

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

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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.

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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.

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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

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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 GRENAДИER.

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

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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.

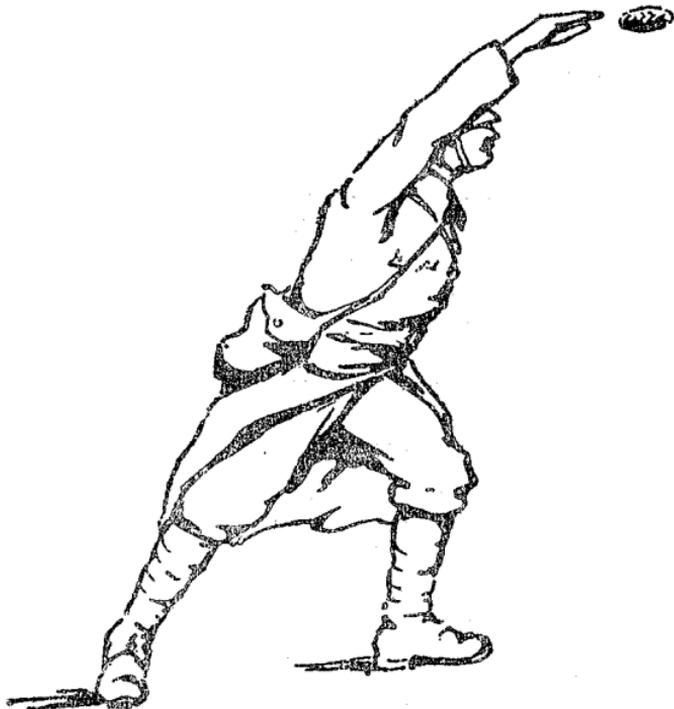


FIG. 15.—Throw the grenade, the right shoulder and the body following the movement of the right arm. The left arm follows the left shoulder, which is held back. The grenade will go in the direction in which the left arm pointed.

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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

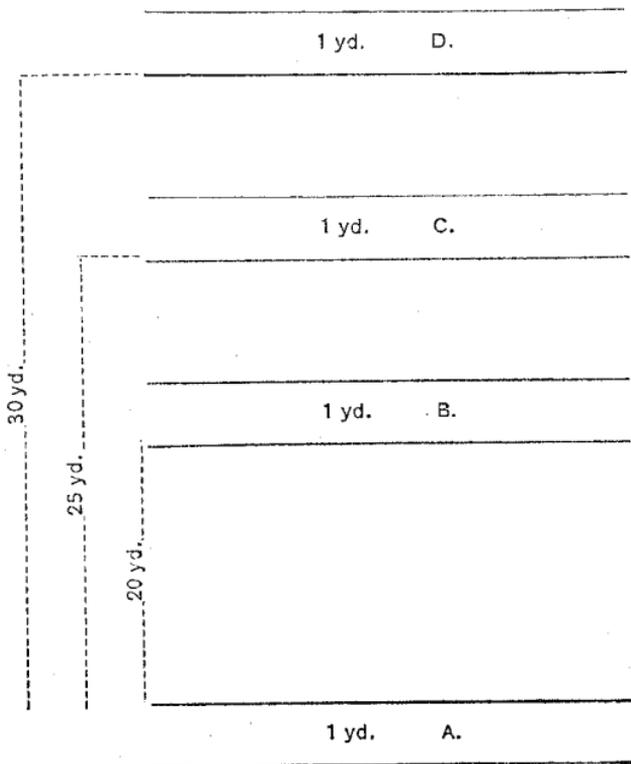


FIG. 16.

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.

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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.

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.

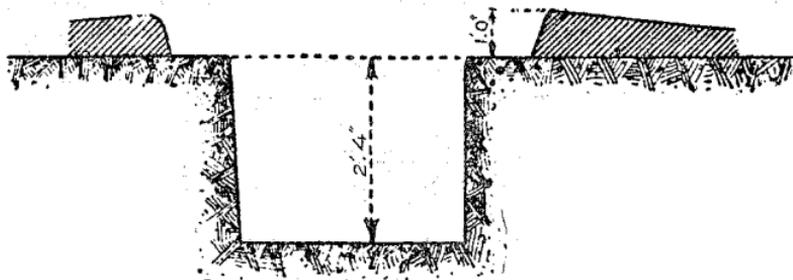


FIG. 36.

