Each quartermaster-general attached to any separate army, command, or district shall be authorized, with the approbation and under the direction of the Secretary of War, to employ as many artificers, mechanics, and laborers as the public service may require; (*Act* March 3, 1813.)

QUARTERS. "No soldier shall, in time of peace, be quartered in any house, without the consent of the owner; nor in time of war, but in a manner to be prescribed by law;" (*Constitution, 3d Amendment.*) The law not having made any provision for quartering soldiers in time of war, troops of the United States at home would be subjected to exorbitant demands for the hire of quarters. (*See* BARRACKS; BILLETS.)

QUESTIONS. (*See* EVIDENCE; TRIAL.)

QUICK-MATCH. It is made of threads of cotton or cotton wick, steeped in gummed brandy or whiskey, then soaked in a paste of mealed powder and gummed spirits, and afterwards strewn over with mealed powder. It is used to fire stone and heavy mortars, in priming all kinds of fireworks, such as fire-balls, light-balls, carcasses, priming tubes, &c. A yard burns in the open air in 13 seconds.

QUOINS. In gunnery, a quoin is a wedge used to lay under the breech of a gun to elevate or depress it.

R

RACK-STICK AND LASHING—consist of a piece of two-inch rope, about 6 feet long, fastened to a picket about 15 inches long, having a hole in its head to receive the rope. Rack-lashings are used for securing the planks of a gun or mortar platform, between the ribbons and the sleepers.

RAFT. (*See* BRIDGE.)

RAFTERS. (*See* CARPENTRY.)

RAISE. To raise a siege is to abandon a siege. Armies are *raised* in two ways: either by voluntary engagements, or by lot or conscription. The Greek and Roman levies were the result of a rigid system of conscription. The Visigoths practised a general conscription; poverty, old age, and sickness were the only reasons admitted for *exemption.* "Subsequently, (says Hallam,) the feudal military tenures had superseded that earlier system of public defence, which called upon every man, and especially upon every landholder, to protect his country. The relations of a vassal came in place of those of a subject and a citizen. This was the revolution of the 9th century. In the 12th and 13th another innovation rather more gradually prevailed, and marks the

third period in the military history of Europe. Mercenary troops were substituted for the feudal militia. These military adventurers played a more remarkable part in Italy than in France, though not a little troublesome to the latter country." A necessary effect of the formation of mercenaries was the centralization of authority. Money became the sinews of war. The invention of fire-arms caused it to be acknowledged that skill was no less essential for warlike operations than strength and valor. Towards the end of the middle ages, the power of princes was calculated by the number and quality of paid troops they could support. France first set the example of keeping troops in time of peace. Charles VII., foreseeing the danger of invasion, authorized the assemblage of armed mercenaries called *compagnies d'ordonnance*. Louis XI. dismissed these troops, but enrolled new troops composed of French, Swiss, and Scotch. Under Charles VIII., Germans were admitted in the French army, and the highest and most illustrious nobles of France regarded it as an honor to serve in the *gens d'armes*.

Moral qualifications not being exacted for admission to the ranks, the restraints of a barbarous discipline became necessary, and this discipline divided widely the soldier from the people. The French revolution overturned this system. "Now (says Decker) mercenary troops have completely disappeared from continental Europe. England only now raises armies by the system of *recruiters*. The last wars of Europe have been wars of the people, and have been fought by nationalities. After peace armies remain national, for their elements are taken from the people, and are returned to the people by legal liberations. The institution of conscription is evidently the most important of modern times. Among other advantages, it has bridged the otherwise impassable gulf between the citizen and soldier, who, children of the same family, are now united in defence of their country. Permanent armies have ceased to be the personal guard of kings, but their sympathies are always with the people, and their just title is that of skilful warriors maintained as a nucleus for the instruction of their countrymen in the highest school of art. (*See* CONSCRIPTION; DEPOT; DEFENCE, *National*; ENLISTMENT; MILITIA; RECRUITING; RE-ENLISTING; VOLUNTEERS.)

RALLY. To re-form disordered or dispersed troops.

RAMP. A ramp is a road cut obliquely into or added to the interior slope of the rampart, as a communication from the town to the terre-plein.

RAMPART. A broad embankment or mass of earth which sur-

rounds a fortified place, and forms the *enceinte* or body of the place. On its exterior edge the parapet is placed, while towards the place it is terminated by the interior slope of the rampart, on which *ramps* are made for the easy ascent of the troops and material.

RAMROD. The rod of iron used in loading a piece to drive home the charge.

RANGES. The extreme ranges of smooth-bored guns firing solid shot may be considered to vary, according to their size, from 2,000 to 4,000 yards. These great ranges are only attained by firing at great elevations, and the practice at such distances is consequently uncertain. Ranges of 1,000 to 1,200 yards for field-guns and of 1,500 to 2,000 yards for heavy guns are as great as can be secured with any thing like accuracy. It seems, however, more than probable, that smooth-bored guns will, before long, be altogether superseded by rifled ordnance, and reasoning from what has been already accomplished, we may at least expect to double the present ranges, and greatly to increase the accuracy of fire. The ranges of grape-shot are equal only to the ranges of the individual balls of which the grape-shot is composed; they are, therefore, subject to considerable variation, according to the dimensions of the gun from which the grape is discharged. The most effective ranges for grape-shot may be considered to lie between 300 and 600 yards. The range of canister-shot is very limited. From the small size of the bullets they rapidly lose their initial velocity. At ranges below 300 yards canister-shot against bodies of troops is very destructive. Spherical-case shot is effective at much greater ranges than canister or grape shot. It may be employed with good effect at any distance between 600 and 1,500 or even 1,800 yards. The ranges of shells vary according to their size from 1,000 to 4,000 yards. They are fired either from mortars or guns. With the method of firing them from mortars at an elevation of 45°, with a charge of powder proportioned to the range desired, any great accuracy of practice is not to be expected. (*See* ARTILLERY; COLUMBIAD; FIRING; RIFLED ORDNANCE; SPHERICAL CASE.)

RANK. A range of subordination; a degree of dignity. *Rank* also means a line of soldiers, side by side. *Ranks* in the *plural*, the order of common soldiers. Questions as to the positive or relative rank of officers may often be of the greatest importance at law, in consequence of the rule, that every person who justifies his own acts on the ground of obedience to superior authority must establish, by clear evidence, the sufficiency of the authority on which he so relies. There may also be many occasions on which the propriety of an officer's

assumption of command, or his exercise of particular functions, or his right to share with a particular class of officers in prize-money, bounties, grants, and other allowances, may depend on the correctness of the view taken by himself or others of his right to a specific rank or command; and an error in this respect may expose him to personal loss and damage in suits before the civil tribunals.

The regulation of military rank is vested absolutely in Congress, which confers or varies it at pleasure. The will of Congress in this respect is signified by the creation of different grades of rank; by making rules of appointment and promotion; by other rules of government and regulation; or is by fair deduction to be inferred from the nature of the functions assigned to each officer; for every man who is intrusted with an employment, is presumed to be invested with all the powers necessary for the effective discharge of the duties annexed to his office.

Rank and Grade are synonymous, and in their military acceptation indicate rights, powers, and duties determined by laws creating the different degrees of rank, and specifying fixed forms for passing from grade to grade; and when rank in one body shall give command in another body; and also when rank in the army at large shall not be exercised. Rank is a right of which an officer cannot be deprived, except through forms prescribed by law. When an officer is on DUTY, his rank itself indicates his relative position to other officers of the body in which it is created. It is not, however, a perpetual right to exercise command, because the President may, under the 62d Article of War, at any time relieve an officer from duty; or an officer may be so relieved by arrest duly made according to law; or by inability to perform duty from sickness, or by being placed by competent authority on some other duty. But whenever an officer is on duty his rank indicates his command.

During the Mexican war, an attempt was made to procure the passage of a law creating the rank of lieutenant-general, in order that Mr. Senator Benton might be placed in command of the army with that rank. Congress, however, refused to create the rank. The President then sought to obtain the passage of a law authorizing him to put a junior major-general in command of a senior. Congress likewise refused him that power. On the 9th of March, Mr. President Polk, in a letter to Mr. Senator Benton, thus writes:

"Immediately after your nomination as major-general had been unanimously confirmed by the Senate, I carefully examined the question, whether I possessed the power to designate you, a junior major-general,

to the chief command of the army in the field. The result of the examination is, I am constrained to say, a settled conviction in my mind, that such power has not been conferred on me by existing laws."

Struggle as commentators may, who desire to subject rank to executive caprice, rather than have its powers and duties defined by law, as the constitution requires in giving to CONGRESS the power to make rules for the government and *regulation* of the army, the rights of rank cannot, without usurpation, be varied at the will of the President. The law has created rank. Rank means a range of subordination in the particular body in which it is created. It is, therefore, effective in that body, without further legislation, and its effect, when the officer is present for duty, is extended beyond that particular portion of the army in which the officer holds rank, or its exercise is restricted within a corps only by legislation. Executive authority cannot make rank vary at will, but whatever authority the executive has over rank must be determined by law. A reference to the 62d Article of War will show that the President is given the authority to limit the discretion of commanding officers, in special cases, in respect to what is needful for the service, and also to relieve the senior officer from any command, so that the command may fall upon the next officer in the line of the army, marine corps, or militia, "by commission there on duty or in quarters," or assign some senior to duty with troops, in order that such officer may become entitled to command under the 62d Article of War. Any power of *assignment* claimed for the President beyond this is not and ought not to be sanctioned by law. The 62d Article extends the validity of commissions in any part of the line of the army, marine corps, or militia, and thus enables the senior officer of the line of the army present for duty to command the whole when different corps come together—while the 61st Article provides that in the regiment, troop, or company, to which officers belong, although they may also hold higher commissions in the army at large, they shall nevertheless do duty and take rank both in courts-martial and on detachments, which shall be composed only of their own corps, according to the commissions by which they are mustered in said corps.

The legislation on the subject of rank is thus complete. Officers, when serving only with their own regiment, serve according to their regimental rank; but when with other corps, the senior by commission in the line, whether by brevet or otherwise, is entitled to command. (*See* ASSIGNMENT.)

RASANTE—is a French term, applied to a style of fortification, in which the command of the works over each other, and over the

country, is kept very low, in order that the shot may more effectually sweep or graze the ground before them.

RATCHET-WHEEL. A wheel with pointed and angular teeth, against which a ratchet abuts, used either for converting a reciprocating into a rotatory motion on the shaft to which it is fixed, or for admitting of its motion in one direction only.

RATION. The President may make such alterations in the component parts of the ration as a due regard to the health and comfort of the army and economy may require; (*Act* April 24, 1818.) The allowance of sugar and coffee to the non-commissioned officers, musicians, and privates, in lieu of the spirit or whiskey component part of the ration, shall be fixed at six pounds of coffee and twelve pounds of sugar to every one hundred rations, to be issued weekly, when it can be done with convenience to the public service, and when not so issued, to be paid for in money; (*Act* July 5, 1838.)

Women not exceeding four to a company, and such matrons and nurses as may be necessarily employed in the hospital, one ration each; (*Act* March 16, 1802.) The President may authorize rations to be issued to Indians visiting military posts; (*Act* May 13, 1800.) (*See* PAY; WAGON.)

TABLE, SHOWING THE WEIGHT AND BULK OF 1,000 ARMY RATIONS.

One thousand rations of	Nett weight in pounds.	Gross weight in pounds.	Bulk in barrels.	100 rations consist of
Pork	750	1,218.75	3.75	75 lbs., or
Bacon	750	903.19	4.90	75 lbs.
Flour	1,125	1,234.06	5.74	112.5 lbs., or
Pilot Bread	750	921.69	9.03	75 lbs., or
"	1,000	1,228.91	12.05	100 lbs. In the field.
Beans	155	177.32	0.71	8 quarts, or
Rice	100	114.50	0.46	10 lbs.
Coffee	60	70.90	0.35	6 lbs.
Sugar	120	135.62	0.50	12 lbs.
Vinegar	92.5	107.50	0.33	4 quarts.
Candles	15	17.50	0.09	1½ lbs.
Soap	40	46.89	0.19	4 lbs.
Salt	33.75	38.63	0.16	2 quarts.

FORAGE.

14 lbs. hay or fodder,
12 qts. oats, or
8 qts. corn
} per horse per day.

When pressed 11 lbs. to cubic foot.
40 lbs. to bush., 33.14 lbs. cub. foot.
55 lbs. to bush., 45.65 lbs. cub. foot.

Average mule pack, New Mexico, 175 lbs.

Average load to mule team across the prairies, 2,000 lbs.

RAVELIN—is the work constructed beyond the main ditch, op-

posite the curtain, composed of two faces, forming a salient angle, and two demi-gorges, formed by the counterscarp. It is separated from the covered way by a ditch which runs into the main ditch.

RAVELIN, (REDOUBT OF THE)—is a work constructed within the ravelin, but separated from it by a ditch.

RAZED. Works or fortifications are said to be razed, when they are totally demolished.

READINESS. A state of alertness or preparation; thus, to *hold a corps in readiness*, is to have it prepared in consequence of some previous order to march at a moment's notice.

REAR, REAR RANK. The hinder rank.

REAR GUARD. A detachment of troops in the rear of an army.

RECEIPT. A voucher or acknowledgment, which should always be given when official papers are received. When flags of truce are the bearers of a parcel or a letter, the officer commanding at an outpost should give a receipt for it, and require the party to depart forthwith.

RECOIL. The motion which a cannon takes backward when fired.

RECOMMENDATIONS. All members of a court who concur in recommendations to mercy sign. The recommendation is introduced after the finding and sentence are closed and authenticated. The recommendation should distinctly set forth the reasons which prompt it; (HOUGH.)

RECOMPENSE. (*See* ALLOWANCE; GRATIFICATION; INDEMNITY; PAY.)

RECONNOISSANCE, RECONNOITRE, RECONNOITRING, —may be distinguished into reconnoissance of the enemy, and topographical reconnoissances.

Reconnoissances are warlike operations for the purpose of procuring information of the positions and strength of corps of the enemy. Without such knowledge, no well-concerted measures of attack or defence can be made. First of all, notes of information are gained from spies, deserters, and travellers, and the position of the different corps of the enemy is marked out upon a good map. But when the opposing armies are more nearly approximated, it becomes necessary to ascertain, every day, what changes and movements have taken place, whether for purposes of concentration or withdrawal to other points. Reconnoissances by force result from this necessity, and lead sometimes to bloody actions.

The custom is almost universal to cover an army by outposts, and to detach clouds of light troops to mask the camp and prevent an enemy from seeing what dispositions are made for attack or defence. To gain

information, it is therefore necessary to *push* a reconnoissance through the curtains of light troops, by which the enemy has enveloped himself, and drive back or cut off outposts, so as to enable the officer charged with the reconnoissance clearly to see the *army* of the enemy, note the advantages and disadvantages of his positions, count his battalions, and judge of his means of resistance: whether he is intrenched, what artillery he has; whether the ground is or is not favorable for cavalry; where the cavalry is encamped, &c. These different objects ought to be seen rapidly and by a practised eye, for the reconnoissance will have called to arms a greatly superior force, and it is necessary as soon as possible to fall back. But the aim will have been attained, for the enemy having been compelled to unmask and deploy his forces, the reconnoitring officer will know all that he desires, and consequently hastens his return to camp, in order that his party may not be exposed to have its retreat cut off.

Similar reconnoissances ordinarily precede battles. By their means a general is assured of the true state of the enemy, before giving his last orders. On a march, the advance guard reconnoitres the enemy. Sometimes a reconnoissance has for its object to discover if a point is solidly occupied; if a bridge over which an army is to pass has been broken; whether a defile is fortified; whether the enemy has guns in any particular position; whether he is in a certain city, or whether he has followed such and such routes after losing a battle, &c., &c. Such reconnoissances are often made by small parties of cavalry alone to ensure rapidity; but if resistance is anticipated or foreseen, the party must consist of all arms, or be constituted according to circumstances, and the command be given to an experienced officer.

The commander of a reconnoissance ordinarily receives written instructions. He should well understand the object before him, and demand such explanations as he may require. He is furnished with a good map, a telescope, writing materials, and means of making field-sketches of the positions of the enemy. He secures two or three inhabitants of the country to serve as guides, and to answer his inquiries relative to the names and populations of villages, the nature of the roads, the extent of woods, the condition of water-courses, ground, &c. He ought to be accompanied by an officer who knows the language of the country, and he should, before commencing his march, inspect the troops intrusted to him to satisfy himself of the good condition of their arms, ammunition, and provisions.

The detachment charged with pushing a reconnoissance marches with its advance guard and flankers; stops all persons who would

precede it, and might give information of its march; questions inhabitants of villages, and, if necessary, takes hostages to secure true information. The attention of the commander is particularly directed to the ground over which he passes, to determine, in advance, points where a stout resistance may be made in the event of his being obliged to fight when making his retreat. He frequently consults his map to ascertain its fidelity to the country over which he passes, and notes its variations. The detachment pushes forward, using all necessary precautions, without fear of compromising itself, attacking boldly such antagonists as present themselves, until the information has been gained for which it was despatched.

There are other reconnoissances made by small detachments, which employ stratagem rather than force, and which consequently ought to shun any engagement that can be avoided. In strong reconnoissances or reconnoissances by force, on the contrary, the aim is to penetrate to the positions of the enemy, and the design must not be permitted to fail by an accidental meeting with troops; but, profiting by such good fortune, the opposing troops must be overthrown, prisoners made who will give useful information, and the fugitives rapidly followed to the outposts, which will probably be in confusion at the repulse of the detachment. The line of the enemy is then soon pierced, and his corps will be soon seen deployed to repulse the attack. The commandant of the reconnoissance ought now to seek some elevated point from which he can gain a good knowledge of the force and positions of the enemy, and make, or have made by officers who acccompany him, a rapid sketch of the ground and the positions of the enemy. When once this object has been gained, a retreat must be sounded even in the middle of the combat. And it is under such circumstances that skill and prudence guide courage; and *sang-froid* is absolutely indispensable. The object of the reconnoissance is to gain information. Boldness must be employed to attain that end; but, if in the hope of surprising a post, carrying off a convoy, or destroying troops, the commander forsakes his route and loses time, it is a violation of duty; he is blamable, even if success attends his enterprise.

Secret reconnoissances are conducted on different principles. They are ordinarily composed of a single kind of troops; of cavalry in flat, open districts, and of infantry in mountainous or intersected countries. The detachment marches with caution. If the *eclaireurs* announce the approach of an enemy, it endeavors to avoid observation by the shelter furnished by woods or any accident of ground at hand; or else escaping by a prompt retreat if necessary; or, if near its own outposts, and the

enemy is in strength, sending back information, and retarding the column of the enemy as much as possible, by simulating strength.

When the commandant of such a reconnoitring party has reached his destination without hindrance, he holds his men concealed behind some curtain, such as a clump of trees, an old wall or ditch, and followed only by a few men in echelons, he takes some elevated position with his guide and two or three soldiers, whence he can observe the enemy. He notes what he sees, with the explanations of his guide. If the positions of the enemy are well seen, he makes sketches, which are always valuable even when very rough. He must not be imposed on by first appearances, but examining with *sang-froid*, he endeavors to seize exact ideas, and exposes himself when necessary to attain his aim. Inexact knowledge or lies are worse than total ignorance. Montluc well says that discretion must be exercised in selections for such expeditions, for an inexperienced man may soon take alarm, and even imagine "bushes to be battalions of the enemy." Send always some fearless and skilful officer, and if you would do better go yourself.

When the reconnoissance is finished, the commanding officer makes a written report to the general, when his verbal account is not sufficient. This report ought to be clear, simple, and as brief as possible. The officer will state only facts of which he is perfectly sure. His conjectures will be presented with great reserve, and always as conjectures. He will guard against flights of imagination, but confine himself to realities, and will avoid speaking much of himself; but, knowing the satisfactory result of his mission must do him honor, he will bestow just praise upon his troops. (*See* SURVEY, *Military.*)

There are many *signs* which, if reported to a general and his staff, enable them to judge of what they wish to know, as clearly as if a detailed picture of the enemy were spread before them. It is necessary, therefore, that every officer and soldier should know how to mark and collect these signs. They consist, when a camp, bivouac, or cantonment is observed, in the color of coats and pantaloons; other distinctive marks, the numbers of videttes, sentinels, fires, and tents of the enemy; the frequency and direction of rounds, patrols, and reconnoissances; the nature and time of signals by trumpet or drum; the placing of signal posts; measures of straw; boughs broken off; the arrival of reinforcements; new uniforms; collections of fascines, beams, joists, ladders, boats. When a corps is watched on the march, the signs to observe are the depth and front of columns; the number of subdivisions; the sort of troops, infantry, cavalry, artillery, trains; the quickness and direction of the march; the height of the dust; the reflection

of arms; the number of the flankers and the eclaireurs. When an army ready for battle is observed, we should particularly note the number of its lines, their extent, the composition of the troops in column or in line of battle; the calibre of pieces; their position relative to cavalry and infantry; the number of skirmishers; their manœuvres; the concentration of forces or artillery on such a point; flank marches of one or many corps. If troops are followed on their march, we note the tracks of men and horses, those made by wheels, cattle, and beasts of burden; the relative positions of these tracks: whether they are regular and preserve an invariable order; whether the places where they stop have little or much space between them; whether the route passed over is covered with remains of animals; whether the skeletons of the horses are lean and sore; whether the ground is bloody; if graves have been freshly made, whether some indications may not show them to be for superior officers; whether the country has been devastated; whether the entrails of beef, mutton, or horses are seen; whether the fires are recent; whether they are numerous, and show much or little ashes; whether bridges are broken, and in what parts; whether the inhabitants of the country are anxious, sad, humble, animated, or satisfied.

Topographical reconnoissances are not less important than reconnoissances of the enemy. It is necessary to know the distances of places to combine the march of different columns, and without a knowledge of the difficulties of a route, necessary measures to overcome them cannot be prescribed. It is by special reconnoissances that such knowledge is gained, for maps are never sufficient. They do not give the nature of the soil, the quality of the roads, the condition of rivers or bridges, the thickness of forests, or the slope of mountains, &c., &c., but it is necessary to know all these things before undertaking any important enterprise. If this detailed information has not been collected in time of peace through special corps, officers of the staff, in presence of the enemy, and protected by troops, commonly make sketches, representing more or less exactly the most essential localities. Those officers, also, on the march of an army, make out itineraries, survey positions, fields of battle, and not unfrequently great extents of country.

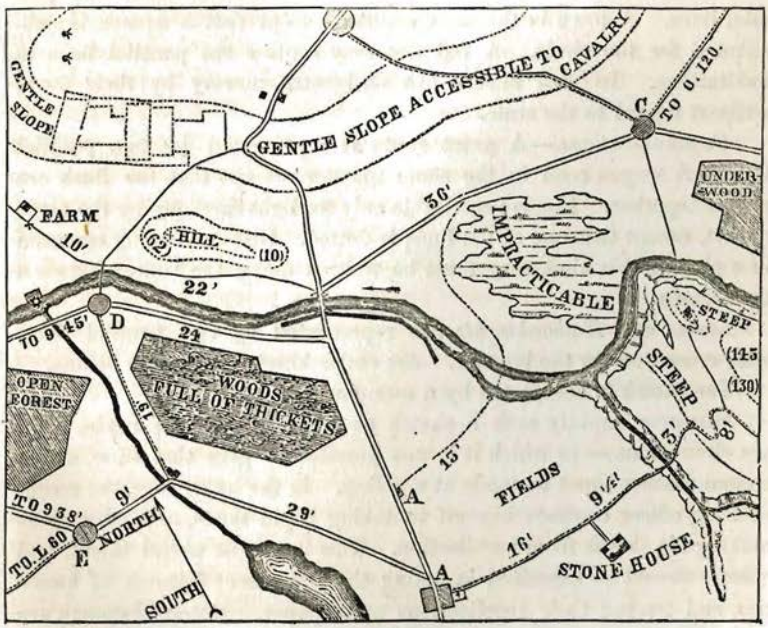
Officers of all arms, however, are liable to be placed in situations which require them to explore localities and give correct descriptions. The following means may be employed for that purpose without becoming an expert in the art of drawing. The system of showing upon plans the levels of the ground by means of contour lines is one of some utility, but it is the most difficult representation in a topographical

map. The art is only acquired by study and practice, and even with skill there is not always time for its display in the field. Instead of attempting lines to represent slopes, the contour of hills may be marked by two curves, one for the top and one for the foot of the slope, and these contour lines naturally present themselves to the eye, and are at once put upon paper, to indicate the general form of the hill. The space between these two lines is sufficient to write a few words indicating the slope, &c. Whether, for instance, the slope is gentle or steep, accessible or not to cavalry, its approximative height. In order that the lines of *circumscription* representing heights may not be confounded with other conventional signs, they must be long dots. Ciphers in parenthesis give the heights of points of the superior curve above corresponding points of the inferior curve.

Other objects, as water-courses, ponds, marshes, woods, vines, towns, villages, large farms, and other isolated constructions which may play an important part in battle, embankments, ferries, fords, stone and wooden bridges, all may be represented as in Fig. 174.

Water-courses.—Two lines, one heavier than the other, are sufficient to represent them. It is usual to add other lines between the two first.

FIG. 174.



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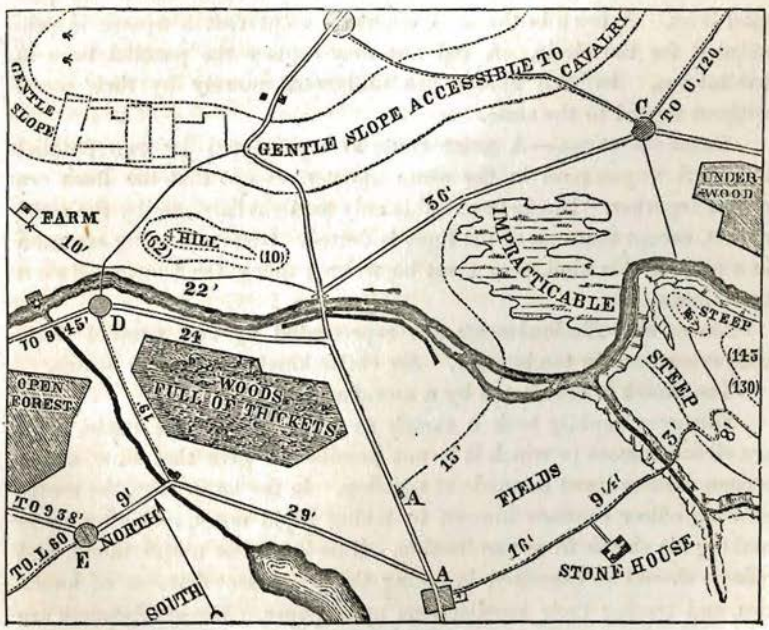
Water-courses.—Two lines, one heavier than the other, are sufficient to represent them. It is usual to add other lines between the two first.

FIG. 174.



Sometimes a blue shade advantageously takes the place of the intermediate threads. An arrow indicates the direction of the current. A mill is seen in the lower part of the river. Smaller streams empty into the river.

Means of crossing.—A ferry boat. A stone bridge, distinguished from a wooden bridge by being wider and having wings on the opposite banks. A ford, marked by dotted lines across the river.

Ponds or lakes are designated by lines of contour, and by threads or a blue tint.

Marshes.—By a line of contour, and horizontal lines in the interior, with some points representing grass in the interior. *Practicable* or *impracticable*, &c., is written.

Woods and vines.—These objects are designated by tracing the contour. If colors are used India ink will designate woods, and violet vines. Write, in the interior, the nature and characteristic circumstances of the wood; whether it is undergrowth or forest, thickset or open, &c.

Rocks.—Endeavor to imitate them, but if they present themselves in prolonged walls, the crest and foot may be designated as in the sketch. Or a few written words may give a better idea.

Habitations.—A village is represented by a circle filled with parallel lines. A town in the same manner, except that a square is substituted for the circle. A red tint may replace the parallel lines in habitations. Isolated houses are designated merely by their form, without regard to the scale.

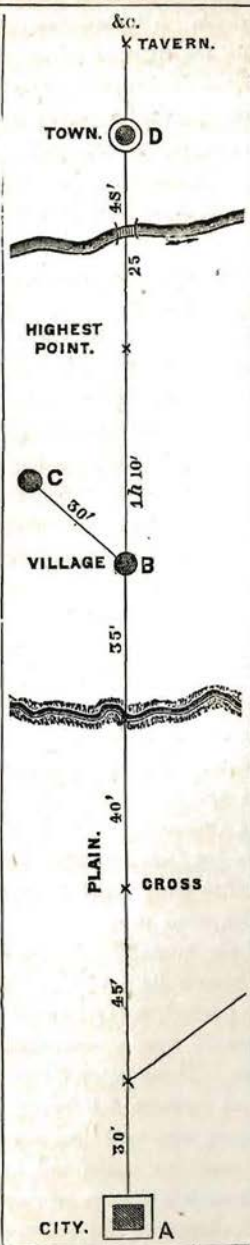
Communications.—A great route is represented by two parallel lines. A wagon road in the same manner, except that the lines are nearer together. Roads practicable only for light carriages by the same means, except that one of the lines is dotted. Distances being essential in a plan of this kind, they must be written along the routes between the objects.

Levees and Embankments are represented by two parallel lines, with cross lines in the interior. *See* embankment near stone bridge.

The sketch is completed by a meridian line.

However rapidly such a sketch as Fig. 174 may be made, there are circumstances in which it is not possible to give that time, and a reconnoissance must be made at a gallop. In the latter case, the reconnoitring officer confines himself to taking rapid notes, and afterwards making his sketch from recollection. This is a most useful talent, and officers should be exercised in noting the prominent features of localities, and tracing their recollections upon paper. Reconnoissances are

FIG. 175.



General Observations.	Conventional Signs.	Particular Observations.
&c.	&c.	&c.
	TAVERN.	Many scattered houses in the neighborhood.
Distance from A to D 4h. 50m. The route is good between these points, except next the river; there are deep ruts which must be filled.	TOWN. D	Surrounded by old walls: accommodates 8,000 men.
	48'	River is fordable. The bridge admits 10 abreast.
	25	
	HIGHEST POINT.	It is necessary to double the wagons.
	C 30' 1h 10' VILLAGE B	
	35'	Marshy stream.
Good position for defence. The front is covered by a marshy river. The flanks rest on woods, leaving an interval of 4,000 steps.	PLAIN. 40' CROSS	
	45'	Road to Y in 4½ hours. Practicable for wagons.
	30'	
	CITY. A	Not capable of defence. Can lodge 10,000 men.

ITINERARY FROM A TO X.

much simplified when confined to noting circumstances along a route, and are then called *Itineraries.* All particularities of the route are noted, whatever is remarkable on the right or left, the breadth of defiles, military positions, the steepness of slopes, what is necessary to improve a road, the distances between points in time; covers, that is, houses of all kinds are given according to their capacity of containing soldiers, &c. In itineraries, conventional signs as well as written notes are used. Itineraries are made of leaves of paper five or six inches in breadth. Leaves are subsequently united, and represent entire routes. Notes begin at the foot of the leaf, and are continued above, as in Fig. 175. (*See* also *article* JOURNAL.)

Details concerning the resources of a country must be embodied in statistical tables. The itinerary would be too much complicated by embracing them. Such information is most important, however, in supplying an army; but statistical tables, prepared with that view, should be confined to necessary objects. They should embrace details of the population of towns, inhabited houses, workmen, mills, ovens, grain, wagons, boats, horses, mules, beef cattle, with general observations which would aid the departments of supply in the performance of their duties. (Consult DUFOUR; BUGEAUD; *Aide Memoire d'Etat Major.* *See* SURVEYS, *Military or Expeditious.*)

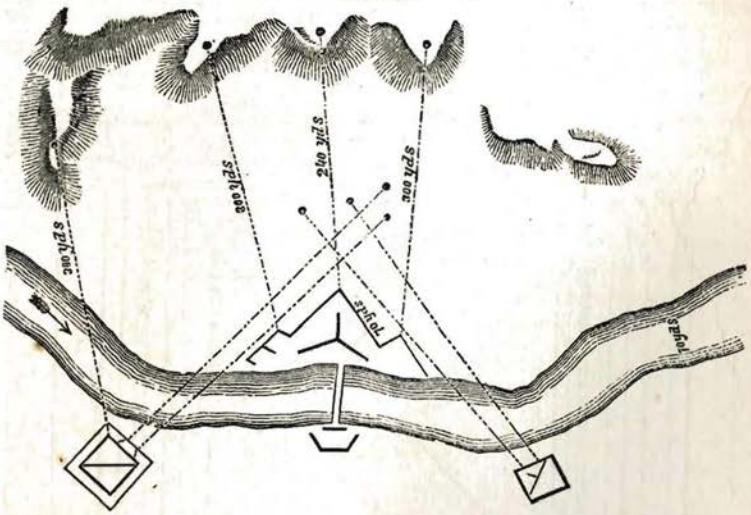
RECRUITING. The system of recruiting armies practised in England and the United States by voluntary enlistments, is vicious. In continental Europe, the obligation is acknowledged that every subject or citizen of a certain age owes military service to his country, either personally or by substitute. The government consequently annually calls for as many men as are needed for the military service. In answer to this call, lots are drawn by the whole class liable to service, and those upon whom the lot falls become soldiers for a fixed period, varying in different countries from three to eight years. The military have but little to do with such a system of recruiting. There is in France simply a council for recruiting, in each department, instituted to pronounce upon the fitness for service of those men desigated by lot. It is composed of a prefect, a commanding general, a field-officer designated by the minister of war, a councillor of the prefect, and an officer of the *gendarmerie.* Those upon whom the lot has fallen, who think that they have good reasons for being exempted, present their cases before this committee, who examine such applications, and pronounce what exemptions shall be made, and in what cases substitutes shall be admitted. With such a system of recruiting, the ranks of an army are composed of all classes of the community. Promotion from

the ranks is of ordinary occurrence. The soldier has a career before him. He is proud of his profession. The army is a national army, or an army of the people. Its sympathies are all with the people, and it is ever, as in France, a true representative of the popular sentiment.

