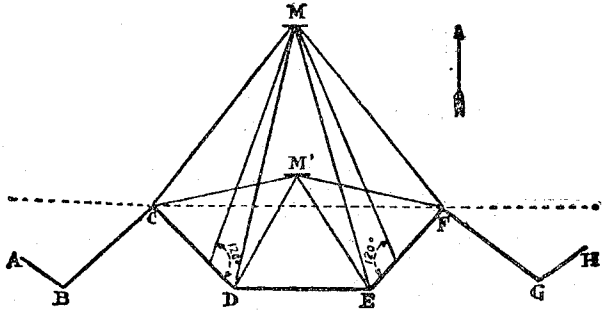


FIG. 167.—Broken-line trace.

Salients and reentrants.—The line of trenches thus constructed always presents in its development on the ground *salient angles* and *reentrant angles.* The former have their

vertices toward the enemy and the latter their vertices toward the defender. This succession of salients and reentrants gives

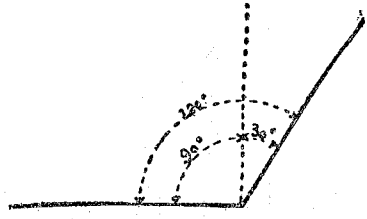
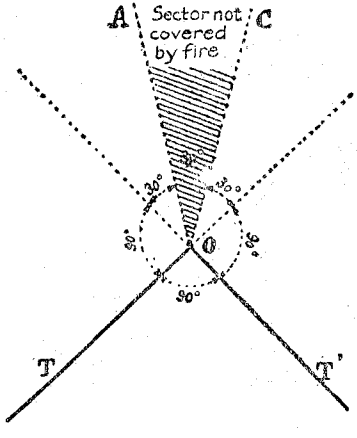
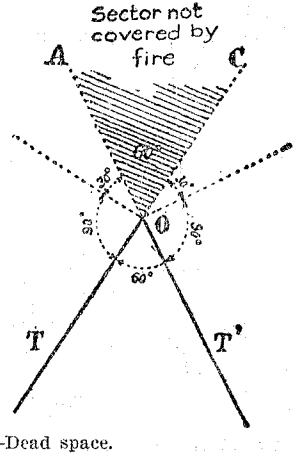


FIG. 168.—Limits of a reentrant angle.





FIGS. 169 and 170.—Dead space.

oblique positions, by means of which the defenders can bring a *crossfire* upon the terrain over which the enemy must pass.

Thus, an enemy M (fig. 167) seeking to penetrate the reentrant CDEF is swept in front by fire from the troops along the parapet DE and obliquely by those along the parapets CD and EF. The fire from the two last named becomes more and more effective the farther the enemy advances toward M; and there will come a moment when the sheaf of fire of a single machine gun, placed in the vicinity of C or F, will enfilade the entire hostile line from end to end, thus *perfectly flanking* the part of the parapet DE. and the direct fire from DE will no longer be necessary to stop the enemy.

From that which precedes we must conclude: (1) *That the reentrants constitute the strong parts of a broken line* since they have, across their front, a cross-fire which becomes more and more deadly as the attack advances. [Figs. 169 and 170 show that the sector upon which no fire can be directed diminishes as the angle at the salient is opened.] (2) That men can be economized on the line DE in case all or part of CD and EF can deliver an effective fire. The minimum limit of a reentrant angle is naturally 90°, since the defenders of one branch or face of the angle, if it were less than 90°, might fire on those of the other face. (Fig. 167.) If it is desired that the terrain in front of the two faces be entirely swept by fire, then the reentrant ought not to be more than 120°. (Fig. 168.) (3) On the contrary a salient forms a weak part of the line—the assailants can overwhelm it with converging fire, and if it is isolated it can answer only with a divergent fire, and in some cases not at all. * * *

Dead spaces.—If the salient of an angle O (figs. 169 and 170) is less than 120° the trench T can fire as far as the line OA, and the trench T, as far as the line OC, leaving the angle AOC in which *direct* fire can not be delivered Such angles are called *sectors deprived of fire* and constitute what are known as a *dead space.* Figure 171 (flanking arrangements) shows how to remedy this grave defect by *arranging a flanking fire.* AB and DE flank the salient O. Figure 172 shows that there is no dead space when the salient is 120° or over. Figure 173 shows that, although the trace in a broken line admits of covering better the immediate foreground, still this arrangement results in dead spaces, or at least in ground not thoroughly swept farther to

the front. This disadvantage is obviated by the use of rapid fire arms.

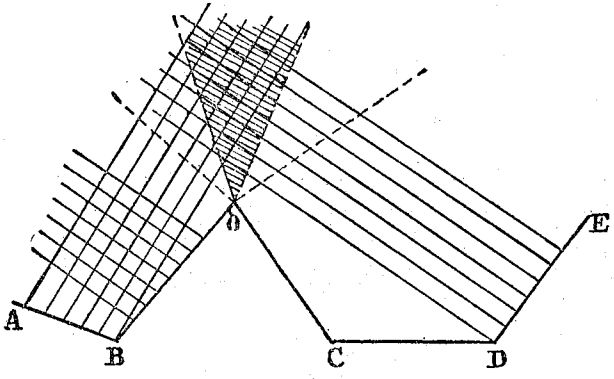


FIG. 171.—Flanking fire.

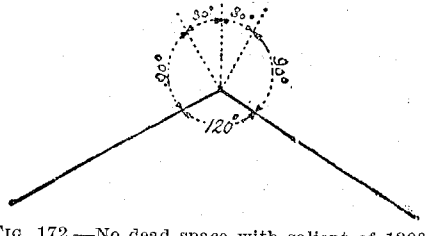


FIG. 172.—No dead space with salient of 120°.

The different types of traces of broken lines are as follows:

1. *Traces with indentations.*—The parts parallel to the principal line of *fire* BC and DE and the *flanks* AB and CD, etc., follow each other in the same order. This trace gives good protection from flanking fire. (See fig. 174.)

2. *Tenaille trace.*—The line of fire is broken in such a manner that the two contiguous parts BC and CD, mutually flank each other. (Fig. 175.)

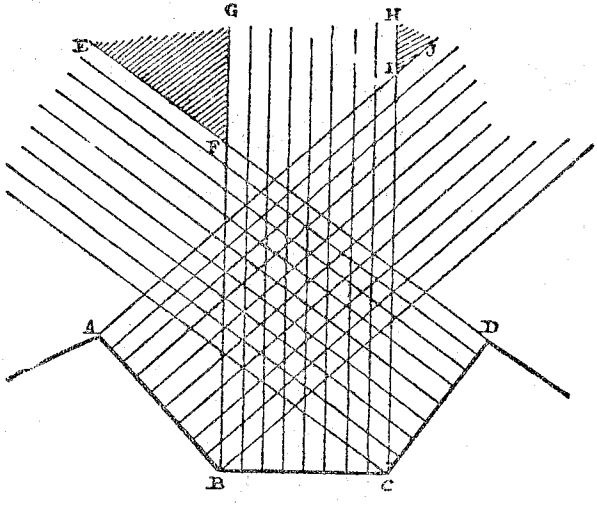


FIG. 173.—Advantages and disadvantages of the broken-line trace.

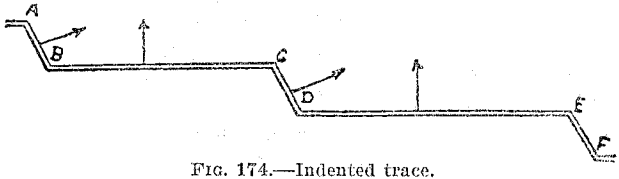


FIG. 174.—Indented trace.

3. *Trace with redans.*—*A redan* is simply a salient considered as a separate work. The sides of the angle are called the faces. If it has not been possible to make the angle greater than 120°,

a blunted salient of several yards in length is arranged to fire on the dead angle. A machine gun should be located in the blunted salient. Figure 176 shows a simple redan, and figure 177

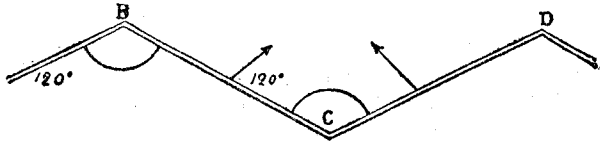


FIG. 175.—Tenaille trace.

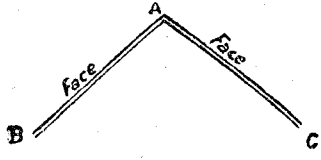


FIG. 176.—Redan.

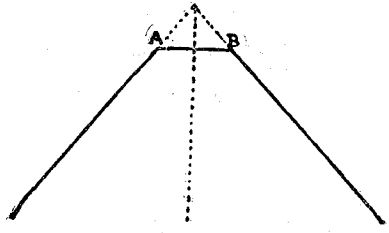


FIG. 177.—Blunted salient.

shows one with a blunted salient. In the double redan, the flank fire is arranged by indentations in the faces of the redan. (See fig. 178.) The *redan trace* is a broken line, consisting of redans united by *curtains*. (See fig. 179.)

4. *The trace with bastions.*—If to the faces of a redan two refused flanks are added, the result is a *lunette*, which, if it forms part of a polygonal trace, is called a *bastion*. [Fig.

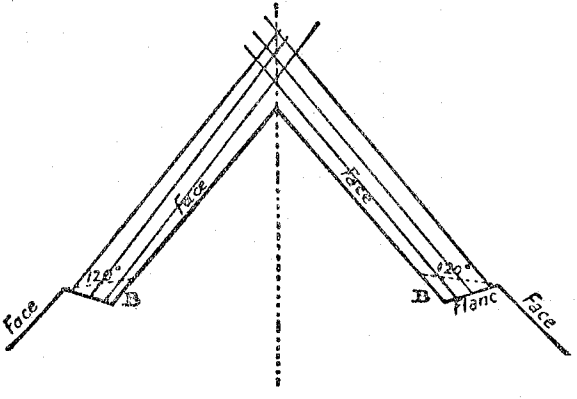


FIG. 178.—Double or flanked redan.

180 shows an ordinary lunette and also a flattened lunette or a half redoubt.] In a *bastioned trace* (fig. 181) the *flanks* of each bastion enable the defenders to deliver a cross-fire before the *curtain* and also a fire flanking the *faces* of the adjacent bastion.

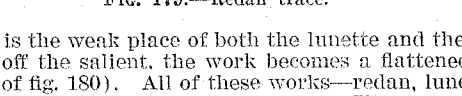


FIG. 179.—Redan trace.

The salient is the weak place of both the lunette and the bastion. By cutting off the salient, the work becomes a flattened lunette (right half of fig. 180). All of these works—redan, lunette, half redoubt—are said to be *open at the gorge*. They are very difficult to defend if once their flanks are turned.

Redoubt.—The *redoubt* is a closed work, capable of offering an obstinate resistance even when completely surrounded. It also

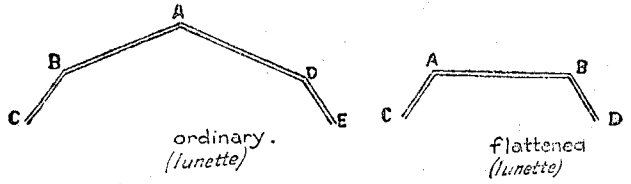


FIG. 180.

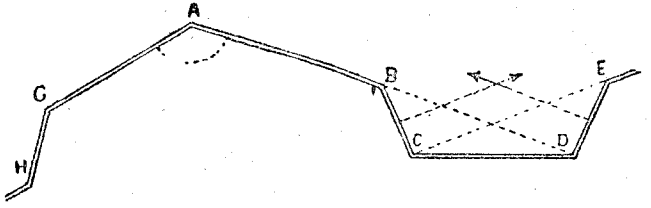


FIG. 181.—Bastion trace.

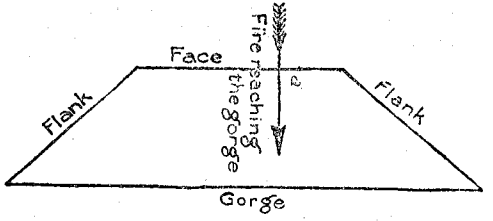


FIG. 182.

favors an offensive return on the part of the garrison. It must be protected as much as possible by traverses and parados, the

defenders thus being able to receive fire without fear from every direction. [Fig. 182 shows a redoubt of four sides, and fig. 183 one of five sides. Fig. 184 shows a redoubt with traverse and parados.]

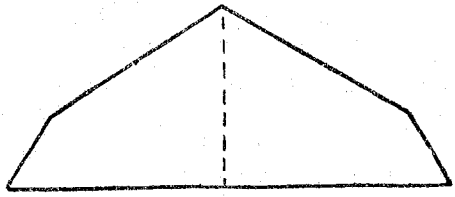


FIG. 183.

Application of the traces previously described.—The trenches and the works, however they may be made, are never actually regular or exact in construction. For that reason it may be said that they are merely theoretical and serve to teach the

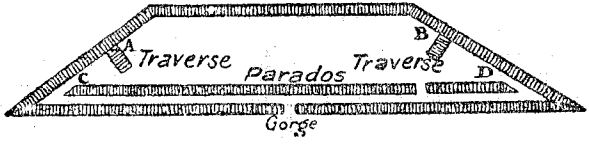


FIG. 184.

names and attributes of those works. *Every trace must, above all, be laid out to fit the terrain,* and as there are very few straight lines in the ordinary ground forms, the firing crest must be curved as much as is necessary. For this reason there will result a series of salients, reentrants, bastions, or irregular redans and curtains, more or less sinuous, having, with relation to each other, the properties already described above.

ELEMENTS OF A POSITION.

All positions, first, second, or intermediate, comprise in the beginning the same elements and are defended in the same manner. They are, as has already been stated, *lines of the supporting points*. The defense of a supporting point is organized in depth by making: (*a*) A first line of resistance (firing trenches); (*b*) a line of supports (support trenches); (*c*) a line of reserves (reserve trenches).

Organization of the firing trenches—The firing trenches are on the line upon which the advanced fractions of the defending force receive the first shock. It is formed by a series of works, strongly occupied (active sectors), bound together by a continuous trench. The front of the whole is covered with

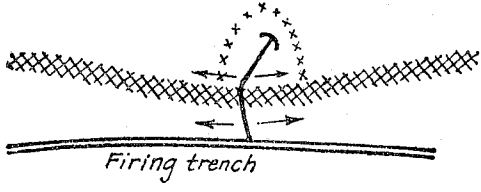


FIG. 185.

an uninterrupted network of barbed wire, of as great a density as possible. It is always bound together in rear by a series of zigzags, at least one for each platoon (approach trenches, fig. 186).

It is not a disadvantage even if the firing line is only 100 yards from the enemy, since, in that case, he will no longer be able to use artillery fire against our firing trench through fear of hitting his own firing trenches. But the firing trench must be out of range of hand grenades or hand-propelled liquid-fire grenades (45 yards). If too close, there is likewise the danger of its being mined.

Small posts.—In front of the firing trenches are thrown out *small posts* or even *watch trenches*, likewise surrounded by barbed wire. (Fig. 185.) These dispositions, even though occupied by comparatively weak forces, offer a first resistance

to the enemy, and thus allow the flanking defenses, which sweep the zones of accessory defenses, to come into action. The trench giving access to a small post will, moreover, usually serve as a flanking defense for the adjacent parts of the first line (fig. 185). In the absence of small posts, the sentinels and men on the watch station themselves in the firing trench, which is in that case sometimes designated as the "watch trench." This is, however, a misnomer.

Small posts should not be abused; that is, do not construct any more of them than are needed. Their garrisons, though small, are immobilized and can not, therefore, be used for any other purpose. Do not push these posts in advance of the firing trenches unless there are good reasons for doing so, such as getting observation or arranging flanking defenses that could not be obtained from the main trench.

Cover trench.—The first-line trench is sometimes doubled by constructing a second trench about 45 yards in rear of it, which permits an immediate counter attack, or, in case of a very violent bombardment and lack of bombproofs, allows the garrison to take refuge in the immediate vicinity. The second fire trench, built at leisure, relieves the defense of much anxiety.

Profile of the firing trench.—The normal type of firing trench has been given in Chapter VIII, Part II, sappers school. (Fig. 35.) Narrow, deep trenches afford the most protection from the fire of artillery, grenade guns, grenades, and bombs; but the circulation of reliefs, etc., and the transportation of wounded, in such trenches, is very difficult, and the troops are forced either to widen them and deepen them at the bottom, so as to allow moving about, below the banquette tread of the firers, or else to dig a special communicating trench, from 12 to 15 yards in the rear. The depth of the cover for troops moving about in rear of the firing trench should be at least 1.8 meters (6 feet) and is frequently as much as 2 meters, or better yet, 2.5 meters (8 feet). In places particularly exposed to enfilade fire, niche traverses may be installed. (Fig. 187.) This likewise affords a method of constructing a firing trench from an old trench, the exterior slopes of which have crumbled away here and there.

Keeping in good condition.—A constant struggle must be maintained against the inroads of the weather, by the use of

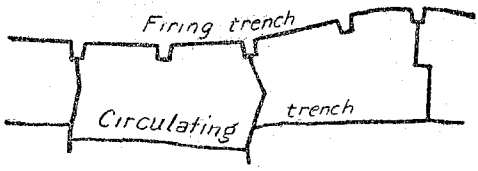


FIG. 186.

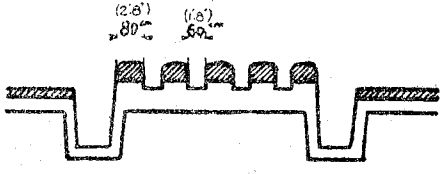


FIG. 187.

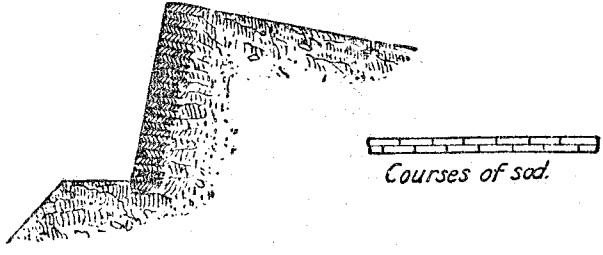


FIG. 188.—Sod revetment.

revetments of turf, sandbags, planks, wickerwork, metallic trellis work, etc. The most important parts to maintain in their

original form are the exterior slope and the firing banquet. It is absolutely forbidden, in principle, to dig under the ex-

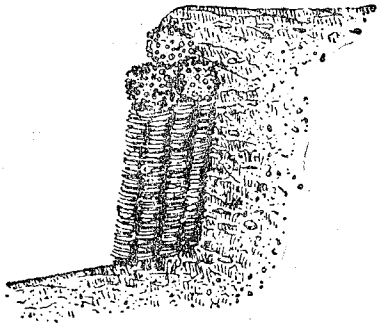


FIG. 189.—Gabion revetment.

terior slope of the parapet, in any way which might weaken the same and cause caving in.

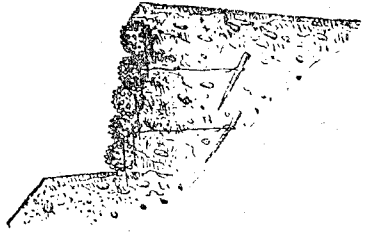


FIG. 190.—Fascine revetment.

Dugouts or niches for ammunition, entrance to shelters, etc., under the parapet, must be firmly shored up by means of timber.

[Figure 188 shows a sod revetment and how a double row of sods is laid so as to give increased strength by breaking joints.] [Figures 189 and 190 show, respectively, revetments of gabions and fascines.]
Fig. 189 and 190 here.

Drainage.—When the terrain has an even general slope, it is possible to drain the trenches by a series of carefully made drains. It is necessary to make certain that the water is carried away to lower ground or to natural excavations, and not toward other firing or communicating trenches. If the soil is permeable or is composed of a thin stratum of clay underlain by a per-

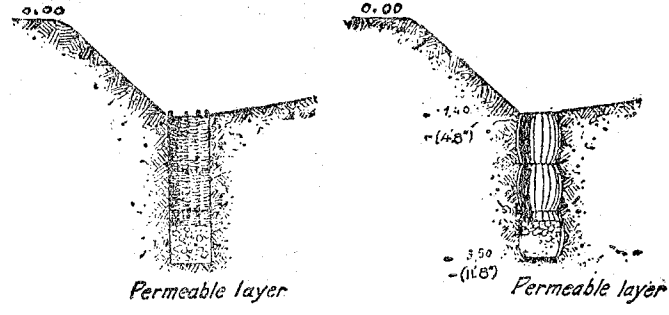


FIG. 191.—Cesspools.

meable one, conveniently spaced cesspools are dug to carry off the excess water. The bottoms of these pools are covered with small stones in order to prevent them from becoming clogged with trash and drift. Figure 191 shows two types of cesspools. In an impervious soil, cesspools will not answer the purpose. A regular system must be organized for getting rid of the water, such as by means of pumps, dipping up with pails, and hauling away, etc. The only certain way of making the bottoms of the trenches fit to occupy in argillaceous soil is to place poles or timbers there and to have on top of these a grating of planks or split poles. Beneath the gratings dig cesspools and drains con-

necting them so that the water and mud will drain into the pools. (See fig. 192.)

The best revetments are those made of sandbags very full and very well beaten down. Any other kind bulge out and narrow the passageways by thus spreading out, after a time. When that occurs, they must be moved farther out or the trench turned aside. An abnormal enlargement or a round point interrupting the cover certainly diminishes the amount of protection; but

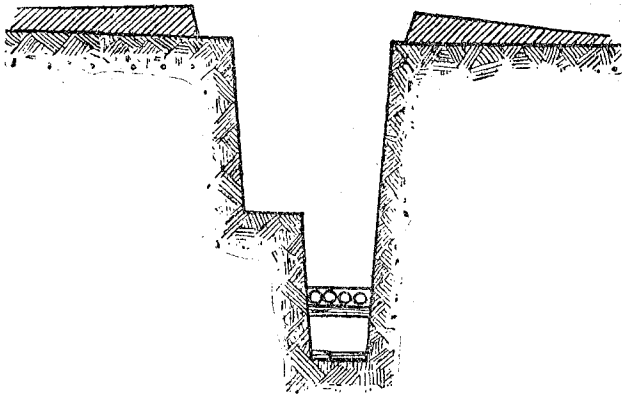


FIG. 192.

anything is preferable to an obstruction of half of the passageway due to the yielding of the revetment to the pressure of the earth.

Loopholes.—The employment of loopholes is not advisable unless it is possible to build them so that the enemy will not know whether they are occupied or not. This condition makes it necessary to do without loopholes on a greater part of the firing crest close to the hostile trenches. The loophole is used, however, in lookout posts and in trenches for flanking the enemy

either defiladed or at a distance. The exterior opening must be concealed by some such device as a piece of closely woven-wire screening stretched over the outside opening of the loophole, which allows one to see through and also does not impede the passage of the rifle barrel when the soldier wishes to fire. It is important that the opening shall not have behind it the sky or other background which contrasts with the color of the

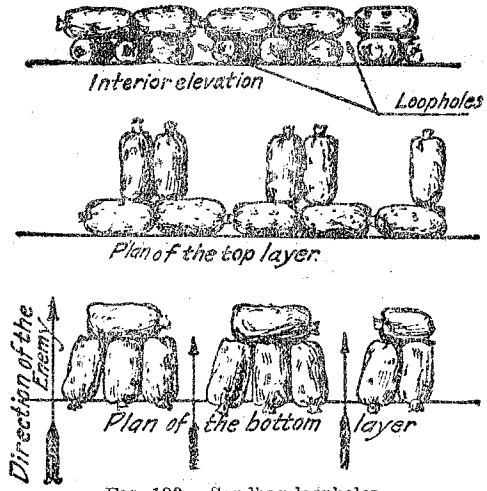


FIG. 193.—Sandbag loopholes.

ground. With this in view, loopholes are established which do not jut out from the parapet; or the parados may be raised above the parapet; or a cloth may be stretched behind the head of the firer, as shown in figure 195. When loopholes are made, their proper orientation is one of the principal cares of the platoon leader in the trenches. It is necessary to verify the direction of their fire, one at a time, in order to be certain that the

part of the trench where they are located may fulfill the tactical rôle which has been assigned to it. Every rifle, when resting

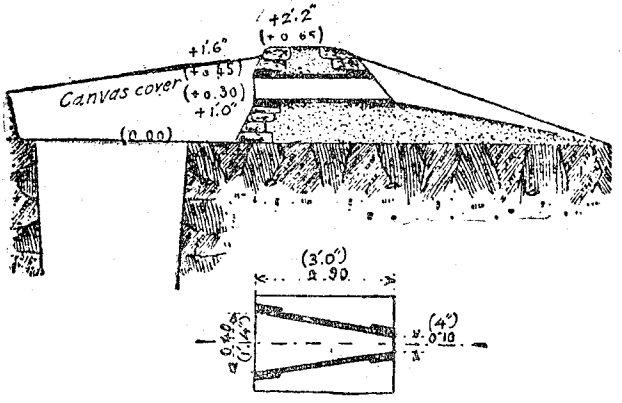


FIG. 195.—Wooden loopholes.

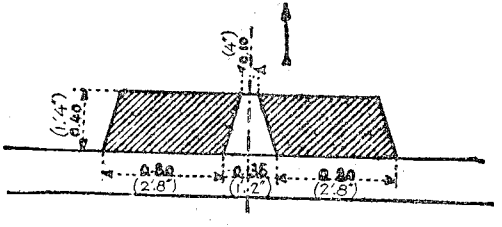


FIG. 197.—Gabion loophole.

naturally on the bottom of the loophole, should be pointed in the desired direction and its fire shall graze the ground, even at night when it is impossible to aim.

The necessity for this is evident. Care must also be taken that the loophole is not accidentally tipped up and that the rifle does not fire into the sky. All loopholes possess the inconvenience that at the moment that the assailant arrives within the zone of effective fire the defender must withdraw his gun in order to fix the bayonet, or if the bayonet has been fixed beforehand the movement to withdraw the gun preparatory to meeting the assault will be fraught with difficulty. Moreover, hostile bombardment destroys many loopholes. The loophole must be considered only an expedient of trench warfare, and ample arrangements must be made, by raising the banquette tread between the loopholes, so that the assault can be stopped by fire *delivered over the top of the parapet, in barbette,* which is the only method that allows the soldier free use of his rifle. Whenever it is possible (which is generally the case in flank defense)

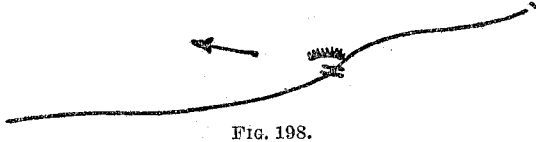


FIG. 198.

orient the loophole obliquely with respect to the hostile trench opposite, so that it will be invisible to the enemy, and the man firing from it can have complete protection for his head (fig. 198). When the trench is planned to deliver a fire not exactly perpendicular to its front it is well to prepare open loopholes, simply cuts in the parapet, which guide the fire of the men and remind them that they are not to fire mechanically to their front. When, in village fighting, a wall is loopholed, it is best to make the loopholes from 12 to 16 inches above the ground and to fire lying down. The low loopholes are less visible and more difficult to destroy than those at the height of a man standing. The loopholes should be spaced about 45 inches apart.

Traverses.—The normal dimensions of the traverses and the manner in which they are spaced have been pointed out in the sapper's school (Part II). The breadth indicated, 7½ feet, is a minimum, which should be unhesitatingly increased to 9 to

12 feet at places exposed to direct artillery fire. In the case of broad traverses it is well to arrange along the sides a firing banquette or row of loopholes, to insure the interior flanking

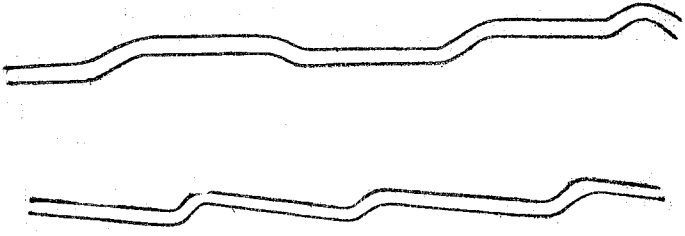


FIG. 199.

of the trench. Precaution must be taken at the same time to keep on hand material to close the trench at the tail of the traverse, such as sandbags, chevaux-de-frise, herissons, etc.,

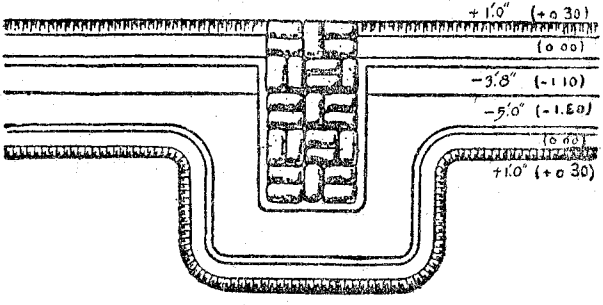


FIG. 201.

which are held on the berm near at hand for use when the emergency arises, thus admitting of the rapid transformation of the trench into a barricade. If there is not time to bring out

all of these fine points in the defense of a trench at the time it is dug, at least we can make jogs in the trench (fig. 199), which will provisionally assure the division of the trench into compartments, just as the traverses do. Later on splinter proofs and traverses of gabions or sandbags are constructed (figs. 200 and 201).

Protection against grenades.—This protection may be secured either by placing a vertical netting above the firing crest or by covering the trench with a roof of two skirts of grill work or poles joined together, the whole covered with a light thickness of earth.

The arrangement described in Appendix 4, Instructions for Grenade Combat (pivoting cage with metal trellis work), is very efficacious and has the additional advantage that it can be instantly utilized in case of necessity, as an accessory of defense to obstruct a zigzag or communicating trench.

Field of fire.—It is necessary that each element have in front of it a well-cleared field of fire, but in trench warfare we may content ourselves with a field of fire of *about 110 yards*, and even less, if the flanks are well secured and the *accessory defenses* are very well arranged.

Influence of ground in relief—Occupation of a crest.—Although the location of the crest of fire depends more often upon the circumstances of the combat than upon the choice of the defender who constructs it, still it is expedient to indicate how it is best to locate it, as regards the natural relief of the terrain, when one is free to do so, which is often the case with the second and third positions, if not with the first. In ground of even slope, the view being practically the same, wherever the location, this factor has but little influence on the choice of the site of the line of fire. On the other hand, in broken country, when it is a question of occupying a crest, there may well be doubt.

Referring to figure 204, it will be seen that the firing trench might be put at A, almost down at the foot of the slope, because the infantry could get a grazing fire over the terrain in front, which could also be easily swept by our own artillery fire, with good observations at B. But the terrain in rear of the firing trench is exposed to hostile view and can be swept by hostile artillery fire. Movements in this area will be difficult and counter attacks organized there will meet with many obstacles

in attempting to advance. The line which joins the most elevated points of the terrain is called the *topographical crest. The military crest* is the line usually in advance of the topographical crest, to which it is necessary to advance in order to bring into view all parts of the slopes below. In moving from the topographical crest to the military crest there is a dead space called the *dead angle* ABE. From the military crest toward the front, there is none. If the firing trench is placed at B, on the military crest, we will have a good field of fire and particularly good observation. But we will be exposed to the enemy's view and consequently to his accurate artillery fire. Moreover, the support of friendly artillery is often defective on a descending slope, such as BA. However, movements in rear of the line, and arrangements for counter attacks, are simpler in this case than in the one where the firing trench is

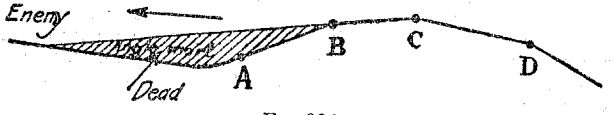


FIG. 204.

located at A. On the *topographical crest* C, distant views can still be obtained, but there would be in front of the firing trench considerable *dead space* which would be favorable to the enemy. The field of fire would also be poor.

Characteristics of the reverse slope.—On the *reverse slope*, at D, one no longer has a field of view, and the dead space will be still greater. But the trench and its wire entanglement can not be seen by the enemy, and is therefore sheltered from hostile artillery observation, without which the enemy's fire is liable to be ineffective. As far as assaults by the hostile infantry are concerned, it has been well established that hostile infantry is powerless to advance against a trench not swept by its own artillery fire, as long as the wire entanglements are intact and there is even a limited field of fire in front of the trench which is being attacked.

These advantages have caused the reverse slope to receive unusual consideration as a place to locate the first-line trenches. However, care must be taken not to employ it as a general solution that will fit every case. In fact, the recent progress of aerial reconnaissance and the methods of zone firing have taken away from the reverse slope part of its former immunity. Moreover, it must not be forgotten that the possession of observing points is of paramount importance, as much in trench warfare as in open campaign. Now, when one gives up the crest he deprives himself of observation. One must know, therefore, the advantages of the reverse slope and know how to profit by them, as, for example, in duplicating the crest trench by constructing a second trench on the reverse slope.

The *line of supports* and *the line of reserves* will generally be established on the *reverse slope.* Precautions will be taken, however, not to put them in low ground where gas might accumulate.

In every case the installation of the firing trench on the reverse slope implies always that there shall be lookouts in advance of the crest. These may be fixed in position or may consist of very active mobile patrols.

Flanking defenses.—Above all, good flanking arrangements must be installed for the whole front.

Flanking defenses.—Above all is it necessary that the whole front should be provided with good flanking defenses.

A firing trench is defended less by frontal fire than by its flanking defenses.—The value of flanking arrangements is so great that it is frequently recommended that *the flanking dispositions of a position be first constructed*, the other defenses being made afterwards. By breaks in the trace, by the creation of salients and reentrants adapted to the ground forms of the terrain, mutual flanking arrangements can be made between the different elements of each strong point, between the strong points themselves, and between the supporting points. It is absolutely necessary to establish these mutually supporting flanking defenses as soon as the general location of the firing line has been determined. These coordinated flanking defenses must sweep *each element* of the front, longitudinally, and, as far as possible, *the exterior border of the accessory defenses.* They must be organized in such a way that their fire will not,

by any chance, be directed upon any part or parts of their own defenses, and, also, so that they will be protected from the direct fire of the enemy. The traces which possess the most effective

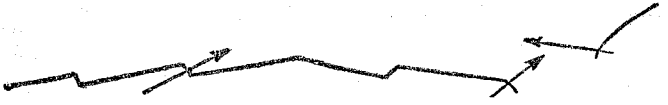


FIG. 205.

flank defenses are those with indentations and those with bastions. They will be adopted for those parts of the line which can be organized at leisure, which is generally the line of supports, line of redoubts of the first position, intermediate posi-

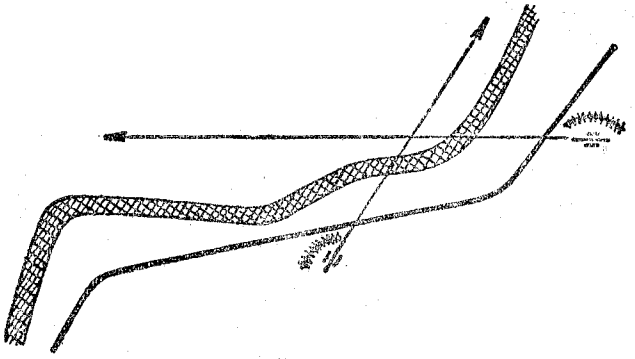


FIG. 206.

tion, and second position. In the advanced line, on the contrary, which is generally established through the exigencies of the combat, and not by the orders of the superior commander, the flanking defense is obtained after contact, by *arrangements*

which are often originated by company and platoon commanders. A short standing trench, with a parados, may be pushed to the

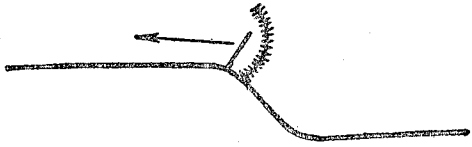


FIG. 207.

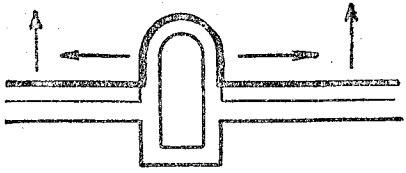


FIG. 208.

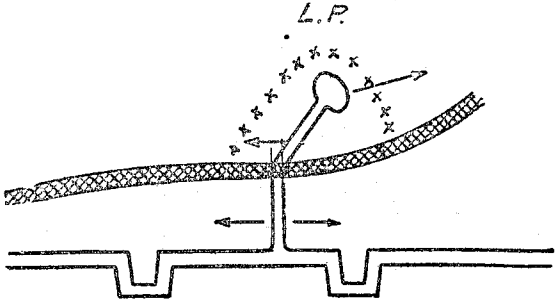


FIG. 209.

front. A few rifles or a machine gun may be placed in it. Care must be taken that it is not exposed to enfilade fire. Or,

a traverse may be used by constructing a circular trench element, making a salient to the front. Figure 209 shows how

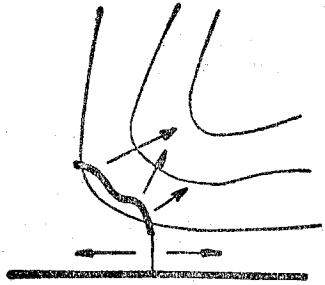


FIG. 210.

a communicating trench leading to a listening post may be utilized. If it has been found necessary to push to the front a

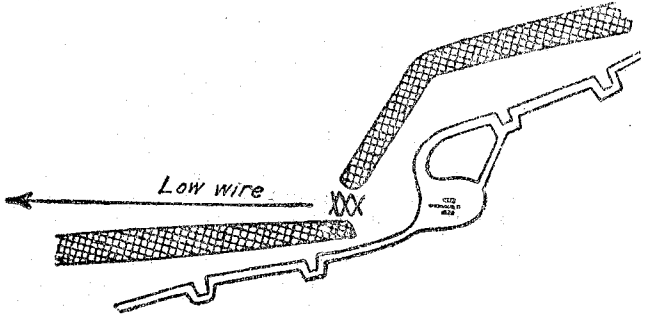


FIG. 211.

small work to sweep a dead space or a depression, take advantage in the same way of the communicating trench which

leads to it to get flanking protection for the main trench. (Fig. 210.)

The machine gun is the arm par excellence for use in flanking defenses.—It must be sheltered as much as possible and the emplacement or shelter must be completely covered, so that at the moment of attack the emplacement will be intact. Numerous emplacements should be prepared, well concealed, and with the guns in position; or the emplacements may be lightly armored, and not armed till the moment of need, the machine guns being held near at hand under the protection of

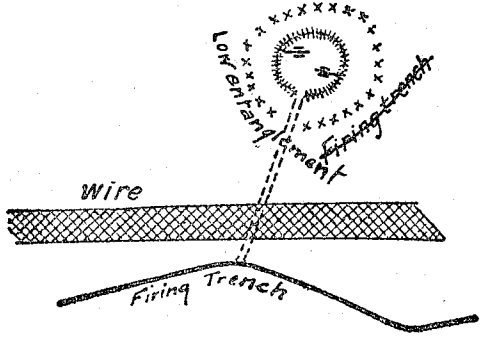


FIG. 212.

bombproofs. The digging of pits in the open ground well to the front of the trace of the firing trench, with which they are connected by subterranean galleries, as is shown in figure 212, also gives good results. For the distribution of machine guns between the first line, the support trench, and the line of redoubts, see Chapter V of this part (IV). The flanking arrangements from one supporting point to the neighboring supporting points by the use of machine guns, 37-mm. guns or 75-mm. guns, is regulated by the superior commander.

Arrangements for entering and leaving the trenches.—The steps (fig. 213) allow access to the natural surface of the

ground. They may be constructed at the rear of the trench or in the communicating trenches or in a parallel of departure from which an assault is to be launched. In the latter case it is well to replace the steps by scaling ladders, which have the advantage that they can be constructed without widening the trench. One type is shown in figure 214. Another type is made by using a picket 8 to 10 centimeters (3 to 4 inches) in

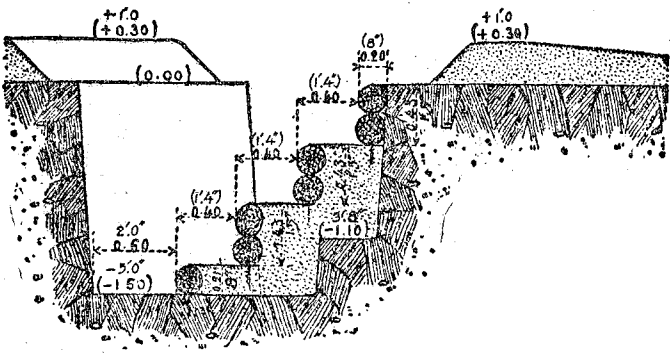


FIG. 213.—Sortie steps.

diameter, sunk vertically into the ground and flush with the interior slope, located preferably in the reentrant angle of a traverse, in such a manner as to project to a height of 20 inches above the banquette tread. The soldier steps on the end of this picket and climbs over the parapet. The steps may be replaced by ramps, which leave the communicating trench where it enters the firing trench. They are constructed parallel to the latter. Such a method is applicable when there is no material available with which to revet the steps.

Accessory defenses.—To the accessory defenses described in the sapper's school, such as wire entanglements and chevaux-de-frise, we may add the following:

The low entanglement formed of pickets 2 to 2½ inches in diameter, not more than 2 feet above ground, and wired in all

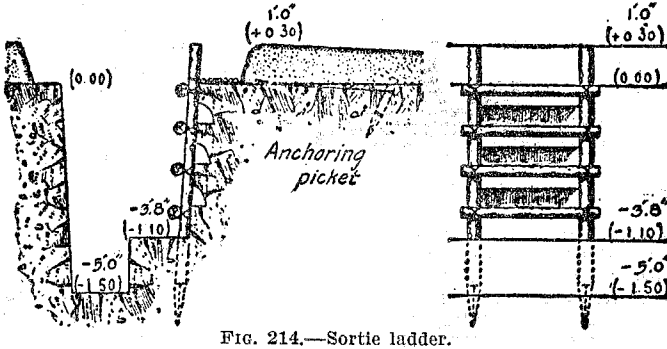


FIG. 214.—Sortie ladder.

directions. The vegetation renders this entanglement invisible even at a very short distance. *Loops of wire of small diameter*

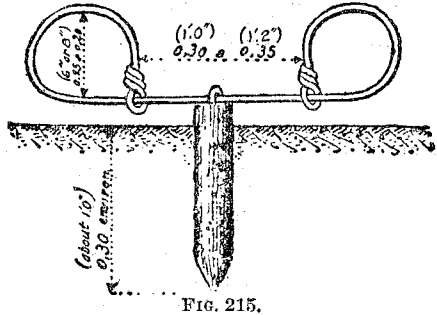


FIG. 215.