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.

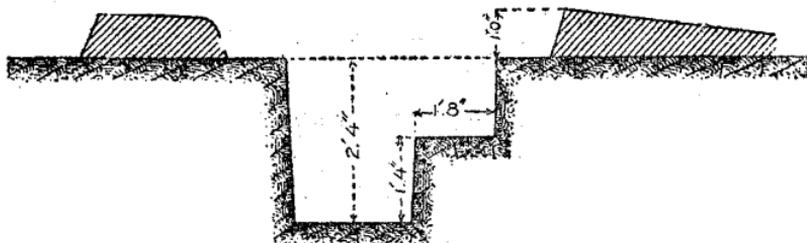


FIG. 37.

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.)

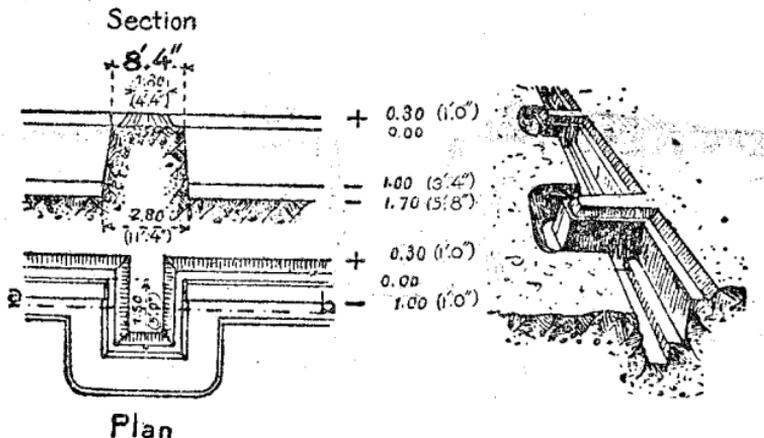


FIG. 38.—Traverses.

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.

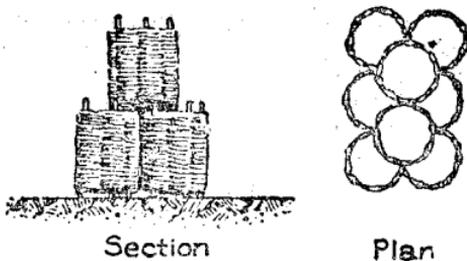


FIG. 39.

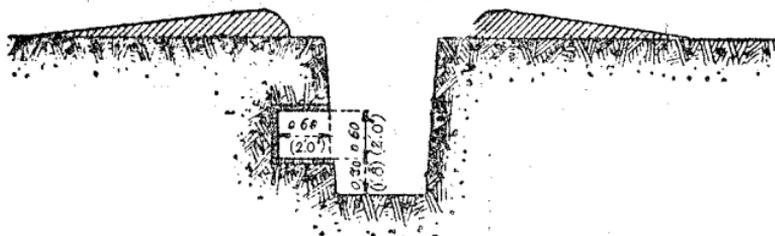


FIG. 42.—Ammunition niche.

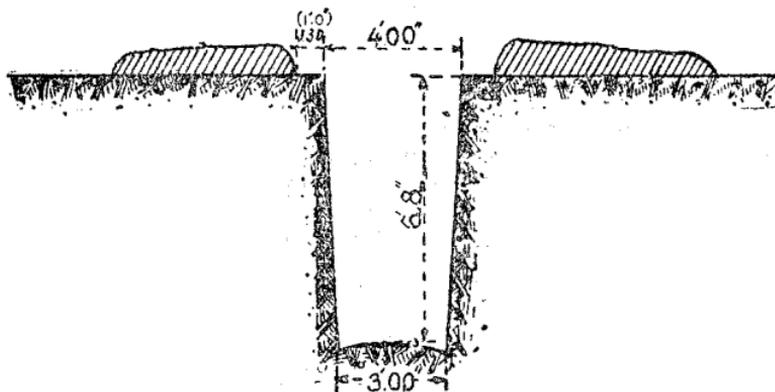


FIG. 43.—Communication trench.