In England, where it is the policy of the government to keep the army under the control of the aristocracy, they are logical in rejecting a system of conscription, and adhering to a system of recruiting which divides an army into two castes: the officer and the soldier. What possible reason can be given for adopting that system in the United States, is unknown. (*See* DEPOT; RAISE.)

REDAN. Small work with two faces terminating in a salient angle, used to cover a camp, the front of a battle-field, advanced posts, avenues of a village, bridge, &c. Fig. 176 exhibits a bridge-head, composed

FIG. 176.



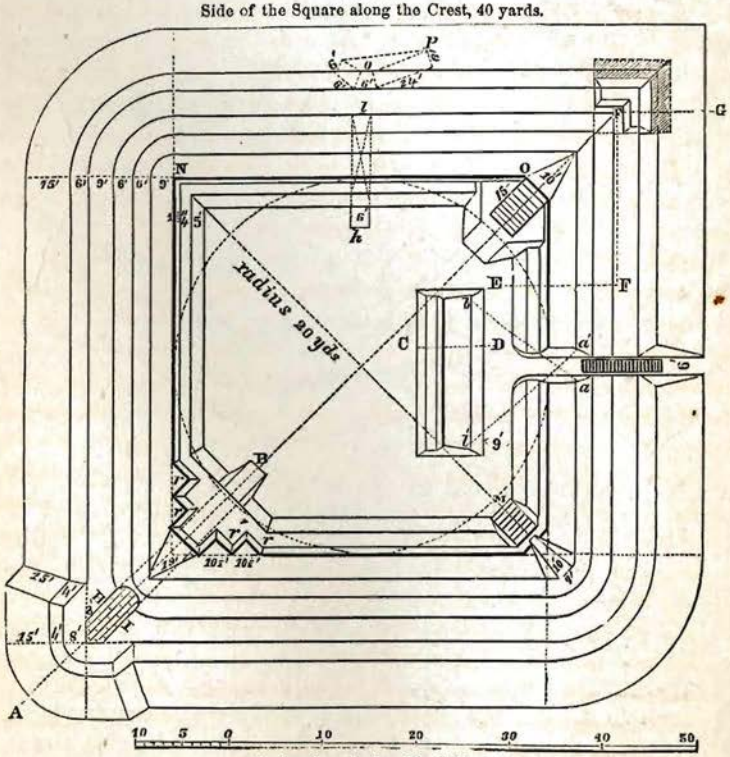
of a redan with flanks, flanked by two redoubts on the opposite bank of the river. These works are supposed to be in the neighborhood of hills, from which it is necessary that they should be defiladed. This is effected by traverses to cover the bridge, and by a traverse across the centre of each redoubt. (*See* FIELD-WORKS.)

REDOUBTS—are works inclosed on all sides of a square, polygonal, or circular figure. The latter form is rarely used, being unsuitable to ground in general, and from the impossibility of giving any flanking defence to the ditch. Redoubts on level ground are generally square or pentagonal. On a hill or rising ground their outline will, in

most cases, follow the contour of the summit of the hill. Their dimensions should be proportioned to the number of men they are to contain. One file, that is, two men, are required for the defence of every lineal yard of parapet; the number of yards in the crest line of any redoubt should not, therefore, exceed half the number of men to be contained in it. Again, as every man in an inclosed work requires 10 square feet of the interior space, that space clear of the banquette must not contain less than ten times as many square feet as the number of men to be contained in it. From these considerations it follows: 1st. To find the least number of men sufficient to man the parapet of an inclosed work, multiply the number of yards in the crest line by two. 2d. To find the greatest number of men that an inclosed work can contain, find the area, clear of the banquette, in square feet, and divide this number by 10.

When the redoubt contains guns, 324 square feet must be allowed for each gun, and this quantity, multiplied by the number of guns,

FIG. 177.
Side of the Square along the Crest, 40 yards.



Scale of yards for Fig. 177.

must be subtracted from the whole interior space. The remaining number of square feet, divided by 10, will give the number of men which the redoubt can hold. The side of a square redoubt should, under no circumstances, be less than 50 feet.

The great objections to small inclosed works are: 1st, the liability of their faces to be enfiladed from without; 2d, the difficulty of providing an effective flanking defence for their ditches; 3d, the weakness of their salient angles, the ground in front of them being undefended by a direct fire. In the preceding diagram (Fig. 177) is shown a square redoubt, having a side of 40 yards, and capable of holding four pieces of artillery, and one hundred and twenty men.

In tracing redoubts and all inclosed field works, care must be taken to direct as much as possible their faces upon inaccessible ground, so as to reduce to a minimum the effects of an enemy's enfilade, while approach on the salients must be rendered difficult by abatis, trous-de-loup, and obstacles of all available descriptions. It will henceforward be very difficult to guard the interior of inclosed works from the effects of distant musketry. Well-trained troops from a distance of 900 yards could throw with certainty every shot into the interior of even a small redoubt; while the angle at which they fall, some 15° to 20°, would enable them to sweep the whole interior and make every part of the redoubt too hot. It seems to be a question whether such a work can be protected by traverses from such a plunging fire; (HYDE'S *Fortification.*) (*See* ATTACK AND DEFENCE of field-works.)

REDRESSING WRONGS. If any officer shall think himself wronged by his colonel, or the commanding officer of the regiment, and shall, upon due application being made to him, be refused redress, he may complain to the general, commanding in the State or territory where such regiment shall be stationed, in order to obtain justice; who is hereby required to examine into the said complaint, and take proper measures for redressing the wrong complained of, and transmit, as soon as possible, to the Department of War, a true state of such complaint, with the proceedings had thereon; (ART. 34.) If any inferior officer or soldier shall think himself wronged by his captain or other officer, he is to complain thereof to the commanding officer of the regiment, who is hereby required to summon a regimental court-martial for the doing of justice to the complainant; from which regimental court-martial, either party may, if he thinks himself still aggrieved, appeal to a general court-martial. But if, upon a second hearing, the appeal shall appear vexatious and groundless, the person, so appealing, shall be punished at the discretion of the said court-martial; (ART. 35.) (*See*

INJURIES, for liability for private injuries, personal injuries, and criminal liabilities; REMEDY.)

REDUCE. To *reduce a place*, is to oblige the garrison to surrender. To *reduce to the ranks*, is when a sergeant or a corporal, for any misconduct, has his rank taken from him, and is obliged to return to the duty of a private soldier. Non-commissioned officers cannot be reduced to the ranks except by the sentence of a court-martial, or by the order of the colonel of the regiment.

RE-ENLISTING. Every able-bodied non-commissioned officer, musician, or private soldier, who may re-enlist into his company or regiment, within two months before or one month after the expiration of his term of service, shall receive three months' extra pay; (*Act* July 5, 1838.) (*See* ENLISTMENT.)

RE-ENTERING ANGLE—is an angle pointing inwards, or towards the work.

RE-ENTERING ANGLE OF THE COUNTERSCARP—is that formed by the intersection of the two lines of the counterscarp, opposite the curtain.

REFUSAL TO RECEIVE PRISONERS. No officer commanding a guard, or provost-marshal, shall refuse to receive or keep any prisoner committed to his charge by an officer belonging to the force of the United States; provided the officer committing shall, at the same time, deliver an account in writing, signed by himself, of the crime with which the prisoner is charged; (ART. 80.) No officer commanding a guard, or provost-marshal, shall release any prisoner committed to his charge without proper authority for so doing, nor shall he suffer any person to escape on penalty of being punished at the discretion of a court-martial; (ART. 81.) Every officer or provost-marshal to whose charge prisoners are committed, shall, within twenty-four hours after such commitment or as soon as he shall be relieved from guard, report in writing to the commanding officer their names, crimes, and the names of the officers who committed them, on penalty of being punished for disobedience or neglect, at the discretion of a court-martial; (ART. 82.) (*See* CONFINEMENT; PROVOST-MARSHAL.)

REGIMENT. (Lat. *rego*, I rule.) A body of troops organized by law, subject to the same administration, discipline, and duties, having a legal head and members, and composed according to arm of companies, battalions, squadrons, or batteries. (*See* ARMY for the organization of the several regiments of infantry, cavalry, and artillery.)

REGIMENTAL COURT-MARTIAL. (*See* COURT-MARTIAL.)

REGIMENTAL NECESSARIES. (*See* NECESSARIES.)

REGIMENTALS. The uniform clothing of regiments, such as coats, trousers, caps, &c.

REGULATIONS. Under the Constitution of the United States, rules for the government and *regulation* of the army must be made by Congress. Regulation implies *regularity*. It signifies fixed forms; a certain order; method; precise determination of functions, rights, and duties. (*See* ARMY REGULATIONS.) Rules of Regulation also embrace, besides rules for the administrative service, systems of tactics, and the regulation of service in campaign, garrison, and quarters. In the case of the staff departments, legislative authority has been delegated *jointly* to the President and Secretary of War. But in relation to the powers, rights, and duties of officers and soldiers in campaign, garrison, and quarters, Congress has not delegated its authority to the President, nor have such matters been *precisely* determined by military laws. Even rights of rank, command, and pay, concerning which Congress has legislated, are subjects of dispute, and variable expositions of laws regulating those essentials of good government have been given by different executives, with an increasing tendency to invalidate rank created by Congress. There can be no remedy for these encroachments, unless Congress should pass a law to enable cases to be brought before the Federal civil courts, in order that the true exposition of military statutes and authorities in dispute may be determined. With such a remedy, laws, however defective they may be, would at least be known, and rights powers, and duties established by law would be well determined.

But it may be said in relation to such rules of regulation, how can a body like Congress determine upon systems of tactics, &c.? Their constitutional duty might easily be performed as follows:—1. By clearly declaring, in a manner not to be misunderstood, that the general-in-chief is charged with the discipline and military control of the army under the rules made by Congress and the orders of the President. 2. The Secretary of War is charged with the administrative service of the army under the rules made by Congress and the orders of the President. 3. By directing the general-in-chief, with the advice of properly constituted military boards, to report to the President rules for the government and regulation of the army in campaign, garrison, or quarters, including systems of tactics for the different arms of the service. 4. By directing the Secretary of War, with the advice of properly constituted boards, to report to the President rules for raising and supporting armies; including regulations for the administrative service. 5. By directing the President to submit the rules

made in accordance with provisions 3 and 4, to another board organized by the President, with directions to harmonize the details of the several reports; which last report shall be submitted to Congress for confirmation or orders in the case. 6. By directing that each year, previous to the meeting of Congress, the following boards be assembled under the orders of the general-in-chief, viz.: a board of general staff officers; a board of artillery officers; a board of cavalry officers; and a board of infantry officers. The Secretary of War to assemble the following boards, viz.: a board of engineer officers; a board of ordnance officers; a board of medical officers; and a board of quartermasters, commissaries, and paymasters. Each of the boards so assembled to report to the general-in-chief or Secretary of War, such suggestions of improvements in their respective services as it may be desirable to adopt. 7. The repeal of all laws delegating legislative authority to the President and Secretary of War. (*See* ADMINISTRATION, and references; ARTICLES OF WAR; COMMAND; CONGRESS; GOVERNMENT, and its references; LAWS, (*Military;*) OBEDIENCE; ORDERS; ORDNANCE DEPARTMENT; SECRETARY OF WAR; SERVICE, and references; STAFF, and references.)

REJOINDER. The weight of authority is against permitting a rejoinder on the part of the prisoner, unless evidence has been adduced in the reply of the prosecutor. But such evidence should not be permitted in reply, and there should be no rejoinder; (HOUGH'S *Military Law Authorities.*)

RELEASE OF PRISONERS. (*See* REFUSE.)

RELIEF. A guard is usually divided into three reliefs. Relief is also the height to which works are raised. If the works are high and commanding, they are said to have a bold relief; but if the reverse, they are said to have a low relief. The relief should provide the requisite elevations for the musketry and artillery, to insure a good defence.

RELIEVING THE ENEMY. Whosoever shall relieve the enemy with money, victuals, or ammunition, or shall knowingly harbor or protect an enemy, shall suffer death, or such other punishment as shall be ordered by the sentence of a court-martial; (ART. 56.)

REMBLAI—is the quantity of earth contained in the mass of rampart, parapet, and banquette.

REMEDY. The rules and articles for the government of the army are defective in not providing sufficient remedies for wrongs. The army of the United States is governed by law. The law should therefore provide a sufficient remedy for cases in which the rights of officers are wrested from them by illegal regulations, purporting to interpret the true meaning of acts of Congress. In cases arising in the land and

naval forces of the United States, where the true construction of any act of Congress is in dispute, legislation is wanted to enable an officer, who thinks himself wronged by an illegal executive decision, to bring the matter before the federal civil courts to determine the true exposition of the statute or authority in dispute. (*See* REDRESSING WRONGS; SUIT.)

REPAIRS OF ARMS. (*See* DAMAGE.)

REPLY. It is the duty of a court to prevent new matter from being introduced into the prosecution or defence, but a prisoner may urge in his defence mitigating circumstances, or examine witnesses as to character or services, and produce testimonials of such facts, without its being considered new matter. If any point of law be raised, or any matter requiring explanation, the judge-advocate may explain. No other reply to be admitted; (HOUGH.)

REPORTING PRISONERS. (*See* REFUSE.)

REPRIEVE. The President of the United States has power to grant reprieves and pardons for offences against the United States, except in cases of impeachment; (*Constitution.*)

REPRIMAND. It is earnestly recommended to all officers and soldiers diligently to attend divine service; and all officers, who shall behave indecently or irreverently at any place of divine worship, shall, if commissioned officers, be brought before a general court-martial, there to be publicly *reprimanded* by the President; (ART. 2.)

REPRISALS. Acts of war to obtain satisfaction for losses or acts of retaliation. (*See* WAR.)

REPROACHFUL or provoking speeches or gestures, used by one officer to another, are punished by the arrest of the officer; in the case of a soldier, he is to be confined and ask pardon of the party offended, in the presence of the commanding officer; (ART. 24.)

REQUISITIONS. Forms prescribed for the demand of certain allowances, as forage, rations, &c. (*See* ADMINISTRATION.)

RESERVE. A select body of troops kept back to give support when needed, or to rally upon.

RESIGN; RESIGNATION. The voluntary act of giving up rank or an appointment. (*See* DISCHARGE.)

RETAINERS. All sutlers and retainers to the camp, and all persons whatsoever, serving with the armies of the United States in the field, though not enlisted soldiers, are to be subject to orders according to the rules and discipline of war; (ART. 60.)

RETREAT. Retrograde movement before an enemy; by retreat is also understood the drum-beat at sunset.

RETRENCHMENT—is an inner defensible line, either constructed in the original design, or executed on the spur of the occasion, to cut

off a breach, or other weak point; so that the capture of the latter shall not involve that of the retrenched post.

RETURNS. Every officer who shall knowingly make a false return to the Department of War, or to any of his superior officers, authorized to call for such returns, of the state of the regiment, troop, company, or garrison, under his command; or of the arms, ammunition, clothing, or other stores, thereunto belonging, shall on conviction thereof before a court-martial be cashiered; (ART. 18.) The commanding officer of every regiment, troop, independent company, or garrison of the United States, shall, in the beginning of every month, remit, through the proper channels, to the Department of War, an exact return of the regiment, troop, independent company, or garrison under his command, specifying the names of the officers then absent from their posts, with the reasons for, and the time of, their absence. And any officer who shall be convicted of having, through neglect or design, omitted sending such returns, shall be punished according to the nature of his crime, by the judgment of a general court-martial; (ART. 19.) Disbursing agents shall make monthly returns, in such forms as may be prescribed by the treasury department, of the moneys received and expended during the preceding month, and of the unexpended balance in their hands; (*Act* March 3, 1809. *See* ACCOUNTABILITY; ORDNANCE DEPARTMENT.)

REVEILLE. Drum-beat and roll-call at daybreak.

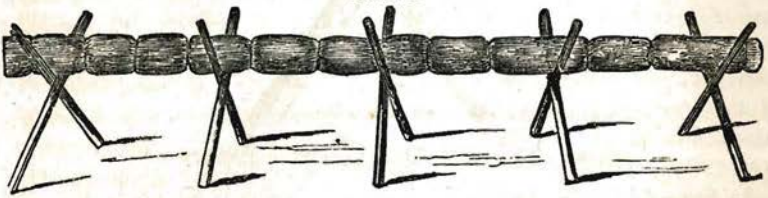
REVERSE. The reverse flank in a column is the flank at the other extremity of the pivot of a division.

REVETMENTS. The interior slopes of the parapets of permanent and field-works, as well as in some cases the sides of the ditches of the latter, require revetments to enable them to stand at that slope which is necessary, and to endure the action of the weather. The materials made use of in the construction of field-revetments are: fascines, gabions, hurdles, sod, sand-bags, and timber. In siege operations, and in fact in all operations in active warfare, vast quantities of these materials are required, and are daily consumed, in the construction of breastworks, parapets, batteries, magazines, and a variety of miscellaneous purposes. Large quantities, then, must be prepared or manufactured by the ordinary troops of the line, superintended by their own officers, who should be acquainted with all the details necessary for their production.

Fascines are strong, close, regular fagots, carefully and compactly made, generally of green brushwood. They should be straight, cylindrical, and pliant; bound round with good thick, unbroken gads or withes, of pliant wood, at equal distances, the knots well tied, and all in one line; no variation in girth exceeding 1 inch to be allowed.

Fascines are of several kinds and various dimensions, according to the purposes for which they are intended. The most common are the long fascines or saucissons, 18 feet long, 9 inches in diameter, about 140 lbs. in weight; such a fascine can be made by five men in one hour, including the cutting of the wood when at hand. Water fascines, 18 inches in diameter, 6 to 9 feet long. Trench fascines, 4 or 5 feet long, 6 inches in diameter. Sap fagots, 3 feet long, 9 inches in diameter, having a sharp-pointed stake, passed longitudinally through the centre, and projecting a foot or so beyond the extremity of the fascine. To make good fascines requires considerable practice and much care and attention, (Fig. 178.) The process is this: Stakes are driven into the

FIG. 178.

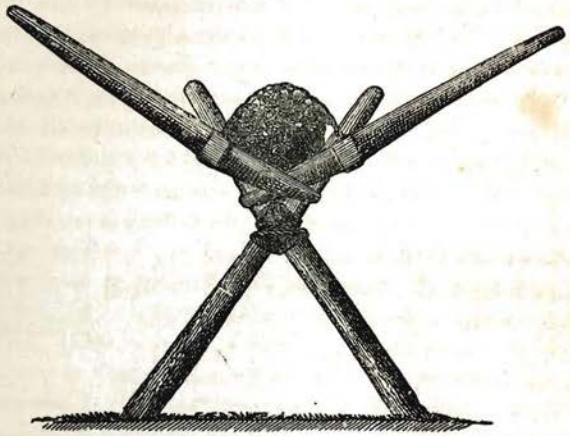


ground, obliquely, in pairs, so that the stakes in each pair cross at the same height above the ground about 3 feet, where they are firmly bound together, forming a row of trestles each in shape like the letter X. These trestles should be placed about 4 feet apart when the brushwood is good; closer together when it is bad. Thus 5 trestles at least will be requisite to prepare 18-feet fascines.

A choker must now be prepared. This is made by fastening, by an iron ring, each extremity of a chain about 4 feet long, to an ash stake. Each stake is 4 feet long, and the point where the chain is fastened is about 18 inches from the thicker end. Two small rings are attached to the chain 28½ inches apart, (equal to the circumference of the fascine,) and equidistant from its middle point. In choking the fascine, the middle of the chain is placed under it, and the ends brought over and crossed as in Fig. 179. Two men, one on each side, then bearing on the longer arms of the levers tighten the chain, and compress the fascine to the proper dimensions, that is, until the rings on the chain meet. A third man now binds the fascine as close as possible to the choker, with a strong gad, or with stout spun yarn, when the choker may be removed and the operation repeated at the proper intervals, generally 18 inches. For withes or gads to bind fascines, very straight rods must be selected; they should be 5 feet long, not thicker at the thickest part than the thumb, nor thinner at the thinnest than the little finger. To prepare them for use, place the thick end under the foot, and twist the

rod from the top downwards, by which the rod will become flexible and capable of being securely knotted without fracture. The knot to

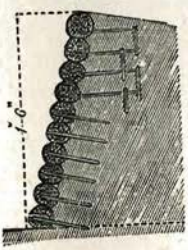
Fig. 179.



be formed in fastening the gad round the fascine is shown in Fig. 180. To make the fascine, the brushwood is laid in the trestles, the longest and straightest rods being kept round the outside, the inferior material in the middle. The proper quantity of brushwood having been thus carefully arranged, the choker is applied near the extremity of the fascine, and subsequently at intervals of 18 inches as already mentioned. The ends and exterior are now neatly trimmed by the hand saw and billhook, and the fascine is complete. When good gads or withes cannot be procured, stout, well-tarred spun-yarn may be substituted for them. With fascines are prepared bundles of stakes, called fascine pickets, in the proportion of six to each fascine; they should be 4 feet long, ½ inch in diameter, and be cut to triangular points.

Fig. 180.

Fig. 181.

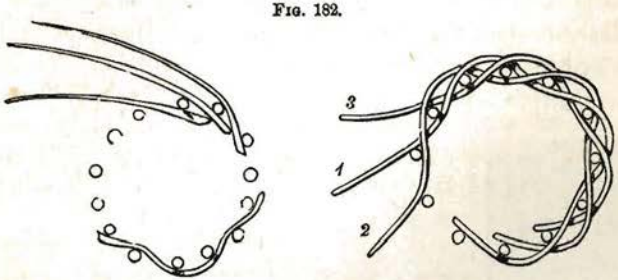


Slopes, to be revetted with fascines, have usually a base equal to one-fourth their height. The fascines are placed horizontally one over another, as the work is built, until the whole slope is covered by one layer of fascines. Pickets are driven through each fascine to secure it to the work, and these are sometimes fastened to other pickets, buried vertically in the mass of parapet, as shown in Fig.

181. To find the number of fascines required to revet any slope, divide the length of the slope by the length of the fascine, and the height of the slope by the diameter of the fascine: these two quotients multiplied together will be the requisite number.

Gabions are stout, rough, cylindrical baskets, open at top and bottom; they are made of various dimensions according to their intended use. Those for revetting the interior slopes of parapets are usually 3 feet high and 2 feet in diameter; strongly and somewhat coarsely made. Those used in sapping (called sap gabions) have about the same dimensions, but are carefully finished. To construct a gabion, a circle of 22 inches diameter must be traced on a clean, hard, level piece of ground, each quarter of this circle is then divided into four or five equal parts, and small holes made at the points of division, to receive straight uprights of 3½ feet in length, around which the withes are interwoven. Gabions may be made with one, two, or three rods woven together about the uprights; when two rods are woven together, the work is called pairing; when three, waling. The last gives the strongest gabions. The method of working will be best understood by reference to Fig.

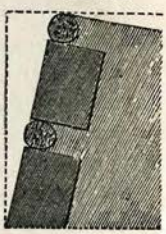
FIG. 182.



182. Each rod passes outside two, and inside one, upright, and the three are twisted together like a rope.

In revetting with gabions, a base is first made for them at right angles to the slope, so that when standing upon this, their surfaces will be coincident with the slope, (Fig. 183). When one row of gabions has been thus placed, and the parapet has risen as high as their upper surfaces, a row of fascines is laid horizontally upon the tops of the row of gabions. Above these again another row of gabions is placed at the same inclination with the former, and finally another row of fascines completes the whole. Two rows of gabions and two of fascines are required for the revetment of an interior slope, of the usual height, without a banquette, and one row of gabions

FIG. 183.



and two of fascines with a banquette; therefore, in the former case, the number of gabions required, will be equal to the number of feet of crest to be revetted, and in the latter case to half that number. The number of fascines, in either case, will be equal to twice the length of the slope divided by the length of a fascine.

Hurdles (Fig. 184) are the common coarse wicker hurdles made for farming, and other purposes, usually 3 or 4 feet high and 6 to 9 feet long. They are useful in temporary works, to retain earth at a steep slope, for a short time. When thus used, they should be secured by anchoring pickets. Hurdles are moreover useful, to form a dry footing in trenches, during wet weather; in the passage of wet ditches, and for many similar purposes. Sods or turfs are used for the formation of the interior slopes of parapets, and the cheeks of embrasures. Sods should be cut from fine close turf, with thickly matted roots, previously mown, and if possible, watered, to make the earth adhere more closely to the roots of the grass. The sods are laid, with the grass downwards, alternately headers and stretchers, like bricks in a wall. Their under or upper surfaces should be perpendicular to the slope of the parapet, and not horizontal, except in a vertical revetment, and each sod should be fastened to those beneath, by two or three wooden pegs. Sod work can be made with great perfection, and is very durable. The arrangement of the sods is shown in plan and in rear elevation in Fig. 185, and in side elevation in Fig. 186. In meadows, the dimensions of sods may be from 12 to 18 inches long, 12 inches wide, and 4 to 6 inches thick.

Fig. 184.

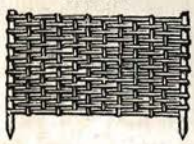


Fig. 186.

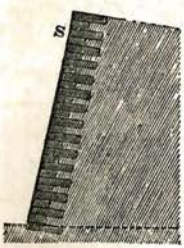
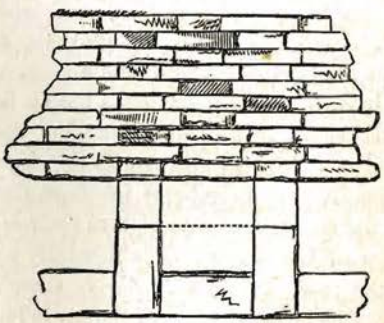


Fig. 185.



In heath, having large roots, they may be 2 feet long, 12 or 18 inches wide, and 8 to 10 inches thick. To find the number of sods required to revet any given length of slope, the revetment being one sod thick:

Divide the height of slope by thickness of sods, for the number of rows. Divide twice the length of the slope by the sum of the length and breadth of a sod for the number in one row. Multiply these two quotients together, for the whole.

Sand-bags are coarse canvas bags, of a capacity sufficient to hold about a bushel of earth; when empty they occupy only a small space, and are frequently of great use. A good field-revetment can be built with filled sand-bags, laid as sods; such a revetment, however, is only fit for temporary purposes, as the sand-bags soon rot; they are unfit for lining the cheeks of embrasures, as the flash of the guns speedily destroys them. In rocky positions, it is sometimes necessary to construct entire batteries and parallels with filled sand-bags. In Figs. 187 and 188, are shown a section of a parapet revetted with sand-bags, and an enlarged plan of the same. Many of the British trenches and batteries before Sebastopol, owing to the rocky nature of the ground, were formed of sand-bags, baskets, casks, &c., filled with earth brought from a distance. Sand-bags are used in great numbers, laid on the superior slopes of parapets, to form loop-holes for riflemen.

FIG. 187.

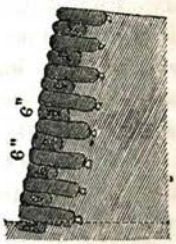
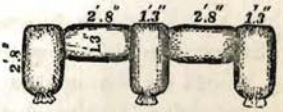


FIG. 188.



SAND-BAGS SHOULD BE TARRED, AND HOLD ONE CUBIC FOOT OF EARTH.

Timber is used for revetments, in particular cases only, as where it may be considered advisable, in important field-works, to retain the escarp of the ditch at a steep slope. In this case, a revetment is necessary, which may be constructed of beams or the trunks of small trees, planted 3 or 4 feet deep, vertically in the ground and touching each other, or by lining the surface of the slope with planks secured by stout posts, 3 or 4 feet apart, planted several feet in the ground, and there fastened to heavy horizontal beams. The strength of the revetment may be still further increased, by connecting the upper extremities of the posts to others buried under the mass of the rampart; (HYDE'S *Fortification.*)

REVIEW. Prescribed form of passing troops before a general officer, an inspector, or other reviewing personage.

REVISION. Where an officer, who orders a court-martial, does not approve their proceedings, he may, by the custom of war, return them to the court for revision, and no additional evidence can be taken on such revision; (HOUGH.)

REWARD. Thirty dollars are paid for the apprehension of deserters.

RICOCHET. Guns fired with a small charge and a low elevation, project ricochet shot, which merely clear a parapet, and thence bound along a rampart, destroying gun-carriages, &c. (*See* FIRING.)

RIFLED ORDNANCE. Rifle-muskets are wholly indebted to the elongated projectile for their efficiency and celebrity. Elongated shot possess, when their axes are coincident with the path they describe, the properties of being less resisted by the air, having longer ranges and greater penetrating power than spherical projectiles of the same diameter. To obviate the difficulty and loss of time in loading ordinary rifles, by forcing the ball into the barrel by repeated blows of the ramrod or a mallet, on account of which that arm had been little used, M. Delvigne proposed that the bullet should have sufficient windage to enter freely into the barrel, in order that, when stopped by the contraction of the chamber with which this arm was furnished, it might be forced to expand and enter into the grooves, on receiving a few smart blows; thus the piece being fired, the bullet would come out a forced, or rifle ball, without having been forced in. But this ingenious contrivance was not found to answer. The edge of the chamber on which the ball lodged, not being opposite to the direction of the blow, did not form a sufficient support upon which to flatten the ball when struck by the ramrod, and thus cause the bullet to expand; whilst portions of the charge of powder previously poured in, having lodged on the contraction, cushioned and still further impeded the expansion of the shot; and as, obviously, no patch could be used, the grooves were liable to get foul, and to become loaded, to an extent which could not be effectually obviated. To remedy this defect, Colonel Thouvenin proposed in 1828 to suppress the chamber, and substitute a cylindrical tige or pillar of steel, screwed into the breech in the centre of the barrel, so that the bullet, when stopped by, and resting upon the flat end of the pillar, directly opposite to the side struck, might more easily be flattened and forced to enter the grooves. But here another defect appeared. The pillar occupying a large portion of the centre of the barrel, and the charge being placed in the annular space which surrounds it, the main force of the powder, instead of taking effect in the axis of the piece, and on the centre of the projectile, acted only on the spherical portion of the bullet which lies over this annular chamber, and thus the ball, receiving obliquely the impulse of the charge, was propelled with diminished force. The next im-

provement, which was proposed by M. Delvigne, was to make the bottom of the projectile a flat surface; the body cylindrical, and to terminate it in front with a conical point, thus diminishing the resistance of the air comparatively with that experienced by a solid of the same diameter having a hemispherical end. The form of the projectile was, therefore, an approximation to that of Newton's solid of least resistance. (*See* PROJECTILE.) In 1841 a patent was obtained by Captain Tamisier for his method of giving steadiness to the flight of cylindro-conical shot, by cutting three sharp circular grooves each .28 inches deep, on the cylindrical part of the shot, by which the resistance of the air behind the centre of gravity of the projectile being increased, the axis of rotation was kept more steadily in the direction of the trajectory; the grooves being to this projectile what the feathers are to the arrow, and the stick to the rocket.

But the tige musket having been found inconvenient in cleaning, the pillar liable to be broken, and, after firing some rounds, the operation of ramming down so fatiguing to the men as to make them unsteady in taking aim, M. Minié, previously distinguished as a zealous and able advocate for restoring the rifle to the service in an improved form, proposed to suppress the tige, and substitute for it an iron cup, *b* (Fig. 189,) put into the wider end of a conical hollow, *a*, made in the shot: this cup being forced further in by the explosion of the charge, causes the hollow cylindrical portion of the shot to expand and fix itself in the grooves, so that the shot becomes forced at the moment of discharge. A slip of cartridge-paper is wound twice round the cylindrical part of the projectile, so that, as the latter does not become forced or rifled till the charge is fired, it fits so tightly to the barrel as to be free from any motion which would be caused by the carriage of the rifle on a march, or by its being handled before the shot is fired. But unless the cup *b* (Fig. 189) be driven, by the first action of the explosion of the charge, so far into the conical space in which it is placed, as to cause the lead to enter into the grooves of the rifle before the shot moves, there will be no rotation—the paper wrapped round the shot not sufficing for this purpose. In the experiments of 1850 it was found that the hollow part of the Minié cylindro-conical shot was very frequently separated entirely from the conical part by the force with which the cup was driven into the hollow part of the shot, and sometimes remained so firmly fixed in the barrel that it could not be extracted; but in the more recent trials

FIG. 189.

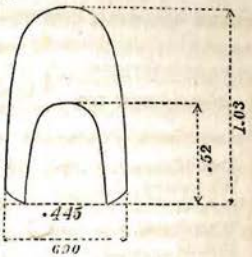
with shot made by compression and with better lead, no such failure occurred.