(figs. 215, 216, and 217) of different types are used. The simplest is made by a clove hitch or boatman's knot, the loops

of which are fastened together, it being so fastened to the ground that it remains vertical (fig. 216). *Crow's-feet*, of from 4 to 6

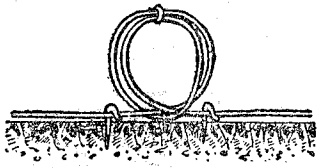


FIG. 216.

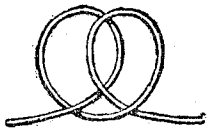


FIG. 217.

points, *wire stretched between the trees of a wood* and *single wire stretched along the ground* and anchored at intervals by pegs driven in the ground are also used.

Sharpened stakes, hardened in the fire, driven obliquely into the ground by striking on a small shoulder cut in the stake for that purpose (fig. 218). Trous de loup (fig. 219).

FIG. 218.

Figure 219 shows *trous de loup.*

Abatis of trees or of branches and entanglements of brushwood (figs. 220 and 221).

Accessory defenses should tend to fulfill the following conditions:

1. Concealed as far as possible from sight of the enemy on the ground and from aeroplanes above; placed, if possible, behind a natural or artificial inequality of the ground which protects them at the same time from artillery fire.

2. They must be placed from 35 to 55 yards in advance of the trench, so that a fire intended to demolish the trench will not

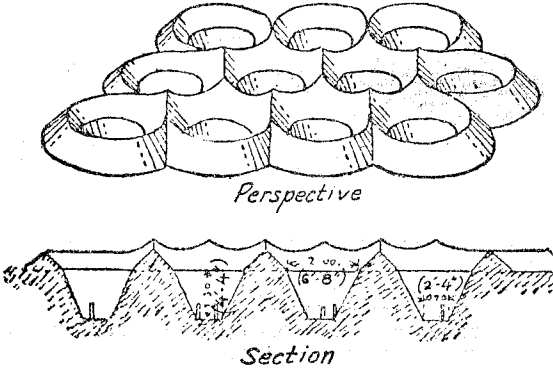


FIG. 219.

FIG. 220.

reach them. This distance is likewise necessary in order to keep the men operating the liquid-fire engines at a safe distance.

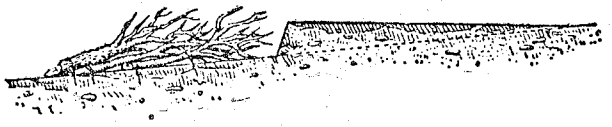


FIG. 221.

3. They must be perfectly and completely swept by the fire of the firing trench; *an accessory defense not so arranged is useless*, because the enemy can come and destroy it without danger to himself.

4. The trace of these works must be absolutely independent of that of the firing trench in order to baffle all attempts of the enemy to adjust his fire. The necessary salients must be made so that the fire of the flanking defenses can sweep the *exterior edges of the* obstacles (see fig. 222).

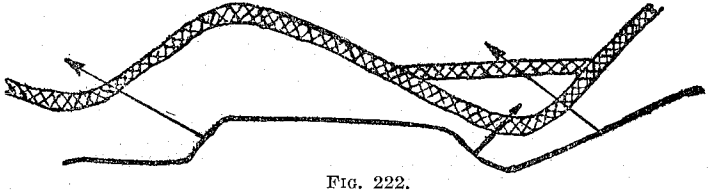


FIG. 222.

5. They must be arranged in *several strips*, separated by from 5 to 10 yards, rather than in a single strip or band. For example, make two wire entanglements each from 10 to 15 yards in width in preference to making one from 20 to 30 yards wide. *Begin by constructing in its entirety the band or strip that is to be farthest away.* The thickness should be greater in front of the passive parts of the line than in front of the active parts.

6. Arrange for *passageways* to the front for the use of patrols, sentinels, etc. They must be concealed or at least not easily discoverable and there must be material close at hand suitable for quickly obstructing them in case of the necessity arising for doing so. (Fig. 223.)

7. They must be *watched* carefully at night by listening posts dug at points along the edge of the obstacles or in front of them and themselves protected by accessory defenses. These posts have passageways leading across the wire entanglement and they give the alarm by signals, little bells, by firing, etc.

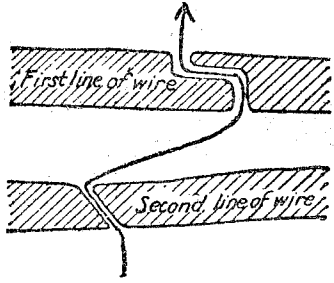


FIG. 223.

Before beginning an offensive the accessory defenses should be removed in order to give passage to the waves of assault. Crow's-feet, loops, etc., scattered irregularly about the ground possess the difficulty of being hard to find and of restricting the freedom of assault.

Dummy trenches.—It is always advisable to make dummy trenches; that is to say, supplementary trenches which it is not intended to occupy, with a view to deceive the enemy's observers whether on land or in the air, and to lead them into error as to the real occupation of a position and the distribution of the troops. It is often advisable, even, to establish them for the purpose of leading the enemy into a trap when he attemps to get a footing in them. With this object in view they may be

constructed in straight line elements, completely enfiladed (flanked) by the true trenches. If the enemy enters them he will be decimated at close range by the fire of rifles or machine guns, the locations of which are conveniently concealed. Figure 224 illustrates one method to be employed on the first line.

Take two trenches which have a lateral interval between them of about 65 yards and construct a dummy redan trench, the two faces of which are beaten by machine guns from the main trenches, as shown in the figure. Construct a false outlet to the front at the salient, by degrees, this serving as a sort of trap into

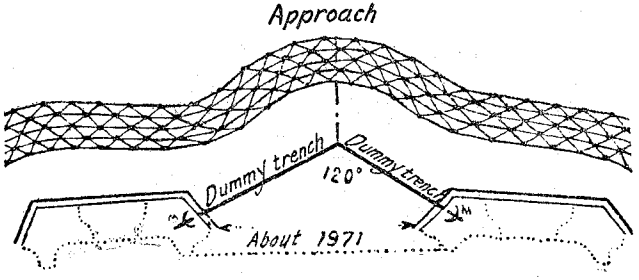


FIG. 224.

which the enemy may advance. The injury to these false trenches wrought by the hostile artillery must be repaired in order to prolong the illusion of the enemy.

TERRESTRIAL OBSERVATION.

COMPANY OBSERVERS.

1. *In the trenches, in a position in readiness, observation must be continuous, the same as when in combat.*

Each company must therefore construct a limited number of *observing posts*, which must be concealed (camouflé) and must not form a salient, and from which the fields of view overlap upon those parts of the hostile line which it is important to

watch, and which have been assigned to the company. These observers try to see everything that happens and to notice even the slightest indications of any movement. It is not absolutely essential that they should be located in the first-line trench or

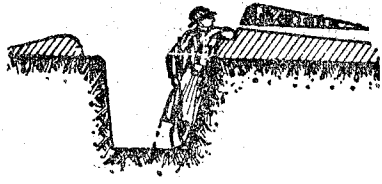


FIG. 225.

in the listening posts. Places will often be found behind these locations which will afford excellent views and be less likely to attract the attention of the enemy. The salients of the works, at which points one has more extensive views, are also favorable locations for these observing stations.

FIG. 226.

2. In addition to this continuous normal observation, it is also necessary to arrange for *lookouts during a hostile attack.*

The only guaranty of the defense is found, then, in a system of watchfulness capable of functioning, however severe may be the hostile bombardment.

As a rule there should be a lookout (watcher) installed near each shelter, who takes his post as soon as the violence of the bombardment makes it necessary for the men to go under shelter, and gives warning of an approaching attack. These watching posts must be armored and protected by every possible means, and have communication with the shelter of a kind that will surely work, in order that there may be no failure of the alarm

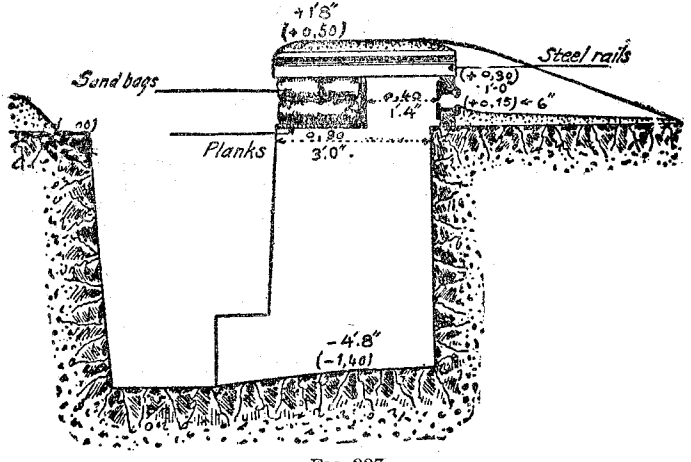
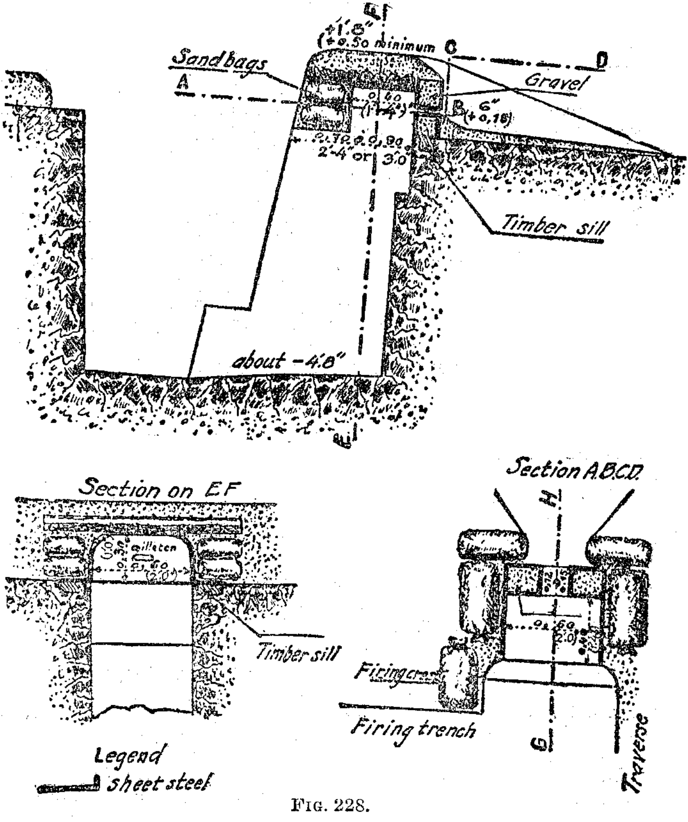


FIG. 227.

signal to perform its function. The watcher must give warning that the hostile artillery is lengthening its fuses and that the enemy is about to assault the trenches.

The officers and the noncommissioned officers who have come, under the menace of attack, to occupy the shelter with the other men must be able to watch the lookout at the entrance of the shelter in order to have him replaced by another if he should be put hors de combat. The entire defense rests upon this ar-



Sandbags
A
Gravel
D
Timber sill
about -4.8"
2'-4" or 3.0"
Section on E F
Timber sill
Legend
sheet steel
Section A.B.C.D.
Firing trench
Traverse

FIG. 228.

rangement, failing which the men, surprised in their bomb-proofs, can not avail themselves of their means of resistance.

The same lookout posts may also be adapted to both of the missions just described. For this it will be sufficient to dig the shelters alongside the positions recognized as favorable for continuous observation, instead of making the shelters first and selecting the observation stations afterwards.

Installation of the lookouts (watchers).—If the time and the necessary material means are lacking, or it is feared that covered posts will betray the position, lookouts will be established without protection, their heads being concealed behind shrubs or tufts of herbage. In the daytime observation is kept up through loopholes of different forms (figs. 193 to 198), or by the aid of periscopes (figs. 138 and 139). To watch certain points it will often suffice to make a circular hole in the parapet with a sharp-pointed round stick or metallic tube. To permit observation with field glasses the loophole must have a breadth of 4 inches. To prevent alternating light and shade due to movements behind the loophole, it is advisable, in a post without a roof, to *stretch a cloth behind and above the lookout man.*

At night the watcher must observe *over the top of the parapet.* If the command is sufficient, the loophole is placed on the natural surface of the ground and the banquette is cut away in line with the loophole, as far as the bottom of the trench. The watcher will thus be well covered. At night he mounts upon the part of the banquette which has not been notched (see figs. 225 and 226). Armored lookout stations consist of niches or metallic boxes (figs. 153 and 154), or are as shown in figures 227 and 228.

ORGANIZATION OF TERRESTRIAL OBSERVATION IN A SECTOR.

In general the observation is organized methodically throughout the sector of a division in such a way as to complete and control the aerial observation, which, however much it may be perfected (by means of photography, etc.), is never anything but intermittent.

The scheme for observation, which is an indispensable part of the *plan of defense,* shows the *command posts* and the *artillery observing stations.* These latter are again divided into *information observing stations* with extensive view and *observing stations of more restricted view for adjustment* and control of fire.

The scheme for observation should include:

1. The map or chart showing the complete system of observing stations and the view obtainable from each.

2. A panorama sketch of the view from each.

3. The scheme of the telephonic liaisons (connections) between the observing stations and the command posts.

4. How the service functions (temporary and permanent observing stations, personnel of each, special orders for certain ones, what assistance the command posts and observing stations may expect to receive from the artillery observing stations, transmission of information, etc.). An observing station must be conveniently fitted up, protected, camoufléd (concealed), including the entrances.

There should be as part of the scheme of observation:

1. Special instructions (personnel, tour of service, sector to be watched, message service, particular points to be specially watched, what precautions to take with reference to *visitors of every rank.*

2. An observing station notebook in which must be written *at once* the observations made.

3. Sketches kept up to date of the hostile entrenchments and troops occupying them on a scale of 1–5,000, and, if expedient, on a scale of 1–10,000 or 1–20,000.

4. A map of the parts of hostile position seen and a panorama of same.

5. The necessary implements for keeping up observation, communication, etc.

The observers are trained until they can read with skill the maps and the panorama sketches and understand how to explore by sight the terrain thoroughly and methodically and to express their observations verbally and in writing completely and precisely. They *signal at once* any preparations of the enemy for attack and *note* every sign of activity or any change of appearance in the hostile lines. They send each day, at the hour or hours fixed, an extract from their notebook. In each body of troops the *information officer* discusses and coordinates all of these reports. He presents them to his chief and corrects to date the 1–5,000 sketch of the command post. Information of

interest and value is transmitted to the generals and from them to the second bureau of the army corps.

B. ORGANIZATION OF THE SUPPORT TRENCHES.

The support trenches are constructed from 165 to 225 yards behind the trenches of the first line and must be so located as to *bring the latter under their own fire* whenever it is possible to do so. This distance is great enough to insure that the same demolition fire will not destroy both trench echelons at one time, and also that in cases of surprise of the first line the garrison of the second line will have time to make the combat dispositions called for in the plan of defense.

The organization of the support trenches must be in all essentials similar to that of the first line, since they are intended to be a substitute for the latter in case it should be carried by the enemy. This rule is general and applies to all of the successive echelons of trenches behind the firing trenches, cover, support, line of strongholds, etc. Any trench may become at any moment, through force of circumstances, a trench of the firing line and must be constructed *in advance* to play such a rôle.

Moreover, the principal communicating trenches connecting the lines must likewise be organized for defense and have barbed wire stretched along the edges. If a momentary retirement is forced upon us, wire entanglements, loopholes, flanking defense, machine-gun posts, lookout posts, shelters, etc., can not be improvised in the course of the combat, and any failure to provide these things beforehand can not be remedied then. On the contrary, if these successive lines are provided with everything necessary a real partitioning of the terrain occurs, forming, so to speak, a series of solid walls of defense opposed to any attempt at a hostile advance, and providing at the same time points of departure for flank and frontal counter attacks. It would indeed be unforgiveable if the support trenches were not made much stronger than the firing trench, since there is much more favorable opportunity to trace, fortify, and surround the former with wire entanglements than the latter. In the same way, from the point of view of its tactical rôle, the support trench must be better than a mere second cover trench located from 100 to 170 yards from the firing trench, which latter can

rarely be methodically constructed and is hard to repair." The support trench, on the contrary, must aim to fulfill a very clear idea of defense and to that end must take advantage of all features of the ground, whether it is necessary to approach quite close to the first line or to withdraw to some distance from it.

It is therefore the real defense trench which has been selected and organized at will under the protection offered by the firing trench. Under these conditions it should be *inviolable*. Like the firing trench, it is not occupied uniformly, and has passive parts as well as active parts. The latter are logically placed behind the passive parts of the first line.

C. ORGANIZATION OF A REDOUBT.

When the center of resistance is completed by a redoubt, the latter should be a closed work, entirely encircled with barbed-wire entanglements. The distance from the line of support to the redoubt is very variable. It is intended to put up a resistance to the death, even if completely surrounded. For that reason it must have fields of fire in all directions, bombproofs, first-aid posts, water depots, with provisions and ammunition for a fight of several days. Its garrison will consist of one or more platoons in charge of an energetic commander. Each one of its faces has regular firing trenches, but there must be numerous traverses and parados for protection against enfilade and reverse fire.

Occupation of a point of support.—The normal garrison of a point of support is one company. For example, the captain might put three platoons on the line, each one disposed in depth into a firing line and a support line, the guards of one or two of the active elements of each line being actually in position. The reserve platoon is held together in the line of support or in the redoubt (fig. 268). The first line receives therefore from one-fourth to one-third of the strength, which is the normal proportion in outposts. The details of this service will be found in Part VII, "Infantry in the trenches." The tactical properties, assignment, and manner of locating the machine (automatic) rifles and machine guns, proper, will be found pointed out in Chapter V, Part IV.

Communications.—The communication trenches constitute artificial routes which insure at all times the replenishment of the firing line in men, ammunition, and rations, and the evacuation of the wounded. In the zone which extends from the places of arms to the advanced line they are numerous, so as to facilitate the movements of assaulting troops, reserves, and reinforcements. In rear of this zone they are not so numerous.

They are never too numerous, provided that their network is simple and clear, and can be used by a body of troops which has had time only to make but a summary reconnaissance of them. It can not be too much insisted upon that the approach trenches should be so constructed as to facilitate movement at night with as much freedom as in the daytime; that there shall be nothing to retard movement or to get hooked onto the clothing; that every inequality be leveled down and every hole filled up. This is the secret that permits a small number of effectives to hold a considerable front, which can be done without fear if it is known that reinforcements can rush up, at a rapid pace, to threatened points. On the contrary, if there is doubt as to how soon these can come up, then one is unwilling to risk the thinning out of the first line and useless fatigue work falls on the companies.

In the interior of the position the communicating trenches are, moreover, eventual *nuclei of defense*, and must be organized accordingly.

"Communicating trenches" is the special name given to those trenches which form passageways leading toward the enemy, and those parallel to the front are called *transversals* or *parallels*.

Profile.—The normal communicating trench has a depth of 2 meters (6½ feet) and is 3 feet wide at the top. (Fig. 43.) These dimensions are suitable for the principal *communicating trenches*. They may be reduced to 5⅔ by 2½ feet for the secondary ones. When it is desired to lessen the visibility the deep sap is adopted. (Fig. 44.) If it is desired to render them wholly invisible, they are covered with screens or hurdles, with a little earth placed on them. The width of the principal *evacuation trenches* may be greater. They must admit of the passage of litters without difficulty; this is the criterion as to sufficiency of width, and must be insisted upon. This width is made as great as 5 feet for the passage of a column of twos,

and even to a width of 8 feet for the passage of small vehicles, etc. For the decanville railway the width must be 10 feet. If the soil is friable, the slopes are given a greater incline and the berms are made wider.

The trace.—As communicating trenches lead in the general direction of the enemy, they have everything to fear from enfilade fire. For this reason they can scarcely be too deep nor too sinu-

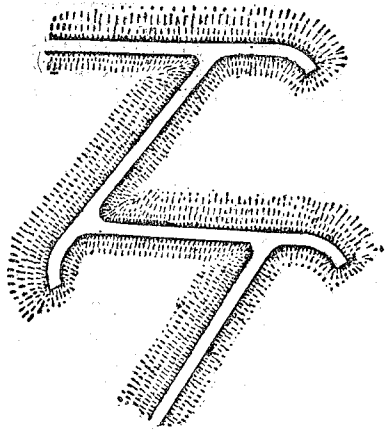


FIG. 229.

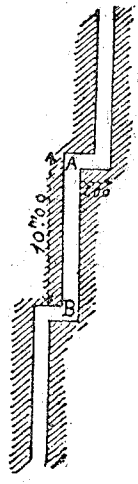


FIG. 230.—Trace with indentations.

ous, especially on slopes turned toward the enemy, when the slope is much inclined and the enemy dominates.

At certain points protection will be secured only by deep, covered saps (fig. 234).; the zigzag trace (fig. 229) guarantees protection against enfilade, but is of considerable length.

When the terrain makes it necessary to run the trench in a straight line, traces are adopted of one of the patterns shown in figures 230 to 233. Movement must be facilitated at the elbows, as shown in figures 235, 236, and 237. For evacuation trenches a trace without traverses is always adopted.

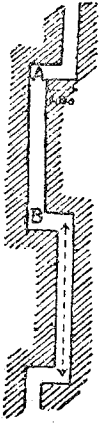


FIG. 231.—Trace with traverses.

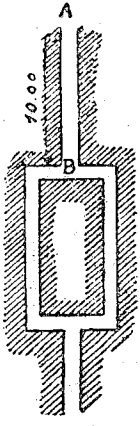


FIG. 232.—Trace with island traverses.

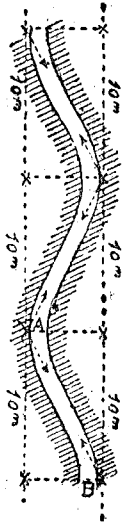


FIG. 233.—Sinuous trace.

Various trench arrangements.—About every 110 yards steps must be constructed for getting out of the trenches and at shorter distances *turnouts* large enough to contain a litter and its two bearers should be arranged. Wide sortie steps should be established at the points where the communicating trenches are to serve as assembly places for a counter attack, as provided

for in the plan of defense. Each communicating trench from its origin to the advanced parallel should be given a distinct

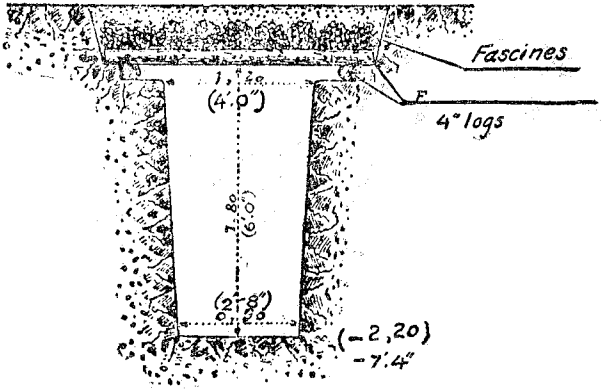


FIG. 234.

name or number. The secondary communicating trenches and the transversals are denominated in a different series from that adopted for the principal communicating trenches.

Arrange crossings in such a fashion that once having entered the approach trench it will guide a man to the advance trench. One method of doing this is to arrange a step into the bottom of the transverse trench where it enters the approach trench. Another way is to wedge a strong stick across the opening of the side trench. Where a transverse trench is crossed ramps from it to a footbridge over it should be constructed, so that if both it and the approach trench are being used at the same time those in the transverse trench may use the ramp and bridge. Mark out the approach and transverse trenches by means of numerous signboards of different shapes, sizes, and colors for principal and secondary approach trenches, for those to be used to go to the front, for those used to go to the rear, and for

transversals. These signboards are absolutely essential at entrances, crossing points, forks, and points of exit. Arrows are

FIG. 235.

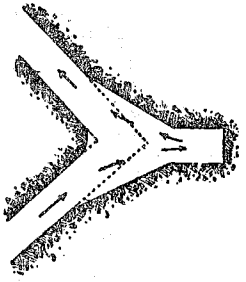


FIG. 236.

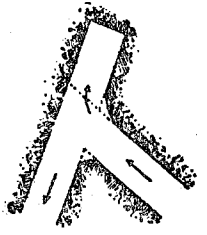


FIG. 237.

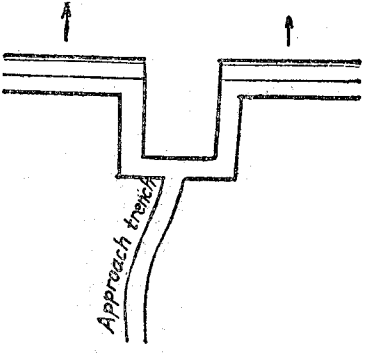


FIG. 238.

also put up to show the direction of authorized movement. In each principal approach trench movement in one sense of the

word is only to the front, except for the agents of liaison, persons authorized specially, etc. A most rigid police discipline must be kept up in the trenches.

The berms permit the men to spring from the trenches and parallels and facilitate the placing in position of footbridges or movable bridges for temporary use. It is always well, by

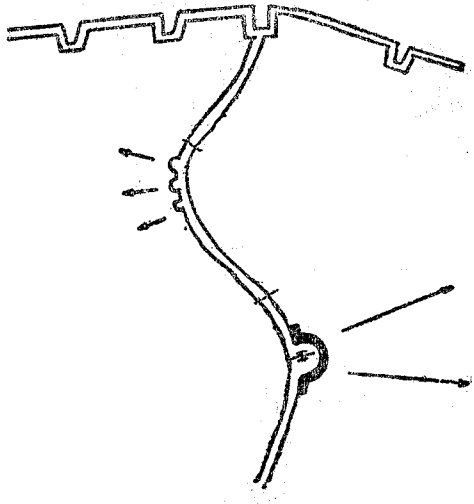


FIG. 239.

providing the necessary footbridges, to have a track or trail alongside of the principal approach trenches, so that at night this open-air route may be used. At the point where the approach trench joins the firing trench there must always be a traverse, as shown in figure 238.

Defensive organization of the approach trenches.—The approach trenches should contribute to the general scheme of stop-

ping at every step an enemy who has gained a footing in the front-line trench. They are, therefore, organized at intervals into firing trenches by making steps or berms from which men

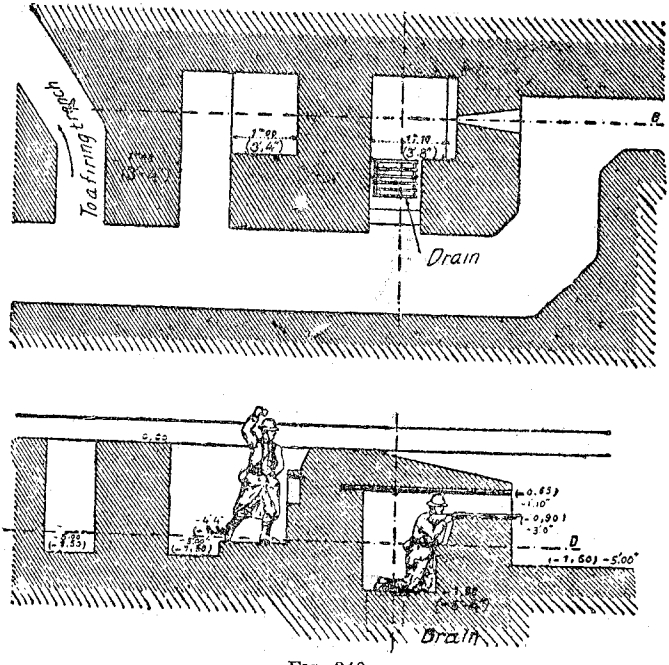


FIG. 240.

may fire, or by building niches in the walls for the firers. By this means they form flanking defenses for all of the terrain between the various parallels. (See fig. 239.) Full use is made of automatic rifles and machine guns in these arrangements.

Their interior, step-by-step defense is organized by the use of barricades, loopholed traverses, platforms for grenadiers, al-

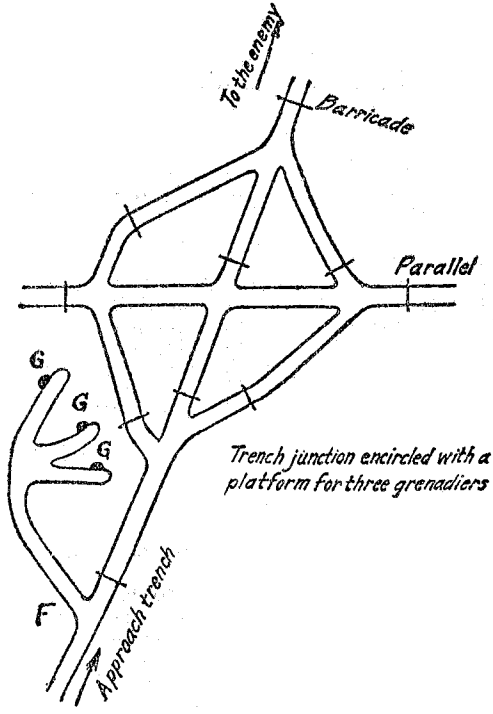


FIG. 241.

lowing of the enfilade of all of the rectilinear parts of the approach trench which are of any considerable length. Figure 240 gives examples of some of these arrangements.

These straight parts of the trench should be 55 yards long and should end by a defensive arrangement, this distance being out of range of the hand grenade, even if the enemy does construct a barricade at the other end of the stretch. Means for obstructing trenches, such as gabions, herissons (wooden frames with barbed wire stretched upon them and having length, breadth, and thickness), etc., are prepared and kept at hand for the very purpose of holding the enemy under fire of these interior flanking defenses. A disposition to be recommended is that shown in figure 241, which consists in encircling a trench junction with a number of other trenches, thus transforming it into a small work which will form one of the active elements of the system of the defense, and the defense of which can be assigned to a squad or half squad. Barricades furnish the means of quickly obstructing a trench in case of attack, and must be carried by the enemy one at a time. Wherever it is desired to dispute the enemy's passage, a double or a triple platform for grenadiers may be prepared, the entrance to which will be defended by the squad. The niches for the grenades are arranged as shown in figure 42, or with a gabion buried horizontally in the slope, the interior being left empty. All of these works for husbanding strength and for defensive organization in the area of a point of support, are to be done by the company which garrisons the point.

SHELTER.

1. BOMBPROOF SHELTER.

Shelter is of value only when it affords complete protection and enables its garrison to leave it in time. The only shelter to consider in the organization of a position is that which is bombproof, and principally cave shelters under 20 feet of undisturbed earth, which have been described in "Trench school," Chapter VIII of Part III. Shelters formed by excavating a hole in soft earth with a roof formed afterwards of earth, supported by logs or rails, are only used in special cases, such as in wet ground, observing stations, shelters for machine guns, etc. They require more materials than cave shelters but do not take as long to construct when the excavation can be made in

the open. They should be made as strong as possible and with small relief. To afford shelter from the 105 (4.2-inch) they should have one layer of steel rails in contact, covered with a yard of earth; one bursting layer (logs in contact, sacks of cement, heavy sheet iron and gravel, broken stone, etc.). The cover against the 150 (6-inch) requires two layers of steel rails separated by 18 inches of earth; two bursting layers separated by ½ to 1 yard of earth. (Or better; 1 layer of steel rails in

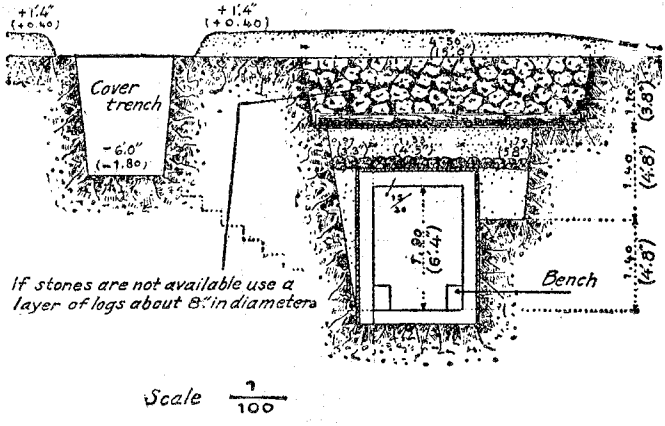


FIG. 241a.

contact covered with 1 yard of concrete.) The bursting layer may consist of 1 or 2 layers of flagstones or reinforced concrete. In general terms 1 yard of solid earth is equivalent to 1 layer of logs, 6 to 8 inches in diameter, covered with 1 yard of soft earth. Fig. 241a is an example of a light bomb-proof shelter. These shelters always cave in after a certain time from the weight of their cover and last a much shorter time than well constructed cave shelters. Whatever their character, shelters should always have *several entrances* (at least

two) on their rear. The precautions against gas should always be insisted upon. (See Chap. XIV, Pt. III.) It is much better to construct a number of small shelters for a squad or section than a few large ones. During the artillery bombardment, the officers should remain in the shelters of their men, and not be together in one shelter. A good disposition consists in excavating two small cave shelters on each side of a traverse, each entrance being at least 2 yards from the traverse; these are connected by a mine gallery 3 feet 4 inches by 3 feet 4 inches, which is enlarged later if time permits, so as to make a single large shelter. (Fig. 242.) Every shelter

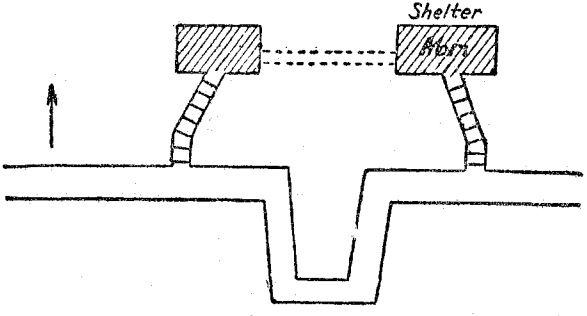


FIG. 242.

should contain a pick and shovel, so that the entrance may be cleared if it is obstructed; some grenades to clear the entrance, so that the garrison may debouch in force if the enemy gets into the trench; arrangements for ventilation, heating, and sleeping; arrangements for observation (large periscope), communication with a lookout, and for the defence of the entrance of the shelter. (See Fig. 277.)

Location of shelters.—Shelters are seldom constructed in the firing trenches, but in the cover trenches, or, if there is no cover trench, in small special lateral tranches, joined by at least two approaches to the firing trench. Others should be in

the support trenches, for the shelter of a section or platoon reserved for counter attacks. Their location is always de-

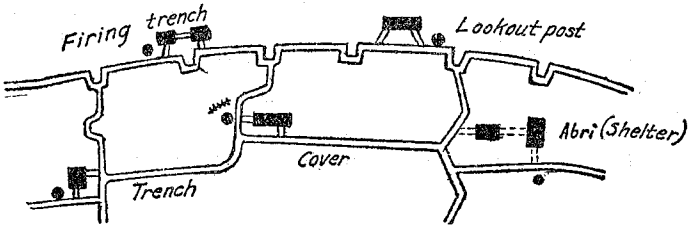


FIG. 243.

pendent upon the location of the lookout posts, for which the most favorable locations must be selected; and the shelter is

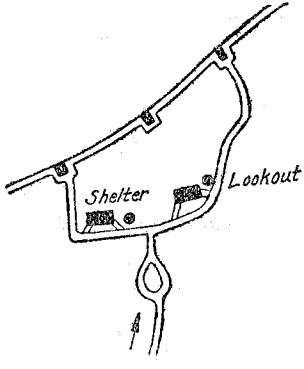


FIG. 244.

constructed in the immediate vicinity of one of these posts. The number of bombproof shelters should be sufficient for all

the garrison (deducting sentinels in observation) to find complete shelter and remain in safety under the most violent hostile artillery bombardment. A company should therefore have six or seven shelters, each for a section, distributed between the cover trench and the support trench.

2. LIGHT SHELTER.

In addition to the bombproof shelters indispensable for the firing line, and which should be provided without delay, it is

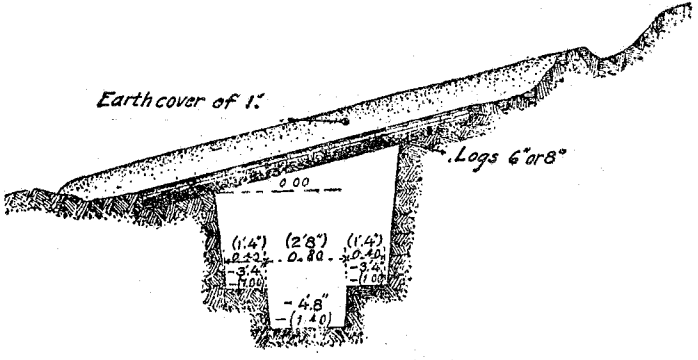


FIG. 245.—Light shelter.

advisable to construct *light shelters* for the other lines and for the reserve positions, which, until better ones can be constructed, will furnish them with *splinter-proof cover* and shelter from the weather. These shelters are constructed either in the trench itself or in rear of it. Figures 245, 246, 247, 248, and 250 indicate the various forms. The time and materials available determine the choice of these types to be adopted. They are temporary expedients of a provisional character, as they deteriorate rapidly under the effects of the weather.

The dangers to be avoided are the weakening of the parapet and the decreasing of the firing crest.

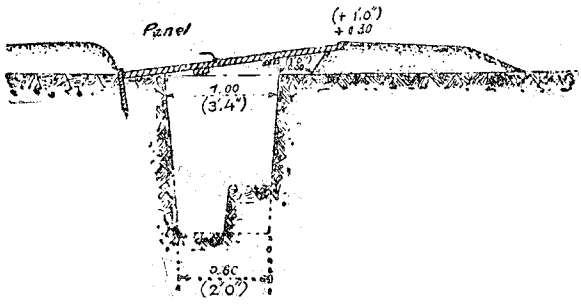


FIG. 246.—Covered trench.

Niches that are not lined with timber should be forbidden in soft or cracked soil.

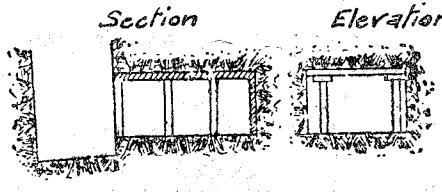


FIG. 247.—Niche for a man with plank roof supported by posts.

The sheds, hatch covers, etc., should not be fixed in place, but should be so arranged that they can be quickly thrown off to enable the men to man the firing crest.

For protection from shell splinters and shrapnel 12 to 20 inches of earth on a roof of light logs or planks should be provided.

3. SHELTERS OF SHEET IRON.

These consist of: (1) Curved sheets of iron, with which shelters like that shown in figure 252 may be constructed in rear

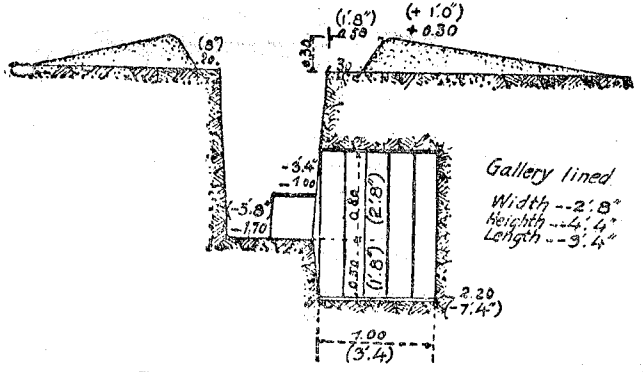


FIG. 248.—Niche for two men sitting.

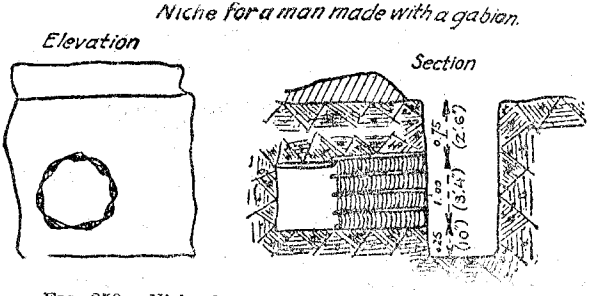


FIG. 250.—Niche for man constructed with a gabion.

of the lines. (2) Elements of light shelters constructed of corrugated iron about 0.04 inch thick, weighing about 22 pounds.

(Fig. 253.) The straps *a* are arranged so that they may be assembled with iron bands. They should be covered with earth.

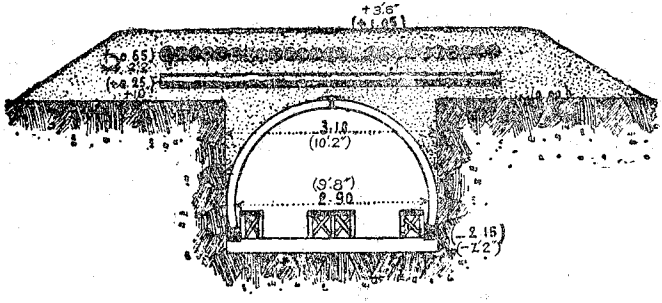


FIG. 252.—Shelter with arched steel plates.

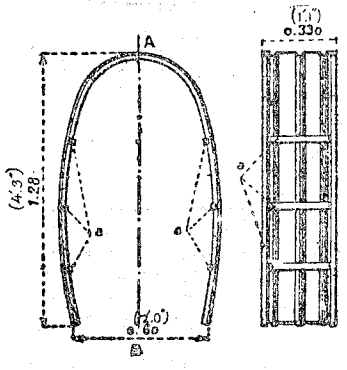


FIG. 253.—Element of a light shelter of corrugated iron.

Shelters may be improvised by means of these devices during an attack.

4. REINFORCED SHELTERS.

The shelters called reinforced should be excluded. There should be no intermediate step between the light shelter and the bombproof shelter. If the construction of bombproof shelters can not be undertaken, it is better to disperse the men in many light shelters than to crowd them in weak shelters, even though they are reinforced. If it is believed that there is time to construct a reinforced shelter, it is better not to do it, but to commence the construction of a cave shelter.