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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

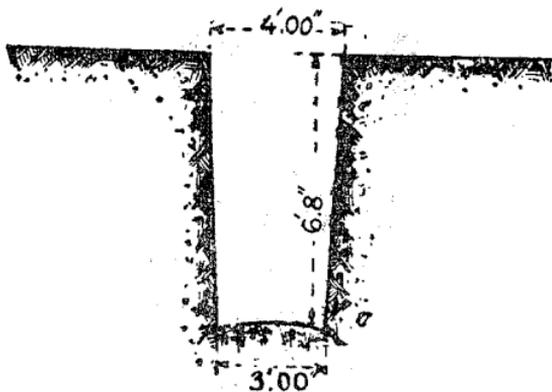


FIG. 44.—Deep sap.

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.

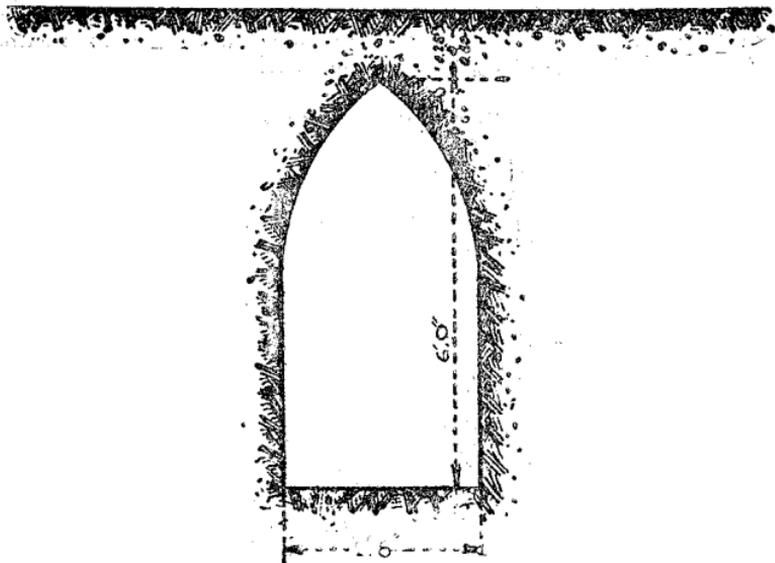


FIG. 45.

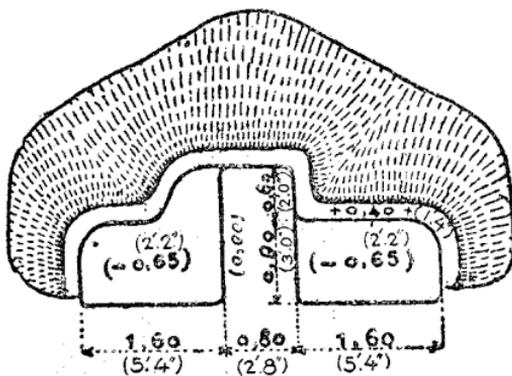


FIG. 46.—Emplacement for a machine gun fired from prone position.

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

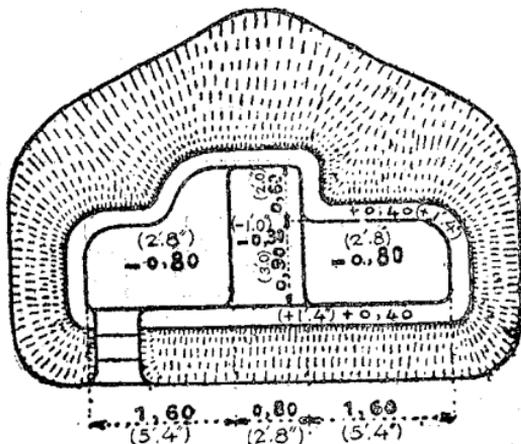


FIG. 48.—Emplacement for a machine gun fired at normal height.