While efforts were being made in France to augment the power and accuracy of small-arms, loaded at the muzzle, as already described, M. Dreyse, of Sommerda, in Thuringia, was led to test whether the inconvenience of ramming down and flattening the shot might not be got rid of by loading the barrel at the breech—an old project; and he suggested a plan for this purpose, which has been adopted to a great extent in the Prussian army. The Prussian rifled musket for firing cylindro-conical shot is loaded at the breech, and is designated "zundnadelgewehr," from the ignition of the charge being produced by passing a needle through the cartridge to strike the percussion-powder placed in the wooden bottom, or spiegel. The escape of gas at the junction of the chamber and barrel is considered by all as a great objection to the needle-prime musket: it is stated that the point of the igniting-needle soon becomes furred, so that it is difficult, and, after a time, impossible, to draw it back by the thumb. The Prussians, however, appear to be quite confident of the superiority of the latter over other rifle-muskets; their government is said to have caused 60,000 stand of these arms to be executed, and at least half as many more are ordered. Their fusiliers, who are armed with the needle-prime musket, have also a short sword, with a cross hilt: this they plant in the ground; and, lying down, they use the hilt as a rest for the purpose of taking a steady aim.

It is, no doubt, in some respects, an important advantage in the Prussian rifles, that they may be loaded more quickly than the ordinary musket or rifle; but rifle actions are generally decided, not by mere rapidity of fire, but by each soldier taking time to use his arm in the most efficient manner possible. Although the use of the rifle was suspended in the French armies throughout the whole of the general war (1794–1815,) yet the French infantry, armed with the common musket, were well trained to act *en tirailleur*, and showed great aptitude for that kind of service. Good patterns having been obtained of the Delvigne carabine à tige, the French and the Belgian Minié rifles, experiments were made at Woolwich in 1851 with these three arms and with Lancaster's pillar-breech rifle, in order to test their relative merits in firing at a target 6 feet square, at 400 yards' distance. The results of these experiments fully established the peculiar advantages of M. Minié's method of quick loading, and forcing the shot into the rifled state, and a large supply of what has been called the regulation Minié musket was ordered. The form of its projectile, which is simply conoidal, is given in Fig. 190 annexed.

Mr. Lancaster, who invented the ordnance with an elliptical bore, spirally formed, and the pillar-breech rifle, proposed also a description of musket having a bore of a similar kind. No grooves are cut in the interior surface of the barrel; but in a transverse section, the bore has the form of an ellipse of small eccentricity, being *freed* at the breech: the projectile is cylindro-conoidal, with a circular base, and, when heated by the fired gunpowder, it expands so far as to take a form corresponding to the elliptical section of the bore. The bore, being a continuous spiral, fulfills the object of grooves, and causes the shot, in passing along it, to acquire a rotatory motion on its axis. The spiral is not uniform in its whole length, but has what is called by Americans a *gaining twist* or *an increasing spiral.* The advantages of this rifle are supposed to be—greater accuracy of practice, less recoil than other muskets have, and no tendency to cause the rifle to turn over sideways.

FIG. 190.



In December, 1853, a trial was made at Hythe of Mr. Lancaster's elliptically-bored muskets freed at the breech, in order to compare their shooting with that of a rifle-musket of .577 bore, having three grooves regularly spiral of one turn in 6 ft. 6 in., which was manufactured at Enfield in the same year; the report of this trial was in favor of the Enfield rifle, Lancaster's muskets evincing a strong tendency to *strip*, and at the longer ranges this defect was very marked.

In 1858, Mr. Whitworth of Manchester produced a musket having a hexagonal bore of a spiral figure, making one turn in 20 in., by which the projectiles—either of hexagonal or cylindro-conoidal form—in passing along the barrel acquire a swift and steady rotation on their axes. This species of rifle has been found considerably superior in accuracy of shooting to the Enfield rifle, which has been adopted in England.

In order to test the relative merits of these two kinds of weapons, a series of trials were made at Hythe, under the direction of Colonel Hay, the able superintendent of the school of musketry at that place, and the results are stated in the following table. The rifles were fired from rests, and ten or twenty rounds were fired from each at the several

distances. The numbers in the fourth column express, in feet and decimals, the means and the distances of the ten or twenty points of impact on the target, from a nearly central point of the group in each trial.

TABLE SHOWING THE RESULTS OF EXPERIMENTS WITH THE "WHITWORTH" AND "ENFIELD" RIFLES.

Description of Rifle.	Distance in yards.	Angle of elevation.	Mean radial deviation.	Remarks.
		° ′	Feet.	
Enfield.....	500	1 32	2.24	
Whitworth.....	.....	1 15	.37	
Enfield.....	800	2 45	4.20	
Whitworth.....	.....	2 22	1.00	
Enfield.....	1,100	4 12	8.04	
Whitworth.....	.....	3 8	2.62	
Enfield.....	1,400	.....	.....	Shooting so wild, no diagram taken.
Whitworth.....	.....	5 0	4.62	
Enfield.....	1,880	.....	.....	Not tried.
Whitworth.....	.....	6 40	11.62	

The superiority of the Whitworth rifle in accuracy of fire is hence manifest; and it may be added that, from its form, the bore is less liable to be worn than that of any grooved rifle. As the projectile may be made harder, it will, consequently, have greater penetrating power; and, in fact, the Whitworth projectile went through 35 half-inch planks of elm wood, and remained in a bulk of solid oak beyond, while the Enfield projectile went through only 12 such planks.

Till within the last twenty years, no *sight* was considered necessary for a common musket—the stud at the muzzle being sufficient for the purpose of taking aim. When percussion-arms were first introduced, a fixed block-sight for 120 yards was adopted; and subsequently a block-sight for 200 yards and a leaf for 300 yards were affixed to the two-grooved rifle. At present every English rifled musket is furnished with a complicated and delicate sight. The rifles used by the Russians at the battle of the Alma were of good construction; they have two grooves, and carry conoidal shot, each weighing 767 grains, equivalent in weight to a spherical bullet of 9 to the pound. They are flat at the base, and have projections at the sides corresponding with the grooves of the musket. The great weight of these projectiles is very objectionable; the soldiers who carry them must be very much distressed by the loads in their pouches, or these must contain a smaller number of shot than are usually carried. The Russian missile is more pointed than the English Minié shot, and no part being cylindrical, it must be liable to irregular movements in the barrel, and, consequently, to unsteadiness in its flight.

It has the designation of a Minié shot, a term now generally but improperly applied to all elongated shot for musketry, since they differ from one another both in form and weight.

The rifle used in the French service up to the commencement of the late Italian war consisted only of the carabine à tige, and these were given only to special corps of riflemen. However eminent the authority of Colonel Minié on the subject of rifles, his method of rifling was never introduced into the French service. Throughout the Crimean war, the French infantry of the line were armed with the smooth-bored regulation musket. Some time previous to the Italian campaign the whole of the French infantry had their old muskets rifled, and conical shot introduced—the rifling principle being a triangular hollow cut in the bottom of the shot, without any cup, as in the Minié system. The efficient range did not exceed 600 yards, and was very inaccurate beyond 400 yards. This imperfect measure, as admitted by the French authorities, hardly kept pace with the general improvement in small-arms; but they were restricted by considerations of economy, which did not admit of any general alteration of the muskets in store. Thus all the French infantry during the Italian campaign used these defective rifled muskets, with the exception of the chasseurs, who retained the carabine à tige, the range of which was far superior to other French musket rifles.

In 1846, iron rifled cannon, loaded at the breech, were invented by Major Cavalli and Baron Wahrendorff, for the purpose of firing cylindro-conical and cylindro-conoidal shot. In these guns the mechanical contrivances for securing the breech, are very superior to the rude processes of earlier times; yet it appears doubtful whether or not, even now, they are sufficiently strong to insure safety when high charges are used in long continued firing. The length of the Cavalli gun is 8 feet 10.3 inches; it weighs 66 cwt., and its calibre is 6½ inches. Two grooves are cut spirally along the bore, each of them making about half a turn in the length, which is 6 feet 9 inches. The chamber, which is cylindrical, is 11.8 inches long and 7.008 inches diameter.

In the summers of 1853 and 1854, trials were made at a spot between Leiny and Cirie, in Piedmont, of a rifled Cavalli gun, loaded at the breech, and with various improvements in the apparatus for loading and pointing. The gun carried cylindro-ogivale shells, each weighing 30 kilogrammes, (66 lbs. 3 oz. English,) and provided with a metal fuze. The shells were fired with charges equal to one-tenth of the weight of the projectile, at elevations varying from 5 to 25 degrees. The firing was directed against a target about 10 feet

square, and placed at the distance of 3,050 yards from the gun. In ten trials, at an elevation of 10 degrees, the mean of the ranges obtained was 3,058 yards; the means of the deviations were to the right 3.4 yards, and to the left 3.39 yards. After one rebound the shot went to the distance of 4,096 yards from the gun, with a deviation to the right equal to 126 yards. The mean time of flight was 11 seconds. In fifteen trials, at an elevation of 15 degrees, the mean of the ranges was 4,128 yards; the mean deviations were, to the right 11 yards, and to the left 1 foot 11 inches. The time of flight was 16 seconds. In fifteen trials, at an elevation of 20 degrees, the mean of the ranges was 4,917 yards; while the mean deviations were, to the right 6 yards 2 feet, and to the left 10 yards. The time of flight was 19 seconds. Lastly, in ten trials, at an elevation of 25 degrees, the mean of the ranges was 5,563 yards, while the deviations were, to the right 3 yards, and to the left 4 yards. These trials were considered highly satisfactory; and no less so were some experiments also made with metal fuzes, and with a charge equal to one-thirtieth of the weight of the projectile; the first shell so fired struck against one of the beams of the target, and tore away splinters of the wood varying in length from 1 ft. 9 in. to 1 ft. 11 in. The bursting-charge appeared to be fired a little before the moment of the shell falling.

Baron Wahrendorf invented a 24-pounder gun, which is also to be loaded at the breech. It is mounted on a cast-iron traversing carriage; and, taking little room, it appears to be very fit for casemates. The upper part of the carriage has, on each side, the form of an inclined plane, which rises towards the breech, and terminates near either extremity in a curve whose concavity is upwards. Previously to the gun being fired the trunnions rest near the lower extremity; and on the discharge taking place, the gun recoils on the trunnions, along the ascending plane, when its motion is presently stopped. After the recoil, the gun descends on the plane to its former position, where it rests after a few short vibrations. The axis of the gun constantly retains a parallel position, so that the pointing does not require readjustment after each round. The gun was worked easily by eight men, apparently without any strain on the carriage, With a charge of 8 lbs., and with solid shot, the recoil was about 3 feet, and the trunnions did not reach the upper extremity of the inclined plane, though the surface was greased.

The Armstrong gun.—In the latter part of the year 1854, Mr. William George Armstrong (now Sir William George Armstrong) submitted to the Duke of Newcastle, then Minister at War, a proposal

for a rifled field-piece on a new principle, and undertook, with his grace's authority, to construct a gun upon the plan he had suggested. This gun was completed early in the following year, (1855,) and became the subject of a long course of experiments, which ultimately led to the general introduction of the weapon into the British service. Fig. 191 shows the exterior of a 12-pounder Armstrong gun, such as is now used for field artillery, and also an end view of the same, showing the hole through the breech-screw for loading and sponging the gun. These guns can be fired with careful aim twice in a minute, and fully three times per minute without aim.

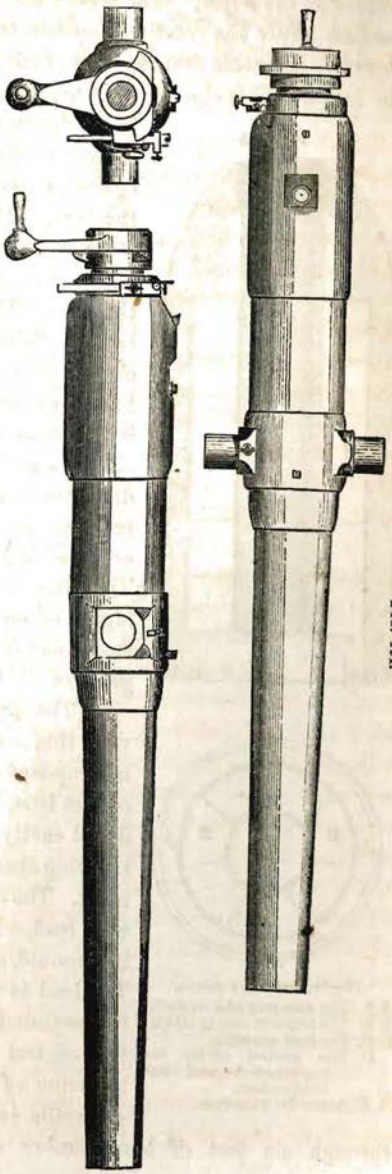


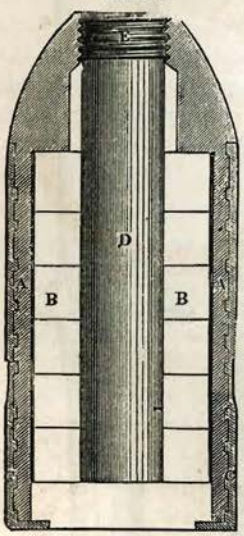
FIG. 191.

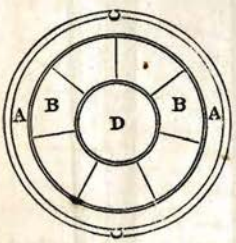
The following description of the Armstrong gun, as now manufactured, was given by Sir William in the discussion which recently took place at the Civil Engineers' Institute.

"The gun is composed wholly of wrought iron, and the prominent feature in its manufacture is the application of the material in the form of long bars, which are coiled into spiral tubes, and then welded by forging. For the convenience of manufacture, these tubes are made in lengths of from 2 to 3 feet, which are united together, when necessary, by welded joints. From the muzzle to the trunnions the gun is made in one thickness, and is therefore, so far as that portion is concerned, strictly analogous to the barrel of a fowling-piece.

Behind the trunnions two additional layers of material are applied. The external layer consists, like the inner tube, of spiral coils; but the intermediate layer is composed of iron slabs bent into a cylindrical form and welded at the edges. The reason for this distinction is, that the intermediate layer has chiefly to sustain the thrust on the breech, and it is therefore desirable that the fibre of the iron should be in the direction of the length, while elsewhere in the gun it is more advantageously applied in the transverse direction. The back end of the gun receives the breech-screw, which presses against a movable plug, or stopper for closing the bore. This screw is hollow, and when the stopper is removed, the passage through the screw may be regarded as a prolongation of the bore. The screw is turned by means of a handle, which is free to move through half a circle before it begins to turn the screw. It has thus a certain amount of run, which enables it to act as a hammer, both in tightening and slackening the screw. The bore is 3 inches in diameter, and is rifled with thirty-four small grooves, having the driving side rectangular and radial, and the opposite side rounded. The bore is widened at the breech end one-eighth of an inch, so that the shot may enter freely and choke at the commencement of the grooves.

FIG. 192.



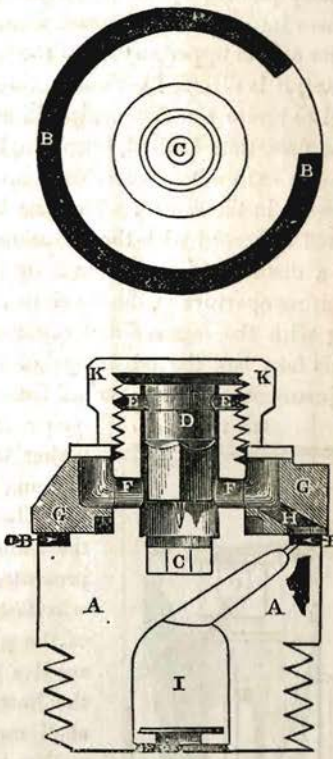


12-PDR. SEGMENT SHELL.
A A. The cast-iron case or shell.
B B. The segment shot in layers.
C C. The lead covering.
D. The central cavity for bursting-tube, and concussion-fuze.
E. Screw for time-fuze.

"The projectile (Fig. 192) consists of a very thin cast-iron shell, the interior of which is composed of forty-two segment-shaped pieces of cast iron, built up in layers around a cylindrical cavity in the centre, which contains the bursting-charge, and the concussion arrangement. The exterior of the shell is thinly coated with lead, which is applied by placing the shell in a mould, and pouring melted lead around it. The lead is also allowed to percolate among the segments, so as to fill up the interstices, the central cavity being kept open by the insertion of a steel core. In this state the projectile is so compact that it may be fired through six feet of hard timber without injury; while its resist-

ance to a bursting force is so small, that less than one ounce of powder is sufficient to break it in pieces. When this projectile is to be used as a shot, it requires no preparation, but the expediency of using it in any case otherwise than as a shell, is much to be doubted. To make it available as a shell, the bursting-tube, the concussion arrangement, and the time-fuze, are all to be inserted; the bursting-tube entering first and the time-fuze being screwed in at the apex. If then the time-fuze be correctly adjusted, the shell will burst when it reaches within a few yards of the object; or, failing that, it will burst by the concussion arrangement, when it strikes the object, or grazes the ground near it. Again, if it be required to act as "canister," upon an enemy close to the gun, the regulator of the time-fuze must be turned to zero on the scale, and the shell will then burst at the instant of quitting the gun. In every case the shell on bursting spreads into a cloud of pieces, each having a forward velocity equal to that of the shell at the instant of fracture. The explosion of one of these shells in a closed chamber, where the pieces could be collected, resulted in the following fragments:—106 pieces of cast iron, 99 pieces of lead, and 12 pieces of fuze, &c.; making in all 217 pieces. The construction of the time-fuze and the concussion arrangement are described as follows:—The body of the time-fuze (Fig. 193) is made of a mixture of lead and tin, cast to the required form, in a mould. The fuze-composition is stamped into a channel forming nearly an entire circle round the body of the fuze, and is afterwards papered and varnished on the external surfaces. As the shell fits accurately into the gun, there is no passage

FIG. 193.

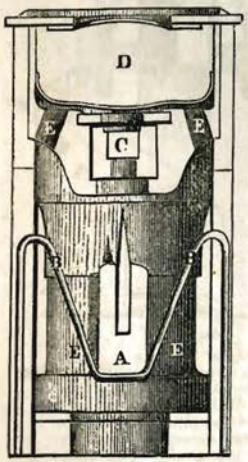


TIME-FUZE.

A A. The body of the fuze.
B B. Groove containing fuze-composition.
C. The detonator.
D. The striker.
E E. The holding pin.
F F. The flame passage.
G G. Revolving cover, or regulator.
H. Igniting aperture.
I. Chamber for priming-powder.
K K. Tightening cap.

of flame by which the fuze could be ignited. That effect is therefore produced in the following manner: A small quantity of detonating composition is deposited at the bottom of the cylindrical cavity in the centre of the fuze, and above this is placed a small weight, or striker terminating in a sharp point presented downwards. This striker is secured in its place by a pin, which, when the gun is fired, is broken by reason of the vis inertiæ of the striker. The detonator is then instantly pierced by the point, and thus fired. The flame thus produced passes into an annular space, formed within the revolving cover, which rests on the upper surface of the fuze-composition, and from this annular space, it is directed outwards, through an opening, so as to impinge on and to ignite the fuze-composition, at any required part of the circle. The fuze, thus ignited, burns in both directions, but only takes effect at one extremity, where it communicates with a small magazine of powder in the centre. The fuze is surrounded by a scale-paper, graduated to accord with the elevation of the gun, so that when the range of a distant object is found by trial, it is only necessary to turn the igniting aperture of the cover to the point on the fuze-scale corresponding with the degrees and minutes of elevation on the tangent-scale. This fuze has the advantage of being capable of adjustment and readjustment any number of times, before entering the gun, and the officer in command has the opportunity of seeing that it is correctly set, at the moment of being used.

FIG. 194.



CONCUSSION-FUZE

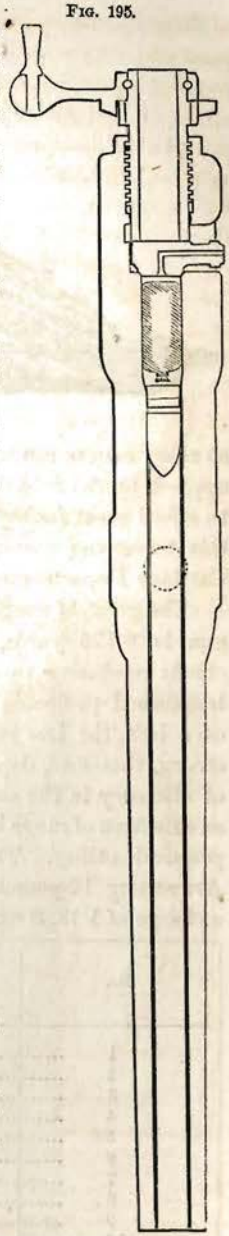
A. The striker.
B B The holding wire.
C. The detonator.
D. The chamber for priming-powder.
E E. Flame passages.

"The concussion-fuze (Fig. 194) is on nearly the same principle. A striker with a point, presented upwards, is secured in a tube by a wire fastening, which is broken on the firing of the gun; the striker, being then liberated, recedes through a small space, and rests at the bottom of the tube, but as soon as the shell meets with any check in its motion, the striker runs forward and pierces the detonator in front, by which means the bursting-charge is ignited. The process of loading is effected by placing the projectile, with the cartridge and a greased wad, in the hollow of the breech-screw, and thrusting them either separately or collectively, by a rammer, into the bore opposite; (Fig. 195.) The stopper is then dropped into its place, and secured by half a turn of the screw. The gun is fired by the ordinary friction-tube, the vent being

contained in the stopper. The whole operation is simple, and can be very rapidly performed.

"In the early guns it was necessary that the portion of the bore which was occupied by the shot should be perfectly clean, otherwise the shot would not always enter its place. A wet sponge had therefore to be used; but in the new guns, now issued for service, a slight alteration in the bore has enabled a greased wad to be employed with perfect effect, in substitution of the wet sponge. The gun can now be fired with great rapidity, and apparently for any length of time, without being sponged at all. The reason for making the vent in the stopper is, that, since the chief wear of the gun always takes place at the vent, it is better to make it in a part which can be easily replaced, than in the body of the gun itself. The breech-screw being internal is never exposed to injury, nor can drifting sand, or dust, ever reach the oiled surfaces, so as to impede the action of the screw by adhering to the lubrication. The screw is of small diameter, and the few inches of extra length in the gun, required for its reception, cannot be of any importance, considering that any further reduction of weight is prohibited by recoil. The stopper is secured from falling by a chain, but in practice it is preferred to leave it loose. The man who fires the gun lifts the stopper after each round, and in so doing only occupies time that would otherwise be vacant. A duplicate stopper accompanies each gun. The form of carriage which was originally used, is represented in the following diagram, (Fig. 196.) It was fitted with a recoil slide, which was afterwards abandoned for field guns; but it has been decided that the principle should be retained in ship guns, (Fig. 197.) It is a point of great importance, that a breech-loading gun should be self-acting, in recovering its position after recoil, so as to obviate the employment of

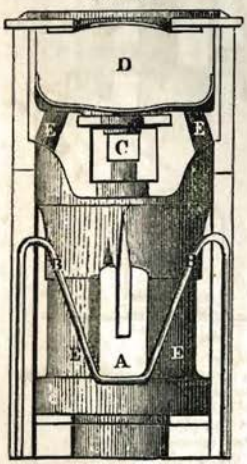
FIG. 195.



Sectional view of the Armstrong Gun; exhibiting the interior, containing the elongated projectile, the greased wad, and the cartridge, ready for discharge.

of flame by which the fuze could be ignited. That effect is therefore produced in the following manner: A small quantity of detonating composition is deposited at the bottom of the cylindrical cavity in the centre of the fuze, and above this is placed a small weight, or striker terminating in a sharp point presented downwards. This striker is secured in its place by a pin, which, when the gun is fired, is broken by reason of the vis inertiæ of the striker. The detonator is then instantly pierced by the point, and thus fired. The flame thus produced passes into an annular space, formed within the revolving cover, which rests on the upper surface of the fuze-composition, and from this annular space, it is directed outwards, through an opening, so as to impinge on and to ignite the fuze-composition, at any required part of the circle. The fuze, thus ignited, burns in both directions, but only takes effect at one extremity, where it communicates with a small magazine of powder in the centre. The fuze is surrounded by a scale-paper, graduated to accord with the elevation of the gun, so that when the range of a distant object is found by trial, it is only necessary to turn the igniting aperture of the cover to the point on the fuze-scale corresponding with the degrees and minutes of elevation on the tangent-scale. This fuze has the advantage of being capable of adjustment and readjustment any number of times, before entering the gun, and the officer in command has the opportunity of seeing that it is correctly set, at the moment of being used.

FIG. 194.



CONCUSSION-FUZE

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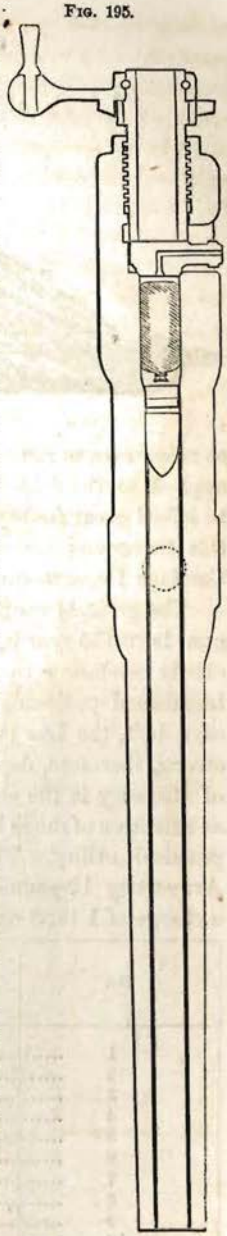
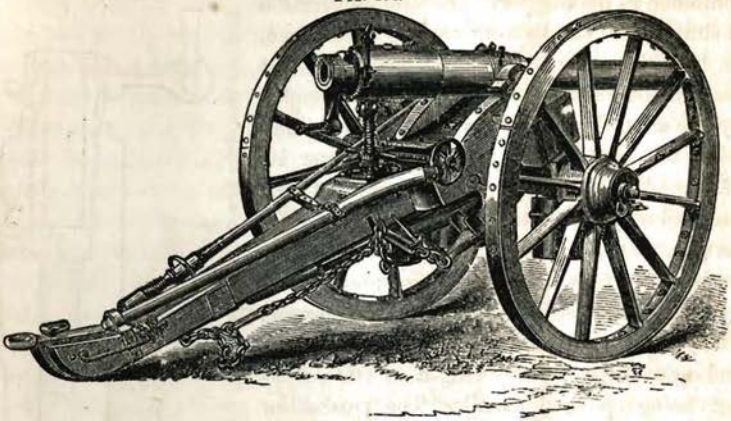
FIG. 195.



Sectional view of the Armstrong Gun; exhibiting the interior, containing the elongated projectile, the greased wad, and the cartridge, ready for discharge.

Fig. 196.

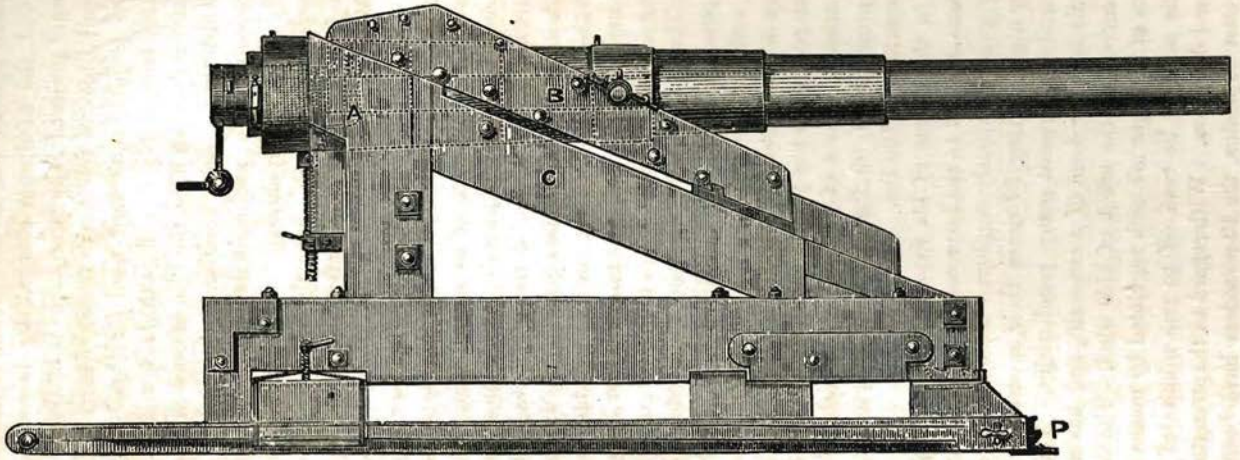


so many men to run out the gun. A traversing movement was originally applied to the field-carriages, as shown in the diagram, and was found to afford great facility in laying the gun. A very neat modification of this traversing movement has recently been contrived in the Royal Carriage Department, and adopted for the field carriages."

The greatest range which has yet been attained with the Armstrong gun is 9,175 yards, or nearly $5\frac{1}{4}$ miles. The conditions which are chiefly conducive to an extended range are, a small bore and a very lengthened projectile; but the more a projectile assumes the character of a bolt, the less suitable it becomes for a shell. Sir William Armstrong, therefore, deprecates any further increase of range at expense of efficiency in the shell; and, indeed, it may well be doubted whether an extension of range beyond a distance of five miles would prove of any practical utility. The following is an example of practice with the Armstrong 12-pounder field-gun of 8 cwt., at an angle of 5° and with a charge of 1 lb. 8 oz.

No.	Range.	Deflection.	
		Left.	Right.
	Yards.		
1	1920		1 ft.
2	1910		1 ft.
3	1909	In line.	
4	1923	1 ft.	
5	1945	3 ft.	
6	1923	3 ft.	
7	1906	3 ft.	
8	1911	3 ft.	
9	1903	2 ft.	
10	1921	4 ft.	
11	1918	2 ft.	
12	1924	6 ft.	

Fig. 197.



THE ARMSTRONG GUN MOUNTED FOR SEA SERVICE.

A. The breech-stopper.
B. The upper carriage, which recoils on the incline C.
P. The pivot bolt, which connects the Armstrong carriage with the common slide.

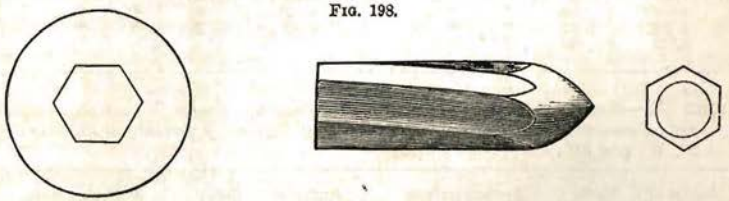
The above practice was made with the ordinary shell adapted for this gun, and the minimum charge. By increasing the charge, and using a longer projectile, the same range is attained with less elevation, but the recoil becomes too severe upon the carriage for long continued firing. The projectiles, as now used for these guns, are in all cases made of cast iron, thinly coated with lead, and, being of somewhat larger diameter than the bore, the lead is crushed into the grooves; by means of which the necessary rotation is given, while all shake and windage are prevented. The projectile for field-service admits of being used indifferently as solid shot, shrapnell shells, or canister shot. It is composed of separate pieces, so compactly bound together that it has been fired through a mass of oak timber 9 feet in thickness without sustaining fracture. When used as a shell it divides into the number of pieces of iron, lead, and fuze, stated in p. 519. It combines the principle of the shrapnell and of the percussion shell: that is, it may be made to explode either as it approaches the object or as it strikes it. The shock which the projectile receives in the gun puts the percussion arrangement as it were from half-cock to full-cock, and it then becomes so delicate that it will burst by striking even a bundle of shavings. It may also be made to explode at the instant of leaving the gun, in which case the pieces produce the usual effect of grape or canister. For breaching purposes or for bursting in the side of a ship, a different construction of shell is adopted. The object in that case being to introduce the largest possible charge of powder, the projectile used is simply a hollow shot, and from its length and form is capable of containing a much larger bursting charge than is compatible with a spherical form of the same diameter. The largest gun which has yet been completed upon Sir William Armstrong's principle is one of 65 cwt., which, although only designed to throw a projectile of 80 lbs., has been frequently tried with a shot weighing upwards of 100 lbs.

Early in the course of his experiments, Sir William Armstrong's attention was directed to the improvement of the sights, as the means of aiming guns previously employed were obviously not sufficiently delicate for a gun having 57 times their accuracy. The sights which he has introduced present many peculiarities. The eye-piece of the tangent-scale is in the form of a cross slit, and has a traversing movement for correcting the effect of side wind. The vertical and lateral movements of the sight are each regulated by means of a vernier which enables the scale to be read off to one minute of a degree both for elevation and deflection. With regard to the strength of the Armstrong guns to resist explosion, the 12-pounders have been proved by filling

the chamber with powder (about 2¼ lbs.), and using a shot of double the service-weight. In the case of the 40-pounders, it is intended to apply double charges and single shot. To provide for a large charge of powder, it is only necessary to reduce the lead on the shot, so as to allow it to enter further into the bore. Sir W. Armstrong believes the strength of his guns to be enormously in excess of these charges, the object of the proof being rather to detect defects in the surface of the bore than the resistance to bursting, which he considers to be almost uniform in all guns constructed on his principle.