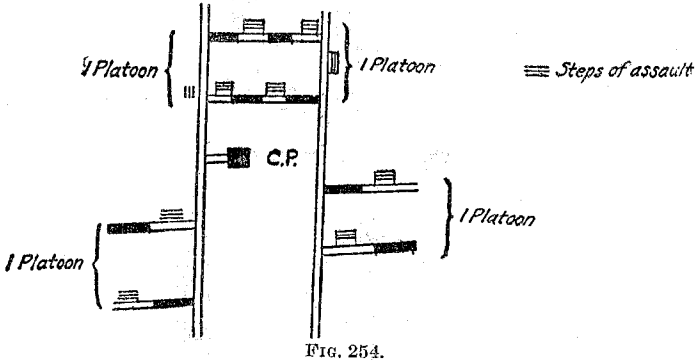


FIG. 254.

Command posts—Telephone stations—First-aid stations—Depots for munitions.—These differ from shelters only in their dimensions and interior arrangements. The location of the *observation station* of a commander should always be made before that of his *command post*, which should be near it. If possible, locate it near a main approach trench; mark its location in several ways (signposts, lanterns, orderlies, etc.) so that it can be found day or night by the liaison agents who are strangers to the unit. The telephone stations should be near the observing station or the command post; *they are supplemented by visual stations, which can be substituted for the former immediately.* Provide each command post with an incendiary grenade

to destroy all papers if it is necessary to evacuate the command post in haste.

The dressing stations and places where wounded are collected should be near an approach trench.

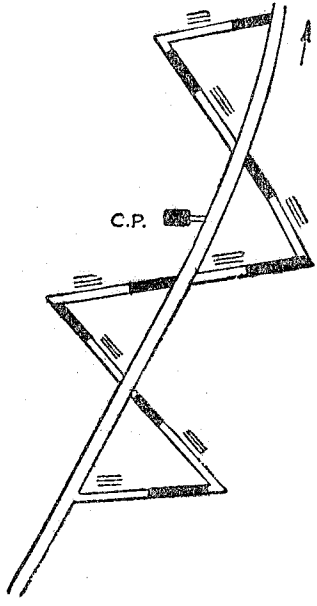


FIG. 255.

Avoid constructing in the approach trenches all works which will cause halts or crowding (distribution of tools, etc.) and therefore interfere with the traffic in them.

Assembly places.—The assembly places are intended to allow the assembly under cover, for a relatively short time, of all the

supports and reserves. They may be established from existing parallels, or be constructed entirely for that purpose by branches from the approach trenches. They may well be located near the reserve trenches, where they can utilize the shelters in these trenches.

They should avoid an excessive division of units; provide easy means of reaching the open ground (steps) and the approach trenches; be provided with shelter (covered trenches, command shelter, etc.), a water supply, and latrines; not attract attention by an appearance different from that of the other trenches.

The choice of the location of the assembly places depends upon the rôle of the troops that are to occupy them. The slowness of the movements confined to the approach trench, the necessity for decreasing the length of the distance to be covered in exposed terrain in order to reach the parallel of departure. These considerations govern the choice of location of assembly places.

LEGEND.

Order of the work.—The plan of the works to be constructed is fixed by the commander. When it is necessary to rapidly organize a position recently captured, the order of importance of the work is as follows: (1) Prepare the works for flank fire; (2) construct the firing trenches; (3) construct at the same time the wire entanglements, the observing stations, the shelters, and the latrines; (4) open communications laterally and to the rear (commence the approaches to the front); (5) complete the trenches.

CHAPTER VII.

OBSERVATIONS AS TO THE TACTICAL CHARACTERISTICS OF THE SEVERAL ARMS AND STAFF DUTY.

ARTILLERY.

Artillery acts exclusively by the power of its fire. Its range permits it to intervene directly not only for the support of troops directly in its front, but also in favor of troops adjacent to it, by oblique and flanking fire (concentration of fire).

Artillery can not drive troops out of a position by fire action alone, but the infantry must take advantage of the effects of artillery fire to advance. These two sister arms, therefore, must be in close and permanent association. To bring about this association is the task of the higher command, of the artilleryist, and of the infantryman.

Classification of artillery.—Artillery is classified as—

A. *Trench artillery*, which throws large quantities of explosives to short distances only. (Mortars of 58, 150, 240, 340 millimeters, i. e., 2.3, 6, 9.6, 13.4 inches.)

B. *Field artillery* (75, 80, and 90 millimeters, i. e., 3, 3.2, and 3.6 inches) which can move at all gaits and over all classes of terrain and which can be placed in battery immediately. The 75-millimeter rifle has a range of about 7,500 yards. Field artillery is employed against the enemy's troops to destroy their auxiliary defenses and to engage all the hostile batteries within its range.

C. *Heavy artillery* (H. A.) which is moved with a certain degree of difficulty, and generally requires preliminary work in placing it in battery before it can open fire. When it has its own motive power (horses or motor tractors) it is called *heavy field artillery;* when it has no means of locomotion it is termed *heavy artillery of position.* The especial value of heavy artillery lies in the superior weight of its projectile and the destructive effects of its impact, the quantity of explosive that it contains, and, for certain pieces, in their extreme range.

The *long pieces*, or *rifles*, on account of their range, are employed against distant objectives (batteries, observing stations, communicating trenches).

The *howitzers* or *mortars*, on account of their curved trajectory, are employed against defiladed objectives (batteries, trenches, wire entanglements on the counterslopes, etc.) and, owing to the smashing power of their projectiles, are able to destroy dugouts, command stations, casemates, etc.

The rifles are of 95, 105, 120, and the 155 mm. caliber (i. e., 3.8, 4, 4.8, and 6.2 inches). The short pieces are the 155 mm. (6.2 inches) howitzer and the 220 (8.8 inches) and 270 mm. (10.8 inches) mortars.

D. *High-power artillery.*—It is composed of motor-drawn pieces, or of pieces which are moved on rails. Its task is the

destruction of objectives which the other classes of artillery, either through lack of range or the inadequacy of their projectiles, can not damage. It therefore has for objectives strongly fortified supporting points, railway stations, centers of communication or supply, aviation parks.

The principal rifles are the 14, 16, 19, 24, 27, and 32 centimeter and the 305 and 340 millimeter (i. e., 5.6, 6.4, 7.6, 9.6, 10.8, 12.2, 12.8, 13.6 inches).

The principal howitzers are the 370 and 400 milimeter (about 14.6 and 15.8 inches).

Projectiles.—Three classes:

Shrapnel, which, at the bursting point, projects the bullets contained by it.

High-explosive shell, containing an explosive which produces its effect by the rupture of the envelope and the blast of its gases.

Special shell.—The projectile may burst on impact (percussion shell) or before impact at some point of its trajectory (time fuse). In both cases the shell is exploded by a fuse.

For the effects of the several classes of projectiles see Chapter XIV, Part III.

Ranging.—To score a hit when the precise range is known, it is not sufficient to take the exact elevation corresponding to the distance. Example: To hit a target at a range of exactly 4,500 yards it is generally necessary to take a slightly different elevation (4,400, 4,475, 4,550, etc.); the reasons for this correction are: Variations of temperature and wind, differences in elevation of the piece as compared to the target (site), slight differences in the quality or weight of powder charge, or in the weight of the projectiles, which are never entirely uniform.

To get the range it is necessary to determine *practically* the elevation which will place the *center of impact* on the target. It is of prime importance to determine the exact elevation. Without it fire is useless; it may even be detrimental.

Observation.—In order to get the range it must be possible to observe the effects of fire. The artillery observer, who is generally an officer, regulates the fire.

The useful effect of artillery fire is proportionate to the extent to which its results can be observed. Artillery can adjust its fire to the advance of the infantry only when it can see or

when it knows precisely the positions occupied by the advance lines of the infantry.

It is important, therefore, that artillery have excellent observation stations; that is to say, points which afford adequate fields of view for the observers, and which can be occupied in spite of the hostile fire. When the infantry needs the support of the artillery, the observer is never, because of danger, justified in quitting his observation station. The observation stations communicate by telephone, signals, messengers, etc., with the batteries of which they control the fire, and with the commander of the infantry which those batteries support.

Dispersion of fire.—It has been shown above that neither the pieces in a battery, nor the charges of powder, nor the projectiles are exactly uniform, and that atmospheric conditions also have an influence upon the accuracy of fire. The shells of a well-aimed fire will not all fall at the same point. This is unavoidable, and the infantry must appreciate this and avoid calling upon its supporting artillery to increase the range of a well-aimed fire simply because some of the shells have fallen short and in the vicinity of the infantry trenches. The infantry which makes premature or unjustifiable complaints to its artillery disturbs the fire of that artillery and diminishes, to the infantry's detriment, the assistance which it affords.

Duty of infantry in connection with artillery.—The infantry must afford to the artillery (*a*) information, (*b*) protection.

Information.—Under normal conditions of trench warfare the results of the service of information performed by the infantry, by which it gathers, collates, and verifies all the information relative to the activities of the hostile artillery and infantry, must be communicated daily to the artillery which supports it. The infantry should keep the artillery informed as to the reliefs of the enemy, their periodicity, hours of marching, their itineraries; likewise complete information as to the enemy's *service of supply*, occupation of the trenches, fatigue details, *hostile observation* stations, machine guns, bomb projectors, etc. It is by keeping the artillery informed as to what he, as an infantryman, knows or sees, that the infantry officer, whatever his rank, obtains to his own advantage, artillery support that is vigilant and well informed, that crushes the enemy by its opportune

entry into the action, and that responds immediately to calls for help.

At the time of an attack.—The infantry officer must appreciate that without his assistance the artillerist is liable to make mistakes, to delay entering into the action or to enter it inopportunely; in short, to render inefficient assistance as a result of which he is sure to suffer. It is therefore the duty of the infantry officer:

(*a*) To inform not only his own chief but also the officer commanding the nearest artillery group as to the position in which his command is located. The best method is by a hasty sketch, traced from his map, with the following note:

"My company is posted from _____ to _____.

"The troops on my right and left are (such) and (such)."

The sketch is authenticated by the sender's signature, and *the hour of signature is given.* The sender insures its speedy transmission.

(*b*) To signal to the artillery the discovery of any good artillery observation stations in the ground that he has just occupied; e. g., "good artillery observation station at (such) point. It commands such and such portions of the ground." If possible, a sketch, with the observation station indicated by a cross, is sent to the artillery commander.

The two rules given above, although applying primarily to the progress of an attack, are likewise applicable to defensive combat when the enemy has succeeded in entering the trenches; the information under such conditions is equally important to the artillery, whose mission is then to stop the enemy as well as to protect the infantry.

Protection.—Under normal conditions the entire system of friendly trenches affords protection to the batteries in front of and around them. During combat, either in attacking a fortified position or in open warfare, the artillery may be called upon to change its position and go into action on ground exposed to the offensive returns of the enemy. The infantry nearest the batteries must supply them with the service of security and information. In certain cases the superior commander assigns a unit as *artillery support.* Moreover, every artillery officer is authorized to ask support from the nearest infantry, and in such a case it must never be refused.

The officer commanding the support communicates with the artillery commander, studies the situation with him, and then makes his own dispositions, for which he alone is responsible. As a rule he places a part of his command sufficiently in advance of the artillery to secure it from hostile infantry fire, and places other fractions, under cover, on the threatened flank.

In every case the infantry must realize that the capture of the guns by the enemy would not only weaken us but would constitute a trophy for him. The abandonment of artillery by the infantry adjoining it is an act of dishonor.

ORGANIZATION OF A FIELD BATTERY.

The light battery of 75's consists of: The combat battery, which can travel at all gaits, and the field train (4 wagons), which can travel only at a walk. The combat battery "in battery" is divided into the firing battery (4 pieces, 6 caissons), the limbers, and the combat train (6 caissons, 1 forge, and 1 battery wagon). The limbers and the combat trains are located behind cover in rear and at distances which vary considerably, depending upon the amount of security required, the probability of having to bring up the limbers, and the requirements as to ammunition supply.

In open warfare these elements may be from 500 to 2,500 yards in rear of the guns. They are protected either by a special support or by a part of the support of the firing battery.

SERVICE OF ARTILLERY.

Artillery is not only an arm, but is likewise a *supply service* which is charged with the supply of ammunition, primers, etc., to all arms, as well as with the replacement of artillery arms and matériel and equipment in general.

CAVALRY.

The cavalry furnishes one regiment to each army corps. The remaining regiments are grouped into cavalry divisions, and these into cavaly corps.

The regiment consists of four squadrons (i. e., troops) of 150 sabers (3 platoons, 4 officers) and machine-gun sections. The noncommissioned officers and troopers are armed with the carbine and bayonet. The dragoons and the light cavalry of the cavalry divisions are armed with the lance. The corps cavalry supplies the divisional cavalry (1 to 2 squadrons).

In addition, the infantry regiments have 12 mounted scouts.

A cavalry division is composed of two brigades of two regiments, a group of horse artillery, a dismounted cavalry regiment, a group of cyclists, and auxiliary elements analogous to those of an infantry division.

Formations.—Line of battle corresponds to the double-rank line of infantry.

Column of twos and column of fours have the same significance as in infantry.

The squadron (i. e., troop) in "column of platoons" is a formation corresponding to the company column of platoons.

The platoon charges in line and as foragers (as skirmishers).

Gaits.—Walk, 110 meters (120 yards) per minute; trot, 240 meters (260 yards) per minute; maneuver gallop, 340 meters (372 yards) per minute; extended gallop, 440 meters (481 yards) per minute. All somewhat faster than prescribed by United States regulations.

Dismounted action.—If the terrain and situation demands it, cavalry fights on foot; 4 men per platoon, designated as horse holders, remain with the horses, each man holding 12 horses. A regiment can thus put 400 carbines in line. In dismounted action each platoon conforms to the rules of combat prescribed for a platoon of infantry.

Duties.—Cavalry is preeminently the arm for surprises. Attached to the infantry, it scouts rapidly and prevents surprises. The *cavalry screen* scouts in advance of the infantry columns outside the limits of infantry reconnaissance, often a day's march in advance of the main body of the army corps. The *divisional cavalry* is assigned to the advance guard of which it constitutes the point, and furnishes patrols to cover the flanks and rear.

The army cavalry (cavalry division) is charged with distant exploration. It remains in concentration in order to be able

to fight, and pushes small detachments (reconnoitering patrols, officers' patrols) boldly to the front.

In addition to its duties in the service of security and information, the cavalry takes part in the battle on the same footing as troops of the other arms. It may fight on an exposed flank, it may exploit a success by a relentless pursuit, or it may sacrifice itself to cover a retreat. It may even undertake the glorious task of sustaining alone the entire shock of battle, thus gaining time for the arrival of the infantry (operations between the battles of the Marne and the Yser). Finally, in trench warfare, it relieves the infantry, and takes its turn in the trenches.

Cavalry is an arm which necessitates a long time for its training, and is costly to maintain. For long periods of time there may be no opportunity for its employment, but, under favorable conditions, it can repay, in a single hour, all that it has cost.

ENGINEERS.

Engineers are closely associated with the infantry. They are assigned to perilous duties; detachments of engineers accompany the waves of assault and share in its dangers.

The infantry, moreover, must never forget that there are strict limitations as to the employment of engineers. In the form which this war has taken there will never be a sufficient number of engineer specialists if they are not reserved for those duties which the infantry is absolutely unable to perform for itself. The infantry, therefore, should not demand labor from the engineers, but guidance; and they must, on the other hand, furnish the engineers with all the assistance they require for mining and other special operations. The engineers must not be broken up into small detachments and dispersed among the infantry units, except in so far as it is necessary to provide overseers. It is better to keep them concentrated and employ them on some well-defined task, to which must be assigned only the exact number of sappers required to complete the work in the required time.

To the engineers is confided the construction, upkeep, and improvement of the lines of communication (roads, railways, pontoon bridges, searchlight sections, military telegraph, carrier pigeons, etc.). By erecting or destroying obstacles and by

constructing certain parts of the intrenchment of supporting points that require especial skill, it participates in combat.

Each army corps contains *corps and divisional engineer companies* (each having its own park); *one company, engineer train* (consisting of wagons loaded with intrenching tools and caissons of explosives), and one *pontoon company.*

The engineer service has also in each army an *army engineer park* and a *telegraphic detachment of the engineer park.*

It supplies engineer equipment and material to all the arms.

AERONAUTICS.

Aeronautical service consists of the aero squadrons of the army corps (reconnaissance, control of fire, bombardments), groups of bombardment squadrons, and balloon companies (balloons and kite balloons).

STAFF SERVICE.

General officers are furnished with a certain number of officers who constitute their staffs.

The staff exercises its functions in the name of the general, of whom it is the assistant. Its duties are—

1. To collect the data upon which the general bases his decisions.

2. To translate these decisions into the form of instructions and orders.

3. In formulating orders and instructions, to go into the necessary matters of detail with which the general should not burden himself.

4. To insure the transmission of instructions and orders, and to supervise their execution.

The chief of staff regulates the work of the staff, directs that of the administrative staff, and in general controls the personnel of headquarters.

Headquarters.—The staff and the other individuals or elements attached to the same superior command constitute its headquarters.

An officer, specially detailed as headquarters commandant, regulates, under the supervision of the chief of staff, the establishment, supply, and protection of headquarters.

CHAPTER VIII.

THE PREPARATION OF ORDERS AND REPORTS.

The characteristics of military style are:

Clarity.—This must be absolute. In composing always put yourself in the place of the man who will read the order. If the least ambiguity is suspected, modify the language and make it precise. Call things by their proper names; choose the exact word. Practical test: Submit what you have written to a comrade who knows nothing as to the subject matter.

Precision.—Spell proper names correctly; give them in full (if necessary in the two languages); underline them; indicate map used; describe the names written in small characters, and especially the hills, by referring them to some prominent point on the map; use the points of the compass instead of right, left, in front, in rear; write important numbers in both letters and figures; avoid inexact expressions such as at dawn or at dark; give the time by the clock, the hours running from 0 to 24.

It must be thoroughly understood that for infantry, as well as for artillery, the *right of an objective* is the part of the objective seen to the right of the person who speaks.

Brevity.—A supplementary quality which must not be sought to the detriment of clarity. Use the abbreviations prescribed in the staff officers' manual, and those only. They are given hereinafter; learn them by heart. In the internal administration of a regiment it is quite possible to save much time and secure greater simplicity by modifying the style customary in peace.

The form.—Bear in mind that the light may be bad at the point where the message will reach the addressee. Write very legibly, in large characters, and use ink or very soft pencil, and punctuate. Protect against rain. State the place, date, and hour of sending, the names of the sender and addressee; however legible the signature is believed to be, always use the following form:

Lieutenant Durand.
(Sig.) A. Durand.

If it can be foreseen that numerous reports must be written under difficult conditions, a message pad, with the above items

entered and signed beforehand, should be prepared. This will reduce writing in the field to a minimum and prevent anything being forgotten. If it seems necessary to keep copies of orders and reports, these should be numbered to simplify reference to a previous order or report, e. g., "Continuing my report No. 4, the machine gun registered . . . . etc."

VARIOUS METHODS OF CORRESPONDENCE.

From a superior to an inferior.—Orders announce to subordinates the decisions of the superior commander. *They are formal directions* applicable to strictly defined conditions of time and space. Only very simple orders of execution, applying to small units, may be given verbally.

From an inferior to a superior.—The *memorandum* is so simple that it should be used in communicating with one's immediate superior, first obtaining his permission.

The *message* is the brief statement of a fact or a situation, written at the *moment of occurrence;* in exceptional cases it may be verbal when it can be made directly by one officer to another without any intermediate agency. Commanders may direct that messages be sent *periodically* (for example, half hourly during combat and twice a day while in the trenches). The sender must be very careful to distinguish between what he has seen himself and reports which he has not been able to verify personally; in the latter case he should always give the source of the information. A message should never contain any speculation as to the unobserved strength of the enemy, or upon his intentions.

The report is the careful, detailed account, written as soon as possible after the events to which it relates. It confirms the information given in a message or it may coordinate that given in several messages. It is invariably written. It must be prepared with care, and if possible on regulation paper, for it may have to be forwarded to the generals. The heading does not indicate the addressee.

REPORT of Lieutenant X. comdg., etc.
Subject (brief of the subject of the report).

The *letter*, on the other hand, is addressed to a superior who is specified.

Lieutenant X, 3d Co., 7th Bn., Alpine Chasseurs.
To: The Colonel commanding the Chasseur brigade.

A brief of the contents is written on the margin, under the heading "Subject."

No formal expressions of courtesy are used. Respect is shown by the tone of the letter. The superior "informs" or "makes known," the subordinate "reports." These shades of expression must be observed.

The *voucher* to indicate receipt is used from superior to inferior and the reverse. It should be signed and returned.

PRESCRIBED ABBREVIATIONS.

Q. G.=Headquarters.
E. M.=Staff.
Inf.=Infantry.
Cav.=Cavalry.
Art.=Artillery.
Gén.=Engineers. } Must not be
Gal.=General. } confused.
C. A.=Army Corps.
D. I.=Infantry division.
D. C.=Cavalry division.
Bde.=Brigade.
Rgt.=Regiment.
Btn.=Battalion.
Gr.=Group.
Col.=Colonel.
Cdt.=Commandant.
Cap.=Captain (not corporal).
Lieut.=Lieutenant.
Sgt.=Sergeant.
H.=Men (privates).
Ch.=Horses.
E. N. E.=Elements not grouped in divisions.
Cie.=Company.
C. M.=M. G. company.
Bie.=Battery.
Pel.=Platoon, cavalry.
Sct.=Platoon, infantry.
A. G.=Advance guard.
Arr. G.=Rear guard.
A. P.=Outpost.
P. C.=Command station.
Cant.=Cantonment.
Biv.=Bivouac.
P. I.=Initial point.
Smi.=Section, infantry ammunition train.
Sma.=Section, artillery ammunition train.
A. C. 9.=Corps artillery, ninth corps.
A. L.=Heavy artillery.
A. D. 53°=Divisional artillery, fifty-third division.
A. T.=Trench artillery.
T. C.=Combat train.
T. R.=Field train.
C. V. A. D.=Supply trains.
C. V. auto.=Motor truck columns.
C. V. A. X.=Auxiliary supply train.
T. M.=Train for transportation of matériel.
Appt.=Supply.
Ravt.=Supply.
P. A.=Artillery park.
S. P.=Section of artillery park.
P. Gen.=Engineer park.
Amb.=Ambulance.
G. B. D.=Detachment of divisional litter bearers.
G. B. C.=Detachment of corps litter bearers.
G. Rav.=Refilling station, rail.
G. O. E.=First station, line of communication.
G. R.=Regulating station.
T. E.=Rail head.
S. M.=Depot station.

CHAPTER IX.

MAINTENANCE OF COMMUNICATION (LIAISON) BETWEEN UNITS AND SIGNALING.

The mental activity of the commander should be constantly *concentrated* on the *search for information*, for in order to command intelligently it is necessary to be *informed*. The commander, therefore, should post himself where he can best observe the entire extent of the front occupied by his troops. Moreover, when an officer receives information it is his duty *to transmit it without delay* to his immediate superior and, if possible, to his neighbors.

The procuring of information often necessitates great sacrifice. *Such sacrifices are a dead loss if the information is not forwarded to the superior commander, arrives too late, is mutilated, or illegible.*

TRANSMISSION OF ORDERS AND MESSAGES.

In issuing orders the regular channels should be used; no intermediate authority being omitted except in urgent cases. In such case the officer who gives the order will inform the intermediate authority, and he who receives the order will report the fact without delay to his immediate superior. The authority who sends, in an exceptional case, a *verbal* order or message requires the person who is to carry it to repeat the order or message word for word. On his arrival at destination the bearer of a message or order delivers the envelop to the addressee or his deputy. He waits for a receipt or a reply, and never leaves without orders or permission. On his return he reports to the person who sent him. If no reply has been returned by him, he limits himself to the formula: "Order delivered."

Any dispatch bearer who is *wounded* appeals to the nearest organization, and it is the duty of the commanding officer of the organization to send forward the message without delay. Important orders are carried by *officers* who are conversant with the situation and have been informed as to the subject matter of the message. These orders may be sent in duplicate by

different routes. Officers charged with such a mission must be prepared to destroy their messages if necessary. The commanding officer of any command of cavalry or of any command having horses is required to furnish a good horse if the condition of the messenger's mount does not permit him to complete his mission in time for it to be of use. (The borrowed horse must be returned with the least practicable delay.) While employed on such mission an officer should strive to obtain personally all the information possible, in order that he may be able to report the same to his own superior and to the officer to whom he is sent. If, while on his way to deliver the message, the situation to which it refers has changed, the officer, nevertheless, delivers the message with which he has been entrusted. He adds the necessary explanations as to the result desired by the commander at the moment he left him. If the order is one requiring immediate execution, he waits until after the execution has been begun in order that he may report the action taken.

Every subordinate who receives an order in the absence of his immediate commander forwards it to the latter as directed by him. He notes the contents of the message, unless it is marked "personal." On his own initiative he takes the steps necessary under the circumstances and reports his action to his superior.

Officers commanding the organizations composing the outposts or the advance guard, or those occupying the first line trenches, are authorized to examine all information passing them from the front. Its further transmission must be delayed as little as possible.

Intercommunication between organizations (liaison).—This, in order to obtain *unity of effort*, and especially the close cooperation of the infantry and artillery, has for its object the freest possible circulation of information between the commanders of organizations forming a part of the same command.

For the commanders of the smaller units intercommunication (liaison) may be symbolized by a cross, its four branches signifying connection with the fractions in front, connection with the commanders in rear, and connection with the adjacent units on the right and left. For these it comprises *terrestrial* (as opposed to aerial) *reconnaissance* as a means of information, and, as mediums of transmission, the telephone, visual signaling, connecting files, and carrier pigeons. The manner in which these

means are employed must always be the subject of a *general plan* set forth in a special paragraph in the *plan of operation* or the *plan of defense*, or added thereto as an appendix. It does not obviate the necessity for frequent and personal contact with neighboring troops.

The fact that mechanical means of transmission have failed in a given instance does not relieve a commander from the responsibility for ignorance of important changes in the situation of his own command or of the adjacent commands, or for failure to exercise the necessary personal influence on the course of events.

A small unit will establish and maintain communication by different methods, according to whether it is in first line, in support, or in reserve. The officer in command must make each particular case the subject of special consideration and decision.

In first line.—Lateral communication is the most important.

In support.—The mission is nearly always assigned beforehand and generally consists in reinforcing a unit placed in front, it is necessary, therefore, to understand the situation of the latter, to know its location, the routes leading to it, and all the other things that must be known to enable the support to replace it without loss of time.

In reserve.—The unit may be called upon to act in any direction. The troops may be resting, but the mind of their commander should be exceedingly alert. He must forsee every possible eventuality, and determine beforehand the steps necessary to maintain communication in each of them. *It is especially important to carefully reconnoiter the roads and communications in all directions.*

METHODS OF OBTAINING INFORMATION.

These are divided into terrestrial and aerial reconnaissance.

Terrestrial reconnaissance.—For combat the commander of every unit (company, platoon) selects an *observation station* which will enable him to see as far as possible everything that occurs within the limits of action of his command. If necessary, he insures continuity of observation by employing *observers* among whom he divides up the duty in such fashion that observation is continuous, both as to time and ground covered. Six observers to a platoon should be previously trained to this duty.

In general their duties consist in following the progress of the fight (movement of friendly or enemy troops, activities of both artilleries), watching for signals from the advance elements, and in repeating or transmitting them according to instructions.

The *command post* (P. C.) should be established near the observation station. *The selection of the observation station must precede that of the command post. While in a position of readiness in the trenches* observation is conducted as in combat. This portion of the subject of terrestrial reconnaissance is discussed in Chapter VI of Title IV and Chapter I of Title VII.

Aerial reconnaissance.—The aeroplane and the balloon serve as means of information (observation, photographs), also as mediums of transmission, thanks to the signals that can be made and received from them.

Among the missions they may be charged with and which are of interest to the infantry are:

(*a*) *Aeroplanes attached to the infantry.*—One to each division. Mission to keep informed as to the march of the advance elements and the reserves. To observe the signals of the firing line and the command posts, and to transmit them to the divisional command post. To inform the divisional commander of everything that occurs in the vicinity of the firing line and in rear of it.

(*b*) *Command aeroplanes.*—One to each army corps. It observes the general progress of the combat and all that occurs on the side of the enemy.

(*c*) *Messenger aeroplanes.*—Mission. Transmission of all orders and useful information from the commanders of the larger tactical units (by weighted messages with sketches prepared beforehand, or photographs, prearranged signals, etc.) to the generals and colonels.

(*d*) *Divisional balloons.*—Observation of artillery fire, location of the firing line, transmission of signals. During an attack they operate distinctively as infantry balloons.

(*e*) *Command balloons.*—As for command aeroplanes.

METHODS OF AERIAL COMMUNICATION (LIAISON).

The aeroplane attached to infantry, or the infantry balloon, or both, are communicated with by the infantry by means of signals made (1) by the firing line, (2) by the command stations of the battalion, regiment, brigade, or division.

1. *By the firing line.*—The firing line indicates its location by:

(*a*) *Bengal lights.*—This is the most certain method. The lights are so placed as to be easily visible to the aeroplane or balloon, but not to the enemy.

(*b*) *By position marking panels.*—Upon call upon the aeroplane the panels should be opened and closed several times to show that they are not abandoned panels or accidental white spots on the ground, and are then left exposed until the aeroplane has answered "understood" (a flare of three lights shown simultaneously); *in any case not longer than 15 minutes.*

(*c*) In the absence of Bengal lights or panels, the firing line must, in order to make its position known, resort to every possible expedient, such as searchlight signaling (–. –. –. –.), the waving of handkerchiefs, the showing of overcoat linings, flashes from pocket mirrors, etc.

The position of the line is indicated either upon a line agreed upon beforehand (one of the objectives assigned); or, upon demand of the aeroplane (sound signal, followed by a flare of six simultaneous lights); or, upon the initiative of the company commanders when the advance of their commands has been stopped; or when, after a retirement, they have taken up—dug themselves in. In the latter case it is preferable to use Bengal lights, either alone or in connection with the panels, to more easily attract the attention of the aeroplane.

Burning Bengal lights or displaying panels elsewhere than on the firing line is prohibited.

2. The battalion, regimental, brigade, and division command stations indicate their locations by *identification panels.* In addition each command station is indicated by a code symbol, a group of several letters or figures.

The command posts communicate with the aeroplane by *conventional signals* (combination of panels, to be given later in the text); by *searchlights* (6 or 9 inch diameters); by *shutter panels.*

They communicate with balloons by means of portable searchlights, the communication being always preceded by the code symbol of the command station.

The balloon replies by means of portable searchlights, or by Morse code signals made with the *flexible cylinder*, a device by which a black surface of 3½ feet high can be made to appear and disappear instantaneously along its mooring cable. He first signals the code symbol of the command station with which he wishes to communicate. As a rule his replies are limited to "understood" or "repeat."

Identification panels are displayed at the sound signal of the aeroplane or upon the initiative of the command post.

They are removed as soon as the aeroplane signals "understood" (three stars).

The panel of a battalion has an area of 4 square yards.

Aeroplanes Attached to Infantry.

These fly at a lesser altitude than the other aeroplanes, and do not rise above 1,500 yards. They are given distinctive permanent marks (bands of color, luminous planes), *and in addition may be recognized by a distinctive flare.*

"*I am the aeroplane of the first infantry division.*" 1 flare of 1 light.

"*I am the aeroplane of the second infantry division.*" 1 flare of 2 simultaneous lights.

These signals are made two or three times, at several minutes interval before any other signals are made. The appearance, characteristics, and signals of any aeroplane should be known to all of the men of the tactical unit to which it is attached. On the other hand, the air service must be in constant readiness to assist the infantry by noting precisely its positions and needs and transmitting the information immediately to the higher command or to the artillery.

In certain cases it may be necessary to drop to a comparatively low altitude above the lines; but only in case of necessity must the machine be risked at an altitude of less than 1,000 yards.

The aeroplane, in communicating with the infantry, uses only a limited number of signals, which are always preceded by a sound signal, followed by the flare giving the identity of the aeroplane.

It must be remembered that *every aeroplane that burns white lights is an infantry aeroplane* and that *its rockets are fired as*

signals to the advance infantry elements. To prevent their being mistaken for those fired from the ground rockets should not be fired from aeroplanes at an altitude of less than 300 yards.

The aviator notes the position of the firing line and of the command stations which signal to him, as above described. In addition, he can perceive conventional signals, signals by searchlight, or by shutter panels.

He transmits information received in this manner as follows:

Urgent information, especially that relating to artillery fire, to the command stations of the division, brigade, or artillery group, by wireless.

Other information to be transmitted to the command stations of the division or army corps by weighted letter. Most complete information is given in these weighted letters, the position of the firing line being accurately marked on a sketch previously prepared.

Infantry Divisional Balloon.

It is identified by several streamers displayed at its rear, and at night by an inclined plane, illuminated at regular intervals. Its identity should be known to everybody. The aeronaut communicates by telephone with a station on the ground, from which the messages are transmitted to division headquarters.

Information Comprised in Operation Orders.

Infantry finds in its operation orders:

The time when the aeroplane or balloon will be in readiness to observe.

The method of tracing the position of the firing line agreed upon for the required operation.

The conditions of time and place under which signals are to be made.

Supplementary conventional signals.

The conditions under which observation will terminate.

Means of Transmission.

The means of transmission have been discussed in Chapters IX and X to Title III. They are recapitulated below:

1. Telephone (Chap. X).

2. Signal rockets.
3. Signal flares of 25 and 35.
4. Flash lanterns.
5. Searchlights of 6 and 9 inch diameter.
6. Signal flags.
7. Identification panels, shutter panels, position-marking panels.
8. Messengers.
9. Carrier pigeons.
10. Wireless telegraph, which functions readily from the aeroplanes to the artillery observation stations, but not conversely.

None of these methods are absolutely certain.

In order to insure the successful operation of each of them as if it were the only one available, preparation should be made for the simultaneous use of all of the means of communication at hand. As nothing can be improvised during combat, and as the troops will then use only the methods that have become familiar to them through actual practice, all the prescribed means of transmission must be practiced daily, if only under the form of drill.

Thus an officer at whose station a telephone has been installed must expect to have his line cut, and must establish communication with his battalion commander by visual signaling and runners.

OFFICER CHARGED WITH THE DUTY OF INTERCOMMUNICATION (LIAISON).

The regimental telephone officer is the *chief of communications* of every description. In each battalion, the battalion commander assigns a noncommissioned officer to this duty.

PERSONNEL EMPLOYED IN INTERCOMMUNICATION (LIAISON).

The composition of the detachments of telephonists and signallers is given in Chapters IX and X, Part III.

The designation, *liaison agent* should be reserved for officers (occasionally sergeants), who are competent to estimate a situation, deliver instructions, and gather information. A custom

has grown up of referring to the *agents of transmission* as *liaison agents.* Agents of transmission are noncommissioned officers or privates who are charged solely with writing out the orders and carrying them to their destination, and who are employed only on simple tasks. Nevertheless these men must be selected with discernment.

In a company they are generally the cyclist, the drummers, and trumpeters.

RUNNERS.

In addition to the above mentioned, in every platoon several men who are faithful and physically active should be trained merely for carrying messages. *Communication by runners, especially by double runners, is the method giving the most certain results during violent bombardment.*

The distance between *two relays of runners* varies between 150 to 300 yards. Each *chain* of runners is commanded by an officer, assisted, if necessary, by several noncommissioned officers distributed among the relays.

In order that communication by signalers, agents of transmission or runners, may function efficiently during an attack it is necessary that they, under the supervision of officers, be made acquainted with the ground beforehand. If they are to avoid getting lost when they quit their habitual routes *they must know not only the trench network, but the open ground as well.* This *study of the terrain* must be made from large scale maps and from the ground itself. It is also necessary that the command posts, down to include those of captains, be easily found by liaison agents from other units (routes being clearly indicated by large and substantial sign boards or by an orderly in the main communication trench if the command post is somewhat out of the way). Command posts should be marked on the map and given a number, a name,or a distinctive letter that can not be easily mistaken.

VISUAL SIGNALING.

Visual signaling should be the subject of a plan studied by all organizations so that each station should be familiar with the probable locations of its correspondents and with their distin-

guishing marks. As a general principle communication should be insured from front to rear. However, communication is never certain unless the receiving station can acknowledge receipt, and signals made toward the front run the risk of attracting hostile fire. It will be prudent to confine them to a few short messages or replace them by signal flares signifying "understood" or "repeat."

The darker the background, the more visible is the flame of the apparatus. Establish your station in front of a hedge or a belt of timber. Avoid such backgrounds as the sky, a white wall, or cleared ground. Avoid the vicinity of rivers, as bodies of water give reflections. Do not expose the mirror to the sun's rays, as by reflection it gives the illusion of a fixed light and prevents the reading of signals. Look for shade; protect the apparatus with a shield. In observing use a field glass having a wide field of vision and only moderate magnifying power (6 or 8 power). Whenever possible two signalers are assigned to each apparatus, one to manipulate the instrument and the other to keep the ray exactly on the receiving apparatus.

SIGNALS BY ROCKETS.

The following precautions should be observed:

Select combinations that are easily distinguished from one another; reserve the most conspicuous for the most important signals. Limit the code to several phrases; before using it, publish it sufficiently in advance to permit everybody to become acquainted with it. In accordance with the situation, let it be understood definitely who will have the right to fire rockets (majors and captains and, exceptionally, chiefs of platoons); needless alarms and expenditure of rockets will thus be avoided. Provide for the repetition of signals by relays and make certain that the artillery has registered these relays and is causing their observation stations to watch them closely. All officers and noncommissioned officers, and the greatest number possible of the privates, should know the conventional signals. If a failure in memory is feared, record them in your notebook, making use of hieroglyphics that will be incomprehensible to the enemy if the notebook should fall into his hands. Make frequent checks to see that you have the latest code.

CARRIER PIGEONS. (P. V.)

Pigeons have carried messages across sheets of poisonous gas and during the most violent bombardments. Great confidence may be placed in them, but they should be reserved for important cases. Pigeons do not fly well at night unless they have been specially trained to it.

Personnel attached to a regiment:

1 noncommissioned officer of the C. H. R.

4 assistant pigeon trainers per regiment and 4 per battalion (soldiers specially trained and detached from their companies in the event of the establishment of a pigeon station).

A station consists of 2 assistant pigeon trainers; 1 basket of 4 pigeons, with the necessary supplies; 3 baskets, designated A, B, and C, are assigned by the central loft to each station. The basket containing the relief is sent to the station in the evening or at night, every two or three days. The pigeons which are relieved are released separately with practice dispatches. The officer commanding the unit concerned may retain both baskets if the circumstances require it.

Messages are written in triplicate in a message notebook. One copy is kept as a stub, the other two are attached to pigeons which are released at an interval of several minutes. If there is danger of running out of pigeons, only one copy is sent, and the other is inclosed with the next message, for the purpose of confirmation. Each pigeon can carry on each leg an *aluminum dispatch tube*, which makes it possible to send both a message and a sketch.

To release it, the pigeon is placed on the ground some little distance from the post, with its head in the direction of the central pigeon loft, and is then driven into the air. While at the post, every attention should be paid to the hygiene of the pigeons, but *none at all to their comfort*. They should be made to consider their stay at the station as a penance and to desire ardently to return to the loft, where abundance and dainties are awaiting them. Their being fed by anyone other than the trainers must therefore be strictly prohibited.

INTERNATIONAL MORSE CODE SIGNALS—SENDING AND RECEIVING—RULES OF SERVICE.

Troops make use of two classes of signals: Signals in international Morse alphabet and conventional signals, generally composed of letters of the international Morse alphabet.

Alphabetic signals may be sent by searchlights or flash lanterns; semaphore signals, with or without flags, shutter panels.

Conventional signals may be made by flash lanterns; searchlights; semaphore signals, with or without flags; fireworks or targets.

INTERNATIONAL MORSE ALPHABET.

a •—	i ••	r •—•
b —•••	j •———	s •••
c —•—•	k —•—	t —
ch ————	l •—••	u ••—
d —••	m ——	v •••—
e •	n —•	w •——
é ••—••	o ———	x —••—
f ••—•	p •——•	y —•——
g ——•	q ——•—	z ——••
h ••••		

NUMERALS.

1 •————	6 —••••
2 ••———	7 ——•••
3 •••——	8 ———••
4 ••••—	9 ————•
5 •••••	0 —————

The study of the International Morse alphabet is facilitated by arranging the letters into series presenting similar characteristics. The table given below is an example.

• = e	— = t	•— = a	—• = n
•• = i	—— = m	••— = u	—•• = d
••• = s	——— = o	•••— = v	—••• = b
•••• = h	———— = ch		

——•— = g	——•— = q	——•• = z	••—•• = é	•—•— = x
—•— = k	—•—— = y	—•— = c	••—• = f	—••— = r
•—— = w	•——— = j	•——• = p	•—•• = l	

SERVICE SIGNALS.

— · · · · — · = b. r. (invitation to commence signaling).
· — · — · = a. r. (end of message).
· · · — · = s. n. (understood).
· — · · · = a. s. (ready).
· · — — · · = ? (repeat).
— · · · — = - (space indicating separation).

CONVENTIONAL SIGNALS.

Call for artillery fire: O — — — — — —
We are going to advance, raise the fire: H · · · · · · · · · ·
Artillery is firing too short: S · · · · · · · · ·
Send forward ammunition: Y — · — —
Key: O = open fire; H = raise (*Hausse*) the fire, more elevation; S = we *S*uffer
Y = there is no more (Y a plus de) ammunition.

EXECUTION OF SIGNALS.

International Morse signals are made as follows:

By light signals: A dot by a short flash (½ second); a dash by a long flash (3 seconds).

By shutter panels: A dot by a short exposure of the white (about 1 second); a dash by a long exposure of the white (about 6 seconds).

By flags: A dot by displaying 1 flag or similar object; a dash by displaying 2 flags or similar objects.

Interval between the elements of one letter, a pause equal to the duration of one dot. Interval between two letters or figures, about 4 seconds.

Sending visual signals.—In order that the International Morse signals may be readable visually, it is indispensable—

That the cadence be not too fast.

That the dots and dashes be very distinct.

That the successive letters be well separated.

The attention of the signalers must be called especially to the following points:

Exaggerate the length of the dashes (about 3 seconds).

Leave a very noticeable interval between the letters (4 seconds at least), to permit the receiver to dictate each letter after he has read it.

Regulation of flash of light apparatus. It is very important that the flash be accurately directed upon the receiving station.

When the receiving station does not see the signals well he sends a series of dots . . . . . .

The sending station then examines his apparatus, sees that it is properly adjusted in direction and that his lamp is burning brightly.