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.

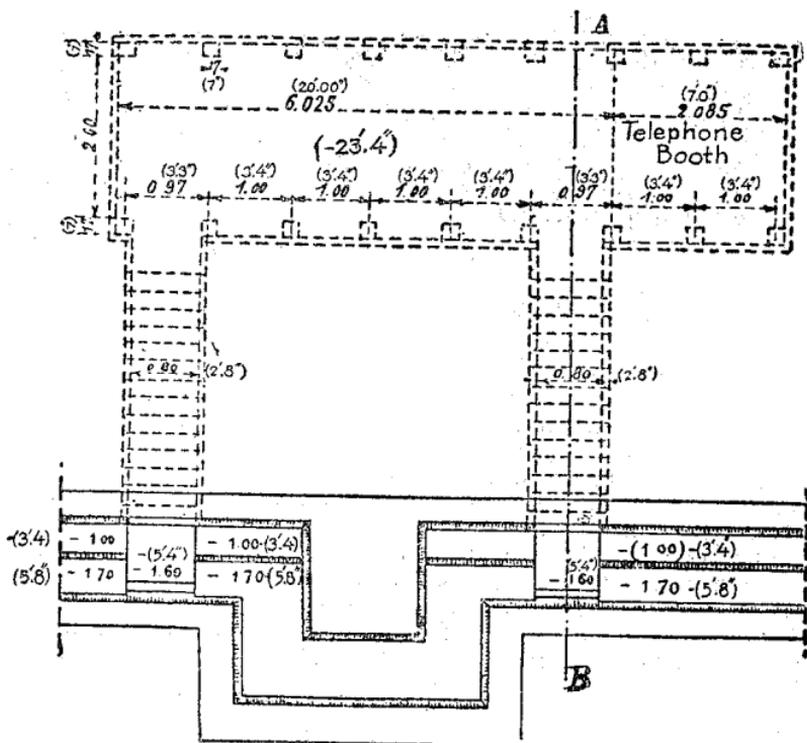


Fig. 52.—Dugout under 10 feet of undisturbed earth. Maximum depth to be executed 20 feet.

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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.

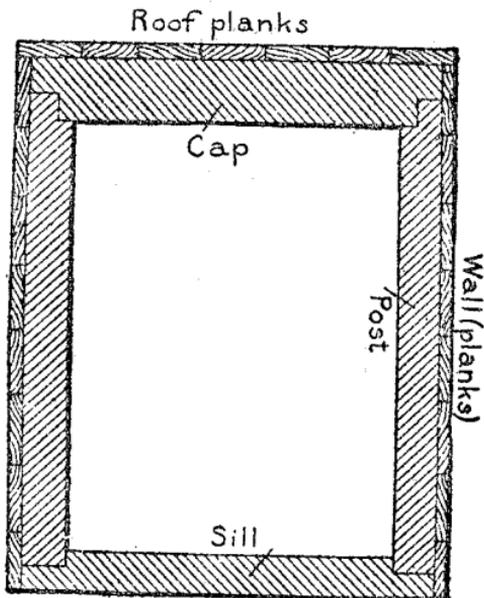


FIG. 52a.

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 wood-work.

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

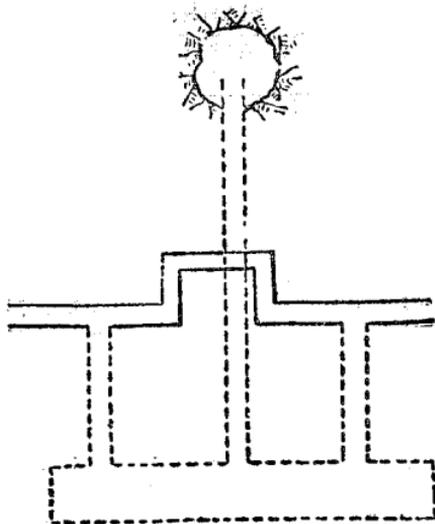


FIG. 52b.