THE WHITWORTH GUN.—Mr. Whitworth, of Manchester, has succeeded in constructing several rifled breech-loading cannon of various calibres: his 3-pounder gun, 208 lbs. in weight, with a calibre of 1½ inches, a charge of 8 oz. of powder, and an elevation of 35°, projects its shot to a distance of more than 5½ miles, and this with remarkable accuracy. He applies the same principles to his guns which have been so successful in his small-arms—using a very long projectile, 3½ diameters in length, that the resistance of the air may be as small as possible, (Fig. 198.) To overcome the tendency of so long a projectile to turn over in its flight, a rapid spin or rotation is impressed upon

FIG. 198.



it, by a more than usually rapid twist in the grooves of the rifle. The bore of the barrel is described by its hexagonal section moving parallel to itself from breech to muzzle, and at the same time rotating uniformly about its centre with such a velocity, that it completes one whole rotation while its centre is moving over a space of 20 inches in the small-arms and 3 feet 8 inches in the 3-pounder gun. So that the barrel may be considered as a rifle with six grooves, making one turn in 20 inches in the one case, and in 3 feet 8 inches in the other. The bullets are made of a hard metal, an alloy of 9 parts lead with 1 part tin, and they are shaped to fit accurately the interior of the bore. Experiments made to test the penetrating powers of Whitworth's hexagonal 80-pounder shot, have established its superiority to any other gun or projectile yet produced in penetrating power. The hexagonal bore is also the best for communicating a rapid rifle motion to the projectile, but experiments in the United States have not shown it to be safe for ordinary cast-iron cannon.

TABLE I.—*Ranges obtained at Southport, February 15th and 17th, 1860, of a 3-pounder Whitworth Gun, length 6 ft., weight 208 lbs., diameter of bore 1½ in., charge 7½ oz., at the undermentioned angles of elevation.*

Angles of Elevation.	Yards Range.	Deviation from Line of Fire.	Angles of Elevation.	Yards Range.	Deviation from Line of Fire.
3°	1,607	¼ yard to the right.	20°	6,784	12 yards to the left.
"	1,593	Line.	"	6,720	14¼ " "
"	1,589	Line.	"	6,910	2 " "
"	1,588	1 yard to the right.	35°	8,907	22 yards to the right.
"	1,577	¼ " "	"	8,930	10 yards to the left.
"	1,575	¼ " "	"	9,059	11 yards to the right.
"	1,573	¼ " "	"	9,164	23¼ " "
"	1,568	2 " "	"	9,688	34 " "
"	1,552	¼ " "	"	9,645	31 " "
10°	4,171	6 yards to the left.	"	9,611	89 " "
"	4,179	4 " "	"	9,547	57 " "
"	4,224	5 " "	"	9,508	72 " "
"	4,122	2 " "	"	9,463	58 " "
20°	6,760	5 " "			

TABLE II.—*Ranges of a 3-pounder Whitworth Gun, at 20° Elevation. Charge 7½ oz. of Powder.*

Yards Range.	Deviation from Line of Fire.	Yards Range.	Deviation from Line of Fire.
6,818	26 yards to the left.	6,561	20 yards to the left.
6,749	27 " "	6,316	20 " "
6,602	54 " "	6,469	11 " "
6,556	35 " "	6,339	12 " "
6,511	34 " "		

TABLE III.—*Ranges of a 12-pounder Whitworth Gun; length 7 ft. 9 in., weight 8 cwt., diameter of bore 3¼ in., with a charge of 1¾ lbs. of powder, at elevations of 2°, 5°, and 10°.*

Angles of Elevation.	Yards Range.	Deviation from Line of Fire.	Angles of Elevation.	Yards Range.	Deviation from Line of Fire.
2°	1,280	¼ yard to the right.	5°	2,333	2 yards to the left.
"	1,270	¼ yard to the left.	"	2,298	1 yard to the left.
"	1,257	¼ " "	10°	3,942	15 yards to the right.
"	1,254	1¼ yards to the right.	"	4,120	13 " "
"	1,208	¼ " "	"	4,011	7 " "
5°	2,342	4 yards to the left.	"	4,002	16 " "
"	2,321	On the line.	"	4,059	9 " "
"	2,326	1 yard to the right.			

TABLE IV.—*Ranges of an 80-pounder Whitworth Gun; weight 4 tons, with a charge of 10 lbs. of powder, and a solid shot of 90 lbs. weight, at elevations of 5°, 7°, and 10°.*

Angles of Elevation.	Yards Range.	Deviation from Line of Fire.	Angles of Elevation.	Yards Range.	Deviation from Line of Fire.
5°	2,544	5 yards to the right.	7°	3,487	6¼ yards to the right.
"	2,604	2 " "	"	3,482	6¼ " "
7°	3,503	4¼ " "	10°	4,700	5 " "
"	3,498	6 " "	"	4,409	6 " "

All serviceable cannon, whether of bronze or iron, may be rifled for the use of General James's projectile. It is, therefore, an invention of the greatest practical utility, and the author is much indebted to Major W. A. Thornton, U. S. Ordnance Department, for the following description and experiments made by a board of officers of the U. S. Army:

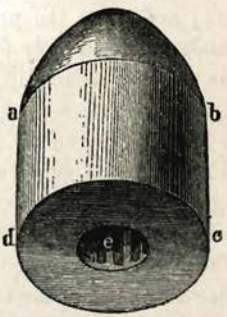
GENERAL JAMES'S PROJECTILE—is a cylindro-conoidal missile of cast-iron, having a compound envelop of canvas—sheet tin, and lead, called packing, encircling nearly the entire length of the body of the cylinder. The canvas, being the external portion of the packing, is well saturated with a tallow lubric, which renders the loading easy, and cleans the gun at each discharge. The head of the projectile may be solid, or, if it has a prepared cavity, the missile then becomes a shell. The average weight of the projectile for a 42-pounder gun is, if a solid, 81¼ lbs., if a shell, 64¼ lbs., of which in either case 6½ lbs. is the weight of the packing. Its length is 13 inches, of which 6¼ inches is the measurement of the conical head, and 6¾ inches is the length of its cylindrical body. The diameter of the cylinder is 6¾ inches, or ¼ of an inch less than the bore of a 42-pounder gun. It retains its full diameter for ¾ of an inch of its length at each end:—then for the intermediate space, the diameter is shortened half an inch, thereby forming a recess round the body of the cylinder, between the ends; (Fig. 199.) The shortening of the diameter, and consequent loss of iron to the circumference of the body of the cylinder, is replaced by the before-named

FIG. 199.

JAMES'S SHELL, BEFORE THE APPLICATION OF THE PACKING.

a. Band ¼ inch wide at ends of cylinder.
b, *c*, *d*, *e*. Recess round body of cylinder.
m. Rectangular openings through to recess.
n. Orifice in base, leading to the recess.

FIG. 200.



JAMES'S SHELL, AFTER THE APPLICATION OF THE PACKING, AND READY FOR USE.

a, *b*, *c*, *d*. Belt of canvas, tin, and lead, called packing.
e. Orifice in base, leading to recess.

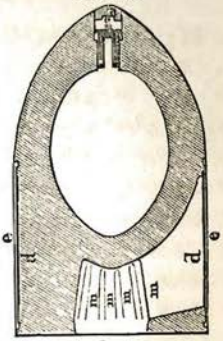
packing, when the projectile is prepared for use, (Fig. 200.) The solidity of the conical head is continued into, and forms the solid end of the cylinder. The base, or opposite end of the projectile, has a central

orifice, of 3¼ inches in diameter, which extends 2½ inches into the cylinder; and from which *ten* rectangular openings diverge, (like the mortises for spokes in the hub of a wheel,) through the body, to the periphery of the cylinder, in the recess of its circumference. The packing is formed by a plate of sheet tin, of the length of the greatest circle of the cylinder; and in width, equal to the length of the recess caused by the shortening of the diameter. This plate of tin is laid on a piece of strong canvas, which is two inches wider, but of the same length of the plate; and the canvas is folded over the side edges of the plate and firmly secured by cross sewing. The tin plate, when so prepared, or half covered, is folded round the body of the missile in the recess, and retained in position by an iron collar clamp; (Figs. 199 and 200.) The space between the inner surface of the envelop and the body of the cylinder is filled with melted lead, which, adhering to the tin and iron, forms a compact mass round the body of the projectile. When the charge is fired, the power or gas generated by the burning of the powder, in its effort to expel the projectile and to escape from the gun, is forced into the orifice in the base of the missile, and through the *ten* openings against the packing, which is thereby pressed into the grooves, in the gun's bore, and by its firm hold in them the rifle motion is imparted to the projectile. The packing has not been known to strip from the projectile while in the gun; and the certainty that it compels obedience on the part of the missile to the rifling, is demonstrated in direct hits, by the perfect circular orifice cut by the shot in entering targets; and when the projectiles are obtained after firing, their head and body are frequently found cut in furrows, conforming to the rifling of the gun, by stones, against which the missile impinged in entering the ground. All serviceable guns, either of bronze or iron, can be made available by rifling, for the use of the said projectiles. The rifling should be of the gain twist nature. It should be shallow; say, for field-guns $\frac{1}{20}$, and for siege-guns $\frac{1}{13}$, and $\frac{1}{17}$ of an inch in depth. The lands and grooving should be of the same width, and about 18 of each, for the bore of a 42-pounder gun. The ordinary grained cannon powder does not appear to act too violently in projecting these heavy missiles from field-guns; but there can be no doubt that the coarse-grained $\frac{6}{10}$ inch powder is far the best for service, in firing James's projectiles from long-bored guns.

When the projectile is a shell, (Fig. 201,) its fuze-orifice is in its head and axis. The length of the orifice for a 42-pounder shell is 2½ inches. For two inches of its length, its diameter is 1 inch, and for the remainder of the length, the diameter is reduced to ¾ of an inch; so

forming a shoulder in the fuze-orifice, to prevent the fuze-plug from being driven into the cavity of the shell, when, by firing, the missile is expelled from the gun. The threads of a female screw are cut in the head of the fuze-orifice for the reception of the body of the fuze-orifice cap. This cap is of brass. Its diameter is an inch, its length half an inch; its head is convexed, and has a slot cut in it for the reception of a screw-driver; the base end is deeply cupped, to admit the nipple of a musket cone, and to give more play to the fuze-plug.

FIG. 201.



JAMES'S SHELL.
Section through the axis.
a. Brass fuze-orifice screw-cap.
b. Fuze slide-plug.
c. Cone to fuze-plug—musket size.
d. Lead portion of packing.
e. Canvas and tin portion of packing.
m. Rectangular openings to periphery in recess.

The fuze-plug is of wrought iron, surmounted by a musket cone; and its action in the fuze-orifice is like the ordinary working of a piston. Its length is 1¼ inches, of which the quarter is the length of its shoulder. The diameter of its shoulder and body, is very nearly the same as the two diameters of the fuze-orifice. Its vent is in its axis, and in size to receive the male screw of the musket cone. The threads of a female screw are cut in the head end of the vent, of sufficient length to receive the screw end of the said cone.

When the shell is loaded, care should be taken not to overfill its cavity, and thereby prevent the working of the fuze-plug. The powder should be cleaned from the fuze-orifice; the plug should be oiled to ensure its free and sure action. Its cone should be capped, but before the application the percussion cap should be carefully examined to see that it is perfect, and of the best quality. The fuze-plug, when so prepared, is then inserted into the fuze-orifice, and it should enter freely but not by its own weight, until the shoulders of the fuze-plug and orifice are in contact. The cap for the fuze-orifice should be then firmly screwed in, which completes the charging of the shells. If after the shell is loaded the fuze-plug should be disturbed by handling; that is, if the plug has slidden forward, it will be forced back to its proper position by the impulse given to the missile, by the firing of the gun charge; and it will so remain during the flight, until the shell impinges against any hard substance; as ground, wood, &c., which, by obstructing the progress of the missile, causes the fuze-plug to slide forward with violence, and by the collision of the cone's point against the bottom of the fuze-orifice cap-plug, the percussion cap on the cone will be exploded, and the bursting charge of the shell fired.

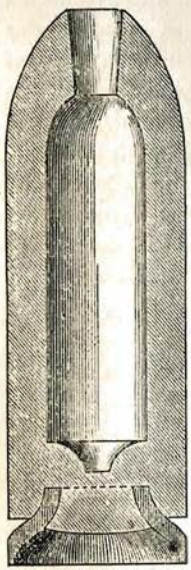
GENERAL C. T. JAMES'S PROJECTILE. SUMMARY OF TARGET-FIRING, WATCH HILL, R. I., 1860.

42-pdr. Service Gun, Rifled.

81¼	lbs. averaged weight of projectile, of which 6½ lbs. packing,	
2	" of powder, the loading charge of shell,	
8	" averaged weight of charge of powder,	
2° ⅛′′	elevation,	target 20 by 40 feet.
3⅛′′	time of flight to target,	
45	projectiles fired,	
31	hits direct,	
8	hits ricochet,	distance 1,000 yards.
68.8	proportional direct hits per 100 shots	
17.7	" ricochet " "	
5° 2′	elevation,	target 20 by 40 feet.
6 ⅖′′	time of flight to target,	
65	projectiles fired,	
15	hits direct,	
7	hits ricochet,	distance 2,000 yards.
23	proportional direct hits per 100 shots	
10.7	" ricochet " "	

Remarks.—The averaged weight of the projectile at rest in the gun was 81¼ lbs.; averaged weight of packing thrown off was 6½ lbs.; weight of projectile when it impinged, 74¾ lbs. Penetration, through 45 inches of the best well-seasoned oak, at 2,000 yards; weight of oak target 17 tons, well bedded and firmly braced by back timbers; forced back 10 inches by impact of shot; range, at 15° elevation 4,346 yards, or nearly 2½ miles; ricochet on water, in prolongation of line of fire, but the projectile does not bound as often as round balls. When the missile is a shell loaded, it bursts by percussion, in penetrating earth, or other denser material.

Fig. 202.



The Reed projectile is also an American invention. Its peculiarity, whether shot or shell, consists in its having a base or cup of wrought iron connected by casting in, or in any other mode of attachment, to the cast-iron projectile, (Fig. 202.) The object is to obtain a material pliable enough to be forced by the expansive action of the powder into the grooves of the gun, and strong enough to give the

SYNOPSIS OF EXPERIMENTS WITH RIFLED GUNS AT FORT MONROE, TARGET 40′ BY 20′, FROM ROBERTS' HAND-BOOK OF ARTILLERY.

Name of Gun.	Calibre.	Bore.		Grooves.			Twist.	Weight of Gun.	Weight of Projectile.	Weight of charge.	1,000 Yards.					2,000 Yards.					Average range.	Corresponding Elevation.	Time of flight.
		Diameter.	Length.	No.	Width.	Depth.					No. of shots fired.	No. of direct hits.	No. of ricochet hits.	Angles of Elevation.	Time of flight.	No. of shots fired.	No. of direct hits.	No. of ricochet hits.	Angle of Elevation.	Time of flight.			
		in.	in.		in.	in.		lbs.	lbs.	lb				° ′	″				° ′	″		° ′	″
Sawyer.....	24-pdr.	5.862	110	6	1.5	0.25	Uniform, one turn in $84^1/_3$ feet.	8,822	45	5½	15	13	2	2		119	32	17	4 30	6	4,359	13¼	
Dimick.....	32-pdr.	6.4	101	6	2.0	0.2 rectan.	Increasing from 0 to one turn in $62^1/_2$ ft. at muzzle; twist to the right.	9,300	51	6	7	5	1	2 15		58	21	6	5	6½			
Dr. Reed.....	12-pdr. Siege.	4.854	109	7	1-14th circum.	.03 to .08	Increasing from 0 at commencement to one turn in 50 feet at muzzle.	5,000	22	3	26	14	9	2 15		30	5	8	4 30				
Do.	12-pdr. Field.	4.636	74	7	do.	do.	Do. do.	1,900	15	2	48	16	3	2	3								
Do.	32-pdr.	6.425	110	3	1-6th circum.	.085 to .12 circular.	Uniform, one turn in 40 feet.	8,500	50	6	10	8	2	2 15	3	84	19	8	5	6½	3,665	11 30	
Do.	6-pdr.	3.69	103.4	3	do.	.077 to .111 circular.	Uniform, to the right, one turn in 25 feet.	1,200	12	1¼	28	18	4	2 10		52	9	5	4 45				
Capt. Dyer...	3-pdr.	2.9	44.5	8	0.4	.05	Uniform, one turn in 16 feet.	250	9	1	28	16	5	2 25		18	4	2	5¼	7	3,270	13 30	15
Do.	6-pdr. bronze.	3.67	57.5	16	0.5	.025	Uniform, one turn in 19 feet.	880	14	1¼	22	11	4	2 15									

The following is a description of the several projectiles, viz. :—

Sawyer's.—Flanged projectile; elongated; entire shell coated with an alloy chiefly of lead, and has a percussion cap on small end.

Dimick's.—Expanding shell; elongated; cup of soft metal cast on rear end of projectile.

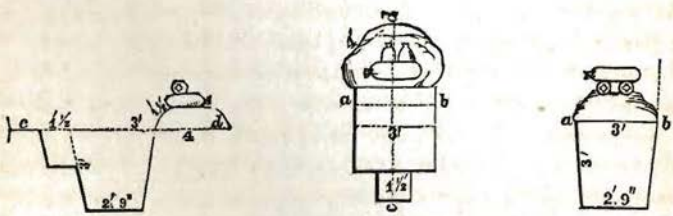
Reed's.—The body is of cast iron, and the expanding portion is a cup of wrought iron, which is fastened to the body by inserting it in the mould and pouring the melted metal around it.

Dyer's.—Description nearly the same as that of Dimick's.

necessary rotative movement to the projectile resulting from the twist of these grooves. The action is in fact similar to that of the common elongated bullet for the rifle musket, or the application of the Minié ball to cannon. The projectile is 2.9 inches. R. P. Parrott, Esq., West Point Foundry, has produced a field-gun for firing this elongated bullet reinforced by wrought iron, the idea of which is not novel, but which he claims to have arranged in proper proportions, and otherwise to have brought into practical shape so as to make a safe, cheap, and good rifled cannon. The gun has, in reference to the projectile, three grooves and a twist of one turn in 10 feet. It has not yet been before a board, but has been successfully tried before officers of the army. (Consult Sir HOWARD DOUGLAS; HYDE; WILCOX. *See* AMMUNITION; ARMS; BULLET; CARBINE; FIRING; PERCUSSION; PROJECTILE.)

RIFLE PITS—are holes or short trenches, about four feet long and three feet deep, forming, with the earth thrown out in front of them, cover for two men. There is generally a loophole on the top of the breastwork, made, by placing two sand-bags across the parapet, and a third resting on these, in the direction of it, to cover the head and shoulders of the riflemen. A rifle pit of this construction is shown in plan, section, and elevation in Fig. 203.

FIG. 203.



RIOT. (*See* EXECUTION OF LAWS.)

ROADS. When it is proposed to construct a line of road, extending between two places, the officer upon whom such duty devolves, first makes himself well acquainted with the surface of the country lying between the two places; he is then to select what he thinks, all circumstances being taken into consideration, the best general route for the proposed road. But previously to laying it out with accuracy, it is necessary to make an instrumental survey of the country, along the route thus selected; taking the levels from point to point throughout the whole distance, and making borings in all places where excavations are required, to determine the strata through which such cuttings are to

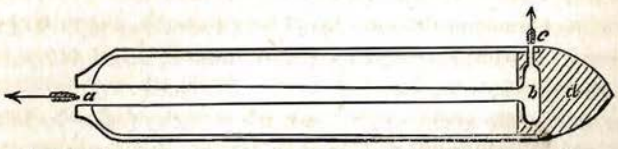
be carried, and the requisite inclinations of the slopes or slanting sides as well of the cuttings as of the embankments to be formed by the material thus obtained. It is also requisite, in the selection of the route for the proposed road, to have regard to the supply of materials, not only for first constructing it, but for maintaining it in repair. The results of such an investigation should be reduced to plan and section; the plan of the road being on a scale not less than 66 yards to an inch, and the section not less than 30 feet to an inch. The loss of *tractive* power and consequent danger produced by steep acclivities, render it necessary that a proper limitation should be imposed on the acclivities or inclinations on every line of road. As, however, this reduction of hills in a country where much inequality of surface exists, is attended with great labor and expense, greater rates of inclination must be allowed to hills or roads where the traffic is not sufficient to repay the expense of excavations. A dead level, even where it can be obtained, is not the best course for a road; a certain inclination of the surface facilitates the drainage, and keeps the road in a dry state. There is a certain inclination or acclivity, which causes, at a uniform speed, the traces to slacken, and the carriages press on the horses, unless a drag or break is used; the limiting inclination within which this effect does not take place is called the *angle of repose*. On all acclivities less steep than the angle of repose, a certain amount of tractive force is necessary in the descent, as well as in the ascent; and the means of the two drawing forces, ascending and descending, is equal to the force along a level road. The exact course of the road, and the degree of its acclivities being determined, the next thing to be considered is the formation of its surface. The qualities which ought to be imparted to it, are twofold: first, it should be smooth; secondly, it should be hard; and the goodness of the road will be exactly in proportion as these qualities can be imparted to it, and permanently maintained upon it. The means resorted to accomplish these objects are: 1. *Gravel Roads.* A coating of four inches of gravel should be spread over the road bed, and vehicles allowed to pass over it, till it becomes tolerably firm—men being required to rake in the ruts as fast as they appear; a second coating of 3 or 4 inches of gravel should be then added and treated like the first, and finally a third coating. 2. *Broken Stone Roads*, or McAdam roads. French engineers value uniformity in size of the broken stone less than McAdam. They use all sizes from 1½ inches to dust. McAdam considers from 7 to 10 inches of depth of stone on the road sufficient for any purpose. He earnestly advocates the principle, that the whole science of road-making consists in making a solid

dry path on the natural soil, and then keeping it dry by a durable water-proof coating. 3. Broken stone roads with a paved bottom or foundation, or *Tilford Roads*; a road thus constructed will, in most cases, cost less than one entirely of broken stone. 4. *Roads of Wood.* The abundance, and consequent cheapness of wood, renders its employment in road-making of great value. It has been used in the form of logs, of charcoal, of planks, and of blocks. When a road passes over soft swampy ground it is often made passable by felling straight young trees, and laying them side by side across the road at right angles to its length. This is the primitive *corduroy* road. A very good road has been lately made through a swampy forest, by felling and burning the timber, and covering the surface with charcoal thus prepared. Timber from 6 to 18 inches through is cut 24 feet long, and piled up lengthwise in the centre of the road about five feet high, and then covered with straw and earth in the manner of coal pits. The earth required leaves two good ditches, and the timber, though not split, is easily charred; and when charred the earth is removed to the side of the ditches, and the coal raked down to a width of 15 feet, leaving it two feet thick at the centre and one at the sides. 5. *Plank Roads.* Two parallel rows of small sticks of timber (called sleepers) are imbedded in the road three or four feet apart. Planks, 8 feet long and 3 or 4 inches thick, are laid on these sleepers across them. A side track of earth to turn out upon is carefully graded. Deep ditches are dug on each side to ensure perfect drainage; and thus we have the plank road. 6. *Roads of Earth.* These roads are deficient in the important requisites of smoothness and hardness, but they are the only roads usually made in the field to carry on military operations. Its shape, when well made, is properly formed with a slope of 1 in 20 each way from the centre. Its drainage should be made thorough by deep and capacious ditches, sloping not less than 1 in 125. Trees should be removed from the borders of the road, so as not to intercept the sun and wind. The labor expended upon it, will, however, depend upon circumstances. Every hole or rut in the road should, however, be at once filled up with good materials, for the wheels fall into them like hammers, deepening them at each stroke and thus increasing the destructive effect of the next wheel. (Consult Gillespie, *Roads and Road-making.*) The cross-section of a road embraces: 1. *The width of the road*—from 16½ to 30 feet, according to its importance, and the amount of travel upon it. 2. *The shape of the road-bed.* The best shape of the transverse profile for a road on level ground is two inclined planes meeting in the centre of road, and having their angle slightly rounded. On a steep hill, the

transverse profile should be a single slope inclining inwards to the face of the hill. 3. *Footpaths, &c.* 4. *Ditches.* The ditches should, if possible, lead to the natural water-courses of the country. 5. *The side slopes of the cuttings and fillings.* These vary with the nature of the soil.

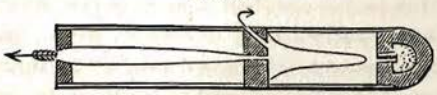
ROCKET, (WAR.) A projectile set in motion by a force within itself. It is composed of a strong case of paper or wrought iron, inclosing a composition of nitre, charcoal, and sulphur; so proportioned as to burn slower than gunpowder. The head is either a *solid shot*, shell, or spherical-case shot. The base is perforated by one or more vents, and in the case of the Congreve rocket, with a screw hole to which a guide-stick is fastened. The rockets used in the United States service are Hale's, in which steadiness is given to the flight of the rocket by rotation, as in the case of the rifle ball, around the long axis of the rocket. This rotation is produced by three small vents placed at the base of the head of the rocket. Fig. 204 shows Hale's rocket now used in the United States. Mr. Hale's last improvement (Fig. 205) consists in

FIG. 204.



a. Bore and vent.
b. Recess in the base of the head.
c. Tangential vent, (three.)
d. Head solid.

FIG. 205.



placing three tangential vents in a plane passing through the centre of gravity of the rocket, and at right angles to the axis. This is accomplished by dividing the case into two distinct parts, or rockets, by a perforated partition. The composition in the front part furnishes the gas for rotation, and that in the rear the gas for propulsion. The two sizes of Hale's rockets in use, are the

2¼ inch, (diameter of case,) weighing 6 lbs.; and
3¼ inch " " " 16 lbs.

Under an angle of from 4° to 5° the range of these rockets is from 500 to 600 yards, and under an angle of 47° the range of the former is 1,760 yds., and the latter 2,200 yards. War rockets are usually fired from tubes or troughs, mounted on portable stands, or on light carriages.

The following rules concerning the length of rocket-fuzes, the ranges and elevations, for Congreve's rockets, may be useful, though they have not been confirmed by an extensive course of practice:—

For 24-pounder rockets; if the whole length of the fuze is left in the shell of the 4-pounder rocket, it may be expected to burst at about 3,700 yards, elevation 47 degrees.

If the whole of the fuze-composition be bored out, and the rocket-composition left entire, the shell may be expected to burst at about 2,000 yards, elevation 27 degrees.

If the rocket-composition be bored into, to within 1.5 inch of the top of the cone, the shell may be expected to burst at about 700 yards, elevation 17 degrees.

For 12-pounder rockets; if the whole length of fuze be left in the shell of the 12-pounder rocket, it may be expected to burst at about 3,000 yards, elevation 40 degrees.

If the whole of the fuze-composition be bored out, and the rocket-composition left entire, the shell may be expected to burst at about 1,500 yards, elevation 20 degrees.

If the rocket-composition be bored into, to within one inch of the top of the cone, the shell may be expected to burst at about 420 yards, elevation 10 degrees.

For 6-pounder rockets; if the whole length of fuze be left in the shell of the 6-pounder rocket, it may be expected to burst at about 2,300 yards, elevation 37 degrees.

If the whole of the fuze-composition be bored out, and the rocket-composition be left entire, the shell may be expected to burst at about 1,100 yards, elevation 15 degrees.

If the rocket-composition be bored into within one inch of the top of the cone, the shell may be expected to burst at about 20 yards, elevation 10 degrees.

For 3-pounder rockets; if the whole length of the fuze be left in the shell of the 3-pounder rocket, it may be expected to burst at about 1,800 yards, elevation 25 degrees.

If the whole of the fuze-composition be bored out, and the rocket-composition be left entire, the shell may be expected to burst at about 850 yards, elevation 12 degrees.

If the rocket composition be bored into within one inch of the top of the cone, the shell may be expected to burst at about 420 yards, elevation 8 degrees; (Sir HOWARD DOUGLAS.)

ROLL. A uniform beat of the drum, without variation for a certain length of time.

Long-roll.—A beat of the drum, as a signal for the assembling of troops at any parade.

Muster-roll.—A return, forwarded every two months from every company in the service to the adj.-general and paymaster. It contains a list of the officers, non-commissioned officers, and privates, specifying their pay, and the casualties arising from deaths, promotions, &c.

ROSTER OR ROLLSTER. Lists of officers for duty. The principle which governs details for duty is from the eldest down; longest off duty first on. If an officer's tour of duty for armed service, court-martial, or fatigue happen when he is upon either duty, he is credited with both duties. A regiment, or detachment, detailed for any duty, receives credit for the duty when it marches off parade to perform the duty, but not if it is dismissed on parade. Officers on inlying pickets are subject to all details.

ROUNDS. Visiting rounds; grand rounds; visiting small posts, guards, and sentinels by commanders or staff officers. He who makes the round is alone, or accompanied according to grade and circumstances.

ROUT. To put to *rout* is to defeat and throw into confusion. It is not a retreat in good order, but also implies dispersion.

ROUTE. An open road; the course of march of troops. Instructions for the march of detachments, specifying daily marches, means of supply, are given from the head-quarters of an army in the field, and are called marching *routes*.

RUFFLE. A low, vibrating sound beat upon a drum not so loud as a roll.

RULES AND ARTICLES OF WAR. (*See* ARTICLES OF WAR.)

RUN; RUNNING. (*See* MANŒUVRES OF INFANTRY IN COMBATS.)

RUNNING FIRE. Rapid and successive fire by troops.

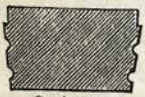
S

SABOT. In *field-guns*, when firing solid shot, the charge is usually about $\frac{1}{5}$ the weight of the shot. For spherical case and canister, the charge is less. These projectiles are always fixed to a block of wood, called a *sabot*, (Fig. 206,) to which the cartridge is also attached; forming what is called a round of *fixed ammunition*; (Fig. 207.) In the 12-pdr. field-howitzer, also, the ammunition used is fixed, A, (Fig. 206;) but with the other howitzers the projectile and charge are separate; the latter being attached to a block of wood called a *cartridge-block*, (Fig. 208,) the object of which is to give a finish to the cartridge

and fill the chamber, the dimensions of the block being so calculated for each different charge as to reach to the mouth of the chamber. The sabots used with these heavy howitzers are conical in shape to fit the connecting surface between the chamber and bore. Care should be taken in loading to put the seam of the cartridge to the sides, so that it will not come under the vent. In loading the 32 and 24-pdr. howitzer, the cartridge is first pushed carefully into the chamber without ramming, and the shell is then sent home, also without ramming.

FIG. 206.
FOR GUNS.

Shot.



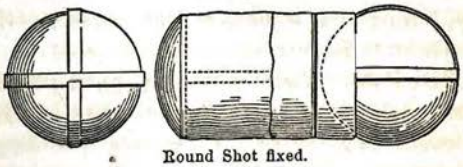
Canister.

12-PDR. HOWITZER.

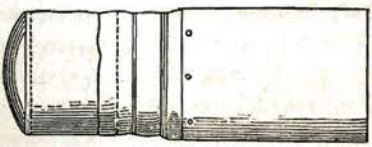
Shell.

Canister.

FIG. 207.



Round Shot fixed.



Canister fixed.

FIG. 208.
Cartridge Block.

Howitzer Cartridge.

When sabots cannot be obtained, place upon the powder a layer of tow, about 0.2 in. thick, forming a bed for the shot; tie the bag over the shot and around the tow; the bag requires to be one inch longer than for strapped shot; (GIBBON.)

SABRE. The cavalry sabre blade has shoulder, back, edge, bevel point, curvature, large groove, small groove, tang reveting. The HILT has a brass surmounting (gilt for officers) guard, and steel scabbard. The blade of the mounted artillery sabre has but one groove; the guard but one branch, (cavalry sabre guard has three;) steel scabbard. Officers of mounted artillery, and mounted officers of artillery and infantry use the sabre for mounted artillery with gilt mounting. (*See* SWORD.)

SABRETASCHE. From the German, *Sabel*, a sabre, and *Tasche*, a pocket. The sabretasche is part of the accoutrements of a cavalry or staff officer, consisting of a leathern case or pocket, suspended at

the left side from the sword belt by three slings, corresponding with the belt.

SACK. An expression used when a town has been taken by storm, and given up to pillage.

SADDLER. All acts of Congress previous to the Act of March 2, 1833, allowed one saddler to each company of dragoons. The omission to provide for saddlers in the present cavalry organization would seem to be accidental.

SAFEGUARD. Whosoever, belonging to the armies of the United States, employed in foreign parts, shall force a safeguard, shall suffer death; (ART. 55.) The men left with a safeguard may require of the persons for whose benefit they are so left, reasonable subsistence and lodging; and the neighboring inhabitants will be held responsible by the army for any violence done them.

The bearers of a safeguard left by one corps, may be replaced by the corps that follows; and if the country be evacuated, they will be recalled; or they may be instructed to wait for the arrival of the enemy, and demand of him a safe conduct to the outposts of the army. The following form will be used:—

SAFEGUARD.

By authority of Major-gen. ———, (or *Brig'r-gen.* ———.)

The person, the property, and the family of ———, (or such a college, and the persons and things belonging to it; such a mill, &c.,) *are placed under the safeguard of the United States. To offer any violence or injury to them is expressly forbidden; on the contrary, it is ordered that safety and protection be given to him, or them, in case of need.*

Done at the head-quarters of ——, this —— day of ——, 18—.

Forms of safeguards ought to be printed in blank, headed by the article of war relative thereto, and held ready to be filled up, as occasions may offer. A duplicate, &c., in each case, might be affixed to the houses, or edifices, to which they relate.