The receiver indicates the variations observed in the sender's light by increasing the cadence of his dots if the light gets dimmer . . . . . ., and by decreasing the cadence . . . . . if the light gets brighter. He sends –....–. (b. r.) when the light becomes normal.

Field glasses should be used in observation.

Identification signals.—By reason of the number of visual signals that can be sent simultaneously, it is necessary to assign a signal to each station which will identify the authority sending the communication.

Identification signals are assigned from division headquarters.—Each consists of one letter and one numeral. Care must be taken to eliminate letters which might be confused with conventional abbreviations.

Preparation of messages.—They should be as brief as possible. Each letter saved reduces the chance of error.

Transmission.—As a rule, two men are necessary at each signal station. At the sending station one man reads the message, letter by letter, and the other operates the apparatus or flags. At the receiving station one man reads the message, letter by letter, and dictates them to his assistant.

To call up the receiving station, the sending station signals the receiving station's identification signal several times. The receiving station answers by the signal —....—. (b. r.). The message is then transmitted, word for word, the receiving station signaling after each word: (A dot, .) if it has received the word correctly; (An interrogation point ?) ..——.. if repetition is desired. At the end of the message the sending station signals .—.—. (a. r.). The receiving station signals ...—. (understood) if the message has been received correctly; or merely a dot, ., by special agreement, when, as has been said above, the receiving station should signal the least possible toward the front. It signals the last word received correctly, followed by (?) ..——.. if repetition is desired.

Before moving a station, all the correspondents are warned by the signal CL (cloture), followed, if possible, by the hour and place at which the station will be reestablished.

Example: CL=17.00=Hill 140.

The signal = (—...—) corresponds to a separating dash.

Example of the transmission of a message.—Identifying signal of the sending station C_3; identifying signal of the receiving station F_4; station C_3 has a message of 4 words for F_4.

Signals transmitted.

Station C_3.	Station F_4.	Remarks.
F_4 F_4 F_4	Understood (B. R.)	
F_4 DE C_3 separation		
First word	Dot	
Second word	Dot	
Third word	?	F_4 can not read third word.
Third word	Dot	
Fourth word	Dot	
a. r	Understood, or 1 dot	

SIGNALS FOR COMMUNICATING WITH AEROPLANES AND BALLOONS.

They may be classified as follows:

A. Signals made by the aeroplane.

B. Signals made by the balloon.

C. Signals made by the infantry to the aeroplane or balloon.

A. SIGNALS MADE BY THE AEROPLANE.

(*a*) *Signals made with white lights* are always addressed to the infantry.

The aeroplane burns a *flare of one or two lights*, which is repeated two or three times at several minutes intervals. This is his *identification signal* and signifies:

"*I am the aeroplane of the first infantry division.*"

"*I am the aeroplane of the second infantry division.*"

Immediately after he asks "*Where are you?*" by burning a flare of six lights. When he has observed the identification panels and the position-marking panels which have been displayed in response to his call, he signals "*understood*" by a flare of three lights.

To recapitulate; there are three signals, and three only.

One or two lights=identification signal.
Six lights="Where are you?"
Three lights="understood."

(*b*) *Signals by wireless* are addressed to the command stations equipped with receiving antennæ. The aeroplane sends its *identification signal*, followed by a message which has been reduced to writing, making use either of the lists of abbreviations contained in Appendix II, Intercommunication Regulations of December 13, 1916, or of the signals contained in the *table of conventional signals given above*, or of additional conventional signals published in operation orders.

Example: *Identification signal*, U TAM ...., signifies: At the point U there are friendly troops (*T*roupes *AM*ies), who signal, "We are about to advance; increase your elevation."

Second example: Identification signal, 3485 PCR TAM ---- V 3, signifying: The command station of friendly regiment (Poste de Commandement Regimental, Troupes AMies) located at point 3485 requests artillery fire on point V 3.

(*c*) *Dropping weighted messages.*—The aeroplane which is about to drop a message calls up the command station by a sound signal agreed upon in advance; the command station shows its *identification panel* at the most favorable point in the vicinity for the fall of the message. The aeroplane then spirals down to 300 yards and drops the message. The command station acknowledges the receipt by the signal, "message received."

B. SIGNALS MADE BY BALLOONS.

The balloon sends the identification signal of the station which it is calling and then signals:

Understood (SN) ....
or *Repeat* (?) ....

by means of the flexible cylinder.

C. SIGNALS MADE BY THE INFANTRY TO THE AEROPLANE OR BALLOON.

(*a*) By *searchlight* or *shutter panel*, using the *table of conventional signals*, to which should be added:

"*I am here*" (firing line) - - - - - - - - - - - - - -.

"*Understood*" or "*Message received*": . . . .

(*b*) By *Bengal lights:* The firing line burns 1 or 2 lights per platoon.

(*c*) By *position marking panel:* One or two per squad. Bengal lights and panels may be combined.

(*d*) By *identification panels* and *rectangular panels:* Appendix II, "Intercommunication regulations," shows the panels and the combinations to be displayed to indicate: "I am here" (battalion, regiment, brigade, division).

Request for artillery fire: "We are about to advance; increase your elevation." "Artillery is firing too short." "Send ammunition forward." "Understood" or "Message received."

It also gives the means of signaling the numerals from 1 to 9, and consequently any prearranged message can be sent.

ARTILLERY LIAISON AGENTS ATTACHED TO THE INFANTRY.

Artillery can act efficiently only if it is in close communication with the infantry which it is supporting.

Such communication is established: (*a*) By a constant understanding between the officers of the infantry and artillery. Their command stations should be established in close proximity to each other whenever possible. (*b*) By artillery liaison agents attached to the infantry.

The necessity for officers of field and heavy artillery (chiefs of groups and commanders of concentrations) maintaining frequent personal contact with the commanders of the infantry units (corps, battalions) with which they are cooperating, can not be insisted upon too strongly.

Liaison and observation detachments.—In the execution of an attack, each group of artillery charged with the direct support of an infantry unit (regiment or brigade) attaches to the headquarters of that unit an officer, *liaison officer*, who has under his orders a liaison and observation detachment.

This detachment consists of: Noncommissioned observers; noncommissioned officers and privates as scouts and liaison agents; telephonists and signalers with the necessary apparatus (telephones, apparatus for light signaling, flags).

The liaison officer accompanies the commander of the infantry unit with which he is cooperating.

His mission consists of—

Keeping his commanding officer informed as to the situation and needs of the infantry and transmitting the requests of the infantry to the batteries in such form that it can be made use of.

Keeping the infantry commander to whom he is attached informed as to the amount of assistance he can expect from the batteries. As far as practicable he attaches a noncommissioned observer to each battalion commander of the first line.

By utilizing his own means of communication, he maintains connection with the commander of his own group, on the one hand, and on the other with the advanced observers attached to the battalion commanders of the first line.

He should give special attention to the constant, efficient operation of intercommunication among all of these several elements.

It must be thoroughly understood that the establishment of communication by the artillery does not forbid the infantry from also establishing, by its own means of communication, connection with the artillery which supports it. The advantage of a double channel of communication is thus insured.

In defensive combat and during stationary periods communication between the artillery and the infantry are maintained in the manner set forth above. The object sought is always the same—to insure to the infantry the efficient support of the artillery at the necessary moment. The relative importance of the different methods of communication employed will vary with the situation, and they may be reduced in number during a stationary period.

ARM AND WHISTLE SIGNALS.

To the general subject of signaling may be added signals with the arm or weapon, which are made when necessary to replace oral commands.

Forward.—Raise the arm vertically, lower it deliberately until it is horizontal and points in the direction to be followed.

March.—Bring the fist back to the shoulder and strike in the same direction.

Halt.—Raise the arm vertically and lower it quickly to the side.

To change direction.—Extend the arm horizontally in the direction of the marching flank, make a circular motion toward the new direction. When this motion has been completed to the degree of the change of direction, signal *March.*

Right turn.—Extend the arm vertically. Make small circles with the forearm. Then signal *March.*

Double time.—Raise and lower the half extended arm several times.

Quick time.—Extend the arm laterally to the height of the shoulder, raise and lower the arm slowly several times (signal for *Gradually*).

Assemble.—Raise the arm vertically and retain it in this position until the assembly has been begun. (When made to an isolated element, this signal means "come to me.")

Whistle signals.—One blast means "attention." All look toward the officer and wait for his order or signal.

Being at route step, one long blast means "attention." One long blast followed by one short blast means "company, halt."

At the end of the halt one long blast means "fall in" with packs on. One long blast followed by one short blast means "forward march" (quick time). A second short blast means "route step."

FLAGS, LANTERNS, BRASSARDS.

Army corps: Tricolor flag without tassels; white or tricolored lantern; tricolored brassard with the insignia of forked lightning and number of the corps.

Infantry division: First division of each army corps, red flag with one vertical white stripe; second division of each army corps, red flag with two vertical white stripes; for an independent division the white stripe is horizontal; red lantern; red brassard with grenade and number.

Infantry brigade: No flag; blue lantern; blue brassard with grenade and number.

Infantry ammunition column: Yellow flag and lantern.

Artillery ammunition column: Blue flag and lantern.

Ambulances: Two flags, one tricolor, and the other blue with a red cross; two superposed lights, white and red.

Quarantine hospitals: Yellow flag.

The headquarter flags of generals of artillery are blue and red. Of generals of cavalry, blue and white.

Distinctive brassards. Artillery, crossed cannon, cavalry, a star; engineers, helmet and cuirass.

Distinctive colors of battalions and companies.—First, blue; second, red; third, yellow; fourth, green. Units not connected with the battalions, khaki. Liaison agents, blue brassard with dark blue **L.**

CHAPTER X.

HYGIENE AND FEEDING.

Rules of Hygiene.

Hygiene can be summarized in two words, order and cleanliness.

Nearly all epidemic diseases are transmitted by water, the soil, or from man to man. Large commands crowded into a small area are particularly liable to infectious diseases, and therefore the measures herein prescribed must be rigorously enforced.

Personal hygiene.—Men must, whenever it is possible, wash the whole body without any false modesty, and not limit themselves to washing only the face, hands, and feet. A dirty skin frequently infects a wound under the first-aid dressing. Company officers should improvise shower baths whenever material is available.

Body lice can produce fatal diseases. They lay their eggs along the seams and wrinkles of the clothes. A means of protection against them is to wear a small bag of camphor or light compresses of benzine sewed under the shirt and drawers. One can get rid of lice by wiping the whole body with a lotion of

camphorated alcohol, kerosene, or benzine. The clothes and blankets should be soaked in the same liquids. If infested clothes are put in a hot oven or a hot iron passed over them, the lice eggs will be destroyed.

A brush must be used on the teeth daily and the hair and nails kept short.

Venereal diseases must not be concealed. Report must be made to the medical officer upon the first appearance of a discharge from the penis or of a suspected ulceration.

Never neglect the flannel waistband.

Ultra-violet rays of the sun disinfects clothing, blankets, straw, etc.

Hygiene of the march.—The rules to be observed are: Feet clean, shoes sufficiently large and pliable, leggins and cravat not too tight. Tender feet should be greased with lanolin or painted with a weak solution of formol or picric acid. Upon arrival in camp the feet should be wiped with a damp cloth if a bath is not available. Blisters should not be broken prematurely lest they become infected.

The soldier should eat and drink moderately. Alcohol destroys the power of the legs to march, but sweet foods stimulate the will and aid marching.

Hygiene of the cantonment.—The medical department is charged with the supervision of the sanitation of the cantonments, the bivouacs, and the trenches (including drinking water, latrines, disinfection of houses and dugouts, incineration of refuse, etc.). Cooperation between medical officers and officers of the line is necessary for the proper execution of the proper sanitary measures. In each cantonment there is a sanitary commission composed of a major of the cantonment and the senior medical officer.

Latrines.—The commander of the platoon must have latrines dug within a half hour after reaching camp and not the following morning. If the platoon is not scattered too much, one latrine per platoon is sufficient. The soldier of the medical department detailed for that duty should disinfect the latrines daily. This man should be sent for if he does not come. The disinfectants employed are sulphate of iron, 10 per cent; cresol, 5 per cent; and unslacked lime or milk of lime.

The simplest form of latrine is a deep and narrow trench (straddle trench) having the width of a spade, with a little ledge on each side upon which to rest the feet. Upon leaving the latrine each man must cover his excreta with dirt. If this is not done the latrine will soon become foul and men will go to other places. Another type of latrine, preferable if cantonments are occupied for any length of time, is shown in figure 256.

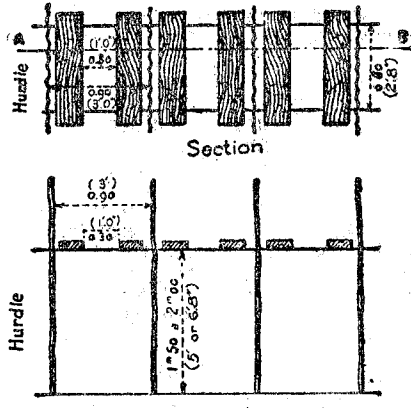


FIG. 256.—Cantonment latrine.

When a building is occupied the proper sanitary measures must be adopted. Let in the air and light; sweep off the dust and destroy the cobwebs; improvise beds in tiers and gun racks from material available; and pile up the equipment neatly. If straw is used to sleep on, it should be shaken out every morning and care taken that it is not walked on, but that a central alley for walking is provided. Spitting on the floor should be prohibited.

Manure should not be allowed to collect in a village occupied by troops, but should be regularly removed and either burned, buried, or put upon the fields of the inhabitants in the vicinity

of the village. If this is not immediately possible, it should be temporarily cared for by sprinkling the manure pile and the surrounding surface with a disinfectant and covering it with 4 inches of earth.

One or more incinerators, in which all trash and kitchen refuse should be burned, should be established in each village. When an incinerator is not available such refuse should be buried. These measures of incineration and disinfection are especially necessary to destroy the larvæ of the flies which breed in filth and which frequently carry the germs of disease and deposit them on whatever they may touch.

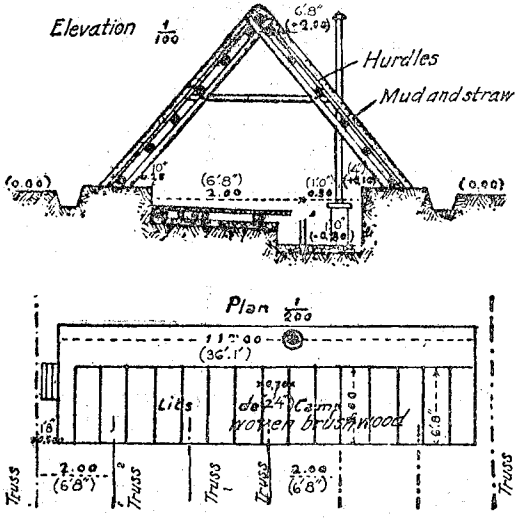


FIG. 258.—Type of shelter for a squad.

Stagnant water also causes disease. All ditches should be cleaned out so that they may drain freely and stagnant pools should be filled up or sprinkled with petroleum.

In cantonment bivouacs one must tax one's wits to contrive some shelter by combining such canvas and other materials as are available.

Hygiene of food.—Clean kitchens must be located at a distance from latrines and manure piles. Useless or decayed food and other things, such as bones, old preserve boxes, old paper, rags, etc., should not be allowed to remain around the kitchen, but must be burned (preferable) or buried. Food closets, in which the food may be protected from flies, dust, and the heat

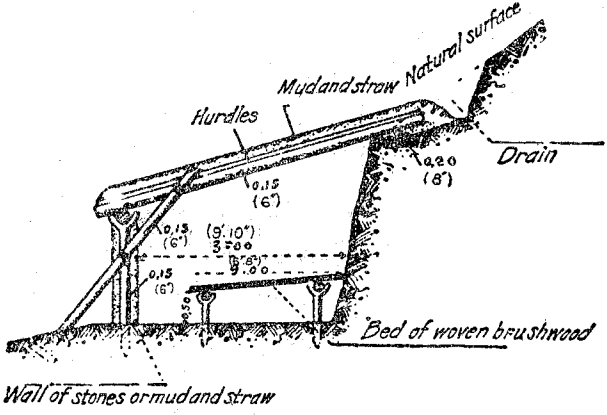


FIG. 259.—Shelter improvised on sloping ground.

of the sun, may be improvised from tin sheeting or other similar materials. Some protection must always be provided. Cooking and eating utensils should be scrubbed with hot water or cinders, but never with earth (some earth has dangerous germs). Before eating, the hands should always be washed.

Purification of water.—Impure water may cause typhoid, dysentery, cholera, and other diseases. Clear water may be impure. Water may be purified by *boiling* for five minutes, or

by adding 3 or 4 drops of extract of javel to each 10 liters (ready for use after standing one hour), or crystal of permanganate of potash until tinted a light pink (removed with a

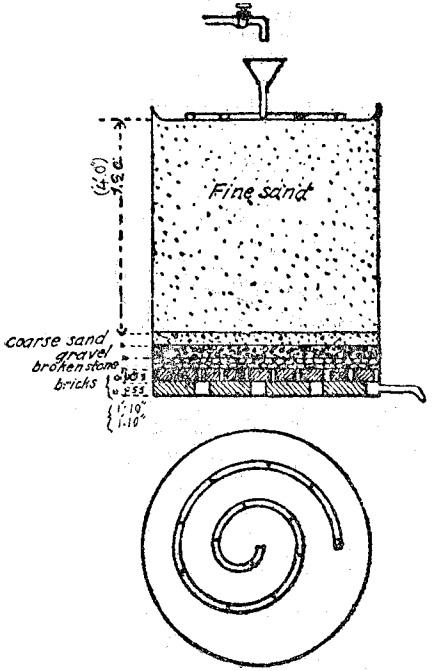


FIG. 262.—A filter of nonsubmerged sand.

little sugar). Filtration through exposed sand is also advisable. The flow is so regulated that the sand is never entirely submerged. (Fig. 262.)

To prevent cold.—Make the blood circulate. Wear clothes that do not bind. Several layers of light clothing will be warmer than one very heavy garment (e. g., two pairs of socks, or papers across the back and chest). Increase the fatty foods; avoid alcohol, it causes congestions.

To prevent freezing.—Freezing may occur at a temperature above zero if the feet and legs are damp and the circulation hampered, or if obliged to remain motionless for too long a time, either seated or standing. Therefore the trenches should be drained and the men made to grease the feet, loosen the lacings of leggings and shoes, move about, remove the shoes and rub the feet and legs for 10 minutes every day, moving every joint of the foot energetically, then put on dry socks, or, if necessary, "Russian socks," or strips of paper. If the feet are already frost bitten care must be exercised not to put them near the fire; they should be dried by rubbing. Greasing the feet during severe cold should be avoided, as the grease will freeze and increase the danger.

First aid to the wounded.—Carefully read the directions on the first-aid dressing before applying. It is preferable to have it applied by a comrade. Avoid touching the wound with any object or with the fingers, or touching that part of the dressing which will come in contact with the wound. Never wash a wound yourself with any so-called antiseptic.

In order to uncover a wound cut the clothing along the seams, and not indiscriminately.

Head wounds.—Only the regulation helmet of special steel should be worn, and not one made for commercial purposes. Head wounds bleed profusely and require a tight bandage. Never put a tight bandage around the neck or chin.

Chest wounds.—Do not be overalarmed by the difficulty in breathing, or by the spitting of blood. Remain calm, without moving or speaking, and have yourself put in a sitting position, supported at the back. If breathing becomes painful tie the flannel belt firmly around the chest as high under the armpits as possible.

Stomach wounds.—Remain quietly on the back or partially seated. Do not touch or attempt to dress the wound, and above all *do not eat or drink anything*, even if help is long in coming.

If possible, take an opium pill. When at the hospital take nothing, not even milk or water, unless prescribed by the doctor.

Wounds of the arms and legs.—If the bleeding is profuse, stop it by a tight bandage or a tourniquet above the wound. This last is always rather dangerous and the wearer should report it immediately to every hospital attendant or doctor in order that it may be replaced as soon as possible by some other means of preventing loss of blood. The dressings on arms or legs should not be tight; application should be begun at the ankle or wrist, working upward.

Fractures must be immobilized.—1. *Arm or forearm.*—Immobilize in the most comfortable position, elbow held to the body, forearm bent, the hand slipped between two buttons of the coat at the breast. Bind firmly around the body by several turns of the spiral puttee.

2. *Legs.*—Do not attempt to walk, as it might aggravate the injury, and do not drag yourself along the ground for fear of infecting the wound. Remain patiently where you are. Immobilize the leg by attaching it to the other with the haversack straps; the bayonet, *discharged* rifle, or a piece of wood will do for a splint. If the wound is in the thigh or pelvis every effort should be made to control the fecal discharges as their contact with the wound is dangerous.

Notes on the regimental medical service.—The most urgent treatment is given at the *first-aid station* immediately behind the first-line trenches (often misnamed "dressing station"). The personnel here is assigned by the medical officer in command. The evacuation and transport of the wounded to the *regimental dressing stations* is made by the regimental stretcher bearers, the musicians cooperating. *The dressing station* is established behind the reserves of the regiment, in a dry, sheltered place.

Duties.—Dressings, simple treatment, and starting the hospital record. Those wounded who are able to fight are dressed and sent back to their units. Those able to walk are formed in detachments and directed to an assembling place under the command of a wounded officer or noncommissioned officer. Those unable to walk are evacuated to ambulances either by the divisional litter bearer group or the corps litter bearer group, or by automobile sanitary sections (ambulance corps). No wounded

should go to the rear without passing through the dressing station, the position of which should be well known. Special measures are taken if the number of wounded is much increased. The number of stretcher bearers is increased sufficiently to allow systematic exploration of the terrain, and the prisoners utilized under the direction of regimental stretcher bearers. Extend the reinforced divisional stretcher bearers of the territorials and prisoners right up to the battalion first-aid stations.

MEMORANDUM OF THE USUAL DOSES OF SOME MEDICINES.

Bismuth, 2 to 4 grams.
Laudanum, 15 to 30 drops.
Opium, 5 centigrams in 24 hours (1 to 2 centigrams at a time).
Paregoric, 1 teaspoonful.
Calomel, 0.25 gram to 1 gram.
Sulphate of soda or of magnesia, 40 grams.
Calcined magnesia, 4 to 8 grams.
Castor oil, 20 to 30 grams.
Ipecac, 1 to 1½ grams.
Quinine, ½ to 1 gram.
Antipyrine, 1 gram.
Ammonia, 10 drops in a glass of water.
Boric acid, 1 tablespoon per liter.
Sublimate, 1/1,000.
Permanganate of potash, 1/1,000 (for antipoisonous hypodermic, 1/10).
Phenic acid, 25/1,000 (added 50 grams alcohol).
Bran and water, 1 teaspoonful of subacetate of lead to 1 liter.
Perchloride of iron (hemorrhages), 1/10.
Solution of antipyrine (hemorrhages), 1/10.
Sulphate of zinc (eyes), 1/100.
Picric acid (burns), 1/1,000 (saturated).
Formol (feet), 2 tablespoonfuls to 1 liter.
1 tablespoon holds 15 grams of water.
1 desertspoon holds 10 grams of water.
1 teaspoon holds 5 grams of water.

One *level* teaspoonful holds 3 grams boric acid, 2.25 grams antipyrine, 1.60 grams ipecac, 1.50 grams quinine, 4.50 grams bismuth, 3 grams sulphate of soda.

FIELD RATION.

Daily ration.—The daily supply train brings the daily food supplies to the *disbursing railroad station*, corps, or the infantry division. The intendance (Q.M.C.) then transports them from there to a *distributing center*, with the help of the divisional supply train, or else, if the distance is not too great, delivers them directly to the regimental supply officer, who loads them on one of the sections of the regimental supply train and distributes them to the companies. In addition to the regular ration issued, the captain buys additional commodities, with the allowance of 0.24 franc per day per man, paid by the disbursing officer. The daily cashbook must show the receipts and expenditures of that allowance and whatever other receipts are there accounted for. The captain himself should purchase in the district or from the supply departments through the supply officer, and shall be reimbursed for such expenditures.

Reserve ration.—One day's reserve ration is carried by the man and one in the company commissary and supply wagon. These rations are eaten twice a day when necessary, by order of the corps or detachment commander. They should be replaced as soon as possible. The reserve section of the supply train carries the reserve rations and tobacco.

Travel and detraining ration.—Troops entraining for a journey of 12 hours receive 325 grams of bread, 100 grams of canned meat, and 1 quart hot coffee. Where the journey is to be 24 hours, it is usual to purchase before departure one cold meal in addition. For use after detrainment they are provided with the following rations, which permit them to subsist until the supply service has resumed normal operations: Two rations of bread, wine, sugar, coffee, rice, or dried vegetables, one ration of meat, soup, bacon, and oats.

Rations.—The tables provide for *reserve rations*, *normal rations*, *increased rations*, and *special issues*. It also fixes the rate of exchange if one commodity is substituted for another. The commanding generals of the army order the change from one ration to the other and direct the special issues supplementary to the normal ration. The generals commanding divisions prescribe substitutions and allow *commutation of rations* (officers, isolated or small detachments). This commutation is

1.99 francs for the normal ration and 2.20 francs for the increased ration (December, 1915).

Allowance for rations.—One day reserve rations: 500 grams war bread (10 slices), 300 grams meat, 50 grams soup, 80 grams sugar, 36 grams coffee, 125 grams chocolate, 20 grams tobacco.

Normal ration (in grams).

	Normal.	Increased.
Bread	750	750
Hard-tack	650	650
Fresh meat	400	450
Bacon or lard (with fresh meat)	30	30
Meat	210	.....
Canned meat	300	300
Soup (with canned meat)	50	50
Rice or dried beans	60	100
Sugar	32	48
Coffee	24	36
Salt	24	24
Wine.....liter	½	½
Beer or cider.....do	1	1
Tobacco (officers)	20	20
Tobacco (enlisted men)	15	20
SUBSTITUTIONS.		
1. In place of meat.		
Herring, salted or smoked or codfish, salted	400	500
Meat, smoked	250	250
Sardines	200	250
Codfish, dried	100	125
Pork, salted	240	300
2. In place of rice or dried vegetables.		
Potatoes	450	750
Cabbage, carrots, or turnips	600	1,000
Pastry	60	100
Vegetables, preserved	60	75
Sweets	75	75
3. Other rations.		
Tea	3 grams (with 10 grams sugar).	
Brandy	1/10 liter.	

Normal ration (in grams)—Continued.

SUBSTITUTIONS—continued.	
Other rations.	
Soap	12 grams per day.
Matches	50 for 15 days.
Candles (according to season)	½ or 1 per squad; 2 grams or 4 per man; ½ or ¼ per officer.
Petroleum	Substituted on the basis of 3 liters per 100 kilograms of candles (candles weigh 16 per kilogram).
When in dugouts	29 grams candles per man per day or 70 grams petroleum or 70 grams carbide.
Water (when supply is limited)	3 to 5 liters per man, according to the season; 40 liters per horse.
Straw for bedding	5 kilograms of long straw or 7 kilograms of short straw.
Fuel	1 kilogram of wood or 0.600 kilogram of carbide.
Fuel when in dugouts for telephone posts	5 kilograms of charcoal or 7 kilograms of coke. Per man, 0.200 of charcoal or 0.300 of coke (in place of the ordinary fuel ration).
Firewood in cantonment	0.850 of wood or 0.530 of charcoal; 0.600 and 0.350 with rolling kitchen.
Firewood in bivouac	100 of wood or 0.630 of charcoal. Supplementary for warming up the trenches, 0.65 solidified alcohol, 0.300 coke, 0.630 charcoal.

Normal ration (in grams)—Continued.

SUBSTITUTIONS—continued.	
Other rations.	
Horses (minimum ration)	5½ kilograms oats and 2½ kilograms hay.
Rations in reserve	5,500 of oats.
INFORMATION.	
Weight of the average beef	800 kilograms, yielding one-half good meat; a beef of this weight will yield 800 increased rations.

Making of bread.—One hundred kilograms of wheat yields 70 kilograms of flour. To make 1 kilogram of bread it is necessary to use 500 grams of flour, 5 grams of salt, and 5 grams of yeast.

Load of a wagon: One horse, 500 to 600 kilograms; two horses, 1,000 kilograms; four horses, 1,500 to 1,800 kilograms.

Weight of one day's reserve rations, 830 grams.

Weight of one day's reserve rations for a company of 250 men, 210 kilograms.

Rapid calculation of weight.—One meat can contains 600 grams of oats. 500 grams of coffee, 1,200 grams of crystallized sugar. One quart contains 100 grams of coffee and 240 grams of sugar.

Allowances.

	Rations.	
	Food.	Fuel.
Privates	1	1
Noncommissioned officers	1	2
Lieutenants	1½	3
Captains	2	4
Field officers	2½	6

CHAPTER XI.

REPLENISHMENT OF MUNITIONS AND MATÉRIEL.

Organization of the replenishment of munitions and matériel.—The great development of specialties, which require heavy and voluminous supplies, make good organization of replenishment a vital necessity and a particularly delicate problem.

Whatever may be the situation, every effort is made to push the animals as near as possible to the troops, so as to reduce the length of the carry. Mules and asses are best for this service. The carrying parties should be well organized; for 20 men a guide or corporal in front, an energetic sergeant behind. All falling out is a crime. It is prudent to reckon that there will arrive at the front line only half of what will have been sent (bombardment, straggling carrying parties, etc.). Another maxim is to always endeavor to have units supplied by parties belonging to the units themselves; they will be much more apt to arrive at their destination. It should be so arranged that, when the front of the company is not too extended, the two platoons in support shall leave in the rear their section of light infantrymen; one, marching with the reserve, shall carry to the conquered position such supplies as are the most needed for immediate use, which are, in general, tools, grenades, and water; the other shall bring up a little later, perhaps in the night, sandbags (empty), barbed wire, rockets, rations, brandy, cartridges, and

more grenades. All these objects are obtained at depots, or dumps, established before the attack, and as far forward as possible, either in the trench of departure (jumping-off trench) or at least near the command posts of the captains and battalion commanders. They are put in sacks in bundles of 11 to 17½ pounds, so that they may be given out—one to a man already loaded; two, three, or four to a "replenisher," who will tie them together and carry them as a bundle. Finally, it would appear feasible to make at the front munition dumps, comprising car-

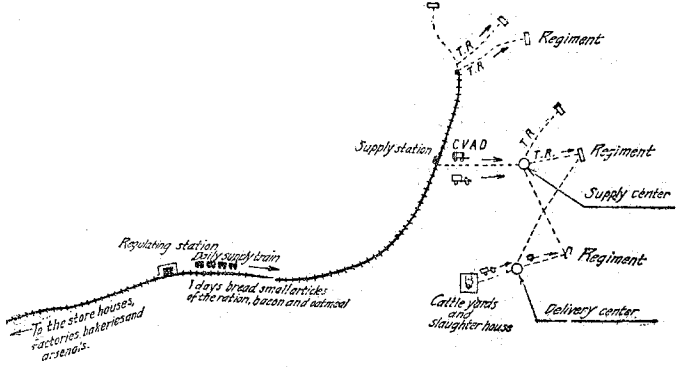


FIG. 263.

tridges for small arms and for machine guns, hand grenades, rifle grenades, rockets or signal cartridges, flares, and sandbags (empty). Whenever the troops request munitions or supplies a complete lot should be sent, unless there are orders to the contrary.

The sending of men from the front to the rear for the purpose of securing supplies is absolutely forbidden on the field of battle.

Replenishment of rations.—Upon their departure (for the front) men should receive all the rations which they can carry, particularly 2 or 3 liters of water. Rolling kitchens and water carts grouped by battalion under the command of a very energetic officer or n. c. o. will be pushed up as near as possible to the

troops. They will avoid foods which are too much liquid and therefore difficult to transport. It will be advantageous in certain cases to arrange by squads a sort of lunch basket (ration box) containing rations for the next day. It will be possible also to establish depots of canned goods near the command posts of captains. Men will receive solidified alcohol for rewarming their food.

Replacement of munitions in the war of maneuver.—At a halt or on the march keep up the individual allowance (theoretically 88 cartridges per man) at first from that provided for the sick, absent, etc.; afterwards taking that which is in the combat wagon of the company.

Before the fight, upon the order of the battalion commander, the supply sergeant of the battalion sends to each company its combat wagon from which the ammunition is distributed. The empty wagons are sent to the second echelon of the combat train, in rear of the regiment, and are not refilled during the action. The supply sergeant reports to the regimental supply sergeant, who takes post at a point fixed by the colonel behind the unengaged battalions with a certain number of sappers and reserves.

During combat a section of the infantry ammunition train (34 munition caissons, flags, and yellow lanterns), or a fraction of that train, is designated to resupply the regiment. An agent (an n. c. o.) goes to the colonel, receives the latter's orders, and indicates to the regimental supply sergeant the number of wagons required (in general, 1 per battalion and machine-gun company). The supply sergeant of each battalion and two men conduct the wagon as near as possible to the firing line, distribute the ammunition, and take the wagon back to the regimental supply sergeant. The agent of the train then reconducts the wagons quickly to the train and returns to the front an equal number of loaded wagons.

After the fight the men's belts and the combat wagons of the companies are refilled from the wagons of the train. The replenishment of horses for the combat wagons is made by the nearest infantry ammunition train upon the order of the brigade commander. The wagons themselves are replaced by requisitioned wagons. Besides this regular method of replenishment, the infantry ammunition train should, in combat, deliver munitions directly to any command, wherever situated in the vicinity,

on a simple receipt signed by its chief. Regimental and battalion commanders should similarly deliver ammunition to a force of another regiment.

Table of the armament of an infantry company in rifles.

Not armed with rifle.	Armed with rifle, but with reduced number of cartridges.		Armed with rifle.	
1 adjutant. 1 sergeant major. 8 automatic riflemen. 8 carriers for automatic riflemen. 1 hospitalman. 2 drummers. 3 guides.	10 sergeants. 4 corporals, grenadiers. 28 grenadiers 16 grenadiers, V. B. 8 carriers, V. B. 1 cyclist (18 cartridges).	48 to 56 cartridges.	12 corporals. 68 infantrymen. 15 various. 8 carriers V. B. (384 DAM cartridges for small arms).	88, 120, or 200 cartridges.

Loading of the wagons of a small arms (infantry) ammunition section.

I. RIFLE CARTRIDGE.

11 wagons (caissons) with 8 caissons and 3 limber chests loaded with cartridges, model 1886 rifle, in packages	[1] 349,696
caisson-body chests loaded with model 1886D, cartridges, in clips	30,960
1 caisson-body chest loaded with APX cartridges	27,520
Total	408,176

II. CARTRIDGES FOR AUTOMATIC RIFLES.

10 caissons loaded with D automatic or machine rifle cartridges, in packages.	392,960

III. CARTRIDGES FOR MACHINE GUNS.

13 wagons (caissons) with 8 caissons, 1 caisson-body chest loaded with DAM cartridges in rigid bands (clips)	248,400
4 caisson-body chests containing each 24 boxes of flexible bands and 7,232 DAM cartridges, in packages	46,464
4 limber chests containing each 11,616 DAM cartridges in packages and 1 machine for recharging empty bands (or 104 empty bands or clips)	57,728
Total	352,592
1 limber chest loaded with revolver and pistol ammunition.	

NOTES.—This table applies to a division having 1907 machine guns and only 10 per cent of 1907–1915 rifles. It is modified according to needs.

A change in the 11 caissons for rifle ammunition is contemplated to provide for carrying hand grenades, V. B. grenades, 37 mm. ammunition, flares, and automatic-pistol ammunition.

[1] Number reduced in the case of American ammunition in boxes.

Armament of the platoon and example of the armaments issued before the combat.

	Arms.				Cartridges.				
					1886-D.			Pistol.	
	Rifles.	Automatic rifles.	Automatic pistol.	Knife.	Each.	Total.	D.A.M.	Each.	Total.
FIRST HALF PLATOON.									
Sergeant	1				56	56			
First squad, grenade:									
Corporal	1				56	56			
Squad leader	1			1	56	56			
2 throwers	[a] 2		2	2				27	54
2 carriers	2		2	2				27	54
2 aids	2			2	56	112			
Second squad, automatic rifle:									
Supply corporal	1				120	120			
Automatic riflemen		1	1				[b] 160	27	27
First carrier			1				[c] 480	27	27
Second carrier	1						[d] 384		
2 extras	1	1	2				1,024	54	54
SECOND HALF PLATOON.									
Sergeant	1				56	56			
Third squad, light infantry:									
Corporal	1				88	88			
8 light infantrymen	8				120	960			
First grenadier, VB	1VB				56	56			
Second grenadier, VB	1VB				56	56			
1 carrier, VB	1				56	56			
Fourth squad, light infantry:									
Corporal	1				88	88			
9 light infantrymen	9				120	1,080			
2 grenadiers, VB	2VB				112	112			
1 carrier, VB	1				56	56			
Total	38	2	8	7		3,008	2,048		216

[a] Throwers will not carry the rifle if the fight is not to be hand to hand.
[b] In 8 clips of 20 cartridges (4 in the leather pouch and 4 in the haversack).
[c] 160 in 8 clips of 20 each in the haversack; 320 in 5 packs (1 in the haversack and 4 in bandoliers).
[d] 320 in 5 packages in bandoliers; 64 in the belt.

Armament of the platoon, and example of the armaments issued before the combat—Continued.

	Grenades.						Signal equipment.
	F or OF *a*		VB.		Suffocating or A B 1916.		
	Each.	Total.	Each.	Total.	Each.	Total.	
FIRST HALF PLATOON.							
Sergeant							5 flares.
First squad, grenade:							
Corporal	8–16	8–16			2	2	2 Bengal lights.
Squad leader	8–16	8–16			2	2	
2 throwers	10–20	20–40					
2 carriers	10–20	20–40			2	4	
2 aids	8–16	16–32			2	4	2 position-marking panels.
Second squad, automatic rifle:							
Supply corporal							2 Bengal lights.
Automatic riflemen							
First carrier							
Second carrier							
2 extras							
SECOND HALF PLATOON.							
Sergeant							5 flares, 1 pistol of 25 (sic), 2 Bengal lights, 2 panels.
Third squad, light infantry:							
Corporal					2	2	
8 light infantrymen	2	16	2	*b* 16			
First grenadier, VB			10	10			
Second grenadier, VB			10	10			
1 carrier, VB			10	10			
Fourth squad, light infantry:							
Corporal					2	2	2 Bengal lights.
9 light infantrymen	2	18	2	*b* 18			2 panels.
2 grenadiers, VB			10	20			
1 carrier, VB			10	10			
Total		106–178		94		16	

a From the point of view of loads 1 F equals 2 OF. The proportion of offensive and defensive grenades is regulated solely by the resources and the terrain to be attacked. Riflemen carry a minimum of 2 and a maximum of about 5 granades.

b Upon arrival at the conquered front the carriers of VB grenades take over the VB grenades carried by the riflemen.

As soon as the command post of the battalion is established it is well to establish there a dump equal to the needs of two companies and of one half company of machine guns, as follows:

"86 D" cartridges	25,000
DAM cartridges, in packages	17,000
DAM cartridges, in clips	20,000
Hand grenades	1,000
VB grenades	800
AB 1916 grenades	100

Complete this afterwards for the three companies and machine-gun company of the battalion.

USEFUL INFORMATION FOR THE ESTABLISHMENT OF A PLAN FOR REPLENISHMENT.

1. *Replenishment by man power.*—One carrier is able to carry—

12 packages of "86 D" cartridges (768 cartridges) weighing 22 kilograms (48 pounds).
28 strips (bands) of DAM cartridges (700 cartridges) weighing 23 kilograms (50 pounds).
30 OF grenades, weighing 11 kilograms (number limited by the bulk) (24 pounds).
30 F 1 grenades, weighing 18 kilograms (40 pounds).
40 suffocating grenades, weighing 16 kilograms (35 pounds).
25 AB grenades, weighing 18 kilograms (40 pounds).
40 VB grenades, weighing 19 kilograms (42 pounds).
33 shells (37's), weighing 19 kilograms (1 box) (42 pounds).
50 to 100 empty sacks, according to thickness.
5 iron or wooden pickets.
15 yards of "Reseau Brun," a spiral of barbed wire on a wooden framework. (*See Chap. VIII, Pt. II.*)
1 picket and 1 roll of wire (material for 2 square yards).
100 signal cartridges or flares, size 25.
Water for a squad (12 half-gallon cans).
1 basket of food for a half-platoon (per man, 500 grams of bread or biscuit, 300 meat, 200 chocolate or sardines, 50 alcohol).

Substitute for 1 full regulation haversack a load of 15 kilograms (33 pounds); for 1 equipment with 88 cartridges and liter bottle, a load of 7.5 kilograms (16 pounds).

It is always best not to fill the sand bags, but to make them up in bundles of 5 to 8 kilograms (10 to 15 pounds).

2. *Replenishment by mules.*—A mule can carry—

3,000 D or DAM cartridges.
4 cases of 50 OF grenades, or 90 kilograms (198 pounds).
2 cases of 50 F 1 grenades, or 70 kilograms (154 pounds).
1 case of 100 grenades, VB, or 70 kilograms (divided into 2 loads or bundles).
4 cases of 33 shells, size 37, or 80 kilograms (176 pounds).
2 cases of 100 flares, or 80 kilograms (172 pounds).
2 cases of 30 cartridges (size 35), single-shot, 60 3-shot, 60 6-shot, or 70 kilograms.

A machine gun cart carries as much as two mules.

One ass carries as much as three men.

Thirty asses making two trips carry as much as a territorial company in one trip.

3. *Example of an ammunition assignment for one section.*—(Corresponding to the table given above as an example of the allotment of ammunition for a section):

12 sacks of 4 bundles of "86 D" cartridges.
8 sacks of 4 bundles of DAM.
3 sacks of 20 OF.
6 sacks of 10 F 1.
1 sack of 10 suffocating grenades.
2 sacks of 5 incendiary grenades.
10 sacks of 10 VB.
1 sack of 10 Bengal lights, 15 flares, 15 signal cartridges.
1 package of 60 empty sacks.
Total, 44 packages, including 100 sand bags.

One such lot may be carried from the depot of the battalion to the firing line by a section of men already loaded, or by 12 carriers—men not loaded.

The lot will be completed by 50 sacks of 3 strips of 25 DAM (10,000 cartridges), replenishment of a machine-gun section; 3 sacks of 11 shells (size 37), replenishment of a 37 gun.