The ceiling planks are thicker than those for the walls (about $1\frac{1}{2}$ 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.

46. MANUAL FOR COMMANDERS OF INFANTRY PLATOONS.

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).

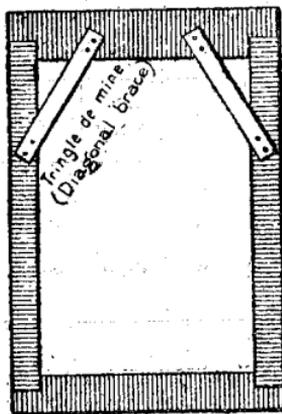


FIG. 52c.—Transversal brace of a chassis

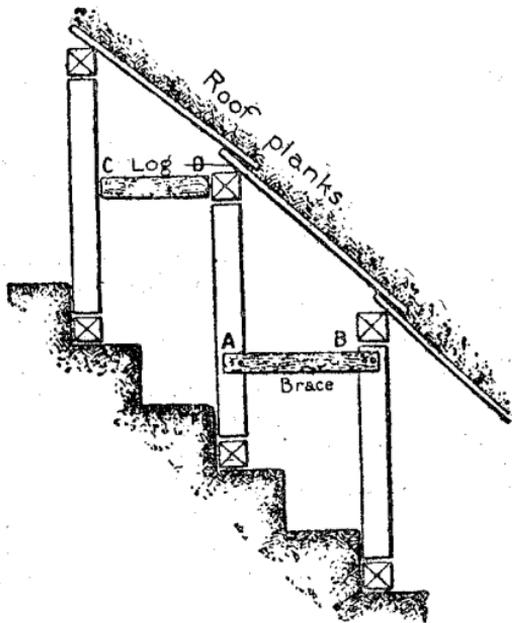


FIG. 52d.—Half gallery, braced longitudinally.

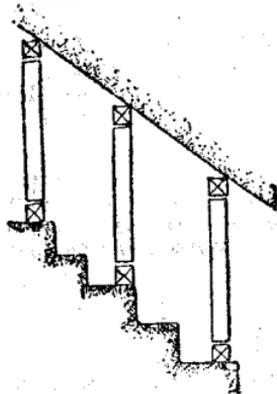


FIG. 52e.—Defective staircase.

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 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 $1\frac{1}{2}$ 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 non-commissioned 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,

 A B C D

First. The panel

 a b c d

 AA' BB' CC' DD'

Second. The panel in the broken line

 aa' bb' cc' dd'

 A' B' C' D'

Third. The panel

 a' b' c' d'

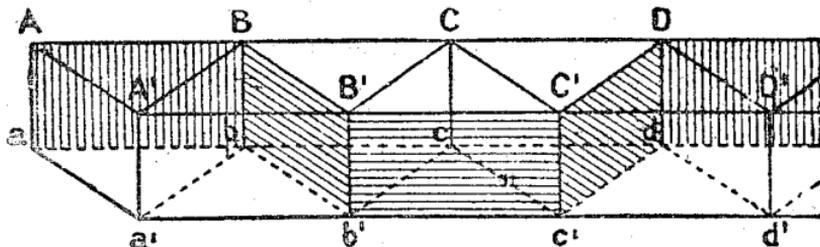


FIG. 53.

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

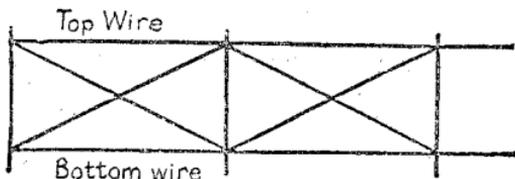


FIG. 54.

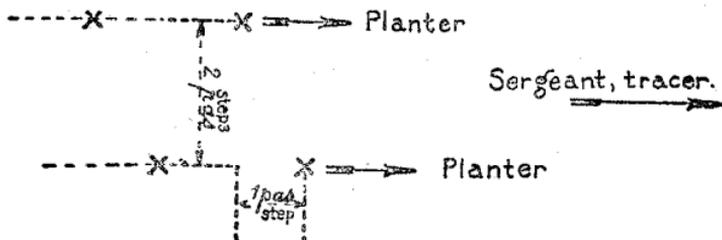


FIG. 55.