SALE. The President is authorized to cause to be sold unserviceable ordnance or stores of any kind, but the inspection or survey of unserviceable stores shall be made by an inspector-general, or such other officer or officers as the Secretary of War may appoint for that purpose; and the sales shall be made under such rules and regulations as may be prescribed by the Secretary of War; (*Act* March 3, 1825.) In all cases where lands have been, or shall hereafter be, conveyed to or for the United States, for forts, arsenals, dock-yards, light-houses, or any like purpose, or in payment of debts due the United States,

which shall not be used, or necessary for the purposes for which they were purchased, or other authorized purpose, it shall be lawful for the President of the United States to cause the same to be sold, for the best price to be obtained, and to convey the same to the purchaser by grant or otherwise; (*Act* April 28, 1828.)

SALIENT. The salient angle of a fortification is an angle projecting towards the country.

SALLY. A sally or sortie is a movement made by strong detachments from a besieged place to attack the besiegers or destroy their works.

SALLY-PORTS. Openings to afford free egress to troops for a sortie. They are cut in the faces of the re-entering places of arms, and in the middle of the branches of the covered-ways. When sally-ports are not in use, they are closed by strongly constructed gates of timber supported by bars of iron.

SALTPETRE. (*See* GUNPOWDER; NITRE.)

SALUTE. A discharge of artillery in compliment to some individual; beating of drums and dropping of colors for the same purpose; or by carrying or presenting arms according to the rank and position of an officer.

SAND-BAGS. Bags filled with earth, usually from 12 to 14 inches wide, and about 30 inches long. They are employed sometimes in constructing batteries, and in repairing breaches and embrasures when damaged by the enemy's fire. (*See* REVETMENT.)

SANITARY PRECAUTIONS. Send troops where we may, they are destroyed by fevers. Is there any safeguard? None, but in the good keeping, good condition, physical and moral, of the troops. After a fever has been established, physic does little, but the battle is fought by the nurse; let that attendant be sagacious and vigilant, and the patient is saved; the contrary, and he dies. The most successful treatment (the necessary evacuations always being premised) is cold water, or, in other words, the regulation of the temperature. Fever, when once it has gained entry, is the most tenacious of all pre-occupants. Rhythm, the rule of number counting by day, as if it played upon the nervous chords, paroxysm, remission and crisis, proclaim its sway. Let the practitioner obviate evil tendencies whenever he can, but if he turn to his medical books he will find in the medical records of two thousand years always the same results, viz.: the futility of interfering with medicines of specific power, and the deaths of a given number, almost always the same, when the air is pure, and the patient has had any thing like fair play. *Quinine* is a specific in intermittent fever,

but it is as futile as all other specifics in continued fevers. The practitioner must content himself with taking for his guides depletion at the outset, refrigeration during all the middle stages, and stimulation with support at the close of the disease. This course may be taken with very little aid from medicine, and the event will be more successful than if the patient had been drugged with all the stuff of an apothecary's shop.

Disinfectants.—The best disinfectants are caloric, light, ventilation, and the operation of water, and a bountiful Providence has placed them all at our disposal. It is a matter of experiment that even the concentrated matter of small-pox, cow-pox, and the fomites of scarlatina are deprived of all infecting power on being subjected to a heat of 140° of Fahrenheit's thermometer. It may then be fairly inferred that if these could be so neutralized, gaseous factitious infectants, such as that of typhus fever, would be dissipated under a much inferior degree of heat, and it is accordingly found that typhus will not readily cross the tropic of cancer, and the plague of the Levant goes out at the same boundary. *Boiling water*, then, must be all-sufficient for the purification of whatever it can be made to touch; and a portable iron stove, filled with ignited charcoal, will infallibly disinfect any building or apartment. The infection constantly given out from a living body cannot, while it continues diseased, be so disposed of; but all that it has inhabited is easily rendered harmless.

Light is another sure disinfectant; the strongest poisons, as prussic acid, when exposed to its influence lose their power.

Ventilation comprehends all that the atmosphere can bring to the process of disinfection; and *water* is only a more concentrated application of the same principle. *Chlorine fumigation* is utterly *useless*, "but the burning of a few handfuls of charcoal, with the aid of clean linen, will certainly disinfect the most saturated lazar that ever came out of a pest-house; but until that ceremony, or an equivalent to it, such as a hot bath, be performed, no one can answer for his being otherwise than dangerous."

Dysentery is truly an army disease. In some services the soldiery in the field may escape fever, but never dysentery if they lie on the ground. Atmospherical vicissitudes, cold of the night, chill of the morning, after heat of preceding day, will cause it to spread. Heat is, however, uniformly the remote cause. The disease is purely inflammatory in the beginning; yet, because the acid and sub-acid fruits sometimes occasion griping when in health, these and vegetables of every kind are sometimes strictly prohibited. They are, however, amongst

the best remedies. For the peculiar inflammation which dysentery sets up in the mucous linings of the intestines, there has been no remedy yet discovered at all comparable to mercury, (calomel.) The specific inflammations, such as the iritic, the hepatic, the pneumonic, the syphilitic, &c., all fall before its peculiar superseding stimulus. The habitual use of mercury is not fitted to all constitutions, and it has often been abused; but the discovery of its power to supersede inflammation is one of the happiest of the uncertain art of medicine.

Miasmata or marsh poisons, it has been supposed, are exhalations produced by the agency of vegetable or aqueous putrefaction. More general knowledge has, however, established the fact, that one condition only is necessary to the production of miasma on all surfaces capable of absorption, and that is, the *paucity of water where it has previously and recently abounded.* The greatest danger may exist, where there is no evidence of putrefaction, as every one can testify who has seen pestilence steam forth, to the paralyzation of armies, from the barren sands of the Alentyo in Portugal, the arid burnt plains of Estremadura in Spain, and the recently flooded table-lands of Barbadoes, which have seldom more than a foot of soil to cover the coral rock, and are therefore, under the drying process of a tropical sun, brought almost immediately after the rains into a state to give out pestilential miasmata. It is not known whether miasma is lighter or heavier than air, but it is established that the inhabitants of ground floors are affected by it in a greater proportion than those of upper stories; and that this is caused by its attraction by the earth's surface is proved by its creeping along the ground, and concentrating and collecting on the sides of adjacent hills, instead of floating directly upwards in the atmosphere. Miasma is certainly lost and absorbed *by passing over a small surface of water.* The rarefying heat of the sun, too, certainly dispels it, and it is only during the cooler temperature of the night that it acquires body, concentration, and power. All regular currents of wind have also the same effect. The leeward shore of Guadaloupe, for a course of nearly thirty miles, under the shelter of a very high steep ridge of volcanic mountains, never felt the sea breeze, nor any breeze but the night land wind from the mountains; and though the soil is a remarkably open, dry, and pure one, being mostly sand and gravel, altogether and positively without marsh in the most dangerous places, it is inconceivably pestiferous throughout the whole tract, and in no spot more so than the bare sandy beach near *the high water mark.* The colored people alone ever venture to inhabit it, and when they see strangers tarrying on the shore after nightfall, they never fail to warn them of their danger.

The chief predisposing causes of every epidemic, and especially of cholera, are: damp, moisture, filth, animal and vegetable matters in a state of decomposition, and in general, whatever produces atmospherical impurity; which always have the effect of lowering the health and vigor of the system, and of increasing the susceptibility to disease. Attacks of *cholera* are uniformly found to be most frequent and virulent in low-lying districts, on the banks of rivers, in the neighborhood of sewer mouths, and wherever there are large collections of refuse, particularly amidst human dwellings. The practical precautions given in Russia are "to keep the person and dwelling-place clean, to allow of no sinks close to the house, to admit of no poultry or animals within the house, to keep every apartment as airy as possible by ventilation, and to prevent crowding wherever there are sick." Next to perfect cleansing of the premises, *dryness* ought to be carefully promoted, by keeping up in damp and unhealthy districts sufficient fires, and this agent will promote ventilation as well as warmth and dryness. If, notwithstanding these precautions, cholera break out, the premonitory symptom of looseness of the bowels almost universally precedes the setting in of the more dangerous state of the disease. This looseness of the bowels may be accompanied with some degree of pain, but in many cases pain is wholly absent, and for some hours or even days the bowel complaint may appear so slight, without previous knowledge of the importance of its warning, as to escape notice altogether. But when the Asiatic cholera is epidemic, never neglect the slightest degree of looseness of the bowels. If neglected only a few hours, it may suddenly assume the most fatal form. The most simple remedies will suffice, if given on the first manifestation of the premonitory symptom, and the following, which are within the reach and management of every one, may be regarded as among the most useful, namely: twenty grains of opiate confection, mixed with two tablespoonfuls of peppermint water, or with a little weak brandy and water, and repeated every three or four hours, or oftener, if the attack is severe, until the looseness is stopped; or an ounce of the compound chalk mixture, with ten or fifteen grains of the aromatic confection, and from five to ten drops of laudanum repeated in the same manner. From half a drachm to a drachm of tincture of catechu may be added to the last, if the attack is severe. Half these quantities should be given to young persons under 15, and still smaller doses to infants. It is recommended to repeat these remedies night and morning for some days after the looseness of the bowels has been stopped, *and in all cases to have recourse to medical advice as soon as possible.* Next in importance to the immediate employment of such

remedies, is attention to proper diet and clothing. The most wholesome articles of vegetable diet are *well-baked but not new bread, rice, oatmeal, and good potatoes. The diet should be solid rather than fluid*, and with the means of choosing, it is better to live principally upon animal food, as affording the most concentrated and invigorating diet—avoiding salted and smoked meats, pork, salted and shell-fish, cider, perry, ginger beer, lemonade, acid, liquors of all description, and ardent spirits. If, notwithstanding these precautionary measures, a person is seized suddenly with *cold, giddiness, nausea, vomiting*, and *cramps*, under circumstances in which *instant* medical assistance cannot be procured, the concurrent testimony of the most experienced medical authority shows that the proper course is to get as soon as possible into a warm bed; to apply warmth by means of heated flannel, or bottles filled with hot water, or bags of heated camomile flowers, sand, bran, or salt, to the feet and along the spine; to have the extremities diligently rubbed; to apply a large poultice of mustard and vinegar over the region of the stomach, keeping it on fifteen or twenty minutes; and to take every half hour a teaspoonful of *sal volatile* in a little hot water, or a dessert-spoonful of brandy in a little hot water, or a wine glass of hot wine whey, made by pouring a wine glass of sherry into a tumbler of hot milk; in a word, to do every thing practicable to procure a warm, general perspiration, until the arrival of the physician whose immediate care under such circumstances is indispensable.

(This article is an abstract from an article in the British *Aide Memoire to the Military Sciences*, under the head of *Sanitary Precautions*, and that article is taken entirely from the works of Dr. W. Ferguson, Inspector-general of Military Hospitals, and Reports of the General Board of Health, London, 1849.)

SAP. The sap is an apparently slow means of constructing trenches, but being continued by night as by day without cessation, its progress is soon felt. The work is executed by sappers rolling before them a large gabion, which shelters the workmen from musketry. In this manner one gabion after another is filled with earth and rolled in advance of its predecessor *after* that part of the trench already made has been well consolidated. A trench thus formed is called a sap. When the fire of the enemy is slack, so that many gabions may be placed and filled at the same time, it is called a flying sap. If two parapets, one on each side of the trench, be formed, it is then called a double sap.

SAP-FAGOTS—are fascines three feet long, placed vertically between two gabions, for the protection of the sappers before the parapet is thrown over.

SAPPERS. There is attached to the corps of engineers a company of sappers, miners, and pontoniers, called engineer soldiers The company is composed of ten sergeants or master workmen, ten corporals or overseers, two musicians, thirty-nine privates of the first class or artificers, and thirty-nine privates of the second class or laborers. The said engineer company shall be subject to the Rules and Articles of War, be recruited in the same manner and with the same limitation, and are entitled to the same provisions, allowances, and benefits, as are allowed to other troops constituting the present military peace establishment. The said company shall be officered by officers of the corps of engineers, shall perform all the duties of sappers, miners, and pontoniers, and shall aid in giving practical instructions in those branches at the Military Academy; and shall, under the orders of the chief engineer, be liable to serve by detachments in overseeing and aiding laborers upon fortifications or other works under the engineer department, and in supervising finished fortifications as fort-keepers, preventing injury and applying repairs; (*Act* May 15, 1846.) In marches near an enemy, every column should have with its advance guard a detachment of sapppers, furnished with tools to open the way or repair the road. It would be well if these sappers, as suggested by General Dembinski, were mounted, in order rapidly to regain the advance guard, after having finished their work.

SAP-ROLLER—consists of two large concentric gabions, six feet in length, the outer one having a diameter of four feet, the inner one a diameter of two feet eight inches, the space between them being stuffed with pickets or small billets of hard wood, to make them musket-shot-proof. Its use is to protect the squad of sappers, in their approach, from the fire of the place.

SASH. A mark of distinction, worn by officers round the waist, and composed of silk.

SAW-MILL, (PATENT, UPRIGHT, PORTABLE.) It is composed of eight pieces of timber, from five to eight feet long; four pieces of plank, from four to six feet long; and about fifteen hundred pounds of iron; besides two long bed-pieces, a carriage, some small wooden fixtures, pulleys, etc. The common up-and-down saw, six and one-half or seven feet long, is used without sash-gate or muley, and will saw timber of the largest or smallest size. It is so very simple in its construction that it has but few bearings, and consequently but little friction, and will therefore require much less power to drive it than the more complicated mills now in general use. As much of the cumbrous machinery of other mills, such as large, heavy frames, sash-gates, etc., is dispensed with in

this, it is much less liable to get out of order; while its simplicity enables any one of ordinary mechanical ability to repair or build it. The amount of repairs required with fair usage is of insignificant import. The great advantage of such a mill for military purposes is its portability. The engines and boilers furnished with these mills are constructed specially for it. The first size is a boiler 10 feet long, 24 tubes 2½ inches in diameter, and 7½ feet long, shell over the fire-box 44 inches in diameter, shell over the tubes 34 inches in diameter, and engine of 7-inch cylinder and 15-inch stroke. This is a large eight-horse power, and is sufficient to drive the mill with any rapidity in the hardest and heaviest timber. It is sold with the mill—the whole establishment weighing about 6,500 pounds—for $1,250. The second size is a boiler 11½ feet long, 25 tubes 2¼ inches in diameter, and 7½ feet long, shell over the fire-box 44 inches in diameter, shell over the tubes 34 inches in diameter, engine same as that described above, (7-inch cylinder and 15-inch stroke,) excepting that it has extra connections. It may be rated as good ten-horse, and is capable of driving the mill, together with some other machinery at the same time, such as circular-saw for sawing slabs, lath, and other light work. This power is recommended. It is sold with the mill—the whole weighing about 7,500 lbs.—for $1,400. In these prices smoke pipes, connections, and every thing necessary for running are included. The mill may be put up and at work in two or three days after its receipt at any given place. It is said to saw three thousand feet a day, and has been made to saw nine hundred feet per hour. With an exhaust pipe on the smoke stack the sawdust may be used for fuel.

SCALING LADDERS. (*See* Escalade.)

SCARFED. (*See* Carpentry.)

SCARP. (*See* Escarp.)

SCARP (To.) To cut down a slope, so as to render it inaccessible.

SCHOOL. (*See* Academy, *Military.*)

SCOUTS. Horsemen sent in advance, or on the flanks to give an account of the force and movements of the enemy.

SCREWS. In screws the parts are—the stem, the head, the slit, and the thread. The bottom of the slit of the larger screws of small-arms is concave; the base screw of the rear sight has two holes in the head instead of a slot, in order that it may not be removed by the ordinary screw-driver. The *Screw* is also a mechanical power. The power applied perpendicular to the axis, is to the weight, as the *pitch* of the screw *s*, or the distance between the two threads, is to the cir-

cumference described by the point to which the power is applied. Thus, if the power is applied by means of a lever l,

$$P = \frac{w\ s}{2\ \pi\ l}$$

SECANT. (*See* TRIGONOMETRY.)

SECRETARY OF WAR. The principal officer of the Executive Department of War. (*See* DEPARTMENT OF WAR.) Mr. Attorney-general Wirt, in an opinion, dated Jan. 25, 1821, says, the Secretary of War "does not compose a part of the army, and has no duties to perform in the field." The duties assigned by law for the Secretary of War are the following: 1. The act creating the new department (*Act* Aug. 7, 1789) gives to the Secretary, besides the custody of records, books, and papers of the old department, the record of military commissions, the care of warlike stores and other duties clearly ministerial. 2. Section 5, *Act* March 3, 1813, continued in force by the 9th section of the *Act* of April 24, 1816, delegates jointly to the President and Secretary of War the power to make regulations better defining and describing the respective powers and duties of staff officers. 3. Articles of War, 13, 18, and 19, intrust the Secretary of War with muster-rolls and returns, and give him authority over the forms of such papers, and to require stated returns. 4. The 11th Article of War authorizes him to grant discharges to non-commissioned officers and soldiers; and the 65th of the same articles makes him the medium in passing proceedings of certain courts-martial, and the organ of the President's orders thereon; 5. Another Article of War (the 95th) charges the Secretary with receiving accounts of the effects of deceased officers and soldiers. 6. *Act* May 18, 1826, section 1, respecting clothing, &c., charges certain duties upon the Quartermaster-general "under the direction of the Secretary of War." 7. Several acts authorize the Secretary to purchase sites for arsenals. 8. The Ordnance Department and its *materiel* are made subject to the Secretary by the *Act* February 8, 1815. 9. Under the *Act* March 2, 1803, Section 1, the Secretary of War is authorized to give direction to the State Adjutants-general, in order "to produce uniformity" in returns, and to lay abstracts of the same, &c. 10. The Secretary shall lay before Congress on the 1st of February in each year a statement of the appropriations of the preceding year showing the amount appropriated, and the balance remaining unexpended on the 31st of December preceding. He shall estimate the probable demands which may remain on each appropriation, and the balance shall be deducted from the estimates of his department for the service of the current year; (*Act* May 1, 1820.)

11. He shall render annually accounts exhibiting the sums expended out of such estimates, together with such information connected therewith as may be deemed proper; (*Act* May 1, 1820.) 12. The Secretary of War shall cause to be collected and transmitted to him at the seat of Government all flags, standards, and colors, as may be taken by the army of the United States from their enemies; (*Act* April 18, 1814.) 13. The Secretary may employ for the office of the War Department one chief clerk, and such other clerks as may be authorized by law; (*Acts* April 20, 1818, and May 26, 1824.) 14. The Secretary of War may furnish to persons who design to emigrate to Oregon, California, or New Mexico, such arms and ammunition as may be needed to arm them for the expedition at the actual cost of such arms and ammunition; (*Resolution* March, 2, 1849.) 15. All purchases and contracts for supplies or services for the military service of the United States, shall be made by or under the Secretary of War; (*Act* July 16, 1798.) 16. He shall annually lay before Congress a statement of all contracts, with full details; (*Act* April 21, 1808.)

Not one of the numerous acts of Congress relative to the War Department gives him authority to command troops. His lawful duties are all purely administrative, and as "he does not compose a part of the army," the President, in the exercise of his office of commander-in-chief, can of course only use the military hierarchy created by Congress. The English, from whom our system is borrowed, opposed to centralization of authority as adverse to freedom, have judiciously recognized the fact, in practice as well as theory, that the War Department is not of such a nature that it can be directed as other departments of the cabinet, or even be made to work by the simple play of constitutional changes in the ministry. They have consequently separated the *action* of the public force from the *direction* of financial matters. But as the safety of the state depends upon the stability of its military institutions, the steadfastness of the means at work, and the skilful direction of all details, the Minister of War, who is changed by every triumph of opposite opinion, is not a military officer, and not charged with military authority. The permanent military institutions of the country do not depend upon him. The army does not look to him for nominations to office, discipline, or military control. He is simply the great provider, the superintendant of accounts, the financier, the interpreter of the plans of the cabinet for exterior and politico-military operations. He is aided by under-secretaries, who do not go out of office with the cabinet, and who are charged with the administration and payments for *materiel*.

The commander-in-chief, on the contrary, is the conservator of

discipline, the centre of nominations, the life-spring which animates and directs the army, the source of orders, the regulator of tactics. He occupies himself with improvements of all kinds, and with the destination of *materiel.* It is to him that the Minister of State for War has recourse when he communicates to parliament or the cabinet the condition of the army, details of organization and other military information. Military finance and the support of armies are thus left with the Secretary of War, while command, discipline, and improvements are regulated by the commander-in-chief. The Minister of War thus follows the fortunes of a cabinet without the military institutions of the country being in any manner affected by party changes. Practice in the United States has widely diverged from this theory. (Consult BARDIN, *Dictionnaire de l'Armée de Terre; Milice Anglaise; Debates in Parliament.*)

SECTION, PROFILE, GROUND-PLAN. If a plane pass through work in any direction, the cut made by it is a section; if the cut be vertical and perpendicular to the face of the work, it is a ground-plan: thus, when the foundation of a house appears just above the ground, it shows the ground-plan of the building.

SELLING. (*See* AMMUNITION.)

SENIOR. Superior rank.

SENTENCE. (*See* COURT-MARTIAL.)

SENTRY OR SENTINEL. Any sentinel sleeping on post or leaving it before being regularly relieved, shall suffer death, or such other punishment as may be inflicted by sentence of a court-martial.

SERGEANT. Non-commissioned officer above corporal. There are various grades of sergeants: 1st. Sergeant-major, the first non-commissioned officer of a regiment, whose principal office is to assist the adjutant; 2d. Quartermaster-sergeant, assistant to the regimental quartermaster; 3d. Principal musicians of a regiment; 4th. Ordnance sergeant; 5th. First sergeant, or orderly sergeant of a company, and 6th. Sergeants, without prefix.

SERVANTS. (*See* PAY, for the number allowed to officers.) Company officers only can take soldiers from the line as servants; (*Act* April 24, 1816.)

SERVICE. The military art is the art of serving the state in war. All studies, acts, and efforts of the profession of arms have this end in view. To belong to the army and to belong to the land service, are the same thing. In a more restricted sense, service is the performance of military duty. In its general sense, service embraces all details of the military art. But in its restricted sense, actual service is the exercise

of military functions. We say the Military Service; Cavalry, Artillery, or Infantry Service; Active Service; Regimental Service; Detached Service; Service on the Staff; Garrison Service; Camp Service; Campaign Service; Service in peace; Service in war; Daily Service; Service abroad; Service at home; Frontier Service; Service as captain, &c.; Armed Service; Actual Service. *To see service* implies actual combat with an enemy. *Service in campaign*, is service in the field; and in the French army, service in war or in colonies counts double, in estimating length of service, for promotions, pensions, retreat, and other remunerations. (*See* ABATIS; ADJUTANT-GENERAL; AIDE-DE-CAMP; ARMS, (*Small;*) ARTILLERY; ASSAULT; ATTACK AND DEFENCE; BARRICADES; BARRIER; BATTERIES; BATTLE; BAYONET; BLACKING; BLINDAGE; BLOCK-HOUSE; BOMBARDMENT; BRIDGES; CAMP; CAMPAIGN; CAPITULATION; CARPENTRY; CAVALRY; CHARGE; CONVOYS; COOKING; COUP D'ŒIL; DEFENCE, (*Coast;*) DEFILE; DEFILEMENT; DISEMBARKATION; DRAGOONS; EMBARKATION; ENGINEERS; ESCALADE; FASCINES; FIELD-WORKS; FIRING; FLAGS OF TRUCE; FLANK; FORAGING; GABIONS; GUNNERY; INFANTRY; LANCE; LAW, (*Martial;*) LODGMENT; MANŒUVRES IN BATTLE; MARCH; MINE; OBSTACLES; OVEN; OUTPOSTS; PARTISAN; RECONNOISSANCE; RIFLEMEN; ROADS; SANITARY PRECAUTIONS; SAW-MILL; SIEGES; SQUARES; STADIA; STRATEGY; SURVEYS, (*Military;*) TACTICS; TARGET; TELEGRAPH; TOOLS; VETERINARY; WAGON; WAR; and Alphabetical list generally.

SEXTANT. An instrument for measuring the angular distances of objects by reflection. It is a segment of a circle of 60°. The quadrant and reflecting circle are instruments which depend on the same principle of optics, viz.: if an object be seen by reflection from two mirrors which are perpendicular to the same plane, the angular distance of the object from its image is double the inclination of the mirrors. The purpose, then, of the sextant, quadrant, and reflecting circle, is the adaptation of a convenient method for measuring the angle between two mirrors perpendicular to the same plane, and thus ascertaining the angle between two objects. This is accomplished by a contrivance which enables the mirrors to be so arranged that an object seen directly is brought to coincide with the *image* of another object seen by reflection, and the angle is shown by an index.

SHAFT—in mining, is a perpendicular excavation.

SHEERS. (*See* DERRICK; GIN.) By removing the pry pole of the gin, it may be used as sheers. When thus used, a block of wood of the same dimensions as the head of the pry pole with a hole in it large enough to receive the clevis blot, must be inserted in place of the pry pole.

SHELLS. A shell is a hollow shot with a hole to receive the fuze. They are usually fired from mortars and howitzers, and are charged with a sufficient quantity of powder to burst them, when they reach the end of their range. When fired at troops, the shells should be prepared to burst over their heads; or if the ground be favorable, to ricochet in front and plunge into the column. When fired at works or buildings, the shells should burst after penetration. (*See* AMMUNITION; FUZE; RIFLED ORDNANCE; SABOT; SPHERICAL CASE.)

SHOT, (SOLID OR ROUND.) Made of cast iron and used as projectiles when great accuracy, range, and penetration are required. (*See* BREACH; SABOT.)

SIEGES. An army, to undertake the siege of a fortress, must have superiority in the field, so that while some of the corps are occupied in besieging the place, others are employed in *covering* this operation, or in repulsing the enemy whenever he endeavors to succor the place. The army covering the siege is called an *Army of Observation*, and that which endeavors to give aid to the place is called the *Succoring Army*. The *Besieging Army* is that which, protected by the army of observation, throws up all the works necessary to take the place, such as trenches, batteries, &c. It begins its operations by investing the fortress; that is, it will advance with the greatest secrecy and rapidity, and occupy positions on every side, to cut off all communication with the adjacent country, and confine the garrison entirely to their own resources. The positions thus occupied are strengthened by field-works, and a sure communication is kept up between them.

It is absolutely necessary to invest the fortress attacked, so as to prevent the garrison holding any intercourse with the neighboring country; for if this precaution be not taken, the defenders will be able to draw fresh supplies of men, provisions, and ammunition from the country, increasing greatly the duration of the siege, and reducing the chances of ultimate success. At the late siege of Sebastopol, the ground being intersected by the inlet of the harbor of Sebastopol, the allied army was unable to complete the investment. Thus the fortress on the northern side was left open to receive all the reinforcements of men and materiel which could be furnished by the resources of Russia. Fresh officers, fresh troops, fresh provisions were continually poured in; the defences were enlarged and multiplied; and the besiegers, attacked in their own lines, held at one period a very critical position. The siege was thus prolonged beyond that of any other of modern times, and success was ultimately attained by a loss of men and materiel altogether unprecedented. Ground was broken on the 10th

October, 1854, and on the 10th September, 1855, the Russians, having sunk their ships, retreated from the southern to the northern side of the harbor, leaving the works on the southern side in the hands of the allies, exactly eleven months after the commencement of their attack.

A place may sometimes be reduced by investment or blockade alone, and where it is possible suddenly to blockade a place ill provisioned and filled with a numerous garrison and population, it may be the most ready and bloodless mode of proceeding. Indeed, many other circumstances may render it desirable to endeavor to reduce a place by blockade. When the defenders have been driven within their works, and the place invested, the ground before the fronts to be attacked is carefully examined, and the most suitable situations selected for the park of artillery, and the engineer's park: the former to receive all the ordnance stores and ammunition; the latter all the engineers' stores and materials to be used in the construction of the trenches, batteries, &c. These parks should be placed in secure localities, behind the slopes of hills or in ravines, beyond the general range of the guns of the fortress, but with a ready access to the trenches and batteries of attack, for the use of which they are formed.

The artillery and engineer parks having been duly established, and an adequate supply of ordnance, ammunition, and materials collected in them, for a week's or ten days' consumption, the actual work of the siege begins. The objects of the besiegers are three: 1st. By a superior fire of artillery to dismount the guns and subdue the artillery fire of the place. 2d. To construct a secure and covered road by which his columns may march to assault the defensive works, so soon as they are sufficiently destroyed to justify the attempt. 3d. To breach or batter down the escarp revetments of the fortress in certain spots, causing the fall of the rampart and parapet supported by them, and thus exposing the interior of the place to the assaulting columns.

Now, before any means can be taken to attain any one of these objects, a strong force must be placed under cover, close at hand to the spots on which the necessary operations are to be commenced, whose duty it is to repel any sortie of the enemy, and drive back any parties which issue from the place to destroy or interrupt the works of the attack. The cover provided for this guard of the trenches is usually a trench and parapet called the first parallel, formed around the whole of the fronts attacked: its distance from the advanced works has usually been between 600 and 700 yards. In the late siege of Sebastopol, the first parallel was opened at a distance of 1,200 yards; and doubtless, in future sieges, owing to the increased range of fire-arms,

the first parallel will seldom be less, and may probably be considerably more distant. This parallel is formed by approaching the place secretly in the night with a body of men; part carrying intrenching tools, and the remainder armed. The former dig a trench in the ground parallel to the fortifications to be attacked, and with the earth excavated from the trench raise a bank on the side next the enemy, while the latter remain under arms, usually in a recumbent posture, in readiness to protect the working party, should the garrison sally out. During the night, this trench and bank are made of sufficient depth and extent to cover from the missiles of the place the number of men requisite to cope with the garrison, and the besiegers remain in the trench throughout the following day, in despite of the fire or of the sorties of the besieged. This trench is afterwards progressively widened and deepened, and the bank of earth raised till it forms a covered road, called a parallel, embracing all the fortifications to be attacked; and along this road, guns, wagons, and men securely and conveniently move, equally sheltered from the view and the missiles of the garrison. So soon as the first parallel is established, the engineers select positions for the batteries to silence the defensive artillery. In the positions of these batteries lies one of the principal advantages of the besiegers.

Batteries of guns and mortars are now constructed a little in advance of this parallel, in positions, such that their guns enfilade all the faces of the works attached. The crest lines of these batteries are therefore made perpendicular to the prolongations of the faces of the ravelins and bastions of the fronts attacked, and so great is the advantage to the besieger arising from such positions of his batteries, that with an equal or sometimes smaller number of guns he is able speedily to subdue the artillery fire of the defence. These enfilading batteries on the first parallel should be completed and ready to open fire on the third morning after breaking ground.

After the fire of the defensive artillery has been sufficiently subdued, the approaches are commenced. These, like the first parallel, are trenches dug in the ground and protected by a parapet formed of the excavated earth, thrown up on the side of the enemy's works. The approaches are made on the capitals of the ravelins and bastions attacked, but not in a straight line directly towards the salients, as in that case they could be enfiladed from end to end, but in a zigzag direction, alternately to the right and to the left of the capitals, in such a manner that their prolongations fall clear of the fortress, and the possibility of enfilading them is entirely removed.

The heads of these approaches are pushed forward by small parties

of men, who, from their great numerical inferiority, are quite unable to contend with sorties issuing from the place. To prevent the repeated destruction of the approaches, and the continual loss of the working parties engaged in their construction, a guard of sufficient strength must always be stationed within a distance from these works not exceeding the distance of these works from the covered-way of the place: so that a sortie issuing from the place for the purpose of destroying the approaches may be met and repulsed by the guard of the trenches before they can have time to carry their object into effect; and as the approaches themselves, from their limited dimensions, afford no accommodation for a guard of the trenches, a parallel must always be established at least as near to the head of the approaches as the heads of approaches to the covered-way of the place.

It may then be considered a general principle of the attack that a new parallel or place of arms becomes necessary when the approaches have advanced half way between the last formed parallel and the covered-way of the fortress. So soon, therefore, as the approaches have advanced half the distance between the first parallel and covered-way of the fortress, a second parallel must be established to accommodate a guard of the trenches, or the working parties at the heads of the approaches will be liable to be swept off by parties of cavalry issuing from the covered-way, before aid can reach them from the first parallel. The approaches are then pushed forward, parallels being made according to the principles just laid down, wherever required, until they reach nearly the crest of the covered way. Here a trench of greater magnitude is formed, and in it batteries of heavy guns are constructed to silence the remaining artillery of the defence, and to breach in certain selected spots the escarp revetment wall, thus destroying the formidable obstacle to assault presented by the high perpendicular sides of the ditches of the fortress.

The order for the assault is given when the breach has been rendered practicable by the overthrow of the parapet upon the ruins of its walls; and after a gallery has been opened for descending into the ditch, across which a good epaulement has been made joining the breach to the gallery. The troops for the assault are held in the ditch, in the crowning of the covered-way, and in the third parallel. These detachments are to sustain each other and to do it with strong arms. At the concerted signal, the first detachment mounts the breach, driving back the defenders, and seeking to establish themselves firmly upon the height by constructing with gabions a lodgement in the angle of the bastion. This is a little intrenchment, called by the French *nid de pie*,

which crowns the breach, and under shelter of which the soldiers fire upon all who present themselves. The sappers are charged with its construction, and in sufficient numbers for this purpose, accompany the assaulting party, each carrying a shovel, a pick-axe, and a gabion. The second detachment aids the first in surmounting the breach, and relieves it if the struggle is obstinate The third detachment lines the trenches upon the glacis, and sweeps with its fire the parapets and top of the breach, and wherever else there is resistance, but care must also be taken, before coming to close quarters, to facilitate the assault by directing upon the work attacked, as many pieces of artillery as possible. When the close combat begins, the artillery ceases, as it would otherwise fire upon friend and foe.