4. *Replenishment of a company.*—(*a*) 1886–D cartridges: Four men carrying each three sacks of four bundles (22 kilo-

grams, 48 pounds) replenish the platoon in one trip and the company in four trips. One man can replenish a platoon in four trips. It will very often suffice to replenish only half the allowance. That is, two men and four trips for the company.

(*b*) DAM cartridges: Same figures; but it will be necessary to ascertain beforehand the total amount to be replaced.

(*c*) Hand grenades: The figures given above show that the platoon is fully replenished by four men and the company by four men making four trips; two carrying 20 OF, 10 F1, and 5 AB; the third, three sacks of 10 F1; the fourth, one sack of 10 F1, one sack of 5 AB. It will be necessary to add a sack of fuses or No. 25 cartridges.

(*d*) VB grenades: If one man carries 40 VB in four sacks (19 kilograms), the replenishment of the company will be accomplished by four men making four trips. This replenishment is often useless, upon the occupation of the objective; few VB are used even in the course of the attack if no center of resistance is encountered. So the 12 carriers indicated above are assigned to the platoon; and 2 squads of riflemen can replenish the company, and can also carry a certain quantity of engineer matériel, calculated under "Replenishment by man power."

(*e*) Defense accessories and park tools: Twelve men can carry 200 yards of "reseau Brun" (Chap. VIII, Part II) barbed wire (front of a company), or 60 park tools; 25 men making four trips can carry the material necessary for 220 yards of wire on stakes. Two squads of riflemen can carry to the company either 100 park tools in one trip, or, in four trips, the material necessary to make 110 yards of "reseau Brun" barbed wire and 85 yards of wire on stakes.

(*f*) Food: There should be named beforehand one man per squad for water and one man per half platoon for dry food; or one squad of riflemen making two trips. The food carriers can also carry sacks of flares.

To sum up: In a fighting battalion the replenishment of the battalion depot and the company may be organized in the following manner:

First. Each company of the first line leaves two squads of riflemen taken from the support platoon for the replenishment of ammunition (cartridges, grenades, VB, and other things);

Second. The reserve company attached to the battalion depot; four squads of riflemen for the replenishment of engineer matériel for the two companies of the first line; and two squads of riflemen for the replenishment of the rations of these two companies. There remains two squads of riflemen for the replenishment of their own supplies.

5. *Replenishment of the battalion.*—The battalion should have at its depot supplies at least equal to that carried by the companies. In considering what has been stated above it is seen that it requires a territorial company per battalion in order to assure the transport between the regimental depot and the battalion.

6. *Replenishment of the regiment.*—The following may be of use: An ammunition-wagon chest carries about 12,500 cartridges, weighing 450 kilograms (990 pounds). It will carry 672 VB grenades—or, 400 F1 grenades (240 kilograms, 530 pounds) and 200 VB grenades (100 kilograms, 220 pounds), or, 300 hand grenades and 300 VB grenades packed as follows: Eight cases of 20 grenades in the chest, 7 cases of 20 grenades on the rear board (or shelf), 3 cases of 100 VB grenades on the rear chest, equipped with a bracket.

This utilization of the chest for the transport of loaded grenades is not without danger and must not be considered as the usual method of transport.

In reserving for the grenades and flares one chest in two (preferably the rear one) there still remains in the combat train 82 cartridges per man armed with a rifle.

It is a good plan to have on each caisson or material-wagon a package of 50 sand bags for distribution.

It is impossible to determine the proportion of OF, F1, and other grenades in an apportionment. It is too positive a statement to say that the F1 grenades should constitute the major part of the depots, for combats have been waged with success with the OF only; it is the only grenade which can be used from concealed positions, and certain grenadiers prefer it in all cases. A normal proportion is as follows: One-fifth smoke or incendiary grenades, three-fifths F1, and two-fifths OF; or the last figures might be reversed. The proportion of one-half incendiary grenades is proper for the moppers up (trench cleaners).

CHAPTER XII.

RAILROAD TRANSPORT.

A train of 50 cars can carry one-third of a regiment of infantry; this is the heaviest element carried by a single train. Length of train, 383 yards; open siding, 438 yards.

Time allowed for entraining or detraining, one and one-half hours as a maximum, if platforms and ramps are available.

It is essential that the detraining equipment shall be sufficiently mobile so that this time shall not be exceeded.

Officer charged with the train inspection.—He precedes the command by at least half an hour, accompanied by an under officer, having a return of the personnel and matériel to be loaded. Duties: To number with chalk the cars from the head to the tail of the train; note the capacity of each car or truck; distribute numerically the men, officers, police guard, horses and wagons; write this upon the cars and make a list according to the car numbers for the commander of the troops. Send this list to the commander as soon as possible, and at the same time give him all useful information regarding the approaches to the train and the most favorable place for making the division into fractions. This place should be outside the station.

Capacity of cars—*Ordinary car.*—In each compartment take the number of places indicated diminished by 2.

Specially fitted cars.—Look at the inscription. The mark "32–40 men" means 32 men equipped or 40 unequipped.

Freight cars not specially fitted.—Carry 40 men each, regardless of marking.

Flats.—An inscription on the side will indicate. For example, 5 axles. Furthermore, the size of all military carriages is stated in axles by an inscription on the carriage, the smallest being the limber of the 75's which is a vehicle of "one axle." It is easy, therefore, to estimate correctly the carriages on a given number of flats.

Police guard.—One officer, 1 sergeant, 1 corporal, 1 bugler, 15 men. This guard is placed in the center of the train near the officer's car; it guards the men undergoing confinement; it arrives at the station at the same time as the troops and

enters its car. The chief receives orders from the commander on the subject of sentinels.

Distribution.—The command is formed in a line. Everybody, except the officers, remains in ranks; the chiefs of platoon sees that arrangements are made to hold space for men temporarily away (loading equipment, ordnance, etc.), and that the men present do not leave ranks. The officer who has made the arrangements then divides the command into parts according to the capacity of the cars without reference to companies. The captains then designate the chiefs of the cars and of the compartments. These note the men for whom they are responsible and inform them of the number of their car. After embarking, write the number on the inside of the car door and add on the cars the designation of the companies occupying it.

Embarkation of the troops.—The command boards the train in column of fours by a route so chosen that each fraction, marching at 2 paces from the preceding one, easily reaches the car, toward which it faces in double rank; it keeps the ranks closed so as not to overlap the length of the car. At the bugle call "Forward" the men put their packs on the ground. The chief of the compartment and one man get into the compartment. All rifles and then all packs are passed to these men who dispose of them in the end of the compartment or under the seats or in the racks overhead. This being finished the chief of the compartment causes the others to enter. He is responsible for their conduct during the trip and for any delay in unloading.

Bugle calls.—"Halt": Authorization to get out at will for 10 to 15 minutes. "Forward": Entrain again. Mess calls: Food station; the supply sergeant of each company and 2 men per car will report to the mess officer or his assistant. These distributions are made *in the cars*, supervised by officers. The men are allowed to get out only when they have finished. For the composition of the meal see. Food. (Alimentation). "Regimental march": Detrain, same principles as entraining except in inverse order.

During short stops, when the call "Halt" is not sounded, the commander of the guard takes charge of the train and may permit some men to get off.

CHAPTER XIII.

NOTES ON THE SERVICE OF THE REAR.

The purpose of the service of the rear is to assure the continuity of communication between the armies and the interior of the country.

The zone of the armies is placed under the orders of the commander in chief.

The zone of the interior remains under the control of the minister of war. (See fig. 264.)

Lines of communication (in general railroads, but also highways and navigable streams) extend over both zones. As regards railroads we have the system of the armies (commander in chief) and the system of the interior (minister) separated by the line of demarcation.

For all the armies of the same theater of operations there is one sole administration of the rear (D. A.) placed at the headquarters of the commander in chief. Two grand divisions: Service of the railroads and the service of highways. In each army or group of armies there is one administration of highways and supply services (D. E. S.)

Line of communications by railroad.—One encounters, in going from the rear to the front: An assembly station (one per army corps); depots, arsenals, bakeries; the regulating station (G. R.) of the army through which everything passes in order to receive its definite destination; the railhead, which is the terminus of the railroad transport, point of contact with the wagons of a division, of one or several army corps. They function to the rear as evacuation stations.

Etapes (stations along a wagon or motor line of communications).—If the railhead does not lie close enough to the troops, the line is prolonged by a line of etapes. The railhead is then called the railway origin of etapes (gare origine d'etapes, G. O. E.) and supply columns, travel from etape station to etape station until the etape head is reached (tete d'etape, T. E.). At the latter place, the supply trains of the division or corps are refilled from the wagon or motor columns of the line of etapes.

CHAPTER XIV.

NOTES ON THE LAWS OF WAR.

The laws of war were instituted under the generous error that certain well-organized peoples had entirely emerged from barbarism and that they considered themselves bound by the placing of their signature to international conventions, freely agreed to.

An infinite number of acts minutely and officially investigated have established that our troops and our Nation should never count on the observance of these laws and that the atrocities committed prove to be not only individual violations dishonoring merely the perpetrator but violations premeditated and ordered in cold blood by the commanders with the moral support of the heads of the enemy nation.

These laws are nevertheless repeated here in order that—

1. The knowledge of how the war should have been conducted may develop in the heart of each man the sentiment of hate (applicable only to foes such as we actually have); that in no case should a chief of platoon tolerate any intercourse between his men other than that of the rifle; this duty is explicit and not to be departed from except in the case of the wounded and prisoners incapable of doing harm.

2. That every violator of these laws, taken in the act, shall be the subject of an immediate report with witnesses, then sent to the division headquarters to be tried as to the facts of the case.

The laws of war resulted from the Geneva convention, from the declaration of St. Petersburg (Petrograd), and from the different Hague conventions. All these diplomatic papers were signed by Germany, Austria-Hungary, Turkey, and Bulgaria.

The following are the principal articles:

Protect the wounded on the field of battle from pillage and from bad treatment; respect ambulances and evacuation convoys; respect the personnel exclusively concerned with the transportation, treatment, and guarding of wounded; do not treat this personnel as prisoners of war if it falls into the hands of the enemy; but return such personnel, as well as matériel, when

its retention shall be no longer necessary for the care of the wounded prisoners.

Refrain from employing any projectile which weighs less than 400 grams that is either explosive or loaded with incendiary or inflammable material, from all projectiles having for their sole object the spreading of asphyxiating or harmful gases, all expanding bullets or those which will easily flatten out inside the human body, such as jacketed bullets whose jacket does not entirely cover the core or is nicked.

Forbid the use of poisons or of poisoned arms; killing or wounding an enemy who has thrown down his arms and surrendered; declarations that there will be no quarter; refrain from bombarding towns and cities which are not defended, from firing on churches, historical monuments, edifices devoted to the arts, to science, to charity, to sick and wounded and which are marked by a conspicuous signal known to the enemy.

Prisoners should be treated as to rations, housing, and clothing the same as troops of the country which has captured them. All their personal belongings, except their arms and military papers, should be left in their possession.

The following should be inviolate: The emissary—that is to say, an individual authorized by a belligerent to enter into talks with the authorities of the other side and coming under a white flag; also his trumpeter, his standard bearer, and his interpreter. He loses his inviolability if it is proven that he has profited by his privilege to provoke or commit treachery.

An undisguised military man can never be treated as a spy.

PART V.

GENERAL DISCIPLINE.

CHAPTER I.

MEASURES NECESSARY TO TAKE TO PREVENT INDISCRETIONS AND TO FURNISH INFORMATION TO THE CORPS COMMANDER.

A. *To avoid indiscretions.*—It is forbidden, either in bivouac or on the march, to abandon any paper, letter, etc., without destroying it. To rumple up a paper and throw it away is not destroying it. Envelopes and newspaper wrappers particularly will furnish information to the enemy. Never write the number of the regiment in the lists or records which are posted on the bulletin boards in camp; limit them to the number of the company, platoon, and squad.

It is forbidden to answer any questions asked by strangers. All persons who appear too inquisitive, or who offer to treat a soldier to drinks in order to get him to talk, should be taken to the captain. One must be very experienced to be able to judge with whom it is safe to converse among the public; it is best to abstain from talking with anyone. Never complain before civilians, as complaints reaching the enemy will tend to raise his morale. Do not believe that it is unimportant to let drop some detail before persons considered unintelligent; these persons are more dangerous than others, because when they repeat conversations they deform and exaggerate them.

In general, strict surveillance should be maintained in all cantonments and bivouacs, and around the batteries, over all persons in civilian clothing, and those in the customary uniform whose presence or actions appear unusual. Every military person who does not wear an insignia, or a brassard, which clearly

establishes his identity should be conducted to the guardhouse and held until he is identified.

Those on leave or furlough should be particularly circumspect in their conversation, and should always suspect anyone who makes inquiries about military matters.

It must be remembered that it is impossible for combatants to properly estimate an action in which they have taken part.

Telephone conversations can be overheard by tapping the line or by the use of induction currents if the circuit is not a closed one. The telephone must not be used for giving attack orders or confidential communications without taking special precautions.

No one should enter an engagement carrying on his person any order, plans, etc., which would furnish information to the enemy.

If taken prisoner military honor forbids giving the least information that can be of use to the enemy. No physical or moral suffering excuses one from departing from a firm and silent attitude, and it will deceive the enemy after he has vainly tried to force information.

Moreover, his bulletins of information, carrying, like our own, the names and the regiments of prisoners examined, will some day fall into our hands; unfortunate will it be for those who return from captivity with the proofs of their treachery to their country.

B. *Information for the corps commander.*—All information and all papers giving information concerning the enemy should be sent back *without delay.* Do not attempt to judge whether it is urgent or important. The clothing and other effects left by the enemy should be carefully examined. An inventory giving the number and the marks, both on the outside and in the lining, should be sent to the commander; all the distinctive accessories of the uniforms, such as shoulder straps, cockades, facings, pipings, headgear, etc., should be packed together and sent back.

Every chief of a detachment which first arrives at a place abandoned by the enemy should immediately seize the letters that have been deposited in the letter boxes and post office, the papers in the office of the mayor, the railways, etc. All documents left by the enemy, and anything that will aid in identifying the units which occupied the place must be sought.

Any military person who has knowledge of the existence of carrier pigeons in a cantonment must report it at once to his commanding officer. Whoever hears of the landing of a small balloon should immediately get in possession of the letter which was probably attached to it.

C. *Examination of prisoners.*—All prisoners should be searched as soon as possible in the presence of an officer, in order that they may not be able to destroy or throw away any papers or other important articles which they may have in their possession during the march to the rear.

It is also necessary to separate as far as possible, from the time of their capture and afterwards, officers, noncommissioned officers, and soldiers, and to prevent any conversation between them.

The detailed examinations of prisoners is made at division headquarters, where they should be sent without delay. The intermediary units (regiment, battalion, company), nevertheless, have a particular and immediate interest in the most minute questions concerning the defensive organization of the position in front of them and from which the prisoners came, viz, occupied trenches, machine guns, trench mortars; gas apparatus, shelter, listening posts, observation stations, telephone posts and routes, emplacements, thickness and nature of the defense accessories, number of grenades, bombs, etc., provided, site of the commander of the support units, hours and itinerary of reliefs, working hours and meal hours, strength by day and by night, etc. Some of this information can be determined or verified at once by means of the periscope or from an observation station. To obtain the above information the prisoners should be questioned separately. However, it is directly forbidden to extend the examination made in the company (and even in the regiment) to questions of general interest: Recruiting, position of troops, orders of battle, strength, previous movements, moral state of the country, etc. In fact, the first examiners have not the necessary information to uncover immediately a deception, and keep the prisoner from getting mixed up in a lie. The prisoner, having been able to relate, without contradiction, a series of trumped-up stories, would not wish to deny them later for fear of being punished if he admitted that he had lied about everything. It is

therefore necessary that prisoners come before the division information officer without having been questioned on any of these subjects. The noncommissioned officers charged with escorting the prisoners from the company to the battalion, etc., are given positive orders that no one is to be allowed to address a word to the prisoners except the officer to whom they are conducted. The same rules will apply to deserters.

CHAPTER II.

POSTAL SERVICE.

Postal service.—Troops in the theater of operations, for mail service, are grouped in postal sectors, the service being handled by the military post office. Military persons should give their correspondents their exact address and request them not to change it in any way. Company officers should give the necessary directions to men arriving at the front.

Example of address:

Mr. Leonard Charles,
Private, 74th Reg't Infantry,
9th Company, 3d platoon,
Postal Sector No. 93.

It is particularly intended that the address shall not in any way indicate the brigade, division, or army corps; such indication must not be shown.

It is forbidden:

(*a*) To all persons in the military service in the theater of operations—

1. To give any information in their private correspondence concerning the location, movement, or strength of troops or the nature or importance of any defensive works; to mention intended operations; to give any geographical or military details of those which have already taken place; to give the name of any general officer under whose orders they are serving; in a word, to give any information which, if it should come to the knowledge of the enemy, could be of use to him.

2. To correspond with prisoners of war in Germany.

3. To forward under cover, not open for inspection, any newspaper, prospectus, commercial circular, or any kind of printed matter.

4. To undertake, in case of travel (on leave or furlough, transfer, or under special orders, etc.) to carry any correspondence for another person.

(*b*) To all military persons within the postal sectors—

1. To mention in their correspondence the locality or region in which they are located.

2. To send any illustrated postal cards representing places or views in the theater of operations, whether the name of the place is indicated or not.

3. To include in their postal address any mention of the brigade, division, army corps, or army of which they form a part (exception is made for members of the staff when it is necessary to designate one of the above-mentioned units).

4. To resort to the civil post to send or receive correspondence or matter of any kind.

Any infraction of the above rules, discovered by the board of control, will be the subject of disciplinary action and may even cause the offender to be brought to trial by court-martial.

All military persons will deposit their correspondence either in the mail boxes of the military post office, in the additional boxes provided for them in the cantonments, in a special place fixed by the unit commander, or deliver them to the mail carrier or one of his assistants.

Those on leave or furlough who desire to send mail matter free from a station where they stop while en route will deliver it to an orderly authorized by the military railway officer to receive such mail and stamp it.

Moving troops, when the army is making a change, must deposit their mail only in the places regularly designated for that purpose. All letters and cards will be examined and those which make any mention of the movement will be destroyed; likewise all mail matter deposited in any other place than the regularly designated places will be destroyed.

CHAPTER III.

PUNISHMENTS.

Punishments.—Offenses are punishable at all times and in all places.

It is the duty of every superior, no matter what his rank or to what corps or service he belongs, to aid in maintaining discipline by taking notice of all offenses committed by his inferiors and correcting them at the time.

Whenever he judges it necessary, and *in every case when his orders are disregarded*, he will correct the infractions, inflicting the punishments provided by regulation.

In the field the punishments are, in principle, the same as in time of peace.

In practice the punishment of confinement and solitary confinement, being the only ones capable of execution, are the only ones inflicted.

The captain of a company may sentence any corporal or soldier of his company to confinement for eight days. The colonel of a regiment may inflict punishments not to exceed 15 days' confinement, of which 8 days may be solitary confinement.

General officers may inflict exceptional punishment of from 30 to 60 days prison and send the offender to the divisional disciplinary platoon.

Sergeants may be punished by their company commanders with 15 days' open arrest or 8 days' close arrest, and by their colonel with 30 days' open arrest or 15 days' close arrest.

A lieutenant or a sublieutenant acting as commanding officer of a detachment has the same powers as a captain of a company.

Everyone who acts temporarily as commanding officer, no matter what his rank, has the same rights in regard to punishments as the regular commanding officer.

Punishments should never be given in the presence of inferiors of the person receiving the punishment.

Any person on leave or furlough who incurs a punishment of confinement will be immediately returned to his corps by the general commanding the district.

Punishments given in the trenches will generally be executed during the periods of rest. The colonel will regulate the diet

and work of the prisoners according to circumstances; their pay is turned over to the mess fund.

Furloughs of men who misbehave themselves may be reduced, delayed, or canceled by the colonel.

A mention in orders cancels punishments.

Reduction to the ranks.—Reduction to the ranks of corporals and sergeants may be made by the colonel without further procedure. In the field reduction to the ranks is not as serious a punishment as in times of peace. Such reduction may be made in the interests of the service, for incapacity or inaptitude for the service, without carrying the least disgrace to the person reduced.

A noncommissioned officer may be named on the day following a battle where he has shown himself personally courageous; but it is also necessary that he can be depended upon, in preparing for the coming battle, in his method of command, his daily zeal, and in his application to details.

The recruiting and the improvement of the organization should be the constant aim of the captain.

Chiefs of platoons, responsible for the proper instruction of their platoon, should do everything they can to see that the positions of authority be given to the most capable and the distinctions to the bravest.

CHAPTER IV.

COURTS-MARTIAL.

Courts-martial.—The penal part of military law should be read periodically in the companies; it is contained in the soldiers' handbook. An officer must be present during this reading.

The following notes will clarify certain points which are often poorly understood.

Desertion.—The soldiers' handbook contains the text of article 231 of the C. J. M. (Code of Military Justice), relative to desertion without quitting the country, but does not mention article 234, which directs that in time of war the time allowed a man absent without leave to return to duty before being declared a deserter is reduced by two-thirds.

These delays are, therefore, two days in the case of desertion without quitting the country and one day in the case where the deserter gives himself up abroad or leaves his corps while operating on foreign territory. The delay commences at midnight following the moment the absence has been discovered and terminates at midnight, 24 or 48 hours later, after which the "absentee" becomes a "deserter."

It must be noted that in the case of desertion to the enemy (art. 238) or of desertion in the presence of the enemy (art. 239) there is no delay allowed; the man is declared a deserter as soon as his absence is regularly established, and is tried as such, even if he returns within a few hours after his absence has been discovered.

The words "in the presence of the enemy" does not imply any definite distance from the enemy. It pertains to the degree of the offense and each case must be considered separately as to whether the act was actually committed in the presence of the enemy or not, especially to determine whether article 234 or article 239 is applicable.

Refusal to obey orders.—The soldiers handbook does not mention "*the refusal to obey an order given by a commander in the presence of the enemy.*" The punishment for this offense is death, the same as "*the refusal to advance against the enemy,*" provided for in article 218, C. J. M.

Delinquents are often under the impression that they are not liable to trial by court-martial unless article 218 has been read to them in the presence of witnesses, and they have continued in their refusal to obey. The reading of this article not only is not required, but it is directly forbidden.

To establish the "refusal to obey orders" in the meaning of article 218, it is not necessary that the refusal be expressed verbally, or by any actual act; it is sufficient that the given order has willfully not been executed.

Quitting post.—The offense of "quitting post" may be committed, either in the presence of the enemy (art. 213, 1, death), or simply in territory in a state of war or siege (art. 213, 2, confinement in prison for 2 to 5 years). Article 213, 3 (quitting post in time of peace; punishment from 2 to 6 months in prison), does not apply under the present circumstances, as the whole country has been declared in a state of siege and of war.

It is necessary, moreover, to interpret in its broadest sense the word "post," which means "the place where the soldier should be to properly perform his duty." It follows, for example, from this definition, that it is not necessary in order to "quit one's post," that the soldier who commits this offense be charged with any particular duty, either guard or sentry duty, or in the trenches.

It is sufficient to constitute the offense that he leave his cantonment. It is evident that, as our different units are liable to be sent to the firing line at any moment, anyone who absents himself from the cantonment, without a legitimate reason, quits the post where he should always be near his commander and comrades.

Willful mutilation and self-contracted disease.—Willful mutilation constitutes, according to the particular circumstances in each case, either "refusal to obey orders" (art. 218), when the soldier, having been ordered to advance on the enemy or on any other duty, mutilates himself with the intention of not obeying the order, or "quitting post" (art. 213), when the culprit has mutilated himself so that he is unable to remain at the post confided to him (G. Q. G., Sept. 12, 1914, No. 4872).

It is the same with diseases, self-contracted for the purpose of being sent to the rear, or simply rendering oneself unfit for duty.

Drunkenness.—Drunkenness likewise constitutes "quitting post" or "refusal to obey orders" when it is contracted with the intention of not advancing when the time comes. In the case of drunkenness, and even in the absence of any culpable intentions, proceedings should be taken not only as an infraction of the law of January 23, 1873, against public drunkenness, but also for infraction of article 214, C. J. M., when the state of drunkenness has prevented the soldier from repairing to his post in case of an alarm or in obedience to signal. Proceedings will likewise be taken against all persons, military or not, who have aided these infractions.

Pessimistic speeches.—Pessimistic speeches and publications spread among the people and susceptible of shaking the morale of the population or of the Army should be prosecuted under the law of August 5, 1914.

This law forbids "any information or article concerning the diplomatic or military operations of a nature to aid the enemy or to exert an unfavorable influence on the Army or the people." Such information is demoralizing, as was distinctly pointed out to the Senate by the Judge Advocate, "even when it has been made without any bad intention." The means of publication that the law meant to reach are not only "literary works, printed works sold or distributed, placed on sale or exposed in public places or assemblies, placards or handbills exposed to public view," but also "speeches, cries, or menaces uttered in public places or assemblies."

These terms must be interpreted in the broadest sense. Thus, *talking even in the ordinary tone of conversation*, but so that a certain number of people can hear it, and also remarks in which only a few words have been uttered, must be considered as "speeches." Likewise, all places open or accessible to everyone must be considered as "public places"; i. e., public roads, streets, squares, public promenades, places of worship, museums, lobbies in hotels and cafés, waiting rooms in railway stations, public carriages, street cars, etc.

Robbery on the battle field.—Article 249, punishing by confinement for despoiling a wounded person, has been extended to the act of despoiling a dead body.

Surrender to the enemy.—Every soldier who falls into the hands of the enemy, wounded or not, will be reported by the commanding officer of the unit, with information as to the conditions under which he was made prisoner. These reports are sent to be filed in the records of the commandants of districts, and will be made use of in the inquiries that will be made after the war into the conduct of each prisoner.

CHAPTER V.

POLICE POWERS OF THE COMMANDING OFFICER OF A CANTONMENT.

Police powers of the commanding officer of a cantonment.—As soon as martial law is declared, the powers with which civil authority is invested for the maintenance of order and police pass entirely into the hands of military authority. This

latter has the right to take, in matters pertaining to general safety and police, all the administrative authority which normally rests with the prefect of police and the mayor.

Civil authority continues nevertheless to exercise those duties which the military authorities have not taken over (law of Aug. 9, 1849, under "Martial law").

Martial law has been declared over the whole country since the beginning of the war.

By "civil authority" is meant the prefects of police and mayors.

By "military authority" is meant: In the zone of operations—the commander of the army and his delegates, the corps commanders.

For local or urgent police measures, military authority, in the execution of the duties of the mayor, is represented by the senior officer stationed in the commune (commanding officer of a garrison or cantonment).

(Instructions of October, 1913, regulating the exercise of the duties of police, by the military authority over the national territory under "Martial law.")

A company officer can thus exercise the duties of police in a commune; he may himself decide all questions of detail or of importance, or he may leave them for the mayor to decide. As he only acts as a representative of the general of the army he must be sure that his decisions agree with the orders already given by higher authority. To that end he will carefully consult the cantonment files which should exist in each village.

Regulation of alcohol.—In the zone of operations, the circulation, and consequently the use of alcohol, is forbidden.

In the rest of the zone of the advance and in the zone of the line of communications the circulation is not prohibited, but it is prohibited to sell or give alcohol to a soldier.

In the remainder of the country soldiers may consume only wines containing not over 18 per cent of alcohol, or sweetened liquors containing not over 23 per cent of alcohol.

Regulation of the sale of wine.—The commanding officer of the cantonment has charge of the regulation of the police of the cantonment, the inspection of the markets (by patrols, etc.), the repression of drunkenness and injurious beverages, the ex-

amination of the quality of the wine sold, by frequent tests, and the fixing of the hours of opening and closing of the sales places according to the hours of work and rest of the troops cantoned there. He should also search out the unauthorized sales places. To comply with law, the dealer must have made a declaration to the administrator of taxes and have paid a license; besides, if he sells drinks to be consumed in the place he must make a declaration to the mayor of the commune. If the dealer can not show the receipts for these declarations and the license the shop should be closed and the dealer should be proceeded against.

The penalties provided by the fiscal laws and by the law of November 9, 1915, apply to inhabitants who sell, without license or declaration, wine to soldiers dwelling or cantoned in the house, whether to be consumed in the place or carried away. (G. Q. G., Dec. 1, 1915, No. 108.)

Private houses, the inhabitants of which sell wine at retail, should be considered as wine shops; they become public places which should be inspected in the same manner as the professional establishments. They should be required to exhibit a sign or placard, clearly indicating their business. The commanding officer of the cantonment is thus armed against the spread of hidden selling places in the crowded districts near the front, and against the abuses which injure the health and discipline of the troops.

All illegal wine shops should be ordered closed.—If it becomes necessary to repress disorder, frauds, or infractions of the police regulations in a regularly opened wine shop, it is generally sufficient to place a guard over it; in serious cases, the place will be closed and a report made to superior authority, who will confirm the action.

Opening of new wine shops.—The commanding officer of a cantonment has authority to forbid whenever he deems it necessary, the opening of any new place for the sale of wine, *whatever the drink may be that is kept and sold*, and no matter whether it is to be carried away or consumed on the place. This prohibition will be the subject of a special order, informing the public in advance, that no new declarations of opening wine shops will be accepted. (G. Q. G., Apr. 13, 1916, No. 8562.)

Traveling merchants.—Provost marshals are authorized to grant permits and licenses to persons who request authority to follow the armies (merchants, sutlers, etc.). These permits are signed by the chief of staff, as well as the certificates which the merchant's employees must have, as authority to accompany them. Commanding officers of cantonments examine and verify these documents.

Current price lists.—The law of April 20, 1916, gives the generals of the army the authority to regulate the prices of the food supplies and drinks intended for consumption by the soldiers. Commanding officers of cantonments will see that the current price lists are adhered to, and will put under guard those establishments which exceed them. They will regulate prices where no schedule is in force and where excessive prices are charged.

CHAPTER VI.

RIGHTS OF REQUISITION.

Rights of requisition.—The supplies, etc., which a commanding officer of a cantonment or a small detachment, may obtain by means of requisition, are:

1. The billeting and cantonment of men and animals, in available places.
2. The daily subsistence of officers and soldiers who have been billeted, in accordance with the customs of the country.
3. Provisions, fuel, forage, and bedstraw for the troops in camp or cantonment.
4. Transportation of all kinds, including the personnel.
8. Guides, messengers, drivers, and workmen for all necessary work.
9. The treatment of the sick and wounded in the homes of the inhabitants.
10. Articles of clothing, equipment, camp equipment, harness, armament, bedding, medicines, and dressings for wounds. (Law of July 3, 1877, art. 5.)

All requisitions should be made on the municipality, notification being sent to the mayor. Nevertheless, if none of the officials

of the municipality are at the seat of the commune, or if an urgent requisition is necessary at a point distant from the seat of the commune, the requisition may be made directly on the inhabitants. (Art. 19.)

Should the municipality refuse to comply with the requisition, the mayor may be fined from 50 to 500 francs.

If this refusal is caused through the ill will of the inhabitants, the necessary supplies may be collected by force; moreover, the inhabitants who do not comply with the requisition orders, are liable to a fine which may be double the value of the supplies required.

Whoever abandons the service for which he is required personally (guide, workman, etc.), should be tried by court-martial, under the provisions of article 62 of C. J. M., and may be punished by imprisonment from six days to five years, in accordance with article 194 of the same code (art. 21).

On the other hand, all abuse of authority, and all acts of pillage will be severely punished.

Requisition orders and receipts.—As a rule, requisitions are made by the officers or employees of the supply department who have been appointed for that purpose by the division commanders; they are supplied with two stub books, the first serves for the written requisition order, and the other one for the receipt, given after the requisition has been satisfied.

Under exceptional circumstances, and only in time of war, the commanding officer of a regiment, or of a detachment acting independently, though not supplied with the requisition books, may make requisition, on his personal responsibility, for the supplies necessary for the daily needs of the men and horses under his command. (Art. 8 of the decree of Aug. 2, 1877.)

These requisitions should always be in writing and signed by the officer; they should be made in duplicate, the mayor being furnished with one copy and the other being immediately forwarded through proper channels to the corps commander. (Art. 9 of same decree.)

These requisition orders should always state the quantity of *rations* required, and the price of the regulation ration, and not simply the total quantity of supplies requisitioned.

In practice a commanding officer of a detachament should not resort to requisition except when all other means to obtain neces-

sary supplies fail, such as direct purchases or by amicable agreements.

If provisions, fuel, forage, bedstraw, etc., are needed, which, for any reason, the supply officer has been unable to furnish the detachment, the best solution is to purchase them, take a receipt, and be reimbursed by the supply officer.

In all cases of purchase or requisition the supply officer should be informed as soon as possible, in order that he may deduct from his issues the rations which the detachment has procured directly.

In the case where requisition is made for transporation for a movement which will require more than five days, the price to be paid for horses, wagons, harness, etc., should be mutually agreed upon by the mayor and the officer making the requisition. Guides, drivers, and horses are subsisted in the same manner as the men and horses of the detachment.

Composition of a meal obtained on requisition.—Four hundred grams of bread; eighty grams of meat, boiled or in a stew; a plate of seasoned vegetables; one-fourth liter of wine or coffee or one-half liter of cider or beer. Food superior to the individual requirements should never be demanded.

Billeting and quartering troops.—The following information is necessary for the commanding officer of the encampment of a regiment or a battalion acting alone. This officer proceeds to the office of the mayor and in conjunction with him arranges for the installation of the troops. The mayor produces the register of property, the list or register of resources which the commune can offer for the billeting and quartering of troops; the list is made up every three years in accordance with article 23 of the decree of August 2, 1877. This list includes the buildings in the principal part of the town and also the detached hamlets. It indicates approximately—

1. The number of rooms and beds which can be provided for billeting officers, and the number of soldiers who can be billeted in each house, at the rate of one bed for each noncommissioned officer, and a bed, or at least a mattress and blanket for each two soldiers. The number of horses and wagons that can be accommodated in the stables and wagon sheds.

2. The number of men that can be quartered in the houses, institutions, buildings, stables, and shelters of all kinds, whether

belonging to private persons, to the commune, the department, or to the State, with the sole reservation that the owners or persons occupying them shall always retain the places necessary for their own lodging and for their animals, supplies, and merchandise. (Art. 23.)

Comparing this information with the strength of the command and with the orders he has received from his colonel, the officer in charge of the encampment will decide whether he will resort to billeting or quartering, or, as will generally be the case, a combination of the two methods.

Relations of the inhabitants with the troops billeted or quartered with them.—In cases where the encampment is very contracted, the troops occupying each house may, generally, use all the available space under cover, but the inhabitants are never required to give up the room or bed which they are in the habit of occupying.

Under all circumstances, where troops are billeted in the house of an inhabitant, they have the right to heat and light. (Art. 16 of the law of July 3, 1877.)

This provision means the right to have light, heat, and to cook in common with the inhabitant without causing him any appreciable increase in expense. This, however, does not apply in the case of troops quartered in a house; they are supplied with fuel and candles by the supply officer.

The troops are responsible for all loss or damage which they cause. The inhabitants will send their claims through the municipal council (art. 14 of the law) to the commanding officer of the troops, who will designate an officer to act with the mayor in preparing an equitable list of the damages. (Art. 28.)

Under penalty of forfeiture, the statement of damages should be made before the departure of the troops, or, at the latest, within three hours after the departure in the zone of the line of communications, or within 12 hours in the zone of operations; these delays will be counted from 6 o'clock in the morning if the troops leave during the night. The report should always state the hour when the claim is made.

If no officer is left after the departure of the troops, the commanding officer of the cantonment leaves a written note to the mayor stating the hour of departure; this note serves

as a basis for estimating the delays during which claims are valid. The report stating the damages allowed is then prepared by the justice of the peace or the mayor acting alone. These reports are sent to the interested person and are equivalent to receipts for an ordinary requisition; payment is made in the same manner as in the case of requisitions. (Art. 28.)

Indemnities due inhabitants for billeting of troops.—Outside of the period of mobilization, inhabitants are entitled to payment for the billeting or quartering of troops, where the occupation exceeds three days in a month, at the following rates: Officers, per bed each night, 1 franc; noncommissioned officers and soldiers, per bed, 20 centimes; stall for a horse, per night, 5 centimes, plus the manure; soldier, quartered, per night, 5 centimes; horse, quartered, the manure.

These indemnities include the washing of clothes, but not separate light and heat for the rooms occupied. They are allotted and paid to the inhabitants by the municipalities; to this end, the commanding officer of the cantonment should prepare, on the last day of the month, as well as on the day when the troops leave the commune, a "cantonment report" (in duplicate), showing the sums due.

That report, the form for which is kept in the mayor's office, *should not indicate the units or corps which have occupied* but only the number and value of the daily occupation and the total of the sums due the commune for the period that it covers.

After the signature by the mayor, who will announce his acceptance of the indemnities allowed, *but without the right to preserve any notes of the detail of strength of the troops*, the commanding officer of the cantonment will send the two reports to the regimental administrative officer, who will take the necessary steps for settlement. (G. Q. G., Oct. 18, 1915, No. 10130.)

Cantonment bivouac.—When the premises are too scanty to quarter the whole number of the troops, a part will bivouac on the neighboring ground, utilizing all available shelter combined with tents. Those in bivouac always have the right to a half ration of bed straw; the bivouac should not last more than a single night. The distribution of straw, in all other cases, is regulated by general orders.

PART VI.

INFANTRY IN CANTONMENT.

CHAPTER I.

PREPARATION OF A CANTONMENT.

By "cantonment detail" is meant the personnel sent forward to select and prepare a cantonment or bivouac.

Cantonment detail of a regiment: The officer of the day, the battalion surgeon on duty for the day, the battalion sergeants major.

From each company: A supply sergeant, a cyclist, the mess corporal, and two men on fatigue duty.

The police guard generally marches with this detail.

When several regiments are to occupy the same cantonment the combined detail is commanded by the senior officer. If a general headquarters forms part of the force, the staff officer in command of the detail of the headquarters takes command.

This officer divides the locality up among the different regiments.

Duty of a commanding officer of a cantonment detail.—The principal duty of the commanding officer of a cantonment detail is to divide the resources for billeting and quartering troops among the following units: Regimental staff, headquarters company, battalions.

Having informed himself as to the effective strength of the different units (officers, men, horses, wagons, etc.), he turns the command of the detail over to the senior sergeant major, and, accompanied by the surgeon and several cyclists, goes on ahead.

He proceeds to the office of the mayor and makes the above-mentioned allotment, being aided by the documents and information furnished him by the mayor. (See Part V, "Requisitions.") He does not go into details. He limits himself to defining plainly the allotment made to each battalion and the headquarters company to prevent any controversy. He gives the central allotment to the battalion of the day, and, if necessary, arranges the other battalions according the order of march for the following day. He designates a place near the center of the village as the post of the guard, generally at the mayor's office; he places the mounted units near the watering places, the headquarters company near the favorable sites for parking the wagons, and picketing the horses (if stables are not available).

Aided by the surgeon, he informs himself of the sanitary condition of the town (men and horses) and of the quality of the water. He records and marks by placards the houses and stables which are contaminated and the wells and fountains at which it is forbidden to drink. If there is a river, he fixes, from upstream down, the limits for drawing water, for watering the horses, and for washing clothes. He makes arrangements for protection against fire (fire station).

Having finished the preliminary organization at the mayor's office, and if the detail has not yet arrived, he makes a rapid reconnaissance of the locality, upon completion of which he decides definitely on the division and allotment.

He selects a place of assembly for the regiment, in case of alarm, generally outside of the town. He prepares the list of information to be furnished to the commanding officer of the encampment and to be posted at the post of the guard.

Upon the arrival of the detail he directs that sentinels be placed immediately from the police guard over the water places, exits of the town, etc. He points out to the battalion sergeants major and to the supply sergeants of headquarters company the location of their allotments, and furnishes them with the information and orders to be communicated to their units; he informs them of the probable time that will elapse before the arrival of the column and sends them to their work.

He remains for some time at the mayor's office to settle any difficulties that the quartermasters may encounter. If at a dis-

tance from the enemy and the supplies have arrived, he will commence the issue to the mess corporals. Finally, he goes to meet the column and submits to the colonel all the orders he has given.

Duty of the battalion sergeant major.—To secure the billeting of the battalion staff and horses (except those of the companies). To indicate to the supply sergeants where he will be located with the battalion headquarters, and, if necessary, a place for the prisoners. To divide quickly the battalion sector among the 4 companies, each company to occupy both sides of the same street. To set aside a house for the sick. To select an assembly place for the battalion, in case of alarm, from which the battalion can quickly reach the assembly place fixed for the regiment.

The sergeant major of the battalion of the day selects the house for the colonel and the chief surgeon. The regimental staff are billeted by the quartermaster of the headquarters company.

Duty of the supply sergeant.—As soon as the supply sergeant has received the information as to the sector of his unit his first duty is to locate a "rallying point" in the center of the company cantonment and to send the cyclist or one of the men on fatigue duty to his captain immediately to act as guide.

This procedure is particularly necessary when the cantonment detail has preceded the troops by only a short distance. Every means should be taken to accelerate the entrance of the troops into their cantonment; the units are generally marched into the town as soon as the officer of the day has reported to the colonel that the reconnaissance is finished, but before the battalion sergeants major and supply sergeants have been able to finish their tasks and report back to their respective units. Conducted, then, directly to its "rallying point," the company stacks arms and waits at rest until all the preliminaries are finished. This rallying point, which will be, necessarily, the point for future assemblies (distributions, reviews, alarms, etc.), becomes known to all the company.

This attended to, it is the duty of the supply sergeant to visit all the places in his sector, to estimate their dimensions (allowing 7 feet by 2½ feet per man), to assign billets to the officers and their mess, to reserve a place for the captain's office and for the clerks.

He will distribute the company, as far as possible, without splitting up the subdivisions, and will put up placards showing where the different units are to go. He will select the place for the rolling kitchen, the supply and baggage wagon, and the company horses (the ammunition wagons are always parked). He will make note of the amount of straw needed. He will carry the list of addresses of the officers to the post of the guard and have it delivered to the sergeant major of the day, who is charged with preparing the "report of billeting" of the regimental officers.