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.

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Panel 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.

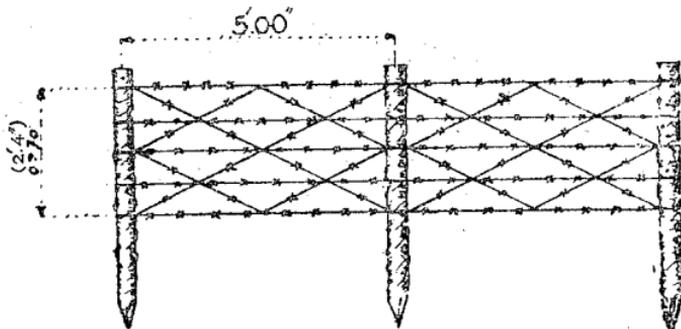


FIG. 56.—Improvised trellis.

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.

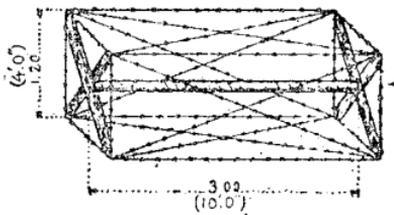


FIG. 57.—Saw-horse.

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-

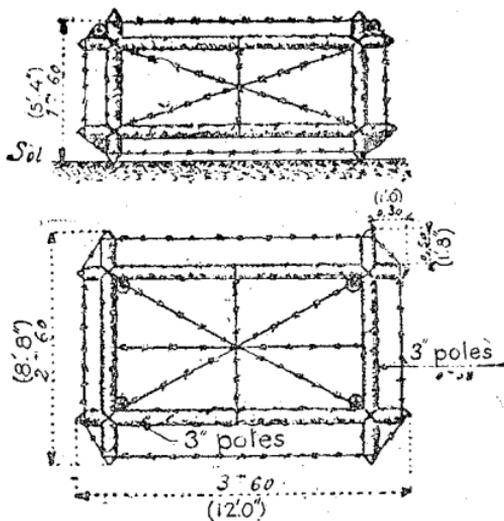


FIG. 58.—Large flattened cubes.

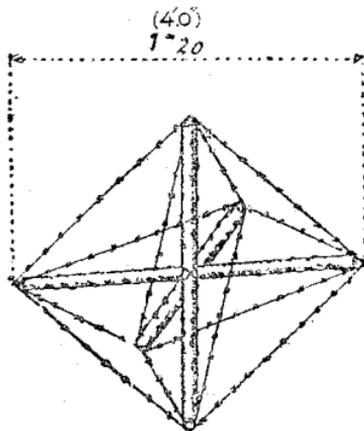


FIG. 59.—Hedgehog.

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

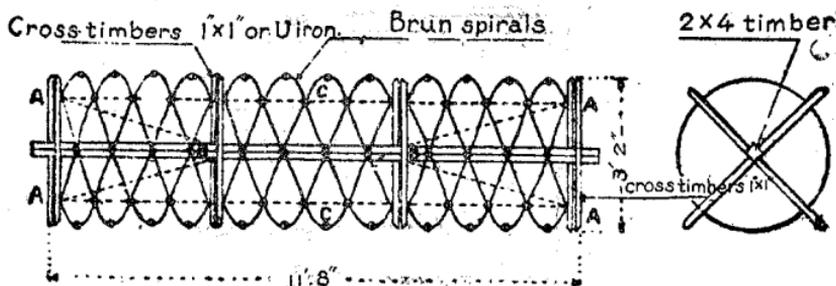


FIG. 60.—Brun spiral.

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:

1. 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 wites per hour. Wire of 0.09 inch diameter is used in place of wites for binding fascines, and of 0.06 inch for gabions and hurdles. Infantry should know how to make fascines, gabions, and hurdles.