Frequently the taking of the first works brings about the surrender of the place, but again it often happens that their resistance is but a foretaste of the obstinate defence to be made, and it is necessary to grasp, step by step, the fortifications of the besieged. Sometimes, again, the possession of the ramparts does not put an end to the fighting, but courageous citizens, willing to sacrifice their property to the honor and independence of their country, dispute inch by inch the possession of the streets and houses. The defence of Saragossa in 1808 is a heroic instance of such devotedness. The Spaniards, after losing their fortifications, sustained during twenty-three days attacks in streets and from houses. They capitulated for want of powder, and only after the enormous loss of fifty-four thousand persons of all ages and sexes.

A commanding officer, *defending the approaches of a fortress* threatened by armed enemies, declares it in a *state of siege*, and from that moment martial law prevails; or, in other words, the military authority alone governs. Every thing is brought into the place necessary for defence, in the shape of wood, fascines, gabions, animals, grain, and eatables of all kinds. All useless mouths are sent out of the place, and those inhabitants who remain are required to provide themselves with wheat, dried vegetables, oil, salt meats, &c., for many months, in order that the garrison may not be obliged to share their provisions with them. The place is put in a state of defence by arming and repairing the fortifications, planting palisades, clearing away the incumbrances in the communications, &c., &c.

When the garrison is sufficiently numerous, and that is the case here supposed, it guards against being entirely shut up in the place, by disputing all approaches. Positions are taken in advance of the suburbs, and far from destroying the suburbs as a smaller garrison must

do, they should be covered by intrenchments, in the double aim of preserving them, and sparing the rear as long as possible.

Besides the preceding intrenchments, advantageous points are selected for solid redoubts and small posts. The most exposed passages are closed by abatis or deep cuts. Walls are pierced with embrasures, the different stories of houses made defensible, and all means whatever resorted to that can prolong the defence.

Upon a field of battle thus prepared, a long resistance may be expected, and the attacking force will experience great losses before they can open their trenches and begin the ordinary labors of the siege. Perhaps even during this exterior struggle, political events or other warlike operations may extricate the garrison from the impending siege, and its glorious struggle will then have freed the place committed to it from many horrors.

If the moment at last comes when it is necessary for the garrison to shut itself up, then follows that series of operations properly called a siege. The defence has a thousand means of prolonging its duration, because his exterior defence has given time to prepare them. Knowing the point of attack indicated by the first operations, the defence will have redoubled his intrenchments. The garrison will have been made warlike by frequent combats. It occupies, it is true, a post hard pressed, but its force is the more concentrated from that cause, and is still imposing notwithstanding the losses that it has experienced.

It is by *sorties* that we retard the operations of the besiegers. Large sorties are executed by numerous corps, and are generally made by day to avoid confusion. Small sorties are made at night, and consist of but few men. The first are designed to overthrow the trenches, fire the batteries, and spike the pieces, and they are consequently always followed by a sufficient number of workmen, provided with the necessary instruments. The smaller sorties are only directed against the workers of the sap; they present themselves unexpectedly and frequently drive away the workmen, and break up the gabions. The sap thus interrupted progresses but slowly.

Defensive mines are also a powerful means of prolonging the defence, as they force the besieger to make works that require much time in their preparation. As soon as the point of attack is known the besieged prepare under the glacis chambers of mines, which threaten the batteries of the besieger and constrain him to dig under the ground. The defence has in this subterranean war a great advantage, as he expects the attack in galleries previously prepared. The attack has no other resource than to prepare his chambers at a great distance in order

to destroy those of the defenders, and for this purpose *globes* of *compression* are employed. These overcharged chambers, however, require a great deal of powder, and also much time for their preparation.

The besieged has also an advantage in the defence of breaches, because the attacking force may be surrounded, and can only reach their object by a narrow and difficult ascent. In defending a breach, therefore, all the energies of the defence should be brought into action. Preparations should be made in advance for this period of the siege, and some pieces of artillery should be carefully preserved, to arm at the moment of the assault these works which take in flank and reverse the columns of attack. At the top of the breach loaded shells are kept ready to roll down upon the assailants; a large fire should be lighted at the foot of the breach, and kept up by fagots. Or, if the enemy has only partially beaten down the wall, the foothold may be cleared away during the night in such a manner as to make the breach impracticable. Mines may be dug under the ruins by which the assailants may be overthrown. Long arms, as pikes, may be given to the soldiers who defend the breach, and those in the front ranks may be protected by cuirasses. If the work attacked has much capacity, reserves may be held in the interior to charge the enemy when he shows himself, and cavalry may also be brought up at this decisive moment.

Such are, in general, the steps to be taken to defend a work; but success will at last depend upon the character, firmness, and skill of the governor, and upon the intrepidity of his soldiers.

The army of observation ought not to be too far from that engaged in the siege, because it may be necessary to call for reënforcements from the latter, and they should be able to return to their camps after the action. Such aid furnished at the opportune moment is precious, and may contribute powerfully to defeat or repulse an enemy. When Napoleon covered the siege of Mantua he did not confine himself to drawing battalions from the besieging army, in order to fight the numerous troops striving to surround him, but he marched the whole besieging army, and uniting it with the army of observation, he gained the celebrated battle of Castiglione.

Besides, if the army of observation be too far off, there is nothing to prevent the enemy from unexpectedly attacking the besieging army, which, occupying a long line of investment, is rarely in a condition to repulse such an attack, and may therefore, without aid, be compelled to raise the siege, with the loss of ordnance and other *materiel*. General rules cannot be laid down for the position to be taken by an army of observation. It must possess mobility of action, and seek concentra-

tion as much as circumstances admit. It must not consider itself tied to the besieging army, and yet be always ready to succor the latter as well as repel a succoring army : conditions which demand much consideration, and which will be fulfilled only by varying dispositions according to circumstances.

In 1640, Prince Thomas of Savoy and the Spaniards held the city of Turin, whose citadel was defended by a French garrison. At the beginning of May, the Count d'Harcourt, celebrated for his courage and his military talents, set himself down before the place, but it was scarcely invested before the Marquis de Lénages arrived with heavy forces to blockade him in his lines. Turin, invested in this manner, presented the singular spectacle of a citadel besieged by the city, of the city besieged by a French army, and the latter surrounded by a Spanish army. In this position the Prince of Savoy corresponded with Lénages by means of shells without fuzes, in which letters were enclosed. The same means were used to introduce into the city a little salt and medicine, of which they were much in want. Count d'Harcourt, obliged to defend himself from continual sorties made by Prince Thomas, as well as from reiterated attacks of the Spanish army, covered himself by double lines as a protection against both. At length after a siege of four months and a half, after having endured in his camp every privation, he forced the city to capitulate. The Prince of Savoy marched out with the honors of war, and the Spanish army retired ; (*Memoirs of the House of Savoy, par le* Marquis DE COSTA.)

Marshal Soult, at the siege of Badajoz, being occupied with an army larger than his own, nevertheless found an occasion by which he ably profited to establish an equilibrium of forces. Ten thousand Spaniards, to avoid being an encumbrance, went out from Badajoz to encamp upon the heights separated from the French army by the Gaudiana, and covered by the Gebora. Howitzers of long range were fired by the French army upon the Spanish camp, in order to drive it as far as possible from the works of Badajoz, from which it was separated by a valley of 600 toises in breadth. An hour before day, the Gaudiana was crossed in boats, the torrent of Gebora forded, and while Marshal Mortier directed a front attack upon the heights and sent his cavalry to turn the right, two or three thousand infantry placed themselves in the valley between the fortress and the camp, and facing both ways cut off all communication. Complete success crowned these beautiful dispositions. Eight thousand Spaniards grounded their arms, five or six hundred were killed, and the remainder escaped. Such was the brilliant combat of Gebora fought Feb. 19, 1811 ; (*Victoires et conquêtes.*)

These dissimilar instances, with hundreds that might be cited, show that no rules can determine the conduct of an army in the field, but genius in war may derive instruction from the memoirs of able commanders. (*Consult* DUFOUR; HYDE. *See* BATTARDEAU; BATTERY; DITCH; FIELD-WORKS; FORTIFICATIONS.)

SIGHT. A small piece of brass or iron, fixed on a gun at its muzzle, to serve as a point of direction, and also to hold fast the bayonet on the firelock. (*See* HAUSSE.)

SIGNAL. To attract the notice of a division of your party, five or even ten miles off, glitter a bit of looking-glass in the sun towards where you expect them to be, (Fig. 209.) It is quite astonishing at how great a distance its flashes will catch the sharp eyes of a bushman who has learnt to know what it is. It is now a common signal in American prairies. The sparks from a well-struck flint and steel can be seen at an equal distance.

FIG. 209.

If, instead of flashing with the mirror, the glare be steadily directed to where the party are, it will be seen at a far greater distance, and appear as a brilliant star; but it requires some practice to do this well. The rays from the mirror, whatever its size may be, form a cone whose vertical angle is no greater than that subtended by the diameter of the sun, and it is therefore necessary that the signaller should be satisfied that he throws his flash within that degree of accuracy. Moreover, a rapidly passing flash has far less brilliancy than one that dwells steadily for a fraction of a second.

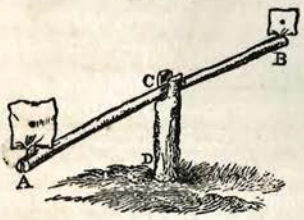
An instrument, called a "hand heliostat," has been contrived by Galton for ascertaining the direction of the flash. Mr. Galton says: The instrument is perfectly easy to manage, and letters can be signalled by a combination of flashes, which I need not here describe. Its power is perfectly marvellous. On a day so hazy that colors, on the largest scale—such as green fields and white houses—are barely distinguishable

at seven miles' distance, a looking-glass no larger than the finger-nail, transmits signals clearly visible to the naked eye.

The result of several experiments in England showed that the smallest mirror visible (under atmospheric conditions such that the signaller's station was discernible, but dim) subtended an angle of one-tenth of a second. It is very important that the mirror should be of truly parallel glass, such as instrument-makers procure. There is loss of power in more than one way from a slight irregularity. A plane mirror only three inches across, reflects as much of the sun as a globe of 120 feet diameter, and looks like a dazzling star at 10 miles' distance.

There are makeshift ways of directing the flash of the mirror; as, by observing its play on an object some paces off, nearly in a line with the station it is wished to communicate with. In doing this, be careful to bring the eye to the very edge of the mirror; there should be as little "dispart" as possible, as artillerymen would say. The aim must be a very true one, or the flash will never be seen. An object, in reality of a white color but apparently dark, owing to its being shaded, shows the play of a mirror's flash better than any other. The play of a flash, sent through an open window, on the walls of a room, can be seen at upwards of 100 yards. It is a good object by which to adjust the above-mentioned instrument. Two bits of paper and a couple of sticks, arranged as in Fig. 210, serve pretty well to direct a flash. Sight the distant object through the holes in the two bits of paper, A and B, at the ends of the horizontal stick; and, when you are satisfied that the stick is properly adjusted and quite steady, take your mirror and throw the shadow of A upon B, and further endeavor to throw the white speck in the shadow of A, corresponding to its pin-hole in it, through the centre of the hole in B. Every now and then lay the mirror aside, and bend down to see that A B continues to be properly adjusted.

FIG. 210.



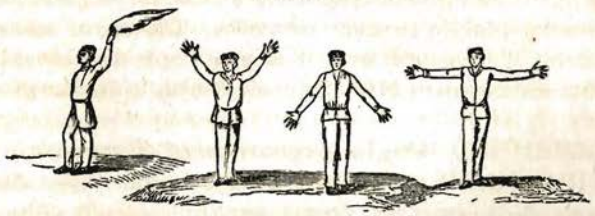
In short reconnoitring expeditions with a small detachment of a party, the cattle or dogs are often wild, and certain to run home to their comrades on the first opportunity; and, in the event of not being able to watch them, owing to accident or other cause, advantage may be taken of their restlessness, by tying a note to one of their necks, and letting them go and serve instead of postmen or carrier-pigeons.

Fire-beacons, hanging up a lantern, setting fire to an old nest high

up in a tree—make night-signals; but they are never to be depended on without previous concert, as bushes and undulations of the ground may often hide them entirely. The smoke of fires by day is seen very far, and green wood and rotten wood make the most smoke. It is best to make two fires 100 yards apart. In the old-fashioned semaphores, or telegraphs, with arms to them, it is a common rule to allow, for the length of the arms, one foot for every mile it is intended to be seen from, and the eye is supposed to be aided by a telescope.

A line of men can be turned into a line of semaphores, by making them each hold a cap or something black and large in their hands, and mimic the movements of one another. Only a few simple signals could be transmitted in this way with any certainty. There are four elementary signals, which deserve general adoption. I fear the use of more would perplex. Men should be practised at these four, (Fig. 211.)

FIG. 211.



No. 1. No. 2. No. 3. No. 4.

NO.		SIGNAL.
1.	Attend to me; or, come to me	Wave.
2.	All right; or, yes. Affirmation signal	Both arms raised.
3.	All wrong; or, no. Negation signal	Both arms lowered.
4.	Stop	Both arms spread.

Energetic movements, of course, intensify the meaning. To use the signals, wave until you are answered; then make your signal while you count five, and wait five. Continue this till your friend does the same, then make a rapid "all right;" he does the same, and all is concluded. In order that you may be seen, try and stand in a position where your friend would see you against the sky; (GALTON'S *Art of Travel.*)

A kite has been suggested as a day-signal; and also a kite with some kind of squib let off by a slow-light and attached to its tail, as one by night; (Col. JACKSON.)

A common signal for a distant scout is, that he should ride or walk round and round in a circle from right to left, or else in one from left to right. "At other times they will lie concealed near a road, with scouts in every direction on the look-out; yet no one venturing to

speak, but only making known by signs what he may have to communicate to his companions or leader. Thus he will point to his ear or foot on hearing footsteps, to his eyes on seeing persons approach, or to his tongue if voices be audible; and will also indicate on his fingers the number of those coming, describing also many particulars as to how many porters, beasts of burden or for riding, there may be with the party; (PARKYNS.) Balloons, rockets, flags, &c., may be used to signal. (*See* TELEGRAPH; RECONNOISSANCE.)

SIGNAL OFFICER. By *Act* approved June, 1860, there was added to the staff of the army "one signal officer with the rank, pay, and allowances of a major of cavalry, who shall have charge, under the direction of the Secretary of War, of all signal duty, and of all books and papers, and apparatus, connected therewith." (*See* SIGNALS; TELEGRAPH.)

SINE. In trigonometry the sine of any arc of a circle is the straight line drawn from one extremity of the arc perpendicular to the radius passing through the other extremity. The sine of an arc is half of the chord of the double arc. It is positive in the first and second quadrants and negative in the third and fourth. (*See* TRIGONOMETRY; TABLES.)

SKETCHING. (*See* RECONNOISSANCE and SURVEYING.)

SKIRMISH. A loose, desultory engagement. Light infantry are the troops usually employed for such service; (*Infantry Tactics.*)

SLEEPERS. Small joists of timber, which form the foundation for the platform of a battery, and upon which the boards for the flooring are laid.

SLING-CARTS. A wooden sling-cart is composed of two wheels, 8 feet in diameter, an *axle-tree*, a *tongue*, and the *hoisting apparatus*, and is used to transport cannon and their carriages. The hoisting apparatus is a screw, which passes through the axle-tree, and is worked by a nut with long handles. The lower part of this screw is terminated with two hooks, to which are fastened the chains and trunnion rings; the breech of the piece being supported by the cascable chain. Or, if a chain be passed around the piece to be raised, it may be fastened to the hooks. The iron sling-cart is smaller than the wooden, and is used to transport cannon in the siege trenches.

SLUICE—is a strong vertical sliding door to regulate the flow of water.

SOLDIER. Whoever belonging to the military service of the State receives pay is a soldier. The term is derived from *solde*. It is an appellation, however, which a soldier proudly claims; and it is on

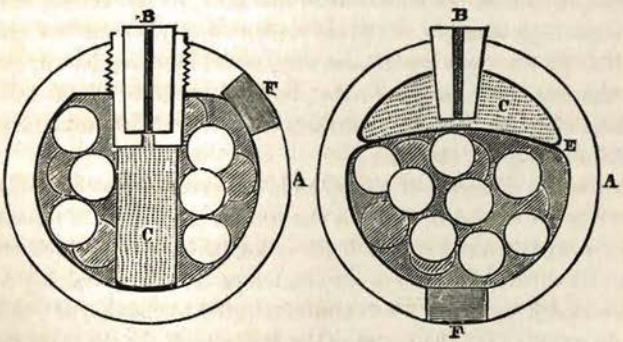
the contrary an outrage to a brave man to say to him, "you are no soldier." "Every means (says Napoleon) should be taken to attach a soldier to his colors. This is best accomplished by showing consideration and respect to the old soldier. His pay likewise should increase with his length of service. It is the height of injustice not to pay a veteran more than a recruit." "There are five things a soldier should never be without—his musket, his ammunition, his knapsack, his provisions, (for at least four days,) and his intrenching tool."

SOLID SHOT. (*See* SHOT.)

SORTIE. An attack by a besieged garrison. (*See* SIEGE.)

SPHERICAL-CASE SHOT. A spherical-case shot consists of a thin shell of cast iron, containing a number of musket balls, and a charge of powder sufficient to burst it; a fuze is fixed to it as in an ordinary shell, by which the charge is ignited and the shell burst at any particular instant. A spherical case-shot, when loaded ready for use, has about the same specific gravity as a solid shot, and therefore, when fired with the service charge of powder, its range, and its velocity at any point in its range, is about equal to that of a solid shot of the same calibre. The spherical case mostly used for field-service is the 12-pdr., and contains, when loaded, 90 bullets. Its bursting charge is 1 oz. of powder, and it weighs 11.75 lbs. Its rupture may be made to take place at any point in its flight, and it is therefore superior to grape or canister. The attrition of the balls with which it is loaded, formerly endangered the firing of the bursting charge. This is now obviated, in making one mass of the balls, by pouring in melted sulphur. It is also prevented by Captain Boxer's improved spherical-case shot, two forms of which are shown in Fig. 212.

FIG. 212.



In either case, it is evident that the bursting charge of powder is kept separate from the balls. In one fig., it is contained in a cylindrical tin

box, attached to a brass socket which receives the fuze, and which is screwed into the shell. In the other, the part of the shell containing the bursting charge is separated from that containing the bullets, by a diaphragm of sheet iron, E, cast into the shell; (*i. e.*, the shell is cast on to the diaphragm which is inserted into the core.) The bullets are introduced into the shell by a second orifice F, and are kept in their places by a composition afterwards poured in. The present 12-pounder spherical-case shot, fired with a charge of 2½ lbs. of powder, is effective at 1,500 yards. The proper position of the point of rupture varies from 50 to 130 yards in front of, and from 15 to 20 feet above, the object. The mean number of destructive pieces from a 12-pdr. spherical-case shot, which may strike a target 9 feet high and 54 feet long, at a distance of 800 yards, is 30. The spherical-case shot from rifle cannon is said to be effective at over 2,000 yards. Spherical case should not be used at a less distance than 500 yards.

SPIES. In time of war all persons not citizens of, or owing allegiance to the United States, who shall be found lurking, as spies, about the fortifications or encampments of the armies of the United States, shall suffer death by sentence of a general court-martial; (*Act* April 10, 1806, SEC. 2.)

SPIKE. To spike guns, is to drive large nails, or a piece of small rod, into the vent, so as to render guns unserviceable. To do this effectually drive into the vent a jagged and hardened steel spike with a soft point, or a nail without a head; break it off flush with the outer surface, and clinch the point inside by means of the rammer. Wedge a shot in the bottom of the bore by wrapping it with felt or by means of iron wedges, using the rammer to drive them in; a wooden wedge would be easily burnt by means of a charcoal fire lighted with a bellows. Cause shells to burst in the bore of brass guns, or fire broken shot from them with high charges. Fill a piece with sand over the charge to burst it. Fire a piece against another, muzzle to muzzle. Light a fire under the chase of brass guns and strike on it to bend it. Break off the trunnions of iron guns, or burst them by firing with heavy charges and full of shot, at great elevations.

To unspike a piece.—If the spike is not screwed in or clinched, and the bore is not impeded, put in a charge of ½ the weight of the shot, and ram junk wads over it with a hard spike, laying on the bottom of the bore a strip of wood with a groove on the under side containing a strand of quick-match by which fire is communicated to the charge; in a brass gun take out some of the metal at the upper orifice of the vent, and pour sulphuric acid into the groove for some hours before firing. If this

method, several times repeated, is not successful, unscrew the vent piece, if it be a brass gun, and if an iron one, drill out the spike or drill a new vent.

To drive out a Shot wedged in the Bore.—Unscrew the vent piece if there be one, and drive in wedges so as to start the shot forward, then ram it back again in order to seize the wedge with a hook; or pour in powder and fire it, after replacing the vent piece. In the last resort, bore a hole in the bottom of the breech, drive out the shot, and stop the hole with a screw; (*Ordnance Manual.*)

SPLINTER-PROOF. Strong enough to resist the splinters of bursting shells.

SPRING. (*See* ARMS for the springs in the musket lock.)

SQUAD. A small party of men. A company should be divided into squads, each under a responsible officer or non-commissioned officer; the whole under the superintendence of the captain or company commander.

SQUADRON. Two companies or troops of cavalry.

SQUARES. My opinion (says Marshal Bugeaud) is that a large square has not proportionally a greater fire than a small one, and that it is no stronger. In a charge of cavalry, that portion only which attacks the face of a square is to be feared. In extending the face of a square, therefore, if its fire is augmented, the number of cavalry that can bear down against it is augmented in the same proportion. A square of three thousand men is not then any stronger than a square of one thousand. It would therefore be absurd to form three thousand men in one square, because they can be more readily formed into three or four squares, which will mutually protect each other, and form, as it were, a system of redoubts. And if one of these combined squares is broken by cavalry, the cavalry becomes disordered in the act, and the remaining squares are left intact. Besides, in presenting a small front to the attack of cavalry, horses, fearing to charge against the shower of balls which welcome them, are apt to oblique to the right or to the left. If the face of the square is extended they cannot do so, and the shock must fall on some part of the face, but the smaller the faces of combined squares the greater will be the intervals, and the more certain the success of the defence.

From these considerations, it is apparent that large squares ought not to be used, but that squares of a single battalion are worthy of all commendation. The formation of troops in two ranks is the prescribed order of the United States infantry tactics. Marshal Marmont says: "Nothing can be said in favor of a third rank. Persons of experience

know that if one can, at a review, fire a volley in three ranks, it is impossible in war. It is better, therefore, to adopt the two-deep formation, and to render it permanent." The tactics direct that the divisions, as a general rule, shall always be formed before forming square. Marshal Bugeaud is of opinion that the square formed from the column by company, which would give a depth of four or six men to the different faces of the square, is greatly to be preferred. Apart from the fact that such squares are more expeditiously formed, the face of the square is reduced one-half, and the square is strengthened by the reduction.

STABLES AND STABLE DUTIES. The following arrangement of stables is recommended:

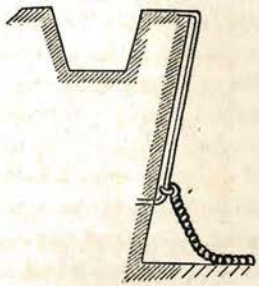
As far as possible, the horses of the same squadron should be placed in the same building, divided by partition walls or staircases into stables of equal capacity. When windows can be arranged in both long walls, place the horses head to head, separating the two rows of stalls by a longitudinal partition, which should not be more than 1′ higher than the top of the hay rack, between the pillars which support the roof. The interior width of a stable, for 1 row of stalls, is 20′; for 2 rows, it is 40′, when they are head to head; 34′ 8″, when they are tail to tail; height of ceiling, 16′ 8″. Doors should be pierced in the gable ends, and in the transverse partition walls, to secure a longitudinal ventilation during the absence of the horses. The doors for ordinary use should be pierced in the long walls; width, 6′ 8″; height, at least 8′ 8″.

There should be a window, with an area of about 16 square feet, for every 3 stalls; the sill 10′ above the floor; the sash revolving around a horizontal axis at the bottom, and opening by the simplest mechanism; wooden shutters to be provided, if necessary. The recesses for the windows should extend to the floor, and be provided with hooks and racks for suspending the horse equipments; in these recesses openings 3′ 4″ × 2′ 4″ should be made through the wall, for throwing out the litter. If necessary, ventilators may be cut through the roof in the middle of the passage ways behind the stalls; ventilators near the floor should be employed only in cases of absolute necessity.

The floor ought to be of hard stones, laid on a firm foundation, and the joints filled with hydraulic mortar, cement, or asphalt; slope of floor of stall from two to three-tenths of an inch in ten inches. Mangers of wood, stone, or cast iron, placed on a mass of masonry, the front surface of which, as well as that of the manger, has a reversed slope of $\frac{1}{4}$. The wooden mangers are divided by partitions; those of stone or iron are hollowed out to the length of 2′ for each horse, being solid between

the hollows; depth 8″, width at top 1′, at bottom 9″ .6; top of manger 3′ 8″ above the floor. The hay racks of wood and continuous, 3′ 4″ high, and placed 5′ 4″ above the floor. The bars round and capable of turning in their sockets, each bar 1″ .2 in diameter, and placed 4″ apart; racks of iron may be authorized. The system of securing the horse consists of: 1st, a bar of round iron bent at both ends, placed up and down, parallel to the face of the manger, the upper end secured to the manger, the lower built into the masonry; 2d, a ring sliding on this bar, and having a chain 2′ long, with a T at the free end, attached to it; this T toggles to the halter ring. Fig. 213 shows this arrangement.

FIG. 213.



Each horse is allowed a width of 4′ 10″, never less than 4′ 8″, so that he may have the allowance of 70 cubic feet, and the space necessary for stable guards, utensils, &c., may be preserved. Stables which are less than 29′ wide and 12′ high can be used for two rows of horses only as a temporary arrangement.

The French have stables of all dates and varieties; one recently completed at Saumur, and the new ones at Lyons are justly regarded as models of excellence. Their dimensions and general arrangements are in conformity with the regulations given above; there are, however, some details worthy of notice; that at Saumur being the most perfect will be described in preference. The stalls are 4′ 10″ wide in the clear, and 10′ long to the heel posts; they are separated by suspended swinging planks.

The floors are of cubical blocks of stone, laid in cement. A shallow gutter in the rear of each row of stalls allows the stale to drain off. The longitudinal partition is of masonry, and about 10′ high. The interior of the stable is plastered; the woodwork painted oak color. In the window recesses there are racks, on which to hang the horse equipments when saddling and unsaddling. The equipments are kept in rooms in the loft, where the saddles are placed on horizontal wooden pins, the bridles hung on hooks. The racks are continuous, and of wood; the string-pieces, and each bar, are bound with narrow strips of sheet iron. The lower string-piece rests upon iron hooks, let into the wall, the upper one is held firm by iron bars, also let into the wall. The manger is a continuous mass of stone, with an excavation for each animal; these excavations are 22″ long, 12″ deep, and 12″ wide at top.

know that if one can, at a review, fire a volley in three ranks, it is impossible in war. It is better, therefore, to adopt the two-deep formation, and to render it permanent." The tactics direct that the divisions, as a general rule, shall always be formed before forming square. Marshal Bugeaud is of opinion that the square formed from the column by company, which would give a depth of four or six men to the different faces of the square, is greatly to be preferred. Apart from the fact that such squares are more expeditiously formed, the face of the square is reduced one-half, and the square is strengthened by the reduction.

STABLES AND STABLE DUTIES. The following arrangement of stables is recommended:

As far as possible, the horses of the same squadron should be placed in the same building, divided by partition walls or staircases into stables of equal capacity. When windows can be arranged in both long walls, place the horses head to head, separating the two rows of stalls by a longitudinal partition, which should not be more than 1′ higher than the top of the hay rack, between the pillars which support the roof. The interior width of a stable, for 1 row of stalls, is 20′; for 2 rows, it is 40′, when they are head to head; 34′ 8″, when they are tail to tail; height of ceiling, 16′ 8″. Doors should be pierced in the gable ends, and in the transverse partition walls, to secure a longitudinal ventilation during the absence of the horses. The doors for ordinary use should be pierced in the long walls; width, 6′ 8″; height, at least 8′ 8″.

There should be a window, with an area of about 16 square feet, for every 3 stalls; the sill 10′ above the floor; the sash revolving around a horizontal axis at the bottom, and opening by the simplest mechanism; wooden shutters to be provided, if necessary. The recesses for the windows should extend to the floor, and be provided with hooks and racks for suspending the horse equipments; in these recesses openings 3′ 4″ × 2′ 4″ should be made through the wall, for throwing out the litter. If necessary, ventilators may be cut through the roof in the middle of the passage ways behind the stalls; ventilators near the floor should be employed only in cases of absolute necessity.

The floor ought to be of hard stones, laid on a firm foundation, and the joints filled with hydraulic mortar, cement, or asphalt; slope of floor of stall from two to three-tenths of an inch in ten inches. Mangers of wood, stone, or cast iron, placed on a mass of masonry, the front surface of which, as well as that of the manger, has a reversed slope of $\frac{1}{4}$. The wooden mangers are divided by partitions; those of stone or iron are hollowed out to the length of 2′ for each horse, being solid between

the hollows; depth 8″, width at top 1′, at bottom 9″.6; top of manger 3′ 8″ above the floor. The hay racks of wood and continuous, 3′ 4″ high, and placed 5′ 4″ above the floor. The bars round and capable of turning in their sockets, each bar 1″.2 in diameter, and placed 4″ apart; racks of iron may be authorized. The system of securing the horse consists of: 1st, a bar of round iron bent at both ends, placed up and down, parallel to the face of the manger, the upper end secured to the manger, the lower built into the masonry; 2d, a ring sliding on this bar, and having a chain 2′ long, with a T at the free end, attached to it; this T toggles to the halter ring. Fig. 213 shows this arrangement.

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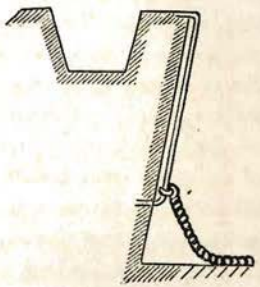
FIG. 213.



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The building is divided into apartments, for about 20 horses each, by transverse partitions and stairway halls; there are large doors in these partitions. In a central hall there are water tanks.

The openings mentioned in the regulations for removing the litter do not exist. The halter bars are arranged as described in the regulations; but there is another ring and chain, above the manger, for use in the day time. Forage for 3 or 4 days is kept in the loft, where there are also rooms for a few non-commissioned officers. In the floor of the loft there are trap doors, so that hay and straw may be thrown down into the halls below. The oats run down from the bin, through a wooden pipe, into a large box on wheels. On the outside of the walls there are rings for attaching the horses while being groomed. At Lyons, some of the stables had quarters in the second story; this is stated by many officers to be an admirable arrangement, and attended with no inconvenience whatever; there are a few who object to it. The hospital stables are always separate from the others, and have box stalls.

Stable Duty.—In each squadron, the stable guard generally consists of a corporal and 1 man for every 20 horses. It is their duty to feed the horses, watch over their safety during the night, and attend to the general police of the stables, being assisted by an additional detail at the hours of stable call.

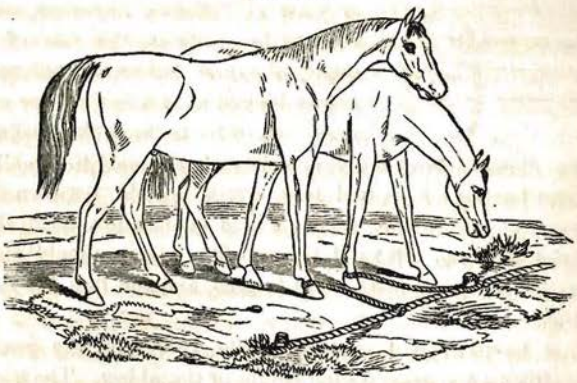
About one-half the litter is usually kept down during the day. The oats are given in two feeds: one-half at morning stable call, the rest in the evening. The hay is divided into three equal portions—at morning, noon, and night; in the forage magazine it is put up in trusses of 1 ration each, and thus received in the stable loft; at each feed the stable guard receive these trusses, and divide each one among three horses. If straw is fed, it is given either just before or just after the hay, always in the same order. The horse is watered twice a day, either just before or after his grain. The horse is cleaned principally with a *bouchon* of straw and with the brush; the comb is used only to clean the brush.

In the Crimea, the cavalry usually encamped in line, with two rows of picket ropes and a line of shelter tents in front of and behind the picket ropes; the arms and equipments between the shelters and the picket ropes.

The picket rope is stretched on the ground, and the horses secured to it by a hobble on the right fore-foot; the hobble is of leather, and about 3′ long; it buckles around the pastern joint; sometimes the hobble is attached to a picket pin, instead of a picket rope. Fig. 214 shows this arrangement; it is spoken of by the French officers as being the best manner of securing the horses. Officer's horses

are on the flanks of the squadron picket ropes; those of the field and staff are near the tents of their owners. For the latter, rude stables are usually formed, by excavating to the depth of a couple of feet, banking up the earth around three sides, and then forming a roof and walls of brush.

FIG. 214.