Duty of company commander.—The supply sergeant having finished his work, the company commander will have published to the assembled company all the orders and information in regard to the cantonment. He will direct the means by which communication will be maintained with the battalion commander and between the company and the platoons. He will give exact orders to be carried out in case of alarm. He will make out a schedule of duty for the day and for the following morning: Detail the platoon for company guard; officer, sergeant, and corporal of the guard; detachments charged with guarding the exits; extra duty; distributions; hours for meals, inspections, and prescribed calls; uniform; hour at which the men are at liberty to visit the town, etc. He will have the sergeant of the guard make a list of the sick. In default of other orders issued during the afternoon or evening, he will set 5 o'clock the following morning as the hour for the company to assemble at the rallying point, ready to march. He will have the billeting tickets issued and direct each platoon commander to conduct his platoon to its billets.

Duty of platoon commander and chief of smaller units.—He will establish his platoon in cantonment or break ranks in the vicinity of their billets. In the latter case, information should be given before breaking ranks, so that each noncommissioned officer will know where to find his men, and each man will know the location of his corporal, sergeant, lieutenant, and company office. (If ranks are broken before this information is given, prompt communication is impossible.)

He will make arrangements for communication and for the necessary action in case of alarm. He will see that the digging of latrines is commenced at once. He will select the place for the kitchens and arrange for the policing of the encampment.

He will, if possible, have the bed straw laid out before night, leaving passageways. He will make arrangements for lighting, either by the squad lanterns or those loaned by the inhabitants. He will have receptacles filled with water for use in case of fire. He will take steps to prevent accidents by having all planking, ladders, handrails, etc., examined. He will establish the uniform of the day and will see that the men proceed to clean up their arms, equipment, and themselves.

Men will be restricted to the limits of their cantonment until the hour fixed by the company commander. Knapsacks will be repacked for evening roll call.

The captain will assure himself before departure the following morning: That the noncommissioned officers have had the bed straw repacked in bundles; that there are no claims against the troops; that the places used for fires and the latrines have been covered up; that each man has received his cold meal and has filled his canteen.

Report of billeting.—As soon as the company has broken ranks, the captain makes a rapid inspection of the places occupied and makes a brief report to the battalion commander under the following heads:

First. Part of cantonment occupied.
Second. Quality of the cantonment.
Third. Straw.
Fourth. Water.
Fifth. Requests of the company commander.

He then sees that his means of communication is in proper working order and that the orders to be carried out in case of alarm are thoroughly understood and have been communicated to all of the command.

DIRECTIONS AND ORDERS TO BE COMMUNICATED TO THE TROOPS BEFORE THEY ARE INSTALLED IN CANTONMENT.

Localities occupied: By regimental staff, headquarters company, first battalion, second battalion, third battalion.

Lodgings: Colonel, field officer of the day, officer of the day, detail officer, supply officer, surgeon of the day.

On duty: Company on duty for the day, color company, police guard, guardhouse.

Roll calls: In the morning, in the middle of the day, in the evening.

Issues: Bread, meat, forage, wood, bed straw.

Parks: Combat trains, regimental (field) trains, horses, inspection of horses.

Water.

Sick: Hour of inspection, place of inspection, evacuations.

Postal service.

Place of assembly of regiment in case of alarm.

Prices of articles on sale.

Measures for maintaining order: Hours of opening of shops.

Measures of security: Points to be guarded.

Hour of departure to-morrow.

_____, _____,

Regimental Commander.

PARTICULAR CASES.

Cantonment in the presence of the enemy.—In a cantonment in the presence of the enemy, only the ground floors or large, well-lighted houses are used; the doors are left open and the men lie down without removing their clothing or equipment; the officers remain with their men; every one is ready to repair quickly to the rallying point.

Cantonment—Bivouac.—Each unit utilizes as completely as possible the houses allotted it, the remainder of the men bivouac in the courts or gardens adjoining or in the vicinity; the roads and streets should be left clear.

Bivouac.—The commander of the cantonment detail has the limits of the bivouac of the regiment marked out and the battalions and the trains are distributed within those limits.

In the battalions, the companies are disposed, in respect to each other, either in line, in column, or in any other tactical formation at distances and intervals varying according to the nature of the ground occupied.

For the *company* acting alone there are two regular formations for bivouac—column of platoons with 12 paces distance

or in line. A platoon bivouacing under shelter tents occupies a front double that of the line of stacks.

If the company bivouacs alone in column, the half platoons take their positions so as to have the stacks between them.

If it is part of a double column, or of a line of columns, the platoons are either to the right or to the left so that the stacks are between them and the neighboring company.

If the company bivouacs in line, the tents are arranged in two ranks, those of the odd-numbered squads in the front rank.

The noncommissioned officers are at the right of their platoon, the officers in rear of the troops, the combat train farther to the rear, the kitchens either to the front or rear according to the diection of the wind.

CHAPTER II.

INTERIOR SERVICE IN WAR.

Discipline in camp—Cohesion.—One of the objects of discipline in camp is to develop cohesion in preparation for battle. Without cohesion, troops can never be prepared for assault. Experience, as old as war itself, teaches that cohesion is greatly developed in a body of troops by the constant and exact practice of certain rules whose principal object is to develop the habit of obedience until it becomes second nature.

On the contrary, to allow the soldier to relax and neglect any of the rules laid down under the impression that, as he is far from the enemy, it is unimportant, is to destroy cohesion. While at rest the soldier ought to have relaxation, which must be ordered and managed by his superior officers; but he must never cease to be a soldier.

The means necessary to maintain this are: To drill and exercise the troops frequently in close order, requiring the fatigue parties to march properly, pay attention to military courtesy, and maintain the proper military bearing. A platoon that is instructed to drill correctly, keeping proper time, and with spirit, takes pleasure in its drill, and has confidence in itself; it feels that it is equal to anything. To get the best results, drills and

exercises should be frequent, varied, and should cease as soon as the object of the drill is obtained.

A soldier who salutes properly, in a precise and loyal manner, shows that he respects his officers and will obey them. His salute says to them "Here I am." He who avoids saluting, or executes it in a careless and awkward manner, makes his officers and comrades consider him a poor soldier and one hardly to be depended on.

A soldier who is proud of his uniform shows that he is proud of his duty as a soldier and of his regiment; he will be an honor to it. A man whose outward bearing shows that he has little self-pride, and who is always neglecting the orders given, does not inspire confidence among his comrades, who doubt that he will show up any better in battle. The bearing of the men should be more noticeable and the manual of arms more carefully executed at the guardhouse than at any other place.

The ideas that should guide the actions of platoon officers in an encampment, are: Actions should be positive but never provocative, always the same, and with the well understood object of exacting obedience. In giving their careful attention to the close-order drills, to the outward marks of respect, and to the proper military bearing, these officers not only increase the interior discipline, but they create cohesion in the troops for tactical work.

Uniform.—Men in camp should always be in proper uniform. Clothing, even old and repaired, can always be properly worn and carefully adjusted and buttoned. Care taken in a proper military dress is shown, above all else, in the accessories; cap on straight, hair cut short, cravat neatly tied, proper leggins and shoes. Officers and noncommissioned officers should correct the uniform of all men they encounter who are not properly dressed, whether they belong to their own unit or not; if the uniform can not be corrected (cravat missing, buttons or insignia lacking, or rents in the clothing), the men should be sent back to their cantonment or to the guardhouse. Negligence among the men must be especially watched for and corrected. A man working in his shirt sleeves is not out of uniform; but a man wearing his jacket unbuttoned or with his shoes off, is out of uniform. A uniform for leaving camp is often pre-

scribed after supper (belt and bayonet, overcoat with flaps turned up).

By "soldierly bearing" is meant the appearance of the men in the streets as well as elsewhere, a free military carriage. The hands must be kept out of the pockets, and the collar of the overcoat turned down.

Duty in camp.—All men are restricted to the encampment from reveille until after supper. The time left free from drills and exercises should be employed in cleaning up. The squad and half platoon leaders should always know where their men are and how they are employed. Besides the morning and evening roll calls, a roll call under arms is held during the day when there is no drill. The daily assembly for the reading of orders and details is generally held before breakfast. The roll call during the day and the daily assembly are often accompanied by an inspection.

Appearance of the encampment.—Most of the directions to be observed are found in Chapter X, "Hygiene." In order that the encampment shall be properly cared for, the entire space occupied by the company should be divided between the four platoons, the limits of each being carefully prescribed, so that no part of a court, street, etc., shall be neglected. This done, the chief of platoon distributes the work between his two sergeants, who are in direct charge of the necessary fatigue parties.

The installation of the encampment is completed by the following means: Numbering serially and painting the numbers on all houses. Placing placards on each house or farm building, indicating: Cantonment prepared for (so many) men, or stable for (so many) horses. Placards at all watering places and dressing stations. Arrows indicating the direction to latrines, incinerators, rubbish holes, etc.

It is sometimes of advantage to install the latrines at a distance from the houses; in this case smaller night latrines should be dug at night, near by, and covered in the morning. During the day men may be required to go 200 or 300 yards from their house.

Memorandum for chief of platoon.—Inspection of the encampment of his platoon, of the grounds in front, of the kitchens and latrines. Personal neatness; hair; attention to the feet. Dress;

footgear; underwear. Inspection of the arms and ammunition. Inspection of the reserve food supply. Inspection of the gas masks. Inspection of the camp. Inspection of material not uniformly issued to each soldier (intrenching tools, wire-cutting apparatus, trench weapons, pistols, grenade pouches or baskets, etc.). Relations between the men and the inhabitants. Additional instruction for those lately joined and for the awkward men in the section. The sick and malingerers.

Memorandum of the supply sergeant.—To establish and oversee the workshop of the tailors and shoemakers (divide their time between the half platoons). To establish a barber service. To distribute cleaning material and candles to the half platoons. To see that the rolling kitchen is cleaned up. Men sent to the rear; they depart with arms, equipment, the gas mask, and one day's food; they turn over cartridges, tools, and their billet.

Memorandum of the sergeant commanding the half platoon.—To keep up to date his register and those of his corporals. Daily cleaning of arms and tools. Cleaning of effects; minor repairs to be made by the men, such as sewing on of buttons, sewing up seams, etc.; other repairs to be made at the workshop; to be inspected on their return. Cleaning of footgear. Washing of clothes, pouches, issue bags, linings, etc. Marking of effects and labeling of haversacks. Personal neatness; have men shaved and their hair cut. Wearing the flannel waistband. Police of camp: To detail by name the members of the fatigue parties, assigning their task to them, and verifying their work. See that the men are in camp and at the work ordered. Sick: See that the doctor's prescriptions are carried out. Conduct of men in the village: Orders relative to the cabarets. To forbid smoking in the barns and lofts, making fires near buildings or the mills, using unprotected candles in lanterns, using canvas buckets for drawing water from the wells, making any noise after evening call to quarters, or having a light after 9 p. m.

Memorandum of the commander of the platoon on guard.—Not to leave the encampment. To be present at the issues of rations when the rolling kitchen is not in use. To report the departure of units on duty and of fatigue parties furnished by the company. To inspect guard mounting, if it is commanded by a noncommissioned officer. To inspect those going on pass, to be sure they carry no explosives. Report the evening roll

call to the officer of the day (at the guardhouse), if the regiment is together. On the march, at the principal halt, to select the places for fires, and see that the fatigue parties proceed immediately for water (detailed during the previous halt).

Memorandum of the sergeant of the guard.—Sending men undergoing punishment to the guardhouse or to a designated place; have them withdrawn at the proper time. To receive and distribute the mail, receiving the charges due. Keeps a record of the sick in the special book provided for that purpose and conducts them to sick call. Has charge of the fatigue parties at the daily roll call and assembles them and starts them out at the proper time. (The fatigue parties are taken at first from the platoon on guard, then from the platoon next for guard, etc.) Assures himself that the men on duty and those undergoing punishment have received their meals from their proper units. Takes the evening roll call and reports to the commander of the platoon of the guard, and to the lieutenant commanding the guard (at the guardhouse) if the battalion is alone. On the march he has charge of the fatigue party sent for water.

Duty of the corporal of the guard.—He is under the orders of the sergeant of the guard.

CHAPTER III.

SERVICE OF ORDER AND SECURITY IN CANTONMENT.

General rules.—Troops in campaign render no honors, either on the march or at a halt. In camp, guards render honors, but without field music.

The *commanding officer of a cantonment or bivouac* has all the attributes of a *commanding officer of a garrison.* If he is a colonel or a general, he usually has as second in command a field officer who is called the *executive officer of the cantonment or of the bivouac,* and has functions similar to those of an *executive officer of garrison.*

Honors rendered by sentinels, outposts, and pickets.—To render honors, soldiers present arms. Sentinels render honors (1) to flags and standards; (2) to officers; (3) to troops under arms; (4) to members of the Legion of Honor wearing the

insignia of their decoration; (5) to funeral escorts. They stand at attention arms at the order, for (1) sergeants major and noncombatants ranking as officers; (2) persons wearing the military medal with which they have been decorated. Outposts, guards, and pickets turn out and render honors (1) to flags and standards; (2) to generals; (3) to the commanding officer of the cantonments. The *police guard* renders the same honors, and in addition (4) to the organization commander.

Strength of the police guards.—For a regiment, 1 platoon, commanded by its chief; for a battalion, half platoon, commanded by its chief; for a company, a squad commanded by a sergeant.

Special duties of sentinels.—The duties of the *sentinel at the guardhouse* are given in "Regulations for garrison service."

The *sentinel at the quarters of the colonel* notifies him of every unusual occurrence that takes place in the cantonment. He allows the flag to be removed only by the color lieutenant with his guard.

The *sentinels with the train* allow no one to approach the wagons except the personnel of the train.

Unit of the day—picket.—The police guard is furnished by the unit of the day (a company for a regiment, a platoon or two platoons for a battalion) commanded by the officer of the day. The part of the unit not on post is called the *picket;* it furnishes the patrols, fatigue parties, unexpected detachments, and so on. The picket must be always ready to assemble without delay.

Duties of the commanding officer of the unit of the day.—Make the distributions (assisted, if necessary, by the company officers of the day).

Look after police and general neatness of the camp (under the executive officer or the commanding officer).

Supervise hucksters and peddlers.

Arrange the work of the prisoners (if they are assembled by regiment or battalion).

Inspect the guards at the outlets.

Receive the evening roll call at the guardhouse.

Prescribe the rounds and patrols (hours, itineraries, duties).

Guards at the exits.—The guard at an exit is furnished automatically by the nearest company without its being necessary to

give orders to that effect. This company, upon its arrival in the locality, relieves as soon as possible the temporary sentinel posted by the police guard.

The companies establish connection with one another so as to be sure that no exit goes unguarded.

Outposts at the exits.—The importance of these outposts varies with the situation. Sometimes a sentinel is simply placed on the road; sometimes a barricade is constructed and held in force (a double barricade with a movable part for vehicles and an obstacle for pedestrians). The strength of the guard is calculated accordingly.

In cantonments in the presence of the enemy or in bivouacs the exit posts are established in the immediate vicinity of the sentinel so that he can easily call the commander of the post.

Each exit post is under the special supervision of the commander of the platoon that has furnished it. He is responsible for furnishing to the sergeant of the post a very explicit written order and for having this order taught to the men on guard. He is responsible for the preparation of this order, and for this purpose gets advice from his captain, the officer of the day, or the executive officer of the cantonment.

Instructions for the posts at the exits.—These vary exceedingly, according to the proximity of the enemy, the amount of travel, the agricultural work in progress, and so on.

These circumstances must be taken into account in each particular case, and the commander of the guard must have clear instructions as to the procedure to follow and the kind of pass or voucher to require for the following classes:

1. By day: (*a*) Officers; (*b*) troops and fatigue parties regularly commanded; (*c*) individual soldiers separated from their regiments; (*d*) men from other corps; (*e*) cyclists, motorcyclists, and courriers; (*f*) automobiles carrying headquarters flags or transporting general officers; (*g*) other military automobiles; (*h*) inhabitants of the village going to work in the fields on foot or with farm vehicles; (*i*) other civilians traveling on foot or in vehicles.

2. By night: The same classes. What hour to what hour is to be understood as "night."

3. Direction of movement. Whether single vehicles, trains, columns of animals shall move in both directions or only one.

The duty of the sentinel is to allow passage in the simple cases that have been indicated to him by the commander of the guard, and to call the latter in all other cases; *it is obligatory to call the commander every time there is a paper to examine.* If the commander of the guard has any hesitation, he sends the individual or the vehicle to the officer of the day, who decides.

The knowledge of the password will not replace in any case the pass or voucher required by the instructions.

The *password* serves to identify *during the night* individual men or troops for whom no pass is prescribed in the instructions (officers, regular fatigue parties, patrols, and the like); in all other cases it must be given in addition to the presentation of the permit for movement, which is the principal formality required.

For cyclists and couriers, the envelope of a document to be carried in the direction guarded serves as a pass going and coming (the envelope should have been signed by the addressee on the return trip). At night all movement by civilians is generally prohibited, and the password is strictly exacted from all soldiers. It should remain secret and be given in a low tone. The sentinel should take the names of all vehicle drivers who give the password in a loud tone from their seats, and should report them. The sentinel must know what villages are reached by the road guarded, so that he can give information to cyclists and automobilists. The signal to stop is made by standing in the middle of the road, holding the rifle horizontally, and moving it up and down with extended arms. The signal may also be made by waving a flag. The sentinels at the exits render honors during the day the same as other sentinels.

Hunting.—Hunting is prohibited in campaign, to soldiers as well as civilians.

Appearance of aircraft.—When a service has been organized to give warning of aircraft by trumpet or some other signal, no one should neglect the precautions ordered. Noncommissioned officers out of camp must require that the men under their control shall conceal themselves under trees or in the shadow of walls, and so remain till the signal is given to resume movement.

CHAPTER IV.

HONORS TO THE COLOR.

When the color is to be taken out a company of the regiment is detailed to escort it. This company, preceded by the sappers, the drum major, the drums and trumpets of its battalion, and the band, marches in column of fours without music. Arriving at the quarters of the regimental commander the detachment is halted in line, facing the entrance. The captain causes it to fix bayonets. The color bearer, accompanied by the lieutenant and two noncommissioned officers, who form the provisional guard, goes and obtains the color and takes post facing the company. As soon as the color appears the captain, in front of the center of the company, causes the company to present arms, commands "*To the color,*" and salutes with the saber. The drums and trumpets sound three flourishes. The band plays the refrain of the national anthem. The captain keeps his saber at the present till the flourishes and music have ceased. The captain causes arms to be brought to the shoulder, the color and its guard take post between the second and third platoons, the lieutenant resumes his post. The detachment marches with the band playing to the place of assembly. It is halted facing the center of the regiment at about 50 paces. The field music and band cease to play. The colonel causes the regiment to fix bayonets. The color and the noncommissioned officers that accompany it move 10 paces to the front. The colonel causes arms to be presented. All eyes are fixed on the color. The colonel moves to about 10 paces from the color, commands "*To the color,*" and salutes with the saber. The trumpets and drums sound three flourishes, the band plays the refrain of the national anthem. The colonel keeps his saber at the present till the music has ceased. He then causes arms to be brought to the order and the bayonets to be unfixed. The color bearer takes his post, the two noncommissioned officers rejoin their company, and the detachment moves to its place, passing in rear of the regiment. The color is returned to the quarters of the colonel in the order prescribed above and receives the same honors. The detachment then returns to its quarters without music.

PART VII.

INFANTRY IN THE TRENCHES.

Infantry in the trenches is usually in a *position in readiness* for combat, a situation which is sometimes prolonged for several months and permits of thorough organization.

During very short crises, it is *attacked* in its trenches or it moves out to *attack*.

These three situations will be treated in succession.

CHAPTER I.

INFANTRY IN A POSITION IN READINESS FOR COMBAT.

The plan of defense.—"The commander of troops in a position in readiness must study in advance the various missions that may eventually be given him, to keep himself informed as to the situation, and to reconnoiter or cause to be reconnoitered the terrain involved. In this way he will be ready, when the moment comes, to enter into action with his troops without loss of time and under the best of conditions." (Field Service, art. 121.)

This regulation contains in brief form the duties of the officers of a company detailed for the defense of a strong point or sector, as defined in "Principles of fortification." (Part IV, Chap. VI.)

Every commander of a unit, large or small, must establish a *plan of defense* with a view to fighting superior forces on the ground which has been intrusted to him.

This plan must be brought to the knowledge of all his immediate subordinates.

It is based upon knowledge of the hostile line and of the terrain, from which result:

The determination of the probable points of attack;

The choice of the principal points of resistance (active elements or sectors) and the strength of the force that will occupy them;

The preparation of counter attacks;

The organization of approaches, food supply, evacuations, and communications.

A paragraph of the plan of defense is called *plan of observation* and prescribes the observation from the ground. (See this organization in Chap. VI of Part IV.)

The plan of defense should embody the following principles:

1. *The defense in depth is made* by stopping the enemy at successive points skillfully selected in advance and prepared for resistance.

2. *Every element of trench, every isle of resistance* (barricades, organized trench crossings, small works, and the like) *must have a commander responsible for its defense and maintenance.*

3. *Troops detailed to the defense of a portion of the terrain must never abandon it, no matter what happens.* It is necessary to remove from the minds of the troops every ambiguity on this subject; the existence of stronger lines of defense in rear of the trench occupied, the echeloning of the company into *advanced elements* (squads, half platoons) and *main body* placed farther to the rear, *never* implies for these advanced elements the authority for falling back on the main body, even if they consider their situation critical. All resistance must be prolonged *on the ground, in the position where the troops have been placed;* resistance ceases only when one is placed *hors de combat* or has received from his superior commander a formal and authentic order (preferably in writing) to go and occupy another position. Every order arriving verbally by an uncertain route must be considered null and void (to be particularly mistrusted are orders for a retreat passing anonymously along the firing line). The "conduct to be observed in case of attack" is given to the smallest elements, and must always be very clear on this subject.

4. *All ground lost is recovered by an immediate counter attack delivered by troops reserved for that purpose.* In a strong point (company), one or more *support* platoons may have the mission of local counter attacks in certain contingencies announced in the plan of defense of the supporting point. The company occupying a part of a line has no *reserve.* The counter attacks are especially provided for and launched by the battalion

commander, who has at his disposal for this purpose the *reserves* of the strong point (companies, half companies, or platoons). *The plan of defense of the strong points* covers the principal contingencies of the penetration of the hostile line in front of the battalion and provides the proper counter attack for each case. Each company or platoon receives copies of the part of the plan that concerns it. The mechanism of the counter attack is explained later. (Chap. II.)

Reconnaissance of the strong point.—When a company is to go into trenches the reconnaissance must be made in daytime by the captain and the commander or a noncommissioned officer of each platoon. It is sufficient to leave in rear an officer or noncommissioned officer to lead the company during the night to the beginning of the trenches. In addition, the reconnoitering party includes the communicating file of the captain and four guides (one per platoon). The four guides return to the rear to meet the company at the place and hour agreed upon, while the rest of the reconnoitering party remains in the trenches to familiarize themselves with the plan of defense and the terrain. This personnel may be reduced when the company is to be the battalion reserve in the strong point.

Plan of defense of the strong point.—The four platoon commanders assembled at the command post of the captain, take note of the plan of defense of the strong point and the explanations of the captain of the company relieved. The captain then distributes the four platoons among the different *elements* of the strong point. He prescribes the groupings of the grenadiers and automatic-rifle sections that it may be necessary to make up in addition to the usual sections, in accordance with the provisions of the plan of defense. Each platoon commander, accompanied by his communicating file and his guide, then takes post near the platoon commander of the platoon that he relieves. The relieving captain is not at all obliged to pattern his dispositions and instructions after those of his predecessor, unless these dispositions have been ordered by superior authority. However, to facilitate relief by night, always a delicate operation, it is recommended the relief be made platoon by platoon and even squad by squad, and those modifications which the captain may wish to make in the interior distribution of the forces in his strong point be postponed until daylight.

Plan of defense and instructions for each platoon.—Each platoon commander inspects quickly the elements of trenches and the shelters which his platoon is to occupy, and also the command post. He then sends back his communicating file to the captain and his guide to the head of the company, after having indicated to the latter the distribution of the squads. The guide returns by the approach trench (a signpost indicates if movement in only one direction is permitted), takes note en route of the necessary reference points, signposts, and the like. The platoon commander obtains from the platoon commander whom he relieves the extract of the plan of defense that concerns the trench or trenches occupied by the platoon and has the terrain pointed out to him in detail. This extract of the plan of defense shows: For the platoons in the first line, *the precise rôle of each of the elements of trench or isles of resistance of which the defense is intrusted to the platoon* (for example, to cover with fire such and such part of the terrain in front, to flank such and such a neighboring element, and so on); for the reinforcement platoons, *the combat stations in case of alarm, the rôle of reinforcing or counter attack to play in the contingencies covered by the plan of defense of the strong point.*

Examples.—Figure 164 gives an example of the distribution of a company taken from an actual case.

This disposition is, however, more complex than the usual case on account of the decided salient and reentrant which the terrain and other circumstances have given to the firing line. Three platoons occupy, respectively, the elements A-B-C, D-E-F, G-H-I. The fourth platoon is in support at K and L. The firing line is thus held by five squads and two listening posts. Positions for flanking defense by machine guns or automatic rifles are prepared at M-M_1-M_2. The *central platoon* D-E-F will receive, for example, the following instructions: Secure the protection and maintenance of the firing-line trench from R to S, of the communication trench E-K to the crossing T, and of the communication trench E-I to U. *Half platoon at salient D:* Watch and cover the hostile line from N to O. *Squad at reentrant E:* Flank the faces E-D and E-A, defend the machine-gun M_1. In case the enemy should take G, fire on the interval G-R. *Squad at the work F:* According to orders, man the inter-

val D-E, man the interval E-A, or, in case the first line is captured, prevent the enemy from debouching from U-E-S.

Figure 268 offers an example of a simpler disposition.

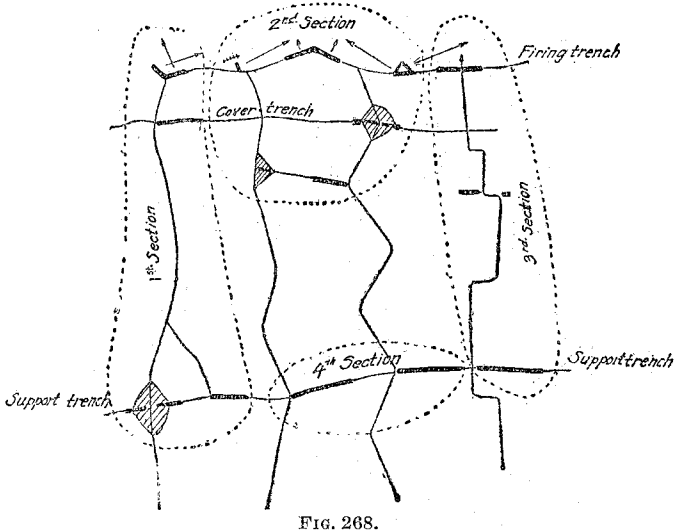


FIG. 268.

A fourth of the strength is in line, the remainder is divided between the cover trench and the support trench. The platoon in the center alternates with the platoon in support in occupying a redan and two small flanking works. The other two platoons each have to guard a trench in the first line, using their squads in rotation.

General remarks.—The task given to a platoon occupying a part of a line, either in trenches or in combat, is always very simple; the difficult part is to communicate it to subordinates

with such precision and clearness that at the critical moment no one will allow himself to be turned aside from his rôle by the obstacles, foreseen or unforeseen, that are sure to arise. *To do exactly what has been ordered, to carry out to the letter what has been recognized as necessary* in defense, as in all other operations of a platoon, is the whole secret of success.

TACTICAL MEMORANDUM FOR THE CHIEF OF PLATOON.

When the platoon commander has thoroughly grasped the particular rôle of his platoon in the whole plan of defense, he easily deduces from it all the measures of tactical detail *which will be his constant occupation during his sojourn in the trenches.* He receives from his predecessor all the information which may be summed up in the following memorandum, which also applies to every chief of a trench or small work:

1. *Extract from the plan of defense.*—Rôle of the trench in the entire position; detailed sketch of its organization; rôle of the adjacent platoons; communications with them and with the captain.

2. *Defense.*—Organization of the defense of the trench (firing positions, fields of fire, flanking arrangements, positions for machine guns and automatic rifles, positions for grenadiers, positions for trench weapons, and points exposed to fire; position, strength, and capacity of shelters; arrangements for protection against gas; nearest dressing stations).

Accessory defenses. Obstructed passages through the wire entaglements.

Information concerning the enemy; sketches of the hostile trench; summary of the results of observation, reference points.

Dangerous points; projectiles received; menaces of mining operations; unexploded projectiles.

3. *Guards.*—Lookout posts; instructions of particular lookouts; listening posts; patrols in front of the accessory defenses; rounds.

4. *Matériel.*—Niches for cartridges and grenades; fuses; condition of grenades and fuses; shields; periscopes; tools for earthwork or demolition; various materials that the captain has been able to install permanently; appliances for defense against gas; nearest water supply.

5. *Works in progress or ordered.*—Trenches to maintain in rear.

6. *Location of the latrines.*—Holes for garbage; state of cleanliness or lack of cleanliness of the trench.

In order to facilitate the transmission of instructions, each chief of a trench must make note of the preceding information and pass it on in writing to his successor.

Distribution of the platoon between the firing trench and the support trench.—As the occupancy of a strong point by the same company may last several days, it is necessary to define clearly for each fraction (and in each fraction for each man) the alternations of rest and duty, rather than to let all the men stay in the trenches in a situation that is neither rest nor combat. The principle is *to keep in the firing trench only the men strictly necessary for watching, ordinary fighting, and work* (strength varying from one-third to one-sixth of the company). The other men are in the cover trench or the support trench at rest or occupied in other work.

According to circumstances, the captain causes the platoons of the company to take the duty in the front line in rotation, or, better, gives to two or three of them a definite frontage, disposing them in depth, and keeping one or two platoons grouped in the support trench as a reinforcement (see Figs. 164 and 268). The platoon commander then organizes his service by causing squads or men to alternate on the firing line (lookouts, grenadiers, riflemen, and so on).

The only absolute rule is that *every trench of the firing line must have at all times a responsible chief present in the trench* (sergeant of the guard) and that a strict discipline must reign among the men who are there at their posts of combat.

They must be relieved often enough to enable their attention to be continuous, and care must be taken that they are not kept in the firing trench when their turn has come for relaxation or sleep.

For the same purpose the captain details by roster an officer of the guard (platoon commander) charged with watching the whole front of the strong point.

Organization of the guard and the harassing fire.—The guard of the trenches is intended not only to prevent the enemy from rushing them, but also to observe continually the details of his

defensive organization, and to take advantage of his slightest movement to inflict losses.

Choice and training of lookouts.—All the men of the company can fill the rôle of sentinel alongside of a bombproof, but all men are not capable of observing. Some men are more apt than others; aptitude is developed by exercise. *The training of good observers is a most important task.* It is necessary that the observers shall not only know how to *see without being seen*, but that they shall also have tenacity and patience in observation. Trench warfare permits the training of *accomplished* observers. Their training rests on the officers of the company, who control the daily service of their observers. It is well to have them make notes of their observations. Each platoon should have at least *six observers*, who should be good shots and have good eyesight. In combat in open country two accompany and assist the platoon commander, one of whom observes constantly the signals of the communicating file of the platoon, who marches at the side of the captain. The other four may serve as scouts. In the trenches they alternate in serving as *lookouts. The communicating agents of the captain and of the battalion commander* serve them as observers. They divide up the terrain to be watched, observing the movements of the enemy and those of their own troops, and the signals. *In every unit the chief indicates without delay to his superiors (and to the artillery) the points which afford a good view over the surrounding country.* The principal *arrangements for observation* have been described in Chapter VI of Part IV, "Principles of field fortification."

Requirement of harassing fire.—The *harassing fire* must be the constant care of every platoon commander of all troops to keep up the continual fear of retaliation. *The war of the trenches is neither a relaxation nor guard duty; it is a phase of the battle.* It is necessary that each hostile company shall go back from the trenches with a loss of at least 20 men. It is necessary that the adversary shall feel in front of him a vigilant hatred, and know that we wish no rest before his defeat. The organization of the harassing fire with the rifle grenades has been explained in detail in the tactical employment of this arm (Chap. V of Part IV).

Lookouts.—The lookouts always keep their rifles in their hands; they are forbidden to sit down. They must remain con-

tinually at their posts, even during violent bombardments. They receive general instructions for the following cases: Attack by surprise or preceded by a bombardment; attack preceded by a discharge of gas; arrival of bombs. They receive, in addition, certain special instructions for each post.

Sector lookouts.—Some men, called sector lookouts, watch a clearly defined part of the hostile defenses. It is advisable to establish the sectors slightly oblique, so as to protect the lookout from shots from the front when he has to fire. The sectors overlap slightly. The sector lookouts observe either through a loophole placed obliquely in the parapet or with a periscope. Equally

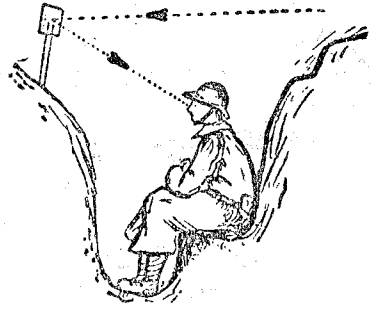


FIG. 269.

good for a general view of the hostile trenches is a small mirror fixed on the end of a stick. (Fig. 269.) The officer of the guard is informed by signal of the least change in the appearance of the hostile line (accessory defenses, earth moved, and so on) and of every indication of preparation for an attack. The written instructions for each lookout post are completed, if possible, by a panoramic sketch, with reference points. (Fig. 270.)

Lookouts for observation points.—Other lookouts keep special watch on points to which attention has been drawn by preceding observations and upon which it may be hoped to place a successful rifle shot. They endeavor to remain unseen and to observe

through a very narrow and concealed loophole. Patient, attentive observation always ends in furnishing valuable information as to the régime of the opposing troops (hours of relief, of food supply, and the like). The dust raised by a shot, the smoke of a cigarette, may reveal a loophole habitually occupied; it should then be watched with a field glass and an attempt made to lay upon it a rifle supported on a rest or an automatic rifle. Earth being thrown up discloses a fatigue party at work, a shelter under construction. A slight elevation or some smoke betrays the location of shelters. The study of the general plan and of aerial photographs may make it possible to locate on the ground the trench crossings and the important approaches upon

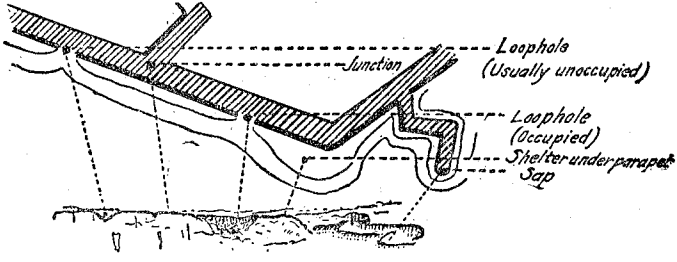


FIG. 270.

which it will be well to fire with the trench weapons during the hours when these elements are thought to be occupied. When the enemy bombards our lines curiosity will cause his men to look through their loopholes to see the effect produced; it is the moment to get at them. All other methods are good for drawing them out—cries, mannikins, pretended fires, placards, and the like. Effort should be made to discover his machine guns, flanking pieces, mine throwers, observation points, and so on, to interpret ingeniously the slightest abnormal object or indication that appears in front. It is indispensable to have this information in case of attack on our part and also to keep up *the daily wear and tear of the enemy.*

Listening posts or advanced posts.—These serve to watch the accessory defenses when they are of great depth, or to flank the front of the trenches. The trench connecting them with the firing trench should be arranged so that it can be obstructed or barricaded instantly by the sentinel, who retires after giving the alarm. (Fig. 272.) In addition, it should be placed

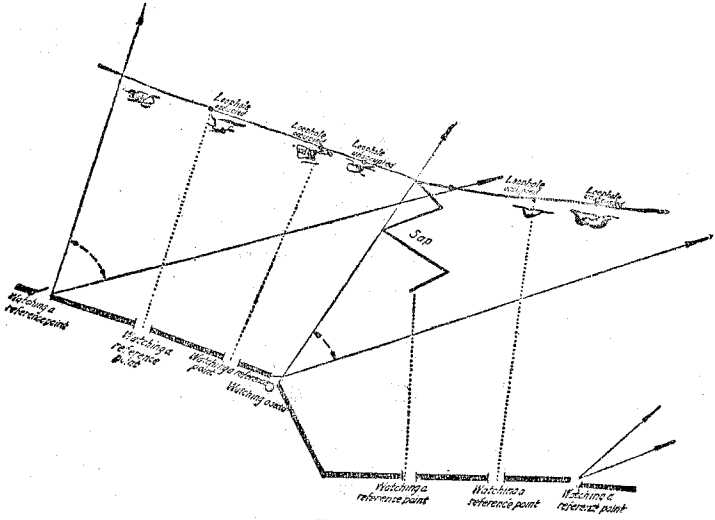


FIG. 271.

without a dead angle under the fire of a loophole in the trench, oriented especially for this purpose. Listening posts should not be misused, as they are rather easy objectives for surprise attacks and they rob the firing line of places for several loopholes. When they are opposite to hostile advanced posts, they may be organized for a triple group of grenadiers. (Fig. 273.)

Lookouts of the support and reserve trenches.—Lookouts are placed near the command posts of the support and reserve trenches to observe the whole terrain and repeat the various signals from the firing trenches.

Patrols.—The guard is reinforced at night by patrols whose field of action and strength depend on the proximity of the enemy. They are armed with shotguns, pistols, and offensive grenades. They are detailed by the captain or the battalion commander. Their strength is sufficient to enable them to

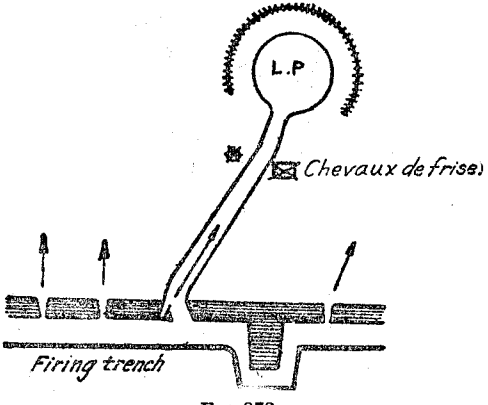


FIG. 272.

bring in wounded men and prisoners, and, if necessary, to establish a line of communication back to the point of departure. They always have a definite mission: to go and reconnoiter such a point, to prepare an ambuscade at such a place, to remain there and listen a certain fixed time, and so on. The success of a patrol depends on the choice of the commander—on his will and audacity. His men protect and escort him, but it is he who must go and see. It is necessary to fix the hour and the point where they shall pass out of the lines

(through a concealed passage prepared in the wire entanglements or by way of a listening post), their itinerary, the point and the probable hour of their return within the lines. All this information should be given at the proper time to the sergeants of the guard and to the neighboring companies, in order to avoid mistakes. The lookouts are notified that the patrol may be obliged to withdraw by an unexpected route. The chief of the patrol must have a luminous compass. He distributes his men at variable distances, depending on the darkness of the night, so as not to lose them; he assures

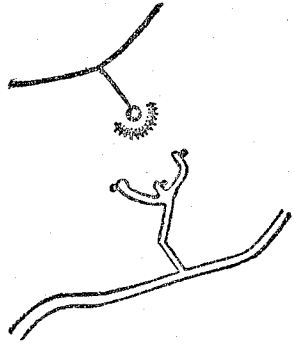


FIG. 273.

himself before starting that their equipment will make no noise; he tells them the mission and how to conduct themselves; he arranges with them a few very simple signals. Patrols are an excellent means of hardening the soldier. Volunteers should be called for only in exceptional cases.

Organization of defensive fire.—Although in the normal case only the "active segments" of the line of fire will be occupied, the platoon commander must arrange for the occupation of the entire line and for firing *either through the loopholes or over the parapet.* Some of the traverses should be loopholed for the in-

terior flanking of the trench. Means of obstruction should be prepared. These at the ends of the trenches should be especially defended. A loophole should always be examined to determine: That it is not obstructed; that it is well oriented; that it sweeps the ground thoroughly; that it is suited to the height of the man. After several cleanings of a trench the loopholes are often found to be too high above the bottom; they must be made over or benches must be used. The loopholes should be assigned to the men in advance and the men should be placed in the shelter in regular order so that in case of alarm the man sleeping nearest to the exit of the shelter will run to the farthest loophole.

Organization of communications.—Communication between the captain and the chief of platoon is maintained by messengers (communication agents) or by square signal flags. The company has two signal lanterns that serve to parallel the telephone lines to the battalion commander or to a neighboring company. Every telephone line should be paralleled by a system of visual signals, provided for in the plan of defense, and should be operated at least once a day as a test (for example, to send one of the regular daily reports). Note should be made of information sent by adjacent stations. *The fact that mechanical means of transmission have failed under given circumstances will not be understood to excuse a commander for remaining in ignorance of important changes occurring in the situation of his command or for not having exercised the necessary personal control over the progress of events.*

Organization of work.—The platoons are charged with the duty of maintenance of the trenches, parallels, and approaches that they occupy, the constant improvement of their accessory defenses, and the new works required in their terrain (principally shelters). The captain also assigns to the platoons the maintenance of the trenches in rear and the general fatigue work of the strong point, utilizing especially the platoons in support. The rôle of a platoon commander is to divide the whole task among working groups of small strength, each under a chief. This chief is made responsible for a well-defined task entirely possible of execution. The platoon commander shows him by day what he will have to do at night, has him place all the necessary marks so that he can find his way in the darkness, and sees

that the chief of the group has the necessary wooden measuring rods for verifying at all times the dimensions to be followed. The platoon commander suggests to the captain new works which he considers useful for improving the flanking arrangements or the communications. For example, in the case of figure 164, the connection of the works B and F.

Communication with the adjacent platoons.—Finally, with a view to developing *cohesion*, it is made the duty of the platoon commander to be in communication and to maintain frequent and personal relations with the chiefs of the adjacent subdivisions, with the trench artillery, the sappers and miners working in the strong point, and so on; he should visit the observation points giving a view over his terrain and over the terrain of the units alongside of him. In order that he may be able to devote the greater part of his time to these occupations of a tactical nature, he requires his subordinates to familiarize themselves very promptly with all the details of the service of the trench and makes them responsible for it.

DETAILED SERVICE OF THE TRENCH.

Relief.—Upon the arrival of the platoon, each squad takes its place; the lookouts, the listening posts, the noncommissioned officer of the guard take up their duties as prescribed for the night.