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

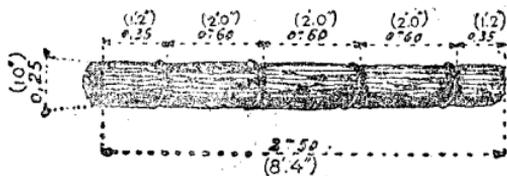


FIG. 61.—Fascine.

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 wites 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.

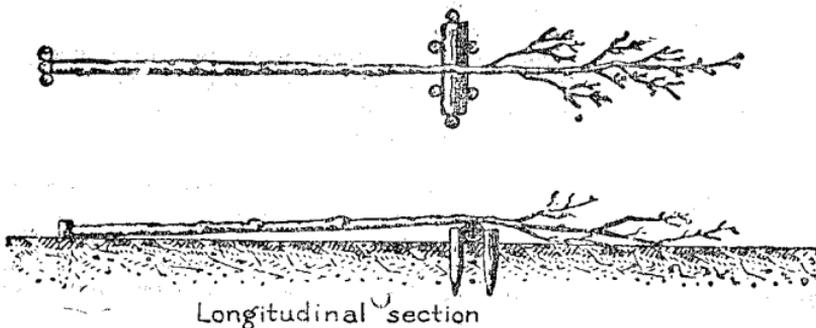


FIG. 62.—Block for trimming rods.

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.

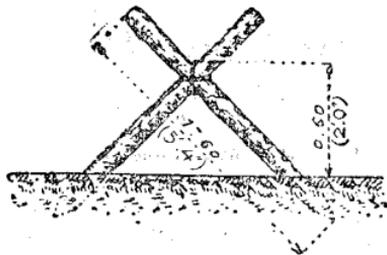


FIG. 63.—Horse for construction of fascines.

To construct a gabion, there are necessary 7 pickets and from 80 to 100 withes. Figure 63 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-

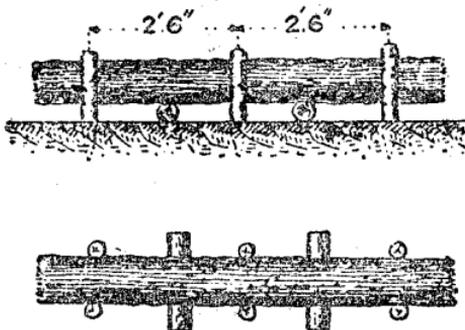


FIG. 64.—Construction of fascines between two rows of stakes.

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

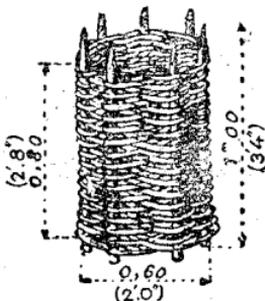


FIG. 65.

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.

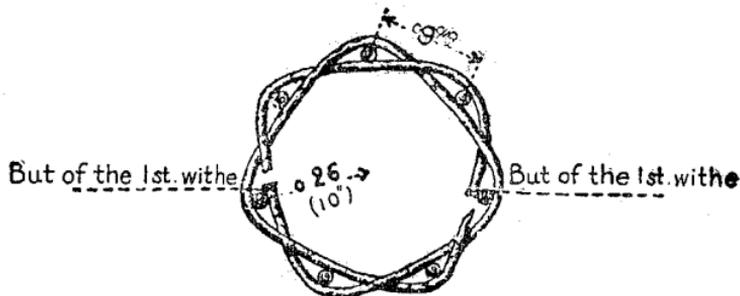


FIG. 66.—Large end of first wither; large end of second wither.

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

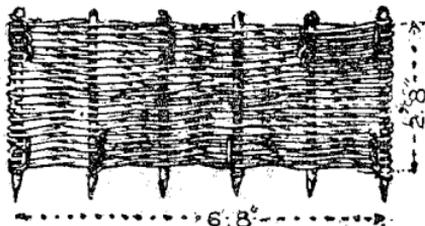


FIG. 67.

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

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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 $\frac{1}{8}$ 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.

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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.