When time and circumstances permitted, the same was done for the horses of the men, especially in the winter. It was stated that a very slight protection of this kind produced very marked beneficial results. In this connection, it may be said, that companies of cavalry ought always to be provided with a sufficient number of tools to enable them to improvise some such shelter in any camp at all permanent; any thing which partially protects the horses from the cold winds is of great service. The French horses were blanketed in camp. (Consult McCLELLAN.)

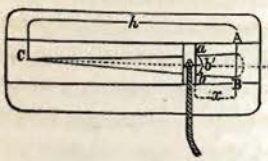
STADIA. A very simple aid in estimating distances, consists of a small stick, held vertically in the hand at arm's length, and bringing the top of a man's head in line with the top of the stick, noting where a line from the eye of the observer to the feet of the man cuts the stick, or *stadia*, as it is called.

To graduate the stadia, a man of the ordinary height of a foot-soldier, say 5 ft. 8 in., is placed at a known distance, say 50 yards; and the distance on the stick covered by him when it is held at arm's length is marked and divided into 8 equal parts. If the distance is now increased, until the man covers only one of these divisions, we know he is at a distance equal to 50 yds. $\times$ 8 = 400 yards. This instrument is not very accurate, except for short distances.

A much more accurate stadia is constructed by making use of a

metal plate, having a slit in it in the form of an isosceles triangle, the base of which, held at a certain distance from the edge, subtends a man, (5 ft. 8 in.) say at the distance of 100 yards. A slider, *ab*, (Fig. 215,) moves along the triangle, being always parallel to the base, AB, and the length of it comprised between the two sides of the triangle, represents the height of men at different distances, which are marked in yards on the side of the triangle, above or below, according as the object looked at is a foot soldier or horseman. In order to keep the stadia always at the same distance from the eye, a string is attached to the slider, the opposite end having a knot tied in it, which is held between the teeth while using the instrument, which is held in the right hand, the slider being moved with the left-hand finger. The string should always be kept stretched when the instrument is used, and the line AB in a vertical position.

FIG. 215.



It must be graduated experimentally, by noting the positions in which the slider *a b* represents the height of the object. The instrument used is not, however, reliable. Its uncertainty increases in an equal ratio with the distance of the object observed. At the extreme ranges it is quite useless. At the school for firing at Vincennes, therefore, they rely entirely on the eye alone for the judgment of distances, and great pains by careful practice and instruction is taken to perfect that judgment. A simple instrument by which distances can be determined is, therefore, still a great desideratum. The prismatic teliometer of M. Porro, of the Sardinian army, is however the best measurer of distances that has been yet invented. It is described in WILCOX's *Rifle Practice*.

STAFF. The staff of an army may be properly distinguished under three heads:—

1. The *General Staff*, consisting of adjutants-general and assistant-adjutants-general; aides-de-camp; inspectors-general and assistant-inspectors-general. The functions of these officers consist not merely in distributing the orders of commanding generals, but also in regulating camps, directing the march of columns, and furnishing to the commanding general all necessary details for the exercise of his authority. Their duties embrace the whole range of the service of the troops, and they are hence properly styled general staff-officers.

2. *Staff Corps*, or staff departments. These are special corps or departments, whose duties are confined to distinct branches of the service.

The engineer corps and topographical engineers are such staff corps. The ordnance, quartermasters', subsistence, medical and pay departments are such staff departments.

3. The *Regimental Staff* embraces regimental officers and non-commissioned officers charged with functions, within their respective regiments, assimilated to the duties of adjutant-generals, quartermasters and commissaries. Each regiment has a regimental adjutant, and a regimental quartermaster, appointed by the colonel from the officers of the regiment. Ideas concerning the utility, organization, and duties of the staff may be found in many writers. Until the end of the reign of Louis XIV., feudal manners and arbitrary notions accommodated themselves badly to written rules; but about this period more wholesome ideas began to prevail; mathematics made some progress; its application spread; the military art felt its effects; it was admitted that a single head was not sufficient for all the details necessary to conduct an army. It was agreed that the general-in-chief should have assistants to perform various duties. Hence certain military grades and financial employments were created. Those thus invested with authority were associated under the same designation. But this STAFF was far from being a special permanent corps. It was only a temporary assemblage of officers, and later took the name of staff, to indicate that they were AIDES of the general in regulating and supplying troops. Frederick the Great and Bonaparte undertook and gloriously terminated more than one war with the aid of staff-officers, but without a staff corps. At the beginning of the last century there existed in regard to the staff a few traditions, or customs, which differed in different armies. Neither laws, regulations, nor instructions had yet been established defining the rights, powers, and duties of the staff. Staff-officers were principally employed in reconnoissances; and on duties connected with lodging troops as aides of the quartermaster-general; in the preparation and distribution of the orders of the day, &c.; and as bureau officers. The war of the French Revolution was finished by the French army without a staff corps. The French army had staff-officers under the names of adjutants-general, commandants, adjunct-captains, and orderly officers; but such officers were rather a momentary aggregation of officers of divers corps, than a special and permanent corps. Officers of cavalry, artillery, engineers, and infantry, if they had not the title, often exercised the functions of general staff-officers, and made reconnoissances. But in 1818, upon the return of the Bourbons, in imitation of the Austrians, Prussians, and Russians, a staff corps was formed in France. The corps was recruited from pupils leaving the school of

St. Cyr; after study they were admitted to the school of the staff; they subsequently served in regiments of infantry and cavalry. After having been advanced a grade, they were definitely admitted as lieutenants of the staff, and became entitled to cavalry pay, with the title of aide-major.

It is necessary that a general staff-officer should have a knowledge of horsemanship—that he should not be ignorant of the sword exercise; he should have some knowledge of topography; he should be familiar with foreign languages, should have studied military administration and castrametation; but above all, he should possess a complete knowledge of tactics, and be able to judge skilfully of military positions. An officer grown old in the silence of a bureau would hardly in the tumult of battle, or under critical circumstances, second his general by aiding him intelligently concerning warlike operations. Can he interrogate spies, watch over the observance of order in military trains; draw up orders and instructions, mark out military positions; improvise a fortification; organize and conduct foraging parties, direct markers for grand manœuvres? Open the march of armies? Vault at the head of the light cavalry? Stimulate and enlighten the troops by his interpretation of the orders he carries, by his intuitive knowledge of their tactical position, by his coup d'œil, by the propriety of his counsels, and by the vigor of his impulsions? None, but officers whose experience has been gained by service with troops, can do these things with promptitude and effect; but these are the important duties of the general staff, and service with troops therefore is the true criterion of merit in such staff-officers. In organizing a permanent general staff corps, it consequently becomes necessary either to employ in peace that large body of officers necessary in war for staff duties, upon duties entirely foreign to their functions in war, or else leave them in idleness. Either course must unfit them for the services required of them on campaign, and it therefore follows, that a permanent general staff involves a useless number of officers in time of peace, and a deficiency of experience, instruction, and aptitude for their duties in time of war. It is impossible to avoid this vicious circle with a permanent general staff. The only true system of staff organization, then, is that which admits of supernumerary general and regimental officers, selected temporarily for staff duties by commanders of troops, as provided by the Act of Congress of 1799, drawn by Alexander Hamilton. "The leading qualifications which should distinguish an officer selected for the head of the staff (says Napoleon) are! to know the country thoroughly; to be able to conduct a *reconnaissance* with skill; to superintend the transmission of orders promptly; to lay down the most com-

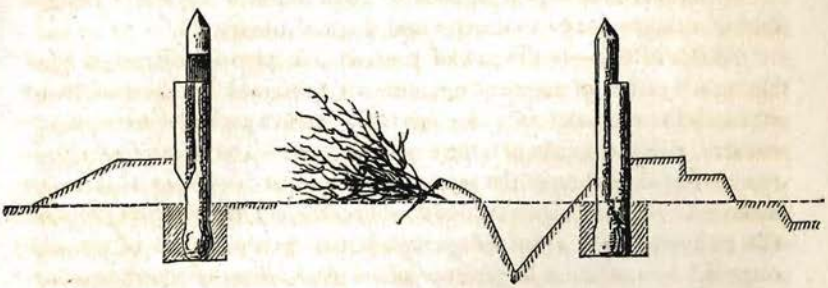
plicated movements intelligibly, but in few words, and with simplicity." (*See* ADJUTANT-GENERAL; AIDES-DE-CAMP; ENGINEERS; INSPECTOR-GENERAL; LINE; MEDICAL DEPARTMENT; ORDNANCE DEPARTMENT; PAY DEPARTMENT; QUARTERMASTER'S DEPARTMENT; SECRETARY OF WAR; SUBSISTENCE DEPARTMENT.)

STANDARDS. Flags, standards, and colors, taken by the army and navy of the United States from their enemies, to be delivered with all convenient despatch to the President of the United States, for the purpose of being, under his direction, preserved and displayed in such public place as he shall deem proper; (*Act* April 18, 1814.)

STATE TROOPS. (*See* MILITIA.)

STOCKADE. A work which may be substituted with advantage for earthen works of very small profile, if it can be covered from the fire of artillery; (Fig. 216.) The stockades or picket works usually

FIG. 216.



employed against Indians are composed of rough trunks of young trees cut into lengths of 12 or 14 feet, and averaging 10 or 12 inches in diameter. They should be firmly planted close together. A banquette or step will generally be required, and the loopholes so arranged that they cannot be used from the outside. If necessary, such a work can be strengthened by ditch and abatis, and flanked by block-houses. The figures show the manner of planting the pickets.

STOPPAGE OF PAY. Where pay is stopped on account of arrears to the United States, the party whose pay is stopped may demand a suit, and the agent of the treasury is required to institute a suit within sixty days thereafter; (*Act* Jan. 25, 1828.) (*See* DEFAULTER; SUIT.)

STORE-KEEPERS. (See ARMY ORGANIZATION for the number.) Military store-keepers and paymasters receive twelve hundred dollars per annum; other military store-keepers receive eight hundred dollars per annum; (*Act* Aug. 2, 1842.)

STORES. All public stores taken in the enemy's camp, towns, forts, or magazines, whether of artillery, ammunition, clothing, forage, or provisions, shall be secured for the service of the United States; for the neglect of which the commanding officer is to be answerable. (*See* BOOTY; EMBEZZLEMENT; SALE.)

STORM. To storm is to make a vigorous assault on any fortified place, or on its outworks. The storming party is a select body of men, who first enter the breach, and are, of course, imminently exposed to the fire of the enemy.

STRAGGLERS. Individuals who wander from the line of march. It is part of the rear guard's duty to pick up all stragglers.

STRATAGEM—is a scheme or plan devised to cover designs during a campaign, or to deceive and surprise the enemy.

STRATEGY—is the art of concerting a plan of campaign, combining a system of military operations determined by the end to be attained, the character of the enemy, the nature and resources of the country, and the means of attack and defence. The *theatre of operations* selected, embraces the territory we seek to invade or that to be defended. It comprehends a *base of operations;* the *objective point* of the campaign; the *front of operations*, that is, the extent of the line occupied by the army in advance of its *base; lines of operations*, the routes followed to reach the objective point or end proposed; *lines of communication* which unite the different lines of operation together; *obstacles*, natural or artificial, and places of refuge.

STREET-FIGHTING. In an enemy's country the case is much simplified: a town so occupied is all inimical, and under the most desperate state of opposition; consequently in the attack there is no respect to person or property. If the houses are combustible, a ready means of subduing the place is within reach; and if not, it is forced in different directions by siege operations, as practised by the French at Saragossa.

On occasions of internal dissensions and insurrectionary movements, the case is different; the efforts of the troops and of the well-disposed citizens are greatly impeded by the difficulty of distinguishing between friend and foe, or of the premises or property with which it may be justifiable to interfere. This, and the very natural and proper anxiety to avoid bloodshed and injury to one's own countrymen, frequently

lead to a habit of temporizing with the circumstances, and by this indication of timidity and weakness give such confidence to the rebels as to enable them, and perhaps with comparatively insignificant numbers, to gain in moral effect as the others lose; by degrees the wavering and the timid are led to join them; the troops themselves imagine that there is a declared power manifested that is not to be opposed, and thus the former obtain a complete ascendency, which the exertion of more firmness and system at first would effectually have prevented.

The best institutions of any country become endangered by such a state of things; but a remedy may be found in a more systematic manner of proceeding. The troops should never be brought into the presence of the insurrectionists until fully authorized to act—the consequence would be that the very appearance of the soldiers would be a warning to every one of the immediate consequences of prolonged opposition, which would prevent further conflict, or make it very short. In order to promote the power of vigorous action by the military, and to prevent the innocent from suffering, the most solemn warning should be issued, in case of tumult, against the presence in the streets of women, children, and persons who do not join in the troubles, intimating that the consequences of any bad result from their being thus incautiously exposed must rest on themselves. These are necessary preliminaries to the consideration of the means of attacking an insurrectionary force. When disturbances are to be quelled in a town, cavalry, artillery, and infantry can act with full effect, and with every advantage of organization, so long as their opponents occupy the open streets. If barricades are constructed across them, the cavalry become unserviceable; the infantry, however, have still full force; for one side of an ordinary barricade is as good as the other, and the infantry can cross any of them without difficulty.

But when it is found that the insurgents have had recourse to the most determined means of resistance, by occupying the interior of houses in support of barricades, the mode of attack must be adapted to the circumstances. The operation should be conducted under due deliberation, nor would any triumph be conceded by care being taken that the use of cover shall not give the impression of defeat. It will be readily ascertained what part or parts of the town are so occupied as to render the movement of the troops through the open streets unadvisable. An endeavor should be made to isolate those portions by detachments of troops posted at all the approaches to them. This of itself would throw the rioters into a most uncomfortable and false position: they would find themselves shut up without any internal organ-

ization to enable them to act to any useful purpose, or to make any combined forcible effort for their release; or, indeed, if they could do so, it would have all the effect of *an escape* instead of a victory.

Nor would it be necessary, under such circumstances, that these detachments should be at all large, numbers of them being supported by some general reserve. Active measures, however, might at the same time be carried on against any portions of the houses that it may be considered advisable to force, for the purpose of confining the resistance within narrower limits, or for subduing it at once altogether. Although in towns the attack of a mass of houses is formidable, and almost impracticable to troops unprepared for such an operation, it will not present much difficulty to a systematic proceeding. One great defect for defence in a house or street is its want of a flanking fire, although every part may obtain a support from the opposite houses in the same street. If, therefore, only one side of the street is occupied, individuals or parties moving close along that side are in security, except from the chance missiles that may be blindly thrown down from the windows. Nothing of that kind could prevent two or three soldiers, under cover of a partial fire on the windows, from passing up and breaking open the doors; by which means, the troops being admitted, possession of the entire building would soon be obtained.

When, however, from any peculiarity of the building, or of others contiguous, or from the circumstance of both sides of the street being occupied in force, such a mode of proceeding would be too hazardous, the soldiers might make an entrance into the nearest available house in the same block of buildings, and, supported by detachments of troops, work their way, through the partition walls, from one house to another; or by the roofs or the back premises, where the defenders will be quite unprepared to oppose them, or, if they make the attempt, would not have the same advantages as in front: small parties, if necessary, keeping up a fire on the windows from the walls of the back yards, or from the opposite houses, would effectually cover these advances of the troops. To carry on such approaches, the men should be provided with an assortment of crowbars, sledge-hammers, short ladders, and, above all, some bags of powder not less than 5 or 6 lbs. weight.

In these desultory operations in the defiles of streets and houses, the troops should not be in heavy columns, but in small detachments well supported; and by acting thus in order, and on system, the effect will be the more certain, as a popular movement is, necessarily, without subordination or unity of action, and peculiarly subject to panics at any proceeding differing from what had been anticipated; (*Aide Mémoire.*)

STRIPES AND LASHES—infliction of, allowed only in case of desertion; (*Act* May 16, 1812, and March 2, 1833.)

SUBALTERN. Commissioned officer below captain.

SUBSCRIBING. Every officer must subscribe the Articles of War; (ART. 1.)

SUBSISTENCE DEPARTMENT. (*See* ARMY for its organization.) Provides subsistence stores for the army, either by contract or purchase. Assistant commissaries subject to do duty as assistant-quartermasters. The President, under authority of law, has fixed the ration at ¾ lb. of pork or bacon, or 1¼ lbs. of fresh or salt beef, 18 oz. of bread or flour, or 12 oz. of hard bread, or 1¼ lbs. of corn meal; and at the rate to 100 rations of 8 qts. of peas or beans, or 10 lbs. of rice; 6 lbs. of coffee, 12 lbs. sugar, 4 qts. of vinegar, 1½ lbs. of tallow, 1¼ lbs. adamantine or 1 lb. of sperm candles, 4 lbs. of soap and 2 qts. of salt. In different climates and on different kinds of service, soldiers require different articles of diet; some latitude should therefore be given to commanders of armies and military departments in making variations from the prescribed ration.

A conscientious administrator should acquaint himself with the peculiar properties of different kinds of food, their relative nutriment, and the differences of food best suited to promote health under the various circumstances incident to field-service. The following extract from some observations made by an eminent Scotch chemist, is worthy of every attention on the part of the student of military administration:

"In consequence of the advances made in physiology and chemistry the nutritive value of any dietary, deduced from practical experience, may be tested with care and certainty by reference to its chemical composition. As this fact is little known to practical men, it may be well to explain the principles on which the method is founded.

"1. All articles of food used by man consist of one or more, and generally several nutritive principles; and most of them contain water and an indigestible cellular tissue. The two latter must, of course, be deducted in estimating nutritive value.

"2. The nutritive principles consist of two sets, one of which maintains respiration, and the other repairs the waste constantly incurred by the animal textures in the exercise of their functions. As the respiratory principles commonly abound in carbon, they are sometimes called carboniferous, while the reparative principles, because they all contain nitrogen, are termed nitrogenous.

STANDARD TABLE OF NUTRIMENT.

NAME OF ARTICLES.	Percentage of Nutriment.		
	Carboniferous.	Nitrogeneous.	Total.
Wheat flour	71·25	16·25	87·5
Bread	51·5	10·5	62·0
Oatmeal	65·75	16·25	82·0
Barley (pearl)	67·0	15·0	82·0
Pease	55·5	24·5	80·0
Potatoes	24·5	2·5	27·0
Carrots	8·5	1·5	10·0
Turnips	5·7	0·3	6·0
Cabbage	6·7	0·3	7·0
Lean of beef and mutton	0·0	27·0	27·0
Fat of meat	100·0	0·0	100·0
Average beef and mutton	15·0	20·25	35·25
Bacon	62·5	8·36	70·86
Skimmed milk cheese	0·4	64·6	65·0
White fish	0·0	21·0	21·0
New milk	8·0	4·5	12·5
Skimmed milk	5·5	4·5	10·0
Butter milk	1·0	6·0	7·0
Beef tea (strong)	0·0	1·44	1·44
Beef tea, and meat decoction of broth	0·0	0·72	0·72

"3. Experience has shown that the most successful dietaries for bodies of men, deduced from practical observation, contain carboniferous and nitrogenous food in the proportion of about three of the former to one of the latter, by weight. During two-and-twenty years that my attention has been turned to the present subject, not a single exception has occurred to me.

"4. Hence it is obvious that the least weight of food in the rough state will be required, first, when there is least moisture and cellular tissue in it; and secondly, when the carboniferous and nitrogeneous principles are nearest the proportion of three to one.

"5. Of the various nutritive principles belonging to each set, some may replace one another; some are better than others; some are probably essential. This branch of the science of the subject is unfortunately still imperfect.

"6. Two things, however, are certain, that nitrogenous may replace carboniferous food, for supporting respiration, though at a great loss; but that carboniferous food (without nitrogen) cannot replace nitrogeneous food, for repairing textural waste.

"7. The daily amount of nutritive principles of both sets must increase with exercise and exposure, otherwise the body quickly loses weight, and ere long becomes diseased. If the above proportion be-

tween the two sets be maintained, the weight of real nutriment per day varies, for adults at an active age, between seventeen and thirty-six ounces; the former being enough for prisoners confined for short terms, the latter being required for keeping up the athletic constitution, or that which is capable of great continuous muscular efforts, as in prize-running and other similar feats.

"8. Dietaries ought never to be estimated by the rough weight of their constituents, without distinct reference to the real nutriment in these, as determined by physiological and chemical inquiry.

"Keeping these principles in view, and with the help of a simple table, it is not difficult to fix the dietary advisable for any body of men, according to their occupation. It is, also, in general, easy to detect the source of error in unsuccessful dietaries. For example, any scientific person conversant with the present subject could have foretold, as a certain consequence, sooner or later, of their dietary, that the British troops would fall into the calamitous state of health which befell them last winter in the Crimea.

"Soldiers in the field will be the more efficient the nearer they are brought to the athletic constitution. But as the demand for protracted, unusual exertion occurs only at intervals, the highly nutritive athletic dietary is not absolutely necessary. *On the whole, from experience in the case of other bodies of men somewhat similarly circumstanced,* 28 *ounces of real nutriment, of which* 7 *are nitrogeneous or reparative, will probably prove the most suitable.* Any material reduction below 28 ounces will certainly not answer; and under unusual exertion kept up for days continuously, as in forced marches, or forced siege labor, the quantity should for the time be greater, if possible."

Biscuit, particularly when salted meat is the principal article of diet, is very apt to produce dysentery and scrofulous complaints; it becomes, moreover, unpalatable when continuously used; and so eager were English soldiers in the Crimea for soft bread that they used to exchange 5 lbs. of biscuit for 1 lb. of bread with the French soldiers, whose first work, after pitching their camps, was generally to construct field-bakeries, and whose supply of soft bread seldom failed. Sallust tells us (De bello Jugurth. 44) that the Roman soldiers used to sell their ration of *grain* for a trifle in order to purchase bread, which at that time they had not the means of manufacturing. Mills and ovens exist in some form or other in all countries, and they should be made available whenever an army halts for a sufficiently long period to admit of their being worked; but as the enemy frequently destroys these means of contributing to the soldier's comfort, the use of hand mills and field-ovens must under

such circumstances be resorted to; and to construct these in the most rapid and at the same time the most effectual manner, should always be done where circumstances permit. The description of camp ovens must necessarily depend upon the permanency of the encampment. If the army be likely to remain in position for any length of time, they should be constructed of durable materials, such as bricks; but for hurried operations a mere excavation of the earth suffices in the course of a very short time to produce an oven capable, with a little care, of baking bread. The impromptu ovens used by the American backwoodsmen, as described by Sir Randolph Routh, are usually raised upon a platform about 3 feet high, and 5 or 6 feet long, by 4 feet broad, and on this they construct the circular form of the oven by means of forest twigs and boughs of sufficient strength to receive and support the cement, which is made of common clay soil and water, mixed to a proper consistence, and put on in successive layers until it acquires the necessary thickness. An opening is left to introduce the bread, and a common piece of wood with a handle supplies the place of a door until it is baked. (*See* also article Oven for the ovens made by French soldiers; and Travelling Kitchen, for a suggested improvement for field-service.) It is very important that soldiers should be instructed in making field-ovens.

Nothing is more important in the field than to keep up the supply of fresh meat. It is the only article of the soldier's ration that provides its own transport, and though a supply of salted provisions is indispensable as a reserve in case of accidents, and to provision fortified places in the event of a siege or blockade, it should be economized as much as possible, and issued only in cases of necessity, not only as being more expensive and absorbing a great deal of transport, but because the frequent use of salted provisions is invariably detrimental to the health of the troops.

The importance of providing the soldier with vegetables is now universally admitted. When salted provisions are much used, it is essentially desirable to counteract the tendency to scrofulous complaints induced by such diet by means of vegetable food; to obtain fresh vegetables in the field is, however, a matter of considerable difficulty, their liability to spoil and their bulk are obvious objections to their use by an army in movement; but the process of compressing vegetables, which has now been brought to perfection, enables a commissariat to keep up this supply at the cost of but little transport, and in the most convenient form for immediate use. Rice is an admirable article of diet, more particularly when there is any tendency to bowel complaints.

It contains more nutriment than wheat flour, is easily conveyed and cooked, and is not liable to suffer from exposure. There would, probably, be no difficulty in making a preparation of rice which would greatly reduce its bulk and still further facilitate its cooking. Corn meal and pease are likewise excellent articles of food; but the latter should, if possible, be issued in a ground state, as it otherwise requires more soaking to render it fit for use than there is time for on the march. The supply of coffee or tea should never be allowed to fail. Dr. Christison says:—"It is difficult to over-value the proposed addition of tea and coffee to the men's rations. They possess a renovating power, in circumstances of unusual fatigue, which is constantly experienced in civil life, and which I have often heard officers, who served in the Spanish campaigns, as well as in the late Burmese war, describe in the strongest terms. This, however, is not all, for it has been recently shown by a very curious physiological inquiry, that both of them, and especially coffee, possess the singular property of diminishing materially the wear and tear of the soft textures of the body in the exercise of its functions in an active occupation."

The object of accounts is to insure the application of public resources to their prescribed ends, and within regulated limits. This is perfectly feasible under ordinary circumstances; but on active service it is not always possible to procure vouchers and receipts according to the established forms, and it is far better to establish, by means of a well-organized department of control, a strict and efficient local supervision over the conduct of supply duties in the field than to exact accounts, which, however correct in their outward form, can but rarely represent the actual transactions as conducted during the hurried and ever-changing events of active warfare. A judicious system of musters and inspections would do more to check waste or malversation in the field than the most ingenious accountability that could be devised; and if a commissariat officer were simply required to furnish the head of his department with a periodical "state of supplies," showing where and how obtained and issued; and officers commanding corps a return of the number of men fed, noting any deficiency of supply; both reports being subject to verification by means of personal inspections and musters, the object in view would be attained with far greater certainty than under the present complicated system of returns, abstracts, and vouchers, the preparation of which occupies much of the time of a commissariat officer that might be more profitably employed for the benefit of the troops, while their subsequent examination, probably after a lapse of one or two years, answers no possible purpose except

to find employment for a large number of clerks. (Consult FONBLANQUE.)

SUIT. In all cases where the pay or salary of any person is withheld, in consequence of arrears to the United States, (and salary can be legally withheld from no other cause except by sentence of court-martial,) it shall be the duty of the accounting officers, if demanded by the party, his agent, or attorney, to report forthwith to the agent of the Treasury Department, the balance due; and it shall be the duty of the said agent, within sixty days thereafter, to order suit to be commenced against such delinquent and his sureties; (*Act* January 25, 1828.)

SUMMING UP. (*See* JUDGE-ADVOCATE.)

SUPERINTENDENT. The chief of the corps of engineers present at the Military Academy is the superintendent; (*Act* March 16, 1802.) The selection of the commander of the corps of engineers shall not be confined to said corps; (*Act* April 29, 1812.) Officers of engineers may be transferred at the discretion of the President from one corps to another, regard being paid to rank; (ART. 63.) The superintendent, "while serving as such by appointment from the President, shall have the local rank, pay, and allowances of colonel of engineers; and the commandant of cadets, while serving as such by appointment from the President, shall have the local rank, pay, and allowances of lieutenant-colonel of engineers;" (*Act* June 12, 1858.)

SUPERIOR. (*See* OBEDIENCE.)

SUPERNUMERARY. Graduates of Military Academy, where there are no vacancies among the commissioned officers of the army, may be attached as supernumeraries by brevet of the lowest grade of commissioned officer, not exceeding one to each company; (*Act* April 29, 1812.)

By *Act* March 3, 1847, the President was authorized to attach in the same manner as supernumerary officers of the lowest grade in any *corps* in the army, any non-commissioned officer who should distinguish himself in service, and be recommended by the commanding officer of his regiment.

SUPPLIES. The departments of supply to the army are 1. The Ordnance Department, which provides ordnance and ordnance stores; 2. The Quartermaster's Department, which furnishes quarters, forage, transportation, clothing, camp and garrison equipage; 3. The Subsistence Department, which furnishes subsistence; and 4. The Medical Department, which provides medicines and hospital stores. The Ordnance and Medical Departments, requiring special knowledge for their peculiar duties, could not be relieved of any part of the duties be-

longing to them respectively; but the want of connection between the Quartermaster's and Subsistence Departments may in war be attended with serious inconvenience, and no good reasons whatever, it is believed, exist for not uniting the two departments in one. Under the orders of one chief in the field, acting, of course, in subordination to the commander of the army, such a department might originate and direct such measures for the supply of the army as had not been provided for; control expenditures; insure a prompt and correct accountability for all disbursements and distributions, and do away with all antagonism of interest caused by the requirement that one department shall furnish subsistence stores, and the other transports. These with clothing and other supplies furnished by the Quartermaster, Ordnance, and Medical Departments, are the great wants of the soldier in active service. A well-armed and well-equipped soldier cannot dispense with food, transportation, and clothing, and the means of providing such necessities in war demand earnest thought, and are happily suggested in the following passages from the work of M. VAUCHELLE, *Cours d'Administration Militaire:*

"We have seen military administration in times of peace conducted upon complete principles and regulations; services regularly organized, and efficiently supported by the natural resources of a fertile and industrious country; sufficient funds always available; the immediate supervision and protection of the war ministry; independence assured to the control of military expenditure and consumption by well-defined laws; nothing wanting, in short, to satisfy all the wants of the army, and to provide them with regularity, order, and economy.

"It is not so, it cannot be so, in a state of war. In the field the frequency of movements, the rapidity of marches, the uncertainty of events, the ever-varying chances, the imperfection of means, the insufficiency of resources—the time ever too short for all that has to be provided and done—embarrass, retard, and paralyze administrative action. Every emergency exacts its immediately appropriate measure, and the least foreseen accident may in a moment frustrate the most wise arrangement, and upset the surest calculations. The duties of administration now assume an entirely new character; they become immense in their extent, limited only, indeed, by the intelligence of the administrator himself, who is charged with their execution.

"The first of all rules, that which the greatest captains, and the most enlightened administrators have never failed to enforce in their writings, and of which experience has everywhere proclaimed the value,

is the formation of depots beforehand, and to such an extent that the army may not only be subsisted during the opening of the campaign, but as long after as the interests of military operations may require, or as distance may permit. A certain mistrust of the country about to become the seat of war is indeed prudent, for it is generally a country unknown to administration, or perhaps little or ill known, and which cannot fail to be opposed to its operations, since they are so apt to wound it in its interests or in its feelings. The subjects of which a knowledge appears the most important are: 1. The divisions of the territory into governments, provinces, counties, or departments, into districts, cantons, &c. 2. The organization of its territorial, military, civil, and financial administration. 3. Its natural products. 4. The periods of seed time and harvest of every description of grain, and the proportion between (local) produce and consumption. 5. The localities of large markets and fairs, the periods of these commercial gatherings, and the more important objects of their traffic. 6. The subsistence which might most conveniently be substituted in lieu of those established by our regulations, and the relative proportion to be established in such substitution. 7. The different branches of commerce and industry. 8. The means of re-mount, both as regards cavalry and general transport. 9. The manufacture of cloth, leather, and other material, suitable for the preparation of clothing, equipments, harness, &c. 10. The articles of consumption drawn from other countries, the designation of those countries, and the objects of exchange in importations and exportations. 11. The weights, measures, and coinage, with relative value to our own. 12. The current prices of articles of consumption. 13. Barracks, quarters, hospitals, magazines, and other establishments of administration, and their capacities, throughout the various towns and fortresses. 14. The most convenient spots for forming temporary establishments. 15. The principal points of communication by land and sea, with the distances between them, distinguishing the different routes, and indicating, as regards the roads, the spots at which they cease to be passable for carriages; and as regards rivers and canals, the places where they cease to be navigable. 16. In the large towns or fortresses the nature and quantities of the provisions stored therein, the means of grinding corn and baking, the principal mercantile firms, and the heads of large manufactories or workshops with whom it would be safe to deal for military supplies.

"One may easily conceive how useful such admirable statistics would be. On the outbreak of war the minister would feel no uncertainty either as to the nature or the extent of the arrangements he

should have to make for himself, or as to the instructions to be given to his commissary-general. How many false moves would thus be avoided; how many useless and heavy expenses saved; how many unknown and lost resources would thus be discovered and employed for the benefit of the army and the relief of the country which has to support it. A commissariat should regulate its arrangements on the double chances of presumed success or failure, according to the peculiar nature of the war to be undertaken. In the case of success, then in proportion to the advance into the enemy's country, it should form its depots in the rear of the army, and establish by stages, on the line of operations, bakeries, magazines, hospitals, convalescent stations, regular convoys, &c., always taking care to select localities with reference to the most favorable means of communication and of defence. In the case of a reverse, the army falling back upon itself will thus find its administrative services secured by means of the supplies which prudence shall thus have collected. The rights of war, which are but the rights of the most powerful, tempered only by the interests of him who wields them, render an army, whatever it may be, absolute master of the provisions and other useful resources which exist, whether they have been provided as depots by the enemy, or destined for other purposes. Administration requires a numerous *personnel*, active, intelligent, and faithful, always ready to avail themselves of supplies for future use, for transmission elsewhere, or for immediate distribution to the troops, wherever they may be stationed. A commissariat requires an extensive and perfectly organized transport; this is the *sine qua non* to enable an army to subsist in the field. Transport is indispensable, and must be obtained at any price; it must, moreover, be *well adapted to the locality*, in order to be able to follow or rejoin bodies of troops in all directions. Thus it is to be understood that the country occupied must be expected to furnish a large proportion of the requisite transport. Although acting in the midst of a state of things essentially inimical to fixed regulations and established forms, the commissariat should prescribe for itself a strict and scrupulous system. In the face of so many pressing and urgent wants, which, if not supplied with regularity, may disturb the discipline and compromise even the honor of the army, it is not enough for the administrator to prove himself intelligent and economical in the dispensation of resources obtained with difficulty and labor; he should further, courageously attacking all abuses and repressing with severity all wastefulness and fraud, secure to himself the means of justifying his expenditure and distribution by authentic accounts, a duty but too rarely accomplished, but which should never be permitted to be neglected.