The platoon commanders and the company commander who are being relieved do not withdraw till they have completely transferred their duties and have received notice from their successors that they are no longer needed. Their successors then become responsible, and make report to their immediate chiefs that the relief is accomplished. In case of attack during the relief the command continues to be exercised by the chiefs of the units that are being relieved.

Leaving the trenches.—Have the men get ready before the time of relief. See that the portable tools and the camp equipment are carried away. Leave in the trenches the grenades and the cartridges in excess of regular individual equipment. Inspect the trench to make sure that nothing is overlooked. *Leave the trench, the shelters, and the latrines in the highest state of cleanliness.*

Faults noted during the execution of reliefs.—In their haste to leave, the officers and noncommissioned officers of the subdivisions relieved transmit only incomplete instructions. The incoming officers and noncommissioned officers confine themselves to replacing the sentinels and housing the men in the shelters; they do only what is indispensable. The information transmitted is very vague, and frequently consists merely of a statement of the signs of more or less extensive activity on the part of the enemy. Consequently the new occupants, poorly informed and oriented, are for some time at the mercy of an attack, and it happens occasionally that they fire on other portions of our line.

Service by day and by night.—The duties should be known by all in advance. The forces to be placed on duty by day and by night are fixed by the captain, who is responsible for the preservation of the strong point.

By day: The service requires a certain number of lookouts per platoon; in addition there may be detailed by platoon or from the company a *picket subdivision*, which remains in one place, without taking part in distant fatigue or other work.

By night: The necessary men are placed in line in the intervals between the lookouts to assure the protection of each trench. Frequently the listening posts are occupied only at night. Night and day there is a sergeant of the guard in each trench and an officer of the guard (chief of platoon) for the company as a whole.

Employment of time.—The chief of platoon regulates the employment of the men who are not on duty. He requires them to rest in the shelters or details them for the different pieces of work that he orders or that are prescribed for him. He should know at all times who is asleep, who is on guard, and who is at work.

Rounds and patrols.—Rounds have for their object the control of the service of the company as a whole. They are made by officers and noncommissioned officers (especially those of the platoons in support). The captain prescribes the number of rounds which the patrols shall make and fixes the hours of departure. He receives a report at the termination of each round. Patrols may also be ordered by the captain (see above).

Alarms.—Frequent calls to arms must be made to make sure that every man goes quickly to his place and knows what to do when he gets there. This is the best method of detecting faulty arrangements. A daily call to arms will be made before daybreak. It will be followed by a roll call. Gas alarms will be made.

Uniforms, etc.—The helmet will invariably be worn; *the gas mask must always be kept within easy reach of the hand;* the men must be completely equipped; the intrenching tool will be attached to the waist belt at all times. Haversacks, pouches, canteens, blankets, etc., will be arranged in orderly fashion in the dugouts.

Rifles.—In the firing trenches the men will always keep their rifles in their hands, even during meals. In the other trenches small-arm racks may be constructed at the doors or inside of the dugouts. If a man leaves the immediate vicinity of his dugout he takes his rifle with him. No one should ever be found in the communicating trenches without his rifle. At night every man will sleep with his rifle at his side. With the exception of those fixed in frames, rifles should never be left in the loopholes. The former will be withdrawn whenever a bombardment is anticipated. The rifles will be covered with a sleeve of cloth tied on with a string. *Introducing a plug of any kind—paper, cloth, wood, or grease—into the muzzle of a rifle is prohibited.* To avoid accidents and weakening the mainsprings, rifles will be habitually kept unloaded. The magazines are always kept charged, usually with only four cartridges, so as to avoid weakening the spring.

Cartridges.—The recesses for ammunition should be kept dry, and their location should be known to everybody. Only a few packages will be opened beforehand. Sticking the points of the cartridges in the ground is absolutely prohibited. The empty cartridge boxes are collected by each platoon and sent to the company property depot.

Hand grenades and rockets.—Grenades and rockets will be kept, if possible, in zinc lined chests, well protected from the action of the weather. Very small recesses, capable of holding a few grenades, will be constructed here and there along the trench, behind barricades, and in the dugouts.

It is well to put ammunition and grenades in sand bags containing an invariable number. The following numbers are convenient:

Ammunition, 4 bandoleers, weight about 16 pounds.
Grenades F1, 10, weight about 15 pounds.
Grenades OF, 20, weight about 13 pounds.
Grenades AB 1916, 6, weight about 9 pounds.
Grenades VB, 10, weight about 11 pounds.

This division allows a man already loaded to carry one of these sacks. The carriers, by tying two or four together, can make a pack which they can carry on their shoulders or back. This system is equally convenient for the replenishment of munitions and the supplies to the firing line in combat. At night, the lookout places the sack of grenades at his side, rolling up its edges. In the morning he places it in a niche, the danger of surprise having passed.

A few grenades will be thrown from time to time to determine their state of preservation.

Property depots.—As a rule there will be only one depot of material per company (near the company command post). But, to prevent waste, the commanders of platoons, or trenches, may form a small depot for the collection of intrenching tools and other trench material furnished them, and which are not in actual use.

A depot for a company should contain at least 500 grenades, placed in sand bags as explained above.

Prevention of waste.—All carelessness leading to waste must be suppressed severely, and the men must be made to comprehend that the sum of many individual negligences will attain a figure for which no system of production at the bases can compensate. Munitions left out in the rain deteriorate or are lost in the mud or in unnoticed holes. Bayonets and unserviceable rifles have been used by the supports, haversacks have been used as sand bags, etc. All surplus material, all scrap metal, fragments of leather, etc., should be collected by each section and sent to the company depot. Fatigue parties will be sent to all abandoned communicating trenches to bring in any property that may have been left there. Any man who, in the course of fatigue or special duty, finds tools, munitions, or abandoned property of any description, should carry the same

to his officers. Reserve rations should never be eaten without orders, or as a result of laziness. Waste in all of its forms must be severely repressed. It is a proof of indolence and indiscipline.

Messing.—At the prescribed hour, after observing the enemy's artillery, the usual fatigue party from each company will leave the trench under the command of the noncommissioned officer in charge (supply sergeant) assisted by a corporal. The responsible officer will send back by them such property as can not be used, the empty ammunition boxes, the arms of the killed and wounded, which they turn in to the supply officer. Food is distributed at the station of the rolling kitchen which accompanies the supply sergeant, who is left by the company with the supply train to draw rations and to attend to their careful preparation. After the food has been served out, the fatigue party returns in a formed body, headed by the corporal and followed by the sergeant in charge, who is required to bring up the rear. The sergeant in charge reports to the captain the return of the detail, and its dispersal to the several platoons. The platoon commander makes every effort to reheat the soup and coffee (using charcoal, faggots, etc). He inspects the mess kits, and should bear in mind that if, in spite of all difficulties, he succeeds in making the meals in the trenches agreeable, he is exercising a most salutary moral influence upon his men.

Memorandum for the platoon commander.—To be responsible for the safety of the trench, which he must hold at all costs.

The rôle of his trench in the general defense.

Daily report for orders and instructions.

Observation; vigilance; lookouts.

Day and night duty: The selection of the sergeant of the guard; rounds; patrols.

Defensive and harrassing fire.

Flank defenses of the trenches, both of the front and of the interior.

Condition of the loopholes, of the arms, and of ammunition. Hand grenades.

Accessory defenses; obstacles; movable obstacles, previously constructed, for blocking the communicating trenches.

Communications; rockets; signals.

Machine guns and adjacent grenade throwers.

Condition of the trench; maintenance of the communicating trenches; improvement of the trench and dugouts; designing and executing new works.

Property received; surplus property; waste.

Precautions against gas.

Calls to arms.

Memorandum for the chief of the half-platoon.—Assignment of the prescribed duties to the individual soldiers by name; roll calls.

Assembly and departure of the fatigue parties for supplies.

Assignment of the men to dugouts; arrangement of their property and the straw.

Police of the dugout and of the trench.

The regular removal of mud; drainage ditches; drain pits.

Burial of excrement; precautions against rats. (It is forbidden to throw away the least morsel of food, either in or out of the trench.)

Digging and police of latrines; daily disinfection by the litter bearers.

Signboards; telephone lines; maintenance of all classes of lines.

Wearing by the men of the prescribed uniform (for guard, for fatigue, or when off duty). Habitual carrying of rifles, helmets, gas masks, and portable intrenching tools.

Daily inspection of arms and ammunition.

Equipment; camp expedients; intrenching tools; reserve rations.

Reheating the food; equitable distribution of the same.

The sick; men excused from fatigue.

Pointing out to the men the command posts of the platoon commander and the captain, the battalion dressing station, etc. The regulation of the movement in the approach trenches.

In readiness to replace the platoon commander at any moment.

Memorandum for the sergeant of the guard.—Exact relation of his trench to the adjacent trenches; instructions for combat; marks for night firing.

Instruction of the men.

Taking charge of the apparatus for trench illumination; illumination of the front of the trench in the event of a suspicious noise.

Inspection of the condition of the loopholes.

Vigilant lookouts; keen and attentive ears; loaded rifles; megaphones for gas alarms.

Verification of the written and oral orders transmitted by the sentinels.

Knowledge of the hours of departure and return of the patrols and their itinerary; warning all of his men concerning their movements.

Reports to the officer of the guard of every incident and the arrival of any superior officer.

Turning over to his successor all of the written orders and the panoramic sketch of that part of the hostile line under observation. Sending the orders and sketch to the platoon commander for his information as often as may be necessary.

Memorandum for the company supply sergeant.—Taking over the list of the property turned over by the supply sergeant of the company which is being relieved, and verifying it, including the property which is in the section.

Signing the receipt to the captain, who then becomes responsible.

Taking charge of the depot of supplies, and making a record of all materials received, issued, or expended.

To be in readiness to fire signal rockets on the order of the captain.

To ascertain what supplies are needed, and to prepare requisitions for the same.

To identify the dead; to take charge of their personal effects; to prepare the inventories and have them signed by the captain, and to turn the inventories in to the designated officer; to leave the identification tags on each body; to cause the bodies to be buried by the litter bearers after tying around their necks bottles containing the means of identification.

To take in from the slightly wounded equipment, intrenching tools, extra ammunition, and other company property in their possession. They will be allowed to retain their rifles, accouterments, gas masks, and one day's reserve rations.

To take charge of the detail sent for food each day.

To turn in to the supply officer all unserviceable or surplus property received.

Memorandum for the battalion sergeant major.—To take charge of the property pertaining to the command post of the battalion commander.

To acquaint himself with all of the established methods of communication by telephones and visual signals.

To make the arrangements prescribed by the battalion commander for firing the signal rockets.

To familiarize himself with the periodical reports and returns and other official papers; to call for them from the companies from time to time; to require the companies to furnish duplicate lists of the property with which they are charged; to consolidate every morning the requisitions for supplies.

To coordinate the services of the agents of communication; to keep them posted as to the location of all the command posts and the available routes thereto (colonel, adjacent battalions, companies, battalion and regimental dressing stations, observation stations, and telephone stations of the artillery).

Memorandum for the company commander.—Responsibility for the defense of the strong point.

Plan of defense of the strong point; sketch map.

To send extracts to the platoon commanders.

The employment of specialists, grenade throwers, machine gunners, signalers.

To limit to the minimum the number of confidential documents kept in the trenches; to arrange for their destruction prior to an attack; to keep no surplus mess funds.

To keep the trenches in good condition; selection of the officer of the day.

To prescribe the inspections of the guard; to suggest patrols to the battalion commander.

To study the possible perfection of his plans for defense and counter attack, and the material welfare of the men in the trenches.

Selection of and strengthening the observation post.

To locate beside it the command post, the telephone, and the depots of ammunition, water, rations, and supplies.

To study all possible surprise attacks and the best employment of the artillery in the trenches.

Communication by telephone, visual signaling, or by other methods, with the battalion commander and the adjacent companies; communications with the platoons; guide boards to the several stations.

Personal relations with the special arms in the trenches, artillery, machine-gun units, engineers, etc.

Methods of calling for barrage fire or retaliatory fire; understanding concerning rocket signals.

Daily reports; observation of hostile artillery fire, origin, hour, caliber, direction of fall.

Requisitions for supplies.

CHAPTER II.

INFANTRY ATTACKED IN ITS TRENCHES.

The trenches may have to repel a surprise attack or an attack preceded by a violent bombardment. Either may be prepared by an emission of gas or by the fire of asphyxiating shells.

Surprise attacks.—Surprise attacks, either by night or day, have no hope of success unless the duties of the lookouts have been poorly performed, or the men have not been sufficiently exercised in responding to alarms, or the accessory or flanking defenses are insufficient. The enemy will then take advantage of the confusion to which even good troops are liable when they are too confident that nothing is going to happen.

The preventive is to keep the troops in the trenches always in the atmosphere of combat by causing them to actively wage a harrassing warfare. If the enemy is constantly annoyed and deprived of his rest he gets a clear idea of what is to be expected from intact trenches.

Attacks after bombardments.—The attack most often manifests itself in a bombardment of extraordinary violence, directed on all of the fronts and communications of the first line and even of the second. Before each assault a heavy concentration of fire is directed on the first objectives assigned to the infantry and a

barrage fire in rear of the objectives. Employment of the largest calibers on the first line trenches. At the end of some hours, or even of one, two, or three days, the enemy judges that the accessory defenses have been destroyed, the trenches leveled, and that the defenders left in the few dugouts that remain intact are completely demoralized. He then "lifts" his fire, at the same time maintaining the barrage, his infantry suddenly emerges from his trenches "*following the projectiles at a run*," and assaults our line.

To defend his battered trench, deprived of a portion of its defenders, is an extremely hazardous task, the difficulties of which one must not be afraid to point out beforehand.

But from numerous examples of defenses that have been *victoriously conducted, in spite of the concentration of the most formidable resources*, it can be proven that it is possible for *brave defenders, though few in number, to man their ruined trenches and hurl back the enemy at the moment of assault.*

All that the most powerful artillery has ever been able to accomplish is to *diminish* the material resources and the morale of the defenders; it can not completely destroy them. The capacity for resistance which lives in warrior souls remains superior to material effects, no matter what they be. Every soldier should endure the bombardment with stoicism, and repeat to himself that if he escapes its perils, *he is certain*, with the assistance of his remaining comrades and the machine guns that are still serviceable, to mow down the hostile waves of assault *provided he occupies, in time, his post*, or the shell craters which have replaced it.

The importance of lookouts.—Everything depends on the vigilance of the sentinels. They must give the alarm the moment the assaulting lines leave their trenches and see to it that the egress of the men from the dugouts, rifles loaded and hand grenades ready for use, takes place before the enemy can reach our lines. It is a question of seconds, not of minutes.

Concerning this, the following rules:

1. *Each shelter should have a sentinel in its immediate vicinity who can be seen and heard from the door.*

2. The post of the sentinel, which is constructed at the same time as the dugout, *should be protected in the strongest possible manner.*

3. *The sentinel*, who is kept constantly in view by a man of his relief, posted in the doorway of the dugout *should be relieved as often as is necessary.* (This post is dangerous, and all the men in the dugout should take their turn at it.)

In addition to the sentinel, a large periscope should be installed, if possible, and manipulated from the interior of the dugout. The periscope alone, however, would be insufficient. No confidence is to be placed on signals, bells, or any sort of wire device to reach from a sentinel some distance away.

These rules apply to dugouts and machine-gun emplacements, and all the more imperatively since the safety of the trenches rests mainly on its flanking defenses.

Maintenance of communication, during bombardment, between the platoons of the firing line, the captain, and the battalion commander.—The telephone can not be relied upon. Its wires are almost certain to be cut. Signaling with lamp apparatus is uncertain on account of the complete disorganization of the firing line and the thick cloud of dust that hangs over it. It may perhaps be established after the assault with lanterns which have been carefully kept under cover until that moment; but this method can not be depended upon to give warning of the attack.

The *courier*, or rather a *pair of couriers*, is the only means of communication that is almost certain. But it is an expensive method, and it is slow. It should be kept as a last resort in critical moments. The courier is the only method by which the hasty sketch can be sent, which clears up the situation, and the arrival of which is awaited with so much impatience by the commander of the echelon in rear.

Rockets constitute the best means of *instantaneous* communication. They should be placed beforehand in every dugout, but it is always difficult to make them function in the firing line, the imminence of the assault not allowing sufficient time for the purpose. At all events each setinel should be supplied with two or three rockets calling for the barrage, a rocket firer should be installed alongside of his observation station, and he should be instructed to fire the rockets as soon as he sees the assaulting line emerge from the hostile trenches.

The best solution is to have the command post of the captain on the line of supports and that of the battalion commander on

the line of the reserve trenches supplied with *intrenched observation stations* carefully located, and from which the sentinels can see the launching of the assault as soon as the sentinels of the firing line do.

Reinforcement of the firing line—Initiative of the supporting platoons.—At the moment of the assault the captain can immediately throw in his supporting platoon, or platoons, to the assistance of the firing line, *a movement that must be studied and prescribed beforehand to the minutest detail*, but which would have been very dangerous of execution during the bombardment and before the enemy "lifted" his fire.

The commander of the supporting platoon does not always wait for the captain's order before acting.—If he learns from any other source than the captain that the first line is in danger, he reinforces as has been prescribed, it being assumed that communication with the captain is impossible at that critical moment.

The case also occurs sometimes that the captain's observation station sees nothing and it is the battalion commander who first detects the hostile wave. He will send one or two of his platoons, which have been prepared to advance for such a contingency, to reinforce the platoons that are sustaining the shock. These platoons will advance quickly to the firing line or will replace the company supports sent forward by the captain, if he has already thrown them in.

Employment of barrage fire.—It is not sufficient for the defenders of the first line to man the trenches and meet the first waves of the assault with rifle fire. The artillery must also be notified that the time has come to open a violent barrage fire behind the leading assailants. The object of this barrage fire is to isolate them, to prevent all reinforcement or replenishment of ammunition, and even deprive them of the possibility of retreat. Thus isolated, they are at our mercy, even though they have pierced the firing line and have penetrated into the support trenches. Such a success will involve them in one or more of the *compartments* of the position (figs. 274 and 275), where they will be subjected to frontal and flanking fire and be open to counter attacks.

All officers should explain to their men, not only theoretically, but by practical demonstration on the ground which they occupy,

the principles of the barrage and of the division of the position into compartments. They must demonstrate to them that *they must never yield to the uncomfortable impression that is experienced when one feels that an enemy that has penetrated the*

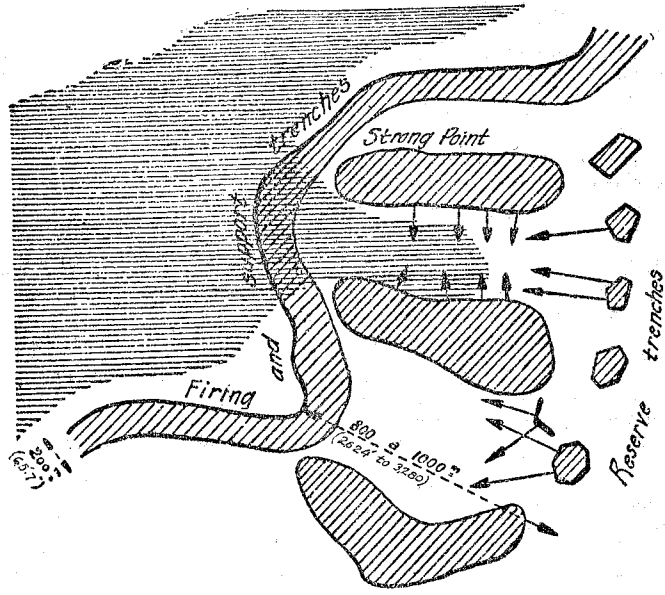


FIG. 274.

position to his right or left has gotten in rear of him, for he himself is also on the flank or in rear of the organizations that have effected penetration. Their local success has only drawn them into a "pocket of fire" which will certainly close upon them if our people do not yield to discouragement. The tenacity of a

few handfuls of men, even if surrounded in their intrenchments, will insure the victory.

Barrage fire is called for from any observation station having knowledge that the enemy is making an assault, by telephone, if it still exists; if not, then by rockets. *Rule: The successive lines should repeat the rockets sent up in front of them, and continue to do so until the barrage has been opened.*

In default of other information the captain and the battalion commander call for the barrage and throw in their reinforcements the moment they see that the enemy has "lifted" his artillery fire, and that rifle fire has been opened from the first line.

If the bombardment has been localized on one or two supporting points, the adjacent ones, which are able to do so, observe the assault, and, as their telephones are probably working, they will notify the artillery concerned. Such observations and lateral communications will be invaluable should direct methods fail.

Carrier pigeons, which have proven to be uninfluenced by the severest bombardments, may also be employed. As the pigeon will fly to the central loft, the message should state precisely what group of artillery must be called upon to immediately furnish the barrage, and on what portion of the front it is needed.

Signals between searchlights on the ground and aeroplanes are employed whenever practicable, in accordance with the rules and methods prescribed in Chapter IX, Part IV, "Methods of communication and signaling."

Counter attacks.—Counter attacks are attended with greater success and less loss the sooner they are launched. They should take the enemy by surprise, and before he has recovered his breath and regained formation. They should be made upon the initiative of the local commanders, as the transmission of orders and intelligence have become, by that time, most precarious. All hesitation or delay will be paid for dearly.

This is why the plan for the defense of a given "area of resistance" should foresee all rational possibilities of attack, and take precautions to designate under each hypothesis: The counter attack, or attacks, to be made; the fractions that will make it (section, platoon); the route each platoon will follow, and its final objective; the prearranged signal for launching the

counter attack. *But it is properly the enemy, himself, who gives the signal for the counter attack.*

Counter attacks should be like the two jaws of a trap, which close automatically the instant the trigger is touched.

Direction of counter attacks.—Counter attacks may be delivered toward the front. Such is the case of a platoon advancing to reinforce a platoon of the firing line, and finding the enemy already in the trenches.

The most successful counter attacks are those delivered simultaneously against both flanks of the hostile wave, and abreast of the first line of resistance. The advance is made with hand grenades along the trenches of the firing line, and those of the supports and reserves; and in the communicating trenches the enemy is attacked in rear, his retreat is cut off, and those that have penetrated the line are surrounded.

Thus to meet the suppositious case of a hostile penetration between C and D (fig. 275), one should provide for the following counter attack: Barrage in front of CD by group X; a column of one or two platoons emerging from the group of intrenchments G, and attacking in the direction from north to south; a similar column advancing from supporting point H, to attack in the direction from south to north. Details of execution are laid down in advance by the commander of the strong point.

Reconstruction of destroyed trenches.—After a hostile attack has failed, *it must be remembered that another attempt will probably follow in a short time.* Work upon the destroyed parapet must be begun immediately. Sand bags and trench shields permit of hasty provisional reconstruction.

Menace of mines.—Wherever the presence of a hostile mine chamber is suspected (sounds heard for a considerable period, and then suddenly ceasing) plans must be made to occupy the crater before the enemy does. When, in the judgment of the engineer officers, the gallery has reached a point below M (fig. 276), and the mean diameter of craters in that region is from 35 to 45 yards, two trenches are established, AB and BC, 10 to 15 yards outside of the probable perimeter of the crater. The menaced trench is abandoned, and preparations are made to rush from AB and BC to the nearest edge of the crater.

From there the enemy is prevented from occupying the crater. It is dangerous to actually occupy the crater, since the enemy

often has a second mine ready, or can easily prepare one shortly with his undestroyed galleries, even though those under the crater are destroyed. It is well also to place a couple of machine guns to fire at PE along the edge of the crater and trench mortars to cover the interior of the crater with curved fire.

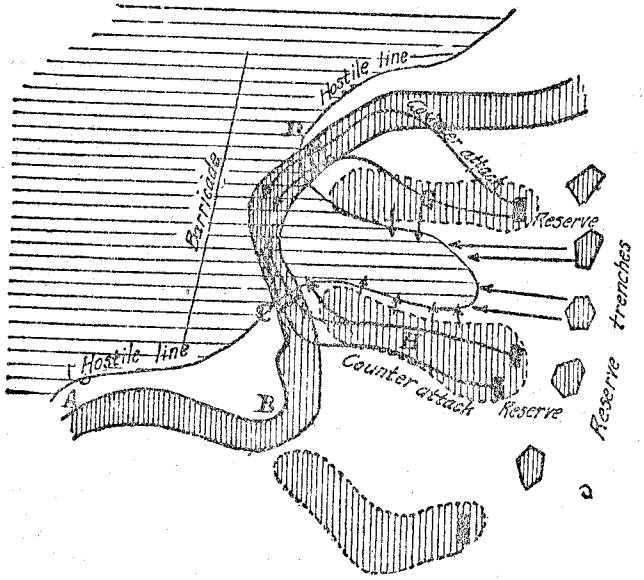


FIG. 275.—Routes of counter attacks.

Fatigue details surprised by an attack.—Isolated soldiers and working details, or fatigue details employed in the service of supply, which are surprised by an attack at a distance from the units to which they belong, automatically place themselves under the command of the chief of the nearest unit. He either

incorporates them in his own unit or sends them to their own commands, with a written order and under charge of a non-commissioned officer.

Fractions surprised in their shelters.—Dugouts permit an intense bombardment to be endured, but have the inconvenience that they retard the egress of the garrison. It must be remembered that the enemy may possibly be encountered at the door-

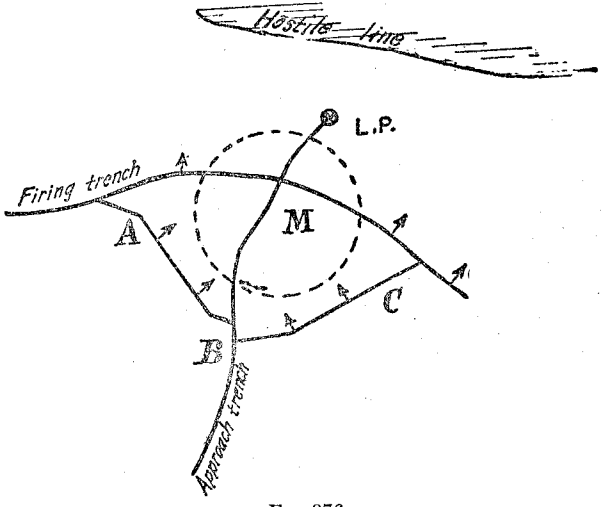


FIG. 276.

ways at the moment the men start to occupy the parapets. In each dugout there should be a small stock of hand grenades, by the use of which space may be opened about the entrances, and the garrison can debouch in force. Every man should determine not to permit himself to be killed or asphyxiated by the intruders,

nor to be frightened by those of the enemy that have already crossed the trench, as there are others that will take care of them, but to exterminate those that are in the trench and man the parapet and open fire on the second and third hostile waves. To insure egress from the cave shelters a traverse blockhouse

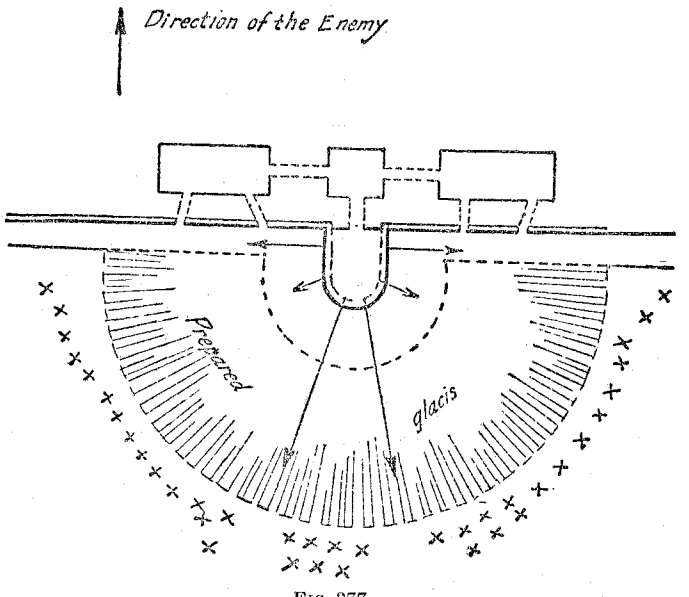


FIG. 277.

should be constructed of reinforced concrete according to the plan shown in figure 277. This forms a sort of caponier, communicating with the dugouts, and which has their entrances under its fire. The ground to the rear should be sloped, and the accessory defenses should offer exits to the enemy who have entered the trench, in using which they will inevitably be shot.

Tenacity of the defenders.—The defenders should, above all things, determine to fight to a finish, and *not to give up the struggle because it appears that their neighbors are getting the worst of it,* for besides these neighbors there are others who are holding on, and who will come to their rescue. A fight must never be judged by what is seen in the immediate vicinity; one must have confidence in one's battalion and regiment.

Not an inch of ground should be voluntarily yielded, no matter what the circumstances. A body of troops, even though surrounded, should resist to the last man, without falling back. The sacrifice of every one of them may be the price of victory.

PART VIII.

THE INFANTRY ATTACK OF A POSITION.

CHAPTER I.

CHARACTERISTICS OF THE INFANTRY COMBAT.

Whether infantry fights in an offensive against lines which have been strengthened by the enemy for a considerable time, in each of the local combats of a general engagement, or in the rencontre of open warfare, its action always takes the form of the "attack of a position." The artillery *devastates;* the infantry *overwhelms.*

The pricipal effort of infantry is the assault. All of infantry tactics is comprised in the preparation for the assault, the execution of the assault, the exploitation of its success.

These operations are repeated successively several times in the course of the same combat; they can be analyzed so as to show that they are made up of a few very simple movements, which should become for each infantryman a mere matter of instinct.

I. Preparation for the Assault.

The preparation comprises—

1. The approach to the point from which the assault is to be launched against the hostile position.

2. The organization of the line of departure of the assault.

The approach.—The approach consists in advacing a well-organized line of attack into contact with the enemy *and exactly opposite the objective.*

In the present case this approach has taken place many long months ago. If it has not already been accomplished, it is

sufficient to construct the parallel, which constitutes the line of departure for the assault at assaulting distance.

Good *assaulting distance* results from a consideration of the following points: It should not be more than 400 to 500 yards, in such a manner as to save our troops and their reinforcements as much as possible from the enemy's artillery barrage. It should not be less than 150 yards, as otherwise the bombardment by our artillery, on the hostile first line, will fall upon our own men. This requirement and *that of being directly opposite the objectives decided upon* may make it necessary to rectify the front and to open one or several parallels in advance of our own first line, and this is particularly true if the latter is too far from the hostile first line. The most advantageous location for the trench of departure for the assault is about 200 yards from the hostile first line.

As a rule, such works as these and the gaining of ground to the front should be avoided as much as possible, as they give the enemy warning of our offensive plans. It is worth a good deal more, usually, to get the benefits of surprise, even though the assault must start at a greater distance from the hostile line.

In the course of the combats which follow the assault, the approach may be pushed to the second hostile position, or perhaps even to another position in rear. The approach, likewise, will be one of the constant problems of a warfare of movement.

The march in the approach will be executed in thin lines, or in lines of small columns, advancing by successive rushes, rapidly, and in good order, *under the protection of the "accompanying batteries" and of the "counter batteries."*

The combination to be brought into play is to have the infantry march as though behind a shield, on the very heels of the bursting shells of a well-regulated artillery fire, arrive in good order at the assaulting distance, deliver the assault without having to fire a shot, and thus continue until the last assigned objective has been reached and taken. Things work out well in trench warfare when one has so disposed his time and necessary material as to severely crush all hostile organizations before the attack. In open warfare such complete preparation is not to be expected.

Theoretically, the object to be attained by the infantry is to reach assaulting distance in good order, under the protection of the artillery, without having opened fire.

But more often, as soon as the enemy is approached, and in direct proportion to his proximity, the advance becomes slower and more painful. A simultaneous advance gives place to successive rushes by groups (platoon, half platoon). Sometimes the firing line is carried forward by skirmishers, taking advantage of any cover that exists, and advancing individually.

With well seasoned infantry, fire is not opened until short range is reached, where the skirmisher can see his objective and take aim.

The officers and noncommissioned officers are the soul of the advance. By their determination and their military training they overcome the tendency to inertia and disinclination to leave cover. It is they who, by their influence on the groups of men that immediately surround them, keep alive the tendency to go forward.

The organization of the zone of departure for the assault.—The zone of departure for the assault is formed by lines of trenches called *parallels of departure.* They should be close enough together so that the one which is most distant from the enemy shall satisfy the condition given above that it will not be in the hostile barrage fire, delivered to prevent supports and reserves being brought up by us. There should be enough of them to shelter all of the troops that are to make the assault. It is even advantageous sometimes to put the battalions of the second line, as well as the assaulting troops, in the parallels of departure, from the very beginning. It has been established that, in the course of the preparation for the attack by the artillery of our own side, the hostile artillery replies but little. It is therefore not necessary to construct bombproofs for all of the effectives in the zone of departure, nor to dig communicating trenches too far to the rear. Nevertheless, it is necessary to have recourse, to a great degree, to "camouflage," from the very commencement of work on the parallels of departure.

The arrangement of the terrain for the attack comprises then generally the following:

The construction of observing stations; command posts; trench-artillery platforms; light shelters for ammunition, food, and material in the first line.

The organization of the communications, trails and paths, and approach trenches both for bringing things forward and for evacuating the trenches.

The organization of means of information (telephones with wires buried, visual signaling, messengers).

The organization of the necessary parallels to shelter (lodge) the troops the day of the assault or the evening preceding the assault.

In open warfare, the parallel of departure is improvised by the men of the first line. When they have been unable to approach during the day to within assaulting distance, the line of departure for the assault is carried forward, as soon as night falls, to the site selected for it, conforming as closely as possible to the rules which govern attacks organized at leisure. The reserves are in the rallying points organized as has been explained in Chapter VI, Part IV (fine print).

II. The Assault.

The intense effort demanded of the assaulting troops, and the successive attacks which they must make, necessitate a deep formation. The several echelons thus constituted have been given the name of "*waves*." But this term does not signify a uniform formation. The foremost waves, generally the first and the second, advance in line; those following are in various formations, for example, in lines of small columns. Moreover, to facilitate the leading of the echelons, the waves are formed by the simultaneous advance of tactical units not deployed in single line but themselves extended in the direction of depth, from which it results that a company or battalion will form a part of several successive waves.

Formation for the assault does not consist of the deployment of rigid lines capable only of a movement straight to the front, but, on the contrary, *of placing side by side tactical units which are capable of being led and even maneuvered.*

The waves are crowded into the first-line trench and the parallels in its immediate rear, sometimes in double rank. They dash forward, following each other at short distances, so as to rapidly cross the zone of hostile barrage fire. Theoretically an assaulting battalion leaves a single block of its parallels of departure and then while marching takes the distances prescribed between waves.

In no event should these waves close up automatically on the leading wave, as its only effect would be in thickening the skirmish line, increasing the losses, and mixing the units. To avoid such effects, when the first wave has crossed the advanced hostile trench it continues its advance toward the objective assigned it. The other waves follow in good order. *They engage successively according to the necessities of the situation under orders from the commanders of the several units.*

III. COMBAT WITHIN THE HOSTILE POSITION—EXPLOITING SUCCESS.

(*a*) *The assault is followed by a combat in the interior of the position.* At certain points the enemy yields, at others he resists stubbornly. The assailants, rallying about the officers that remain, *rush into the openings and surround the nuclei of resistance.* As soon as the trench is carried the attack pauses only long enough to re-form, and the groups of assailants then dash into every opening that offers. Their audacity will constitute their strength.

These scattered combats will bring the assailants in contact with a new line of defense. If it is occupied, they dig themselves in, in order to form a line of departure for an assault by the reinforcements. The attack of the new position will be conducted in the same manner as the preceding, but with fresh troops.

The operation of having the line of reserve battalions cross the line of battalions which have just delivered the assault is called *the passing of lines* and the reserve battalions then become the first line. The new attack is made against a line of intermediate objectives, if it is estimated that the final objective is too far away to admit of these same reserve battalions carrying it through to the bitter end; or it is made (imme-

diately after the first attack) against the line of objectives which were last assigned, which is then crossed by the troops *previously detailed for the tactical exploitation of success.* Very detailed instructions are laid down for this in the *plan of the engagement* or in the *plan of exploiting a success.*

This is a simple operation with well disciplined troops. It must be put into effect promptly, because upon the line where the passage of lines takes place the density of the troops is momentarily doubled, thus adding greatly to their vulnerability. The battalions which have been passed become part of the reserve or are left to guard the captured position. If the attack has for its only aim the taking of a certain definite position, the firing line occupies the position and digs itself in, pushing to the front only some advance elements (patrols). The reserves move up near at hand, in order to insure the occupation of the conquered terrain.

Attacks will generally have as an aim the carrying of the hostile artillery line, in order to disorganize the defense by capturing the enemy's guns. The plan of the engagement indicates to each one, in unmistakable terms, the objective that it is desired to reach. *That is the minimum line which must be reached, but beyond which the troops may and should progress.*

The *plan for tactical exploitation of success,* after the advance has come to a halt, indicates what is to be done as soon as the attack has been successful. It applies principally to the troops which follow in rear for this very purpose.

Without waiting for them, the troops which have carried on the *combat within the hostile position,* having reached the last objective which has been assigned to them, must *push forward at once contact patrols,* charged with reconnoitering the new hostile position. If the results of this reconnaissance and a personal estimation of the situation by the commanders of the units show that the occasion is favorable, these commanders themselves (*captains,* etc.) must take it as a strict duty *to exploit the success obtained by appropriate action.*

They report at once to their commanding officers if they consider that the exploitation of the success requires the putting in of fresh troops. Should the reconnaissances reveal the fact that the attack should limit itself to making secure the objectives carried, the units which have made the assault begin at

once the consolidation of the captured terrain. *The best way to get things under control is to put working parties systematically at the task of fortifying a judiciously rectified marked out trace.* Avoid if possible having the new trench made up by joining together a lot of separate elements begun during the ups and downs of the struggle in accordance with individual ideas. Signal without delay to the artillery observers so that they can bring their fire to bear upon the new position to be attacked.

Sometimes the attack, deprived during the struggle of most of its officers, and harassed by converging counter attacks, has a tendency to break and retire. *This must not be. Ground taken must be held.* The groups find a footing upon and entrench points on the terrain where they are able to resist all attack. Surrounded, they resist till they are completely exhausted. It must not be forgotten, moreover, that the first waves (lines) are followed by a line of machine guns and supported by reserves.

NOTE I.—It is expedient to explain, by an example, what has just been said about the assault and the struggle in the interior of the position. Figure 278 represents the assaulting troops which have attacked in waves V_1, V_2, V_3, V_4, and have found, beyond the first line of resistance, TT, different degrees of resistance (V_1 represents a line of assaulting platoons which might be disposed in two lines or waves separated by some 20 paces). In front of C, breach is made. The forces C cross the zone of hostile barrage and attack the intermediate line, which there will be a chance to carry in the first rush.

If the resistance in the trenches T T, and the barrage, have caused V_1 and V_2 to slacken their pace, and as a result the waves in rear have closed up too much, the latter must increase their distance to avoid mixing of units and to constantly retain the power of maneuver. This accordionlike movement can be employed equally as well by V_3 and V_4, whether deployed in line or in line of small columns.

Group B encounters on its left flank a strong point, N, which has not yielded. The reinforcing waves V_3 and V_4 maneuver to face the obstacle and begin to *surround* it in order that the advance in the free interval may proceed. The new direction

which is given to the elements of V_3 and V_4, their *maneuver*, is here facilitated by their formation of line of small columns.

For D the same formation is required in order that the four waves may maneuver, by creeping and *crawling* to the right, and *attack* the strong point N_1, which is tenaciously held on that flank and delivers a flanking fire across the interval that must be suppressed.

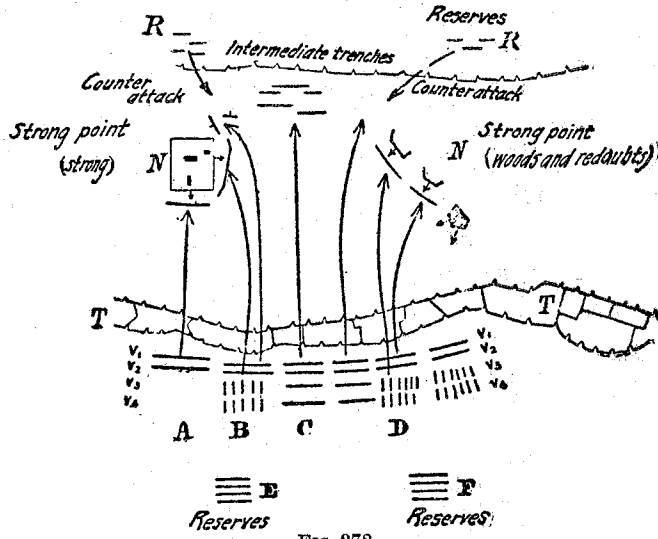


FIG. 278.

Before A, the fighting line brings up suddenly against N. In this case the reinforcement will often produce no result except to increase the losses. It is by surrounding the obstacle and attacking it in reverse that the same can be taken. This explains why the density of the attack, of infantry at least, will be generally greater in front of intervals than in front of the strongly fortified points N and N_1.

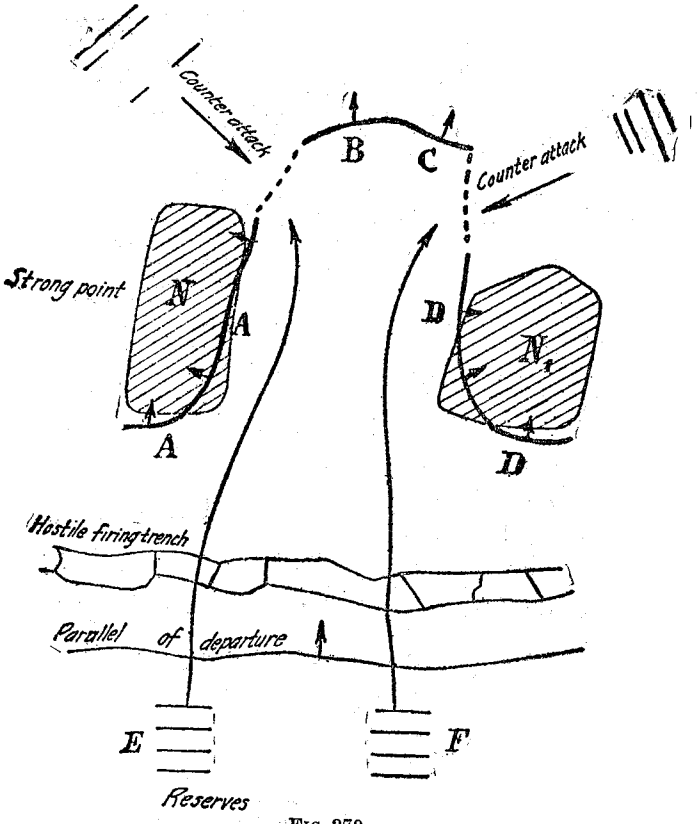

Counter attack
B
C
Counter attack
Strong point
N
A
D
N
A
D
Hostile firing trench
Parallel of departure
E
F
Reserves

FIG. 279.

NOTE II.—There is another reason why strong reserves, E and F, ready to engage in the interval are necessary. It is the isolation of the units B and C, due to their rapid advance, while the adjacent units have to attack the borders of the strong point N and N_1. (Fig. 279.) If the enemy has hidden some reserves behind these strong points, which is likely, his counter attacks against these gaps will be dangerous. These counter attacks must be prevented by pushing forward reserves by the approach trenches already captured, and attacking N and N_1 in their most vulnerable point, i. e., the rear.

(*b*) *Continuation of the struggle during the night.*—The night which follows a day of attack generally occasions a delay which the enemy will improve by digging himself in and hastily bringing up reserves. It is to the assailant's interest to use the night to follow up his advantages, to advance methodically at every point yielded by the enemy, and to seek to carry his new intrenchments before they can be consolidated. A night attack will have no hope of success except by troops already in contact with intrenchments that are partially destroyed, that are intrinsically weak, or still occupied by demoralized troops.

When it is a case of intact and well-constructed trenches, defended by unshaken troops, the attack must be invariably preceded by an efficient artillery preparation. In such a case the night is profitably employed in speeding up the concentration of ammunition and trench material, and even beginning the preparation for the attack with the aid of trench weapons.

By reason of the difficulties of an advance by night over unknown ground, night attacks should never have a distant objective. They will be limited to the carrying of a well-defined point or a well-defined line of trench. An exact knowledge of the ground being indispensable an attack of this nature, to be made by troops which have arrived on the ground after dark and without opportunity to make the necessary reconnaissances, is not to be thought of.

Night attacks are jobs for colonels and battalion commanders, for, because of the difficulties of communication and the mixing of units, the influence of brigade and division commanders can hardly make itself felt.

First and foremost, the troops that have made the day attack must be reorganized. This is the duty of all officers who move

along the front making the necessary dispositions and lending the encouragement of their presence.

In preparing for a night attack the concentration of the necessary materials and the distribution of the troops are made in accordance with the usual rules. When the preparation is complete, the line of infantry charges with the bayonet and without firing. When a trench is taken it is immediately reversed, rockets and illuminating flares are set off to permit reconnaissance of the ground in front, and very particular attention is given to the flanks. It must be thoroughly understood that a strong garrison must be left in the trench of departure and that the same must be linked with the captured trench by approach trenches as speedily as possible. Good order and silence are indispensable to the success of every night operation. Unless all of the above conditions for insuring success can be arranged for it will be better to refrain from making an attack.

IV. Notes on the Rôle of the Artillery on the Offensive.

It has three rôles: (*a*) the artillery of the counter batteries; (*b*) the artillery for the destruction of the enemy's organized defenses; (*c*) the artillery to accompany the attacking infantry.

(*a*) *The artillery of the counter batteries.*—The object to be accomplished by this artillery is the *destruction* of the hostile batteries, and, meantime, to be ready to *neutralize* them effectively at any moment during the period when that destruction is being carried into effect. It reduces to a minimum the hostile barrage and counter-preparation artillery fire, by harassing both the batteries, whose locations are already known, and also those whose positions may become revealed during the development of the action.

(*b*) *The artillery for the destruction of the enemy's organized defenses* has for its aim:

1. To break down the obstacles; make breaches in the wire entanglements, etc.

2. To destroy the principal defense constructions of the enemy, such as points of support, command posts, observing stations, bombproofs, rallying points, etc.

3. To demoralize the surviving defending troops.

(*c*) *The aim of the accompanying batteries is:*

1. To furnish *direct support* to each assaulting body. It is the shield behind which the infantry will march. It prevents the defending force of the enemy, in the zone being attacked, from lining their parapets with men and installing their machine guns. A cooperation to the minutest detail must be established between the advance of the artillery barrage and the advance of the infantry. The latter *must follow the shells, and advance under the protection of its own artillery fire.*

2. To accomplish the complete covering of the attacking forces, which means that they must cover them not only in front, but also that they must protect them from hostile interventions of every sort, which might be inaugurated in the hostile zones not being attacked. They must likewise prevent the approach of reinforcements from near at hand or a distance and must bring under rapid fire hostile troops trying to rally, or counter attacks as they are unmasked or discovered. They will also prevent the bringing up of reserves, reliefs, material, and ammunition.

CHAPTER II.

COMBAT OF THE PLATOON AND SQUAD.

The formations and organization of the platoon, *its advance to the combat and to the assault*, have been set forth under Part II, Chapter V.

The *fire action of the platoon* has been made the subject matter of Part III, Chapter V, of which only the beginning concerns the assault.

The mission of the nonindependent platoon is always very simple and energetic.

Comparison of a line of skirmishers and a line of squad columns.—Skirmishers in line have the sense of comfort that comes from companionship. They can see each other, and they go forward together, at the same pace, to face the same risks. If deployed at intervals of several paces, the individual skirmisher can see better where to put his feet in advancing, and where to take cover on halting. The line of skirmishers, at the widest possible intervals, is the most appropriate formation for

crossing a beaten zone at a walk. With intervals of four or five paces it is the formation for firing and for delivering the assault. Its disadvantage is that it constitutes a target that is visible at considerable distances, and that is the reason why, when troops are under the fire of artillery only, it is forbidden as an approach formation.

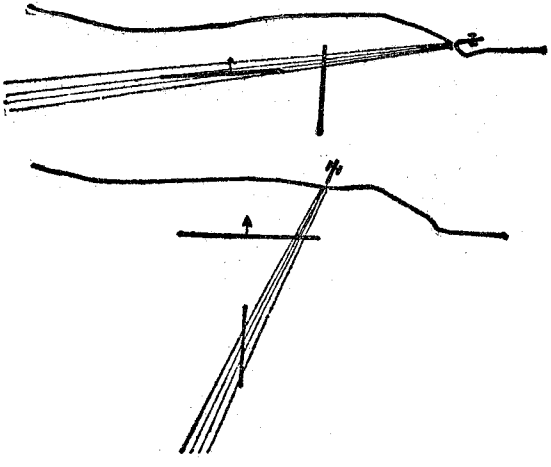


FIG. 280.

From the standpoint of *vulnerability to* infantry fire, it is impossible to assert that, *at short ranges*, one of the two formations is more dangerous than the other. All depends on the location of the hostile machine guns, and the proportion of frontal and flanking fire developed. The sheaf of machine-gun fire is very dense, but very narrow. If the guns are located to a flank they will give greater execution on a line than on a column; if to the front, the converse will be the case. (Fig. 280.)

This explains why, in the case of waves following each other at short distances, the leading waves may be in line and those in rear in small columns.

Small columns have more elasticity than lines. The latter, when launched, can only move straight to the front. The small column is easy to command and to divert to any direction, and therefore remains capable of *maneuvering*, even in the midst of an assault.

Small columns of files or twos are used. (1) In the formation for the approach, under artillery fire. Their employment is obligatory in all classes of terrain. (2) In the formation for combat, under infantry fire, but only if the country is close and difficult to traverse. (3) In the formation for the assault, by the supporting waves in which it is desirable to retain the ability to maneuver.

The great disadvantage of this formation is the tendency the men have to "bunch," especially at the moment of the assault. Supervision by many especially reliable noncommissioned officers is essential. When a supporting wave is to advance in line of squad columns of files, it must leave the trench in line. in the same manner as the leading waves, and then form line of columns. If the men leave the trench one at a time and all at the same place, they will take too great distances and will lose all cohesion.

To resume: Under artillery fire, small columns are essential; under infantry fire the choice between the two formations will be more of a question of good order than of vulnerability.

Rôles and objectives which may be given to platoons.—It should be the object of the dispositions adopted *to paralyze instantly the defense in all of its elements.*—Every German should find a Frenchman in front of him unexpectedly, and before he can collect himself for defense. The platoon may fight as an *assaulting unit* or as a *reinforcing unit.*

The platoon as a unit of assault.—To paralyze the defense it is necessary to seize immediately all of the important points, which are: the dug-outs (the dug-outs under the parapet, dug-outs further to the rear in the communicating trenches); the trench intersections; the machine-gun emplacements; the command stations, or posts.

Aerial photographs will permit a series of these important points to be assigned to a section as successive objectives.

Each noncommissioned officer receives a sketch (made with colored pencils) upon which the objectives assigned to him will be clearly indicated. Each platoon must march straight on its objective; it must not diverge; it must not permit itself to be diverted. Unless they have been assigned as final objectives, *the trenches must not be entered.* They must be attacked from the surface of the ground. When an intermediate trench has been carried, the platoon re-forms a few yards beyond the parados and advances to the next objective. The principal lines on which the successive rallies are to be made will be indicated in advance by the captain from the plan of the hostile trenches. In any case the section should rally automatically at each halt.

The supporting platoon.—The platoons of the second wave (company supports) reinforce the platoons of the first wave, if these have suffered serious losses. If not, they strive, in the course of the fight and after the rallies, to move toward the flanks of the company to fill in any gaps that have been caused in the line. If a platoon of the first wave encounters a resistance, the supporting platoon takes care not to move directly against the same resistance. It must seek to outflank it and take it in reverse.

The fight in which the two leading waves are engaged should be rapid and should be limited to putting out of action those defenders who are in evidence and whom it would not be safe to leave in their rear. The remainder is attended to by the trench cleaners.

FORMATIONS TO TAKE.

1. *When the platoon is an assaulting unit.—The first line of the platoons,* which is generally called a "wave" is usually composed of the first half platoon (grenadiers and fusiliers). *The grenadiers* are intended for action against the enemy ensconced in his earthworks or in shell holes. The automatic riflemen have the task of firing upon any of the defending forces who show themselves, or who are retreating, or who are forming for a counter attack.

The second line of the platoon (*second wave*) consists of the second half platoon. *The grenadiers of this half* (using rifle grenades, V. B.) have the mission, with their plonging fire, of making a barrage in advance of the front occupied, or in rear of the hostile front being attacked, or against hostile forces ensconced in the trenches but too far away to justify the use of hand grenades against them. The riflemen march well to the front and take a hand in the bayonet combats that have been inaugurated by their comrades of the first wave. The platoon commander marches with the second wave between his two squads of riflemen. The distance between the two waves varies from 10 to 15 paces. Under some circumstances it is permissible to send the riflemen in the first wave, particularly when the front assigned to the platoon is above the normal. It is recommended in the latter case to employ them by squad in such a way as to support the squad armed with the automatic rifles.

2. *When the platoon is a reinforcing unit.*—The platoon, if its effectives are sufficient to admit of it, takes a formation in two lines, the same as the assaulting platoon. The platoon commander marches in front with the line of specialist squads, in order to be able *to direct* his platoon by the developments of the combat as brought out by the assaulting platoon which has just preceded it. He deploys his squads, or has them march in column of files, in order to have them a greater time under control. When the support platoon has been diminished by one or two squads of specialists, as is provided for further on, its chief may arrange it in a single wave.

Combat of the platoons in the approach trenches.—Combat upon ground cut up by trenches often leads to an advance by groups of skirmishers along the approach trenches instead of an advance on the surface of the ground. Fighting in the approach trenches is step-by-step fighting and is extremely slow, as only one man can be engaged in front at a time and the enemy step by step. The weapon for this kind of combat is the hand grenade, and the "School of the grenade" (Pt. II, Chap. IV) and the tactical employment of the grenade (Pt. IV, Chap. IV) contain all the necessary instructions.

Uniform and equipment for the assault.—The following is an indication or memorandum:

Dress: Service uniform without the pack.

Equipment: Shelter tent diagonally across the shoulder in a roll; foot cloths rolled in the tent; intrenching tool hanging from the belt, sometimes two (see table, Pt. III, Chap. VII); provision haversack, with rations for the day and reserve rations; grenade haversack, containing grenades, fuses, etc.; canteen; supplementary water bottle or canteen for brandy, 1 liter; empty sandbags, two to five, attached to the tent roll; cup and spoon in the provision haversack; first-aid packet in the pocket of the greatcoat; soldiers' handbook in the pocket of the greatcoat; gas mask, hung from the belt, in front of the stomach, so that it can be easily reached with the hand. A second mask is taken if practicable; two identification tags, one around the neck and one attached to the wrist; piece of cloth, one side white, other red, for marking the position of the firing line to friendly aviators engaged in artillery observation. At night special lights (called Bengal) are used for indicating same. Rations for the day and reserve rations. Ammunition, 120 cartridges per man; 3 hand grenades, and 2 rifle grenades.

Another combination is to take the shelter tent, the provision haversack, and the foot cloths. If very rainy the foot cloths are useless.

CHAPTER III.

THE COMPANY IN COMBAT.

EFFICIENCY OF NEW WAR APPLIANCES IN USE IN THE COMPANY.

The maximum efficiency of the company will not be attained, especially on the offensive, unless the following three basic conditions obtain:

The war appliances of new types must be *coordinated in their use.*

There must be adequate arrangements for their *ammunition supply.*

The men who make use of them must be *thoroughly instructed* in their use.

The combination of the automatic or machine rifles, the 1.5-inch rapid-fire gun, the rifle grenades permit our infantry to force the enemy to hug his trenches, while our grenadiers (bombers) and riflemen throw themselves upon him and close with him in the hand to hand struggle.

The arms of flat trajectory, the machine gun, the machine rifle, and the 1.5-inch gun, fire upon everything that raises itself above the surface of the ground. The weapons of curved trajectory—the rifle grenades and the hand grenades—attack everything which is sheltered by the trenches. The riflemen complete and take advantage of the results obtained by these specialists.

The ammunition service must be perfectly organized in order that these war appliances shall have all the ammunition necessary to function properly. It must be remembered that the heavier and more cumbersome that these appliances are, just so much more difficult is the replenishment of their ammunition.

Instruction is much more necessary with the new armament than it was with that formerly used. The weapons of great efficiency are of value only when handled by *disciplined, instructed, courageous* soldiers, directed by leaders knowing perfectly how to employ them. We must eliminate absolutely from the mind the idea that the specialists form a separate body, having in ordinary life, and in combat, obligations different from those of their comrades. Machine gun, personnel, grenadiers, automatic riflemen all live and fight in the ranks, in an intimate coordination with the rifleman proper. They are specialized only in their instruction.

The present company, furnished with all of its appliances and supported by a number of machine guns corresponding to its effective strength, is capable, through a proper coordination of its fire, of obtaining an efficiency far greater than that which could have been achieved by this unit at the beginning of the campaign. The difference is quite perceptible at the mid-ranges, but becomes absolutely startling at ranges of less than 200 yards.

On the defensive the company possessing all of these war appliances can hang on to the ground more firmly while waiting for *the appearance of the friendly artillery barrage.* This

quality is particularly favorable to the infantryman, because after the taking of an objective there is often a considerable period when, through lack of exact information as to the situation, his own artillery can not cover him.

On the offensive the infantry has recovered a strength and a faculty for maneuvering which it had to a great extent lost since the appearance of trench warfare. When friendly artillery has made a breach in the line of hostile defenses the infantry can throw itself through the same and break, *by the means in its own possession,* all local resistance and counter attacks.

FORMATION FOR THE ADVANCE—THE ADVANCE.

1. *Formation for the advance.*—The formation *most used* is the *double column,* with variable distances and intervals. The platoons in line of squad columns (squads in column of files); or of half platoons either in column of files or twos. The company may likewise employ line of half platoons, either in column of files or in column of twos.

2. *The advance.*—(*a*) *In open warfare.*—As soon as the company leaves the route column it takes the *formation of approach.* As soon as the hostile artillery fire becomes effective, and in any case, upon arrival in the zone of infantry fire, it takes the *formation for combat.* However, in difficult or covered terrain the formation in small columns may be maintained until a point nearer to the hostile infantry is reached. Lines of terrain particularly conspicuous, such as roads, borders of woods or fields, etc., are crossed with a rush, one company at a time. In this case the rear units close up on the leading units, which stop. The distances are then resumed as the advance continues.

The captain exerts himself to push the firing line as near to the enemy as possible. He pays very great attention to the maintenance of order in the reinforcing platoons and profits by every opportunity to keep them in control. He engages them (reinforces the firing line) as soon as he judges that their support is necessary to continue the forward movement.

When an effective hostile fire makes it impracticable for him to freely change his position in order to direct the movements of

the company he endeavors to place himself with the group most favored by the terrain and to push it forward. He thus influences the further advance of the company which he still commands, if by signals only.

(*b*) *In trench warfare.*—The advance and the forming for attack take place under cover in the defiladed or sunken approaches, which have been previously prepared, and in the parallel of departure. That which follows, refers to an attack prearranged in every detail, to be started from a system of trenches occupied for some time, for the purpose of attacking an enemy himself strongly fortified. In open warfare the principles would be the same, but the application would be modified by the fact that the two adversaries would occupy only improvised lines; with few, if any, communications in the sense of depth.

PROCEDURE DURING COMBAT AND ASSAULT.

The front of combat assigned to a company (200 men) is in the neighborhood of 200 yards and may even amount to as much as 330 yards. In the usual case the company may appropriately place two platoons on the combat front side by side. It may put three there and, in exceptional cases, four. The platoons which do not form part of the assaulting line are called *supporting platoons.* The *assaulting platoons* form the first two waves or lines of the company and are called *the assaulting waves.* They follow the principles, in the advance, laid down above for the platoon. Immediately behind the assaulting waves, at a distance of from 10 to 20 paces from the second wave, *come the trench-cleaners,* forming what is called the *cleaning wave,* or third wave, for a description of which see below. The remaining elements of the company, one or two platoons, diminished if advisable by the trench-cleaners, form, according to the strength of the company, one or two waves called *supporting* or *maneuvering* waves.

The captain marches in front of the leading one of these last two waves. The supporting waves are separated from the cleaning wave by a distance of about 40 to 50 paces. (See figs. 277a and 277b; and for the conventional signs, see fig. 17.)

PLAN OF COMBAT.

The success of an attack depends upon the perfection of its execution. This perfection must be assured by the *plan of combat* of the chief of the unit. This plan is based upon:

The mission assigned to the unit.

The obstacles to be overcome in accomplishing this mission.

The means at the disposal of the unit.

The company's mission and the supplementary means placed at its disposal are given in the order of the chief of the battalion. At the present time the obstacles to be overcome are known almost to the minutest details, thanks to the excellence of the

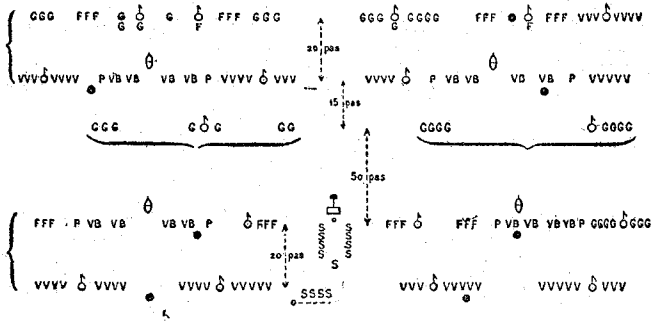


FIG. 277*b*.

methods of investigation and information placed by the General Staff at the disposal of the troops, published in information bulletins concerning hostile organization, and given by the daily aerial photographs, large-scale guide maps, sketches, and various information. This information must be classified by the colonels and useful extracts and reproductions carefully distributed by them, even to the companies themselves. The captains have

their subordinates, even to the noncommissioned officers, make the necessary copies and indicate accurately with colored pencil the line of advance and the successive objectives of their units.

The captain, in his order for the attack, makes all plain; the major must examine and approve it without unnecessary red tape.

The plan for the combat fixes—

1. The mission of the battalion, the missions of the companies, and the missions of the detached companies.

2. The number of assaulting platoons, the position from which each is to set out, and the particular mission assigned to each.

3. The number and composition of the detachments of trench cleaners, their missions. The latter should be in accordance with the orders of the major.

4. Assignment of missions and routes to the reinforcing platoons. These platoons may have withdrawn from them some men for the squads of trench cleaners.

5. The direction in which the various units are to attack given by the aid of the compass.

6. The distance between the various echelons.

7. The location of the captain if he changes position as the advance continues.

8. The hour of beginning the assault.

9. The manner in which the teamwork between the infantry and the artillery will be maintained, mainly by colored signal fires and bombs (cartridges, rockets).

10. The manner by which the captain and the platoons will let each other know their locations.

11. The liaison to be sought for with the adjacent units and the means to be adopted to secure this.

12. The conventions provided for in order to indicate the front line (to aviators), whether it be at a certain hour, upon a certain agreed line, or when called for.

13. The occupation of the position carried and the exploitation of success.

14. The equipment to be carried in making the assault.

15. The organization for replenishment of ammunition. V. B. grenades, bands of cartridges for the machine guns, clips for the automatic rifles; who will attend to these matters (one-

half of a platoon of riflemen from the company or the battalion); where these things will be obtained, and where they will be taken.

16. The location of the depots of material (barbed wire, sandbags, tools, etc.), intended to organize the portion of the front that is captured. One half of a platoon of riflemen of the company is charged with bringing this up.

17. The evacuation of the wounded.

Remarks.—In paragraph 9 of his combat order the captain must explain to the men how the artillery will advance its fire (barrage) successively during the course of the assault and, consequently, how the infantry must march, almost in the fire, by following as closely as possible behind the bursting shells. The officers do not carry the saber. They wear a uniform and carry an equipment similar to those of the men, with the insignia as inconspicuous as possible.

The setting out for the attack and the progress in the hostile positions.—At the precise minute that the signal is given the entire company rises and moves forward as one man. The two waves (lines) of each platoon, which are both located in the same parallel just prior to moving out get their distance on the march, each one knowing clearly beforehand where he is to march.

The first wave follows the barrage.

If the advance is normal the company advances without changing the dispositions which it had upon setting out. All of the noncommissioned officers do their best to preserve these dispositions up to the end. *Good order is more important than speed.*

If resistance is encountered, or the conditions are not favorable for the assault, the captain may be forced to change his dispositions. He pushes certain squads into the gaps and others receive the mission of taking the hostile resistance in reverse. These squads complete the task begun by the trench cleaners. They regain their companies as soon as possible. In a general way the companies rally while marching and keeping up the fight. The men strive during the mêlée to join the noncommissioned officers of their company who are still standing. These noncommissioned officers re-form the men into a skirmish line.

Thus order is restored, as much as possible, by a regrouping of the elements of the company. If contact with the enemy is lost, the captain at once rapidly throws out scouts to cover his front, or he may throw out a platoon for this purpose, being ready to back it up closely. It is necessary to act quickly; the sending out of these elements has no other aim than to prevent surprise. These patrols pass alongside of the communicating trenches in order to discover any flanking arrangements that the enemy may have installed there to sweep the zones between the trenches. The reconnaissance of objectives farther on is made by the firing line itself as it advances.

Holding the conquered ground.—When the company is stopped by an obstacle which makes it impossible to continue the advance, the first care of the captain must be to organize a new position far enough from the enemy to admit of a later artillery preparation, against that part of the hostile line opposite, when the time comes to resume the advance. This installation must take into account the safety of the flanks and the arrangement of machine guns and automatic rifles to bring a flank fire along the front of the position.

During the day, it is generally necessary to dig in as one best can wherever one may be. As soon as night falls, a modified trace is staked or marked out and the arrival of the tools, etc., is followed by putting regular working parties at it, and a normal trench is commenced, wire entanglements placed in front, and flanking defenses arranged. The captain restores order in the subdivisions of his company and makes one of them available, provided it is not already so.

He establishes very carefully the liaison with the neighboring units on both sides of him.

In rear of the line constructed by the units of the first line the reinforcing units construct points of support, which are closed works, shaped in accordance with (to fit) the existing hostile works, surrounded with barbed wire, and having arrangements for flanking fire. They also flank each other.

The selection of locations giving good views of the hostile position is of the utmost importance. Views of the hostile flank are particularly important. *The hostile observing stations are*

pointed out without delay to the headquarters which makes them known to the artillery.

To facilitate the rapid drawing up of reports all of the company commanders and chiefs of platoon are furnished with a certain number of sketches of the terrain and with memorandum pads with headings, instructions, etc., printed upon them.

Employment of detachments of pioneers and sappers.—When detachments of engineers have been assigned to the assaulting units, they must go forward the same as the other troops, but they must be considered as a reserve of technical workers, to be held ready for use when needed and not to be frittered away. These detachments may also receive the mission of joining up the parallel of departure with the captured hostile trench in order that uninterrupted communication may be insured. They should seek out any electric or other fuses that might lead to subterranean mines, and should render them useless.

DETAILS REFERRING TO THE COMPANIES OF THE SECOND LINE.

The commanders of these companies must continually have in view the *covering of the flanks of the companies which precede them.* The latter, thus rid of the embarrassment of attending to this matter, can concentrate all of their efforts upon the march forward. The commanders of the companies of the second line also have charge of the rallying of all of the reinforcements of the assaulting companies. Finally, they must not hesitate to join in the action on their own initiative when it is necessary; as for example, in order to cover a flank, exploit the success, stop a counter attack, etc.

This engagement without orders must take place only in case of *urgent necessity.* Theoretically, it is the duty of the battalion commander to order the entering into the engagement of part or all of the units at his disposition, in order to secure the continuation of the forward movement. Ordinarily these units should not be allowed to get out of his control and go and throw themselves into the first line, thus increasing its density and disorder. This danger is principally to be avoided when the line of combat is brought to a standstill before a hostile strong point. In such a case, the reinforcement will produce no result, and the bat-

talion commander will prescribe for the support company, when possible, a maneuver by the flank. The support company must always be ready to execute just such a maneuver without delay.

It may be advantageous, with this aim in view, to call to the attention of those parts of the companies of the second line behind the flanks of the companies of the first line that they are assigned the mission, in advance, of seeking the hostile flanks in case the attack is brought to a halt. This has been stated already in the instructions to the support platoons.

DETAILS CONCERNING THE HANDLING OF THE RESERVE COMPANIES.

The reserves (see fig. 289) are distinct from the support companies and do not form part of the assaulting waves (lines). They generally take the place of the assaulting companies in the parallels of departure as soon as the latter have evacuated them. The commander of a reserve unit usually posts himself by preference at the command post of the chief immediately in his front, in order to get more prompt information and to be able to send back more quickly the orders rendered necessary by the moving out to the attack. The counter attack is stopped by units in good order, well posted, and capable of delivering a powerful fire instantaneously.

Holding elements in rear of the attacking waves in good order, well in hand, provided with machine guns, choosing their positions, and capable of organizing these positions under conditions better than those of the first line—this constitutes the best means of certainly stopping a counter attack. It is not necessary that the numbers of troops assigned to this duty shall be very great. Sections or platoons, *mainly of machine guns*, will generally suffice. With an eye to the occupation of the conquered terrain, the reserves will immediately organize a series of strong points, forming a second line. The positions (trace of the works) are fixed by the battalion commander.

THE BATTALION IN COMBAT.

Depending upon the length of the front assigned to him, the battalion commander will place one, two, or three companies on

the line. The companies of the second line take a thin approach formation, mainly making use of the line of squads in columns of files.

PLAN OF COMBAT.

The plan of combat for the battalion is based upon the same principles and treated under the same headings as those contained in the 17 sections laid down above, for the company. Besides these, the battalion commander must give orders for:

18. The cleaning up of the trenches and the evacuation of the prisoners.

19. The employment of the machine-gun company.

20. The employment of the rapid fire 1.5-inch gun.

21. The plan for the occupation of the hostile position if taken.

22. The reconnaissance of the next objective and the exploiting of success.

23. The organization of the ammunition supply.

24. The organization of the liaison (coordination as to information and tactical action, with other units of the command and adjacent units of other commands).

Cleaning up the trenches.—The cleaning up of the captured trenches is an extremely important operation, which must be carried out systematically and rapidly. Brave men, well commanded, are needed for this. *The plan of cleaning up the trenches.*—This plan is drawn up by the battalion commander in accordance with the orders given by the colonel. It is based upon the photographs taken by friendly aviators. These show the principal positions of the enemy's trenches and shelters. With the aid of this information, the battalion commander assigns the necessary force to clean up each group of hostile shelters, notifies the unit that is to furnish these, and tells each detachment what its mission will be as soon as the cleaning up is finished.

As a rule the cleaning squads are made up of squads of grenadiers (bombers) reinforced by a few riflemen. They are always commanded by noncommissioned officers. In certain cases these detachments may be as much as a half platoon or a platoon even. Sometimes a whole company will be charged

with the cleaning up of a particularly important point of support. *The trench-cleaning detachments never come from the assaulting platoons*, which need every man. They are taken from the support platoons or from the companies or battalions of the second line. In this latter case, it is well to attach them, a few days beforehand, to the company or companies with which they will advance. When the objectives of the companies of the first line are comprised in two lines of hostile trenches at some distance from each other, it is absolutely necessary to detail special detachments for the cleaning up of each of the hostile trench lines. But whatever may be the objectives of these various detachments, they *all* march behind the assaulting waves. Thus, they march in front of their own unit and not behind it, and receive the support of that unit, if it happens that they meet unexpected resistance at one or more points. Their task finished, the trench-cleaning detachments may be charged with the occupation and consolidation of the captured trenches. In this case they are given machine guns or automatic rifles. The detachments of trench cleaners march in line or in line of small columns, according to the necessities of the case. It is absolutely necessary to have frequent practice exercises in trench cleaning.

In making provisions for the evacuation of the prisoners, it can sometimes be arranged to have some of them assist the litter bearers in caring for the wounded.

The machine-gun company.—The machine-gun company is the powerful means at the disposal of the battalion commander to complete the action of his units by fire. As a rule it is employed:

At the beginning and during the progress of the attack.

For the occupation of the objective assigned.

1. *At the beginning of the attack*, the machine guns of the battalion of the first line accompany their battalion, in accordance with assignment previously made by the battalion commanders, and having in view their installation on the captured front. In general, they follow the battalion, each platoon having a very clear mission assigned to it, specified in the plan of combat. One platoon may be held in reserve for an unforeseen mission or to release a platoon destroyed. The automatic rifles seem to

suffice to maneuver the enemy by fire; hence the machine guns proper are becoming more and more a weapon of defense.

The machine guns of the battalions of the second line, placed beforehand at certain chosen points of the parallel of departure with good fields of fire, are advantageously used to cover the flanks of the battalions of the first line, sweeping with their fire the intervals which may occur between them, and especially the exterior flank of the whole.

When the form of the ground permits, it is equally to be desired that the machine guns should bring fire to bear on the hostile support and reserve trenches; upon the approach trenches; and such hostile machine guns as may be located, taking precautions, however, not to hit or inconvenience our own troops.

2. *After the attack has gained a foothold*, the battalion commander directs part or all of the machine guns to the positions which he has designated in advance, and which will secure to the best advantage, by direct and *flanking fire*, the possession of the terrain captured by his own and the neighboring battalions. It is always important to utilize to the greatest advantage and extent, the appliances for trench warfare, such as machine guns, automatic rifles, V. B. grenades, to help to hold the conquered ground.

The subdivision, then, of the companies placed along the front line should generally conform to the principle of placing the squads of automatic riflemen and V. B. grenadiers in the first line and to hold in support the squads of riflemen and grenadiers to meet possible counter attacks. It is likewise part of the duty of the battalion commander to dispose his machine gun company, the squads of automatic riflemen, and the groups of V. B. grenadiers of the company or companies in reserve, with a view to being able to reinforce the density of the fire in front.

The 1.5-inch (rapid fire) gun.—This gun is utilized as explained in Chapter V of Part IV.

Plan for the occupation of the captured terrain.—This plan is based on the orders received from the colonel drawn up in accordance with the plan of occupation published by the division commander. It consists of the following:

Assigning the troops who are to occupy the captured terrain.

Fixing the manner in which they will be divided up, both in breadth and in depth; the assignment of the machine guns and of the 1.5-inch guns.

Indicating the works to be constructed; the actual construction of the trenches and the communicating trenches; the division of the work between the various units.

Informing all of the locations of the depots of all kinds, such as those for tools, barbed wire, stakes, poles, sandbags, etc.

The selecting of the locations for the command posts.

Reconnaissance of subsequent objectives and exploitation of success.—The taking of the objectives assigned does not mark the end of the offensive of the battalion. It is exceedingly important:

(*a*) To regain contact with the enemy if it has been lost.

(*b*) To reconnoiter his new position.

(*c*) To make preparations for and then execute the movement forward which is destined to secure a new base of departure for another attack, or is made for the purpose of reaping the complete fruits of the success just won.

The resumption of contact and the reconnaissance of the new hostile position are accomplished by *contact patrols*, sent out by the troops of the first line as soon as they arrive upon the captured position. The objectives of these patrols are indicated by the battalion commander in his orders for the engagement. These patrols, composed of bombers (grenadiers) and automatic riflemen, supported by some riflemen, move rapidly toward their objectives. They install themselves in these and become the framework of a new line, which is occupied and organized (prepared for defense and offense) as quickly as possible.

Any gap noticed in the hostile organization is taken advantage of without delay. Enterprising infantry will always find opportunity to complete an initial success by carrying points of support which to-morrow it might cost a great deal to secure. *It is of the utmost importance to take possession at once of every point abandoned by the enemy.* The limitations prescribed as to not going beyond the assignd objectives does not mean the suppression of the spirit of enterprise. The battalion commander must not lose sight of the fact that exploiting success

is not done by the infantry alone, but *is secured by the assistance of the artillery.*

The progress to be made after the preliminary successes must have been studied in advance, with a view to coordination with the artillery and regulated in the minutest details to agree with the artillery action. This is the object of the *plan of exploitation of success*, which was mentioned above.

The attention of all officers and noncommissioned officers of the battalion should be called to the necessity of sending back frequent and quickly drawn up reports.

A description of the organization of the ammunition supply will be found in Chapter XI of Part IV.

NOTE I.—Referring to figure 278, and to the remarks on the characteristics of the general combat, we see that a combat such as has been described, is one like that which the companies in the sector C will be called upon to make. Observe that the companies of the sectors B and D, having been turned from their original direction by the necessity of encircling the resistances at N and N_1, there will be an opening out of the companies in the sector C, which continue to advance in the interval. In fact, they are obliged to cover the parts of the front originally assigned to the companies in the sectors B and D.

This causes a spreading out of the first line at the very period in which it is most liable to receive counter attacks. These should be parried by the maneuvering of the reserves at E and F, which have been placed with this object in view behind the intervals.

NOTE II.—The intervals, which may easily be pierced by the attack, would become traps and nests of machine guns if the resistances at N and N_1 are able to continue their flankling rôle. It is absolutely necessary, therefore, to deprive them of it. The complete conquest of these strong points might be a severe and uncertain task, beyond the strength of companies such as those at A, B, and D, but it will suffice if they neutralize the parts of N and N_1, which are really dangerous; that is, the borders (edges) and the places from which flanking fire and reverse fire may be delivered against the companies

moving to the front. Thus the companies of the sector A, although they attack to the front, as did the companies of the sector C, will employ quite different tactics. They will throw themselves at once into the hostile trenches and will undertake the combat in the communication trenches, which will hold the enemy with a minimum of men and without great losses. They should be very well supplied with grenades and sandbags. If they seek to carry several successive lines of trenches in frontal attack, as would be the case in the sector C, they would suffer considerable and useless losses. The companies of the sectors B and D will have to make an envelopment of the hostile points of resistance N and N_1, quite difficult to carry out, but nevertheless quite necessary. The objectives to be given along the border (edge) of the hostile strong point are:

Those points along the edge able to bring flanking fire on parts of our line advancing to the front.

The rear part of the strong point.

The envelopment is made gradually, each platoon wheeling in its turn so as to successively mask the flank defenses of the enemy, in front of which the units that are moving to secure the more distant hostile objectives must successively pass (first wave, second wave, etc.).

The companies of the sectors B and D operate afterwards like the companies of the sector A.

CHAPTER IV.

LIAISON DURING THE ADVANCE.

Liaison with the artillery.—From the preceding chapters it can be seen that an advance is destined to be halted and is at the mercy of counter attacks if it is abandoned by its artillery. The artillery never abandons the infantry if it knows where they are and on what points they should fire to support or defend them. The composition and duty of the "liaison and observation detachment" sent by the artillery battalion to the infantry regiment which it is supporting have been given in Chapter IX, Book IV.

Liaison with the commanding officer.—The problem of informing the commanding officer of the points reached by the advance elements is one of the most difficult encountered. The company and battalion commanders should take every means to solve it. Their chances of safety and of victory depend on it. Successive changes of position of the command posts must be arranged for, they must be improved by the pioneers, telephone lines leading to them must be laid, and marks or directions indicating to any strange orderly where to find the command post must be placed. A well-drilled personnel for transmission of messages (signalers, liaison agents, runners), especially conversant with the operations about to take place, must be arranged for. Every means of transmission must be carefully organized and arrangements must be made for the replacement of carriers of special matériel in case they should fall, etc.

The means of communication, which have been explained in detail in Chapter IX, Part III, and Chapter IX, Part IV, are: The telephone, rockets and signal cartridges, sound signals, seachlights and panels with shutters, pigeons, runners, and, finally, signals by Bengal lights, panels, or searchlights to the aeroplanes and balloons, and transmitted by them to the corps commander.

It must be remembered that, in the employment of the latter means, the aeroplane rockets always apply to the infantry. One should learn to recognize an aeroplane or balloon belonging to his division.

It should be remembered that the commander is impatiently waiting for information, and that he can not take action until he knows what is going on in front. Never neglect any opportunity for communication; employ several different methods simultaneously. Before demanding artillery fire or making signals with the object of tracing the contour of the advance line, a company should always make sure that there is no friendly element in advance of them. In the confusion of battle, reinforcements and troops making a counter attack, being poorly supplied with information and sustaining losses, often think they have arrived on the first line before they have reached it. This will result in bitter mistakes, as they will either open fire or will demand barrage fire in front of them.

Liaison with neighboring units.—This liaison is regulated in the last paragraph of the plan of the battalion commander (see above). It is particularly important when the neighboring unit is a different regiment. There is always an instinctive tendency in each unit to close in toward the center, and this takes place even when the objectives have been carefully pointed out in order to avoid it. Consequently, it is a good plan to have a half platoon, a platoon, or even more march on the flank of the battalion, abreast the companies of the second line, and charged with keeping contact with the adjacent battalion or regiment. The platoon commander keeps his command in small columns, observes carefully how the action is going, and extends or deploys abreast of the first line if an appreciable gap has occurred between the two battalions with which he is charged to maintain contact.

Personnel grouped around the battalion and company commanders.—The division of the company into combat sections and soldiers not included in these sections, the extension given to certain specialties (signalers, pioneers, etc.) have resulted in bringing together around the captain or the battalion commander a certain number of men who get in the way at the post of the commander and in the battle if they have not been assigned a place or duty while waiting until they are needed. This personnel, which may be called captain's group or battalion commander's group, should under all circumstances stand, move, and maneuver as a small supplementary section, under the command of the quartermaster corporal for the company and the battalion sergeant major for the battalion. They should always be arranged in the same order, in order that their presence can be instantly verified, their replacement assured, and they can be found when they are needed. In battle they are not allowed to collect around the commander; they are kept in formation similar to the other fractions of the company, and are required to march in their assigned place and to leave it only when called.

The two tables below are given as suggestions.

CAPTAIN'S GROUP.

	Not included in the combat sections.		Included in the combat sections.	
	Company.	Platoon.	Company.	Platoon.
Noncommissioned officer, chief of the captain's group	1			
First group, liaison agents:				
Drummers and buglers		3		
Bicyclists		1		
Second group, signaling and observation:				
Bugler		1		
Signalers		2		
Observers				[1] 2
Third group, pioneers		4		
Fourth group, runners:				
Company				[2] 4
Battalion [4]			[3] 1	[3] 4

[1] Included in a squad of riflemen.
[2] Included in 2 squads of riflemen.
[3] Included in 2 squads of riflemen.
[4] The group of battalion runners is only sent to the battalion commander on his order.

NOTE.—It follows that—5 squads of riflemen detach 2 men each; 2 squads of riflemen detach their corporal (courier corporal and mess corporal) and are commanded by privates of the first class.

BATTALION COMMANDER'S GROUP.

	Belonging to battalion staff.				Drawn from—	
	Officers.	Noncommissioned officers.	Company.	Platoon.	Headquarters company.	Companies.
A. To the battalion commander's command post.						
First group, command:						
Adjutant	[1]1					
Sergeant major		1				
Noncommissioned officer of attached cavalry		[1]1				
Noncommissioned officer of information						1
Corporal of the field music			1			
Second group, liaison agents:						
Sergeants						3
Noncommissioned officer, liaison agent of machine-gun company						1
Cyclist				[1]2		
Third group, telephone operators:						
Sergeant					1	
Corporals in charge					2	
Telephone operators					10	
Fourth group, signalmen:						
Corporal and signalmen			1	4		
Pigeon men						[2]2
Fifth group, runners:						
First company, 1 corporal and 4 messengers						[3]5
Second company, 1 corporal and 4 messengers						[3]5
Third company, 1 corporal and 4 messengers						[3]5
Sixth group, pioneers:						
1 corporal of pioneers					1	
8 pioneers					8	
Seventh group, artillery liaison:						
As ordered						
Variable strength						

[1] One sent to the colonel.
[2] When the battalion is assigned a lookout station.
[3] Provided to allow the battalion commander (1) to furnish the colonel with 1 corporal and 4 messengers; (2) to keep two similar detachments for himself.

BATTALION COMMANDER'S GROUP—Continued.

	Belonging to battalion staff.				Drawn from—	
	Officers.	Non-commissioned officers.	Company.	Platoon.	Headquarters company.	Companies.
B. To the battalion dressing station.						
Surgeon, battalion	1					
Assistant surgeon		1				
Stretcher bearers [1]			1	16		
Attendants						[2] 4
Cyclist				1		

[1] The other 12 stretcher bearers are sent to the regimental dressing station.
[2] Rejoining their company if it is detached.