"War, it is said, should feed war; the axiom may be true, if not just; but in no case should it be pushed to extremes; circumstances may occur, indeed, to render its application impolitic and dangerous. Under no circumstances, however, can the enemy's country under occupation be altogether relieved from the charges of war; it must inevitably bear a large share, even though its contributions may occasionally be considered as advances only. But whatever their nature, these exactions from an enemy's country should be imposed with discernment and moderation, with reference to the population and the nature of the produce, the geographical position and the wealth of the country and, when possible, with consideration for the feelings of the vanquished. Pillage a country and you reduce the inhabitants to misery, to despair, to flight, and thus not only deprive yourself of assistance, but in the day of reverse find implacable and cruel adversaries."

All that can be done when a country yields nothing is to form depots wherever bodies of troops are likely to be stationed; to have the largest possible reserves at head-quarters; and to be prepared with a sufficient land transport establishment to carry all requisite supplies in the event of an advance or a change of position. But this is an exceptional state of things; in general the country can be placed under contribution, either voluntary or coercive, for the supply of provisions and forage, and the commissariat officer then enters upon his legitimate functions. Several measures are open to his adoption; he may avail himself of the enterprise of local contractors; he may make his purchases directly from the owners at the market price; he may fix an arbitrary rate for the different articles of supply; and lastly, he may levy contributions on the people and compel them to furnish according to their means the provisions required for the army. His own judgment must guide him in the choice of these measures. The employment of contractors, in time of peace undoubtedly advantageous, is attended with certain objections during a period of war. Sir Randolph Routh says truly, "the best and surest contractor is the country occupied by the troops and its natural resources carefully and duly economized;" and he proceeds to cite instances within his experience of the inconvenience arising from too great a confidence in contractors "who swarm about an army when it is prosperous to prey upon its wants, but are the first to fly in the event of a reverse."

The commissariat has to consult at once the wants of the army, the economy of the state, and the resources and feelings of the country in which he is acting. To seize supplies, unless from an enemy in arms, is to be deprecated; to pay for them more than their value, is equally

objectionable; unnecessary force creates an ill feeling which may defeat the objects of administration; to submit to imposition enhances the difficulty of the service; but conciliation and fair dealing, backed by decision, will never fail to prove a good policy and enable the army to procure supplies without unnecessary expense to the public or uselessly exasperating the population. If the territory be that of a friendly or a neutral power, every effort should be made by the commissariat to arrive at a just estimate of its resources in grain, cattle, fuel, and other articles of supply, to ascertain their current market value, and having obtained all possible information on these points, the people should be invited, either through the local authorities, or the agency of private individuals, to furnish whatever is required, with the understanding that the usual price will be paid for the supplies brought in, and that the head-quarters of the army will prove a profitable market to them.

When confidence in the good faith of the purchaser has been once established, the population of a country occupied by a military force will be willing enough to sell, and should a disposition to hold back supplies in the hope of enhancing their value be shown, the interposition of the local authorities should be sought in preference to the adoption of arbitrary measures. Conciliation and firmness, temper and justice combined, will seldom fail to induce the inhabitants, even when their sympathies tend in another direction, to contribute to the extent of their means to the maintenance of the army quartered upon them.

Amid a hostile population a conquering army should exercise its power with every possible regard to justice. Fair treatment may reconcile a people to the presence of a conqueror, and induce it to submit to superior strength. No effort should be left untried to produce such a result, since a resort to force, although it may provide for immediate want, inevitably destroys the sources of supply. The best course to be adopted in levying supplies in an enemy's country is, having first ascertained the resources of the district, to demand, through the local authorities, the head men of villages, or other channels, that certain quantities of provisions should be brought at a given time to the head-quarters of the army, care being taken that the demand be not beyond the means of the district, and a fair price should be paid whenever a disposition is shown to comply promptly with these requisitions. Such a measure will rarely fail of effect, and when the inhabitants feel certain that there is no alternative between selling their produce and having it seized, they will submit to the necessities of war in its least aggravated form, and yield to a compulsion which, though it do violence to their national feelings, consults their individual interests. Nor is it

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only in the supply of provisions that the theatre of war should be laid under contribution; labor and transport may likewise be attained by means of judicious administrative arrangement. The stern rules of war justify the exaction of all the resources within its influence; it is for administration to render these exactions as little oppressive as possible when dealing with a class of people which, as a rule, is the most innocent of the causes of war, the most exposed to its ravages, and the least benefited by its results. In proportion as tact and moderation are displayed by the agents employed in levying supplies upon the population, so will the resources of the country become available and productive. Violence and wrong will convert the peaceable peasant into a desperate and implacable foe; conciliation and fair dealing may make him, if not an ally, at least a profitable neutral. Interests far beyond the hour may be involved in the action of military administration under such circumstances, and the seeds of rancor or good-will, sown to-day on the scene of contending armies, may bring forth fruit to influence the destinies of nations long after the combatants themselves have ceased to struggle.

If it be necessary at established stations that a prompt settlement should be effected for all services rendered to the army, and that every engagement entered into by the commissariat should be most scrupulously complied with, how much more so is this the case in the field. The love of gain—that mainspring of human action under all circumstances, and in all places—is seldom appealed to in vain; but the feeling must be supported by confidence; for one man who will run a risk for a remote prospect of reward, a hundred will toil for a certain remuneration, and it should be one of the first aims of administration to inspire all classes among which it is called upon to act, with a full and entire confidence in its good faith. A breach of faith involves more than immediate consequences: it permanently destroys *credit;* (FONBLANQUE.)

SURGEON. A staff-officer of the medical department. He has the rank of major, but "shall not in virtue of such rank be entitled to command in the line or other staff departments of the army;" (*Act* Feb. 11, 1847. *See* ARMY for the organization of the Medical Department.)

SURGEON-GENERAL. The chief of the Medical Department, with the rank of colonel, but subject to the same restriction of command as other officers of the Medical Department.

SURGERY, (*Military.*) Restricted to its rigorous signification, military surgery is the surgical practice in armies; but in its broad and

ordinary acceptation embraces many other branches of art, comprehending the practice of medicine, sanitary precautions, hospital administration, ambulances, &c. The military surgeon must not only be a skilful physician and surgeon, but he must have a constitution sufficiently strong to resist the fatigues of war, and all inclemencies of weather; a solid judgment and a generous activity in giving prompt assistance to the wounded without distinction of rank or grade, and without even excluding enemies. He must have the courage to face dangers without the power, in all cases, of combating them; he must have great coolness in order to act and operate in the most difficult positions, whether amidst the movement of troops, the shock of arms, the cries of the wounded when crowded together, in a charge, in a retreat, in intrenchments, under the ramparts of a besieged place, or at a breach. He must have inventive ingenuity which will supply the wants of the wounded in extreme cases, and a compassionate heart, with strength of will which will inspire confidence in those with whom he is brought so closely in contact. The military surgeon, with his flying ambulance, throws himself into the field of battle, through the mêlée, under the fire of the enemy, runs the risk of being taken prisoner, being wounded, or being killed, and is worthy of all the honors that should be bestowed on bravery and skill in the performance of his high functions. Additional grades, as hospital-surgeons, surgeons of divisions, surgeons-in-chief, and inspector-generals of hospitals, &c., are required for every army in the field.

SURVEYS, (*Military or Expeditious.*) In military surveys the first thing done is to determine by triangulation, the principal points, to which surveys of details are subsequently referred.

Triangulation.—A base is chosen from the extremities of which a large extent of the ground to be surveyed may be seen. The length of the base ought to be in proportion to the extent of the triangle to be constructed; the equilateral form being preferable. This base is sometimes furnished by the regular charts from the topographical bureau. If not, it is measured by chain or by paces. From the base, pass by the fewest possible stations to two points occupying central positions in the survey, and suitable for stations; from these two points let lines radiate, cutting those that are known, and their intersections serve as points of data in details; multiply in this way the number of triangles, always diminishing the length of their sides; intermediate details may be determined by paces. Such is the process.

Plane Table.—For these operations a plane table and the ALIDADE are sufficient. The plane table used is of small dimensions. Com-

mander Salneuve advises a plane table made of several rulers equal in length and breadth, united by parchment and strong cloth, upon which they are folded. When the plane table is used, the rulers are kept in the same plane by means of two other rulers which take a rectangular position towards the others by being revolved on one of their extremities and are then kept in place by means of a little hook at the other extremity of each. (*See* Fig. 217.)

When the work is ended or suspended, these two rulers are unhooked and turned so as to cover the last two of the parallel rulers, and the whole may then be folded and put in a pistol-holster. This plane table has besides an upright stick with an iron ferrule which supports the table horizontally on being stuck in the ground. If such a plane table has not been provided, however, it is easy to procure a small flat board, which will answer the same purpose.

Alidade.—For an alidade, a triangular rule of a double decimetre may be used, upon which are fastened two nails or pins which serve as sights. The problems resolved by means of the plane table and alidade are the following: 1. To determine the projection of an accessible point by means of two other points R and P given and also accessible. 2. To determine the same thing by means of two other points, only one of which, R, is accessible. 3. To determine the same thing by means of two others, R and P, which are inaccessible, but upon whose direction we can find stations. 4. To determine the same thing by means of two others not only inaccessible, but upon whose direction it is impossible to find a station. 5. The same determination by means of three points, R, P, Z, inaccessible.

FIG. 217.

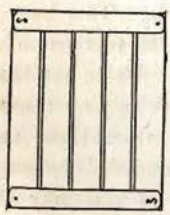
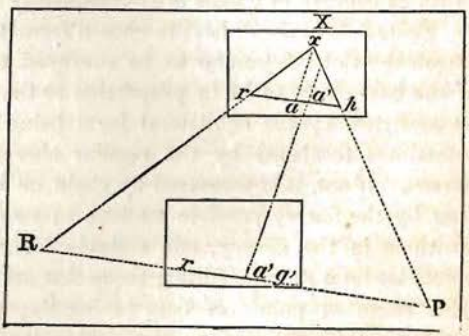


FIG. 218.

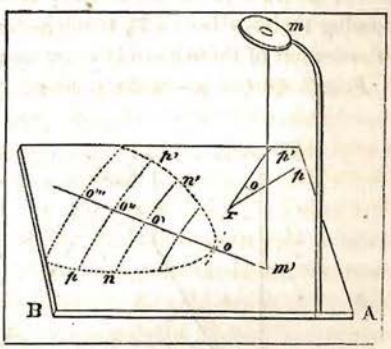


Adjusting.—The first thing to be done at each station is to adjust the plane table. Let R P be the base, (Fig. 218.) Assume *r h* arbitrarily as its projection on a sheet of paper corresponding to the scale

of say $\frac{1}{2000}$. At the station R place the instrument horizontally by means of a plumb-line, and let one of the sides of the alidade (using the same side for all operations) rest upon the projection, turning it until the side covers *r h*. Turn then the plane table until P is seen in the prolongation of the sights. The plane table is then adjusted, and it must be maintained in that position while at the station.

To adjust with reference to the meridian—trace this line upon the leaf and afterwards turn the side of the frame until it has the same direction; the problem is resolved by means of corresponding heights of the sun. Let R P be a side upon the ground, and *r p* its provisional projection; (Fig. 219.) Erect upon the horizontal plane a vertical stile terminated by a plate of blackened iron, pierced with a little hole at its centre *m*, and disposed in such manner as to receive nearly perpendicularly the rays of the sun at noon. Project the centre *m* in *m'* upon the plan by a plumb-line, and from *m'* as centre describe several circumferences *n o' n' p o'' p'*. Observe the march of the sun a little before and a little after noon. Divide in two equal parts the circumferences intercepted by the solar spectrum: the middle points belong to the meridian, whose projection we thus have. Measure then the angle *o* made with the side of the frame A B; lay off by the line *r p'* an equal angle; then turning the plane table until this line *r p'* corresponds in direction with the line that it represents: the side of the frame indicates the meridian of the place. The questions may then be thus resolved:

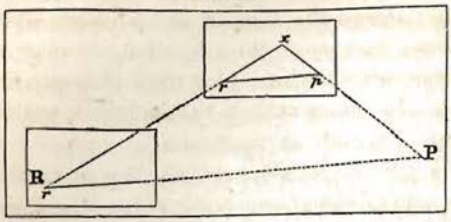
FIG. 219.



First Question, (Fig. 218.)—Take a station at R; adjust upon P; look at *x*, the point sought, by turning the alidade around the point *r*, the projection of R, and trace *r x* the projection of R *x*. Go to P; operate in the same manner, and the intersection of the two right lines *r x* and *h x* gives the projection of the point sought. This is the method of intersection.

Second Question.—Take a station at R; adjust upon P: radiate on X; go to X; adjust upon R, following the indefinite projection already traced; turn the alidade around *p* until P is seen: the intersection of the right line thus traced with the first gives X. This is a method of *offset*. (Fig. 220.)

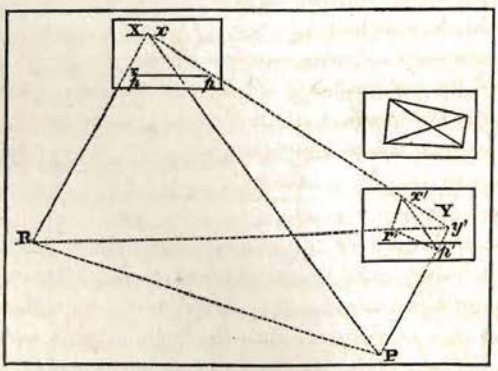
FIG. 220.



Third Question.—Assume upon $r\ h$ a point a', (Fig. 218;) supposed projection of A any point whatever; look at X; draw the assumed line through a': this line of direction will serve for adjusting when at X; for, although not the true projection of A X, it is necessarily parallel to it; go to X, adjust upon A; it is only necessary to draw two lines passing through R and P, turning the alidade on h and r: the point of intersection of these lines is the projection sought.

Fourth Question.—Take a fourth point Y, (Fig. 221,) at which the

FIG. 221.

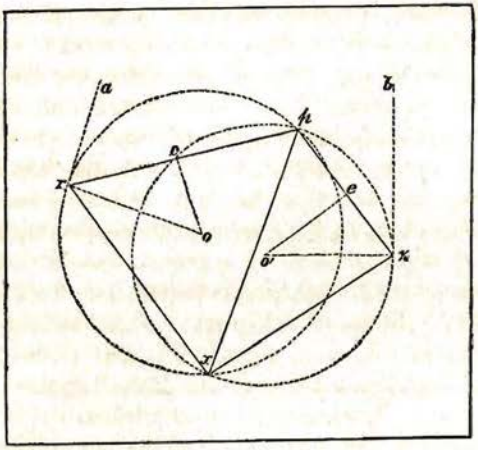


observer may place himself, and from which the other three may be seen; construct afterwards upon the leaf a quadrilateral similar to that made upon the ground, and then construct an equal quadrilateral upon $r\ p$: for this purpose, go to X, of which we have the arbitrary projection x'; look at R, P, and Y, tracing these directions upon paper; go to Y, of which we have also the projection y' upon the line leaving X and drawn through x'; adjust upon $x'\ y'$ and look at R and P; the points of intersection determine two angles r' and p' of a quadrilateral, of which the two others are x' and y', similar to that made upon the ground by R, P, X, and Y, and similar also to the projection sought; nothing more is necessary than to establish the relation on $r\ p$.

Fifth Question.—Measure at x (Fig. 222) the angles $r\ x\ p$, $p\ x\ z$, and make at r and z two angles $a\ r\ p$, $b\ z\ p$, which shall be respectively

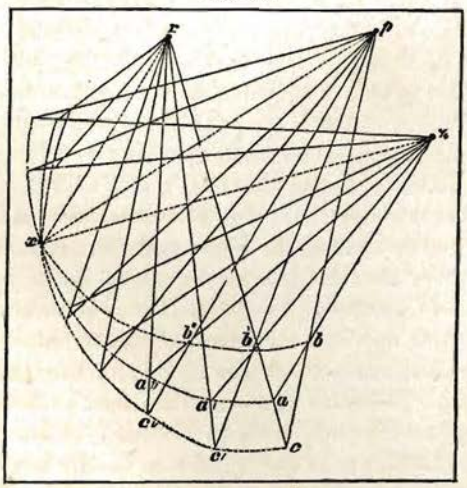
equal; through the middle of the lines $r\ p$ and $z\ p$ erect perpendiculars; at z and r raise also perpendiculars to $a\ r$ and $b\ z$; the points of

FIG. 222.



meeting o and o' are the centres of two circumferences which will intersect in x the projection sought: this is the method by capable segments. Or (Fig. 223) let r, p, z be the projections on the plan of three points

FIG. 223.



of ground R, P, Z. To determine X without change of station, adjust partially the plane table with reference to X. Afterwards, through R P Z or their projections, draw three right lines which will cut each other and form a triangle $a\ b\ c$. If the plan had been perfectly adjusted,

the three lines would have cut each other at the same point x, the projection of X. It is necessary, then, to turn the plane table so that the three lines by their intersections will form another triangle $a' b' c'$ smaller than the first. Continue thus until the triangle is reduced to a point. The intersection of the three curves $a\ a'\ a''$, $b\ b'\ b''$, and $c\ c'\ c''$, gives the projection sought. These are the different means employed to determine the points of stations. When each is obtained, all details to the right and left of a direction may be filled up by sight and by paces; one of the sides of the triangle being taken for the direction, an angle made with it may be traced by means of the alidade, or else observed in number and degree with an instrument, and subsequently drawn with a protractor.

Observations of Angles.—A pocket sextant may be employed; or, in the survey of details, the operation may be accelerated by a compass. This instrument may be even used in the first triangulation, if the sides of the triangle are not too great. Time is gained, and the results are sufficiently satisfactory for an expeditious survey. The compass is nothing more than a magnetic needle in a rectangular box, at the bottom of which a limb turns in such a manner that the north and south line is exactly parallel to the larger side of the box. This instrument, when adapted to the plane table, greatly abridges the operations by the facility it gives for adjusting the survey. Thus the magnetic needle or magnetic meridian makes with the astronomical meridian an angle called the declination. If O be the declination, put the compass on the plane table in such a manner that the needle coincides with the north and south line. Turn it afterwards until the needle passes over the number of degrees equal to the declination O. Then the long side of the box is parallel to the meridian, and if it is wished that one of the sides of the survey should have this meridian direction, the needle is made to describe, by turning the plane table, an angle equal to that made by the side of the triangle with the side of the compass.

When without instruments, the adjustment of a survey may be determined by setting up vertically upon the plane table a pin or needle, and tracing by means of a watch the shadow of this pin at different hours of the day. The solar spectrum thus formed serves on subsequent days to adjust the plane table in the same manner. It is sufficient to do so to look at your watch and turn the table until the shade of the pin corresponds to the same indication of the hour. Or, the sides of hills in expeditious surveys are obtained as in regular surveys, by calculating them by means of the base and the angle of fall.

To level and measure angles without any instrument.—We may ob-

tain the principal angles graphically as follows: plant a staff vertically in the ground by means of a plumb-line; trace upon a leaf of the sketch book a vertical line representing the height of the staff; rest upon the paper a rule, directing it upon the object whose relative height is to be determined; trace this line with a pencil, and the angle of depression or ascension is concluded from that made by the two lines, and the right angle formed by the vertical and horizontal. The difference of level between two points may also be determined by means of two staves of different heights: let the shorter be placed at the station and the other upon the direction of the point whose elevation is sought in such a position that the point of sight and the tops of the two staves may be on the same line. The difference of level is determined by the similitude of the two triangles. The angle of depression is found by placing the longer staff at the station. With the angle of elevation or depression, the height is always found approximately by means of a table of tangents: let h be the height, b the base, c the angle; then $h = b$ tan. c in right-angled triangles.

Or, when the angle of ascension or depression is known, differences of level may be determined graphically as follows: let A B (Fig. 224) represent a length of 1,000m. by the scale—lay off the line A C, making an angle of 25° with A B; draw the perpendicular B C: B C, multiplied by the denominator of the scale, will give a height corresponding to a base of 1,000m. at an angle of ascension of 25°. If lines then radiate from A, making angles of 5° with their adjacent radii, and the base is divided into parts of 50m., and perpendiculars are erected at the points of division, a figure is obtained by which all differences of level will be approximately determined.

FIG. 224.

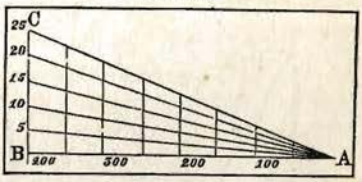
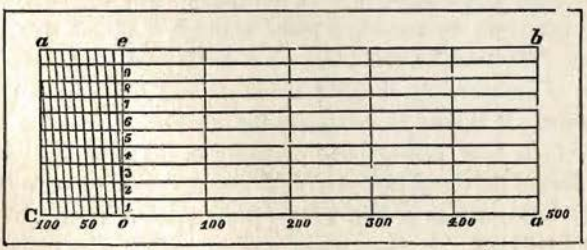


FIG. 225.



Scale.—All plans are accompanied by a graphic scale which makes

known the length of lines on the ground by means of their representations upon the plan and reciprocally; (Fig. 225.) This figure represents a scale of $\frac{1}{20000}$, that is to say, a scale by which 1 metre on paper is equivalent to 20,000 metres on the ground.

Reduction of Plans.—It may be necessary to copy a plan and reduce the scale. This is done by tracing an outline in which the desired relation is preserved. The different parts are then reduced by means of an angle of reduction. This angle is constructed by tracing a line $a\,b$; (Fig. 226.) From b as a centre describe an arc of a circle with the radius $b\,c$ so chosen that $\frac{b\,c}{a\,b} = \frac{m}{n}$, being the relation between the two scales; draw then the tangent $a\,c$. It results from this that if $a\,d$, for example, is a line to be reduced, in describing from the point d an arc of a circle tangent to $a\,c$, e being the point of tangency, $d\,e$ will be the desired reduction.

FIG. 226.

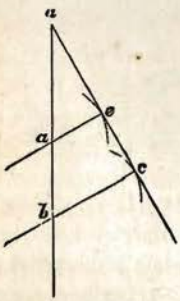
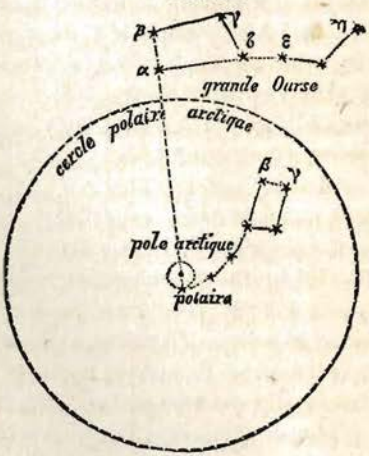


FIG. 227.



To trace a meridian at night.—The means of establishing the meridian by the solar spectrum have been indicated. The meridian may be determined at night by passing a plane through a plumb-line and the north star. The trace of this plane on a horizontal plane will be the projection of the meridian sought; the north star being only $1\frac{1}{2}°$ from the true pole. It is easy to recognize the north star; it is the seventh star of the little bear, and is found precisely in the prolongation of the two first stars of the Great Bear, (*Grande Ourse*,) a constellation disposed in symmetrical order as in Fig. 227; (*Aide Memoire d'Etat Major.*)

SUSPENSION. In cases where a court-martial may think proper to sentence a commissioned officer to be suspended from command, they

shall have power to suspend his pay and emoluments for the same time, according to the nature and heinousness of the offence; (ART. 84.) Rank and command are distinct.

SUTLERS. All sutlers and retainers to the camp, and all persons whatsoever, serving with the armies in the field though not enlisted soldiers, are to be subjected to orders, according to the rules and discipline of war; (ART. 60.) All officers commanding in the field, forts, barracks, or garrisons of the United States, are hereby required to see that the persons permitted to sutle shall supply the soldiers with good and wholesome provisions or other articles at a reasonable price; (ART. 30.) Sutlers not to sell or keep their shops open after nine at night, or on Sundays during divine service or sermon; (ART. 29.) Exorbitant prices not to be exacted from sutlers by commanding officers for the hire of stalls or houses let out.

SWORD. The foot artillery sword resembles the Roman sword. The BLADE is 19 in. long, straight, two-edged; *Body* (or blade proper)—shoulder, rounding, ridges, point bevels, edges; *Tang*, its riveting and rounding, three holes for the gripe rivets; HILT, (brass, in one piece,) cross, knob, and pommel of the cross; SCABBARD (harness leather jacked) blackened and varnished with mountings and ferrule.

The Infantry Sword.—BLADE, (straight, cut, and thrust,) back, edge, groove, bevel point; HILT (surmounting brass)—covering of gripe brass with grooves and ridges; GUARD in one piece; SCABBARD, (leather.) This sword is for the non-commissioned officers of foot troops; a similar one, without the guard plate, and with a blade 26 inches long, for musicians. The sword for officers not mounted is also of the same pattern, with ornamented gilt mountings, and a silver gripe; the inner half of the guard plate is made with a *hinge*. (*See* SABRE.)

SWORD-BAYONET. Short arms, as *carbines*, are sometimes furnished with a bayonet made in the form of a sword. The back of the handle has a groove, which fits upon a stud upon the barrel, and the cross-piece has a hole which fits the barrel. The bayonet is prevented from slipping off by a spring-catch; the sword-bayonet is ordinarily carried as a side arm, for which purpose it is well adapted, having a curved cutting edge as well as sharp point.

T

TABLES. (*See* Articles ARTILLERY; FIRING; RIFLED ORDNANCE; RATION; WEIGHTS.) (Consult *A Collection of Tables and Formulæ useful in Surveying, Geodesy, and Practical Astronomy, including Elements for the Projection of Maps*, by Capt. T. J. LEE, Top. Engineer; also *Ordnance Manual* for numerous useful tables.)

TABLE OF NATURAL SINES AND TANGENTS.

Deg.	Min.	Sine.	Tangent.	Deg.	Min.	Sine.	Tangent.
0	10	0029089	0029089	14	00	2419219	2493280
	15	0043633	0043634		15	2461533	2539676
	30	0087265	0087269		30	2503800	2586176
	45	0130896	0130907		45	2546019	2632780
1	00	0174524	0174551	15	00	2588190	2679492
	15	0218149	0218201		15	2630312	2726313
	30	0261769	0261859		30	2672384	2773245
	45	0305385	0305528		45	2714404	2820292
2	00	0348995	0349208	16	00	2756374	2867454
	15	0392598	0392901		15	2798290	2914734
	30	0436194	0436609		30	2840153	2962135
	45	0479781	0480334		45	2881963	3009658
3	00	0523360	0524078	17	00	2923717	3057307
	15	0566928	0567841		15	2965416	3105083
	30	0610485	0611626		30	3007058	3152988
	45	0654031	0655435		45	3048643	3201025
4	00	0697565	0699268	18	00	3090170	3249197
	15	0741085	0743128		15	3131638	3297505
	30	0784591	0787017		30	3173047	3345953
	45	0828082	0830936		45	3214395	3394543
5	00	0871557	0874887	19	00	3255682	3443276
	15	0915016	0918871		15	3296906	3492156
	30	0958458	0962890		30	3338069	3541186
	45	1001881	1006947		45	3379167	3590367
6	00	1045285	1051042	20	00	3420201	3639702
	15	1088669	1095178		15	3461171	3689195
	30	1132032	1139356		30	3502074	3738847
	45	1175374	1183578		45	3542910	3788661
7	00	1218693	1227846	21	00	3583679	3838640
	15	1261990	1272161		15	3624380	3888787
	30	1305262	1316525		30	3665012	3939105
	45	1348509	1360940		45	3705574	3989595
8	00	1391731	1405408	22	00	3746066	4040262
	15	1434926	1449931		15	3786486	4091108
	30	1478094	1494510		30	3826834	4142136
	45	1521234	1539147		45	3867110	4193348
9	00	1564345	1583844	23	00	3907311	4244748
	15	1607426	1628603		15	3947439	4296339
	30	1650476	1673426		30	3987491	4348124
	45	1693495	1718314		45	4027467	4400105
10	00	1736482	1763270	24	00	4067366	4452287
	15	1779435	1808295		15	4107189	4504672
	30	1822355	1853390		30	4146932	4557263
	45	1865240	1898559		45	4186597	4610063
11	00	1908090	1943803	25	00	4226183	4663077
	15	1950903	1989124		30	4305111	4769755
	30	1993679	2034523	26	00	4383711	4877326
	45	2036418	2080003		30	4461978	4985816
12	00	2079117	2125566	27	00	4539905	5095254
	15	2121777	2171213		30	4617486	5205671
	30	2164396	2216947	28	00	4694716	5317094
	45	2206974	2262769		30	4771588	5429557
13	00	2249511	2308682	29	00	4848096	5543091
	15	2292004	2354687		30	4924236	5657728
	30	2334454	2400788	30	00	5000000	5773503
	45	2376859	2446984		30	5075384	5890450

TABLE OF NATURAL SINES AND TANGENTS—(CONTINUED.)

Deg.	Min.	Sine.	Tangent.	Deg.	Min.	Sine.	Tangent.
31	00	5150381	6008606	53	00	7986355	13270448
	30	5224986	6128008		30	8038569	13514224
32	00	5299193	6248694	54	00	8090170	13763819
	30	5372996	6370703		30	8141155	14019483
33	00	5446390	6494076	55	00	8191520	14281480
	30	5519370	6618856		30	8241262	14550090
34	00	5591929	6745085	56	00	8290376	14825610
	30	5664062	6872810		30	8338858	15108352
35	00	5735764	7002075	57	00	8386706	15398650
	30	5807030	7132931		30	8433914	15696856
36	00	5877853	7265425	58	00	8480481	16003345
	30	5948228	7399611		30	8526402	16318517
37	00	6018150	7535541	59	00	8571673	16642795
	30	6087614	7673270		30	8616292	16976631
38	00	6156615	7812856	60	00	8660254	17320508
	30	6225146	7954359	61	00	8746197	18040478
39	00	6293204	8097840	62	00	8829476	18807265
	30	6360782	8243364	63	00	8910065	19626105
40	00	6427876	8390996	64	00	8987940	20503038
	30	6494480	8540807	65	00	9063078	21445069
41	00	6560590	8692867	66	00	9135455	22460368
	30	6626200	8847253	67	00	9205049	23558524
42	00	6691306	9004040	68	00	9271839	24750869
	30	6755902	9163312	69	00	9335804	26050891
43	00	6819984	9325151	70	00	9396926	27474774
	30	6883546	9489646	71	00	9455186	29042109
44	00	6946584	9656888	72	00	9510565	30776835
	30	7009093	9826973	73	00	9563048	32708526
45	00	7071068	10000000	74	00	9612617	34874144
	30	7132504	10176074	75	00	9659258	37320508
46	00	7193398	10355303	76	00	9702957	40107809
	30	7253744	10537801	77	00	9743701	43314759
47	00	7313537	10723687	78	00	9781476	47046301
	30	7372773	10913085	79	00	9816272	51445540
48	00	7431448	11106125	80	00	9848078	56712818
	30	7489557	11302944	81	00	9876883	63137515
49	00	7547096	11503684	82	00	9902681	71153697
	30	7604060	11708496	83	00	9925462	81443464
50	00	7660444	11917536	84	00	9945219	95143645
	30	7716246	12130970	85	00	9961947	114300520
51	00	7771460	12348972	86	00	9975641	143006660
	30	7826082	12571723	87	00	9986295	190811370
52	00	7880108	12799416	88	00	9993908	286362530
	30	7933533	13032254	89	00	9998477	572899620
				90	00	10000000	Infinite.

Frigorific Mixtures.

Nitrate of ammonia 1, water 1; thermometer falls from 50° to 4°
Sulph. soda 8, muriatic acid 5 . . . . . 50 to 0
Phosphate of soda 9, nitrate of ammonia 6, diluted nitric acid, 4 . . . . . 50 to —21
Common salt 1, snow or ice 2 . . . . . 32 to — 4
Cryst. chloride of lime 3, snow 2 . . . . . 32 to —50

Elastic Force of Steam at Different Temperatures.

[From experiments of Committee of Franklin Institute.]

The unit is the atmospheric pressure, or 1 atmosphere = 30 in. of mercury.

Temp.	Press.	Temp.	Press.	Temp.	Press.	Temp.	Press.	Temp.	Press.
212	1	275	3	304½	5	326	7	345	9
235	1½	284	3½	310	5½	351	7½	349	9½
250	2	291½	4	315½	6	336	8	352½	10
264	2½	298½	4½	321	6½	340½	8½		

Freezing Points of Liquids.

Olive oil . . .	36° Fahr.	Strong wines .	20° Fahr.
Water . . .	32	Sulphuric acid .	1
Milk	30	Brandy . . .	— 7
Vinegar . . .	28	Mercury . .	—39
Spirits of turpentine .	16	Nitric acid . .	—55

Boiling Points of Liquids. (*Bar.* 30 *in.*)

Sulphuric ether . . .	98°	Phosphorus . . .	554°
Ammonia	140	Spirits of turpentine .	560
Alcohol	174	Sulphur	570
Water, and essential oils	212	Sulphuric acid . .	590
Water, saturated with salt .	224	Linseed oil . . .	600
Nitric acid . . .	248	Mercury . . .	660

Liquids boil at a much lower temperature in vacuo, or under diminished pressure of the atmosphere. At the altitude of about 17,500 feet above the sea, where the barometer stands at 15.35 in., water boils at 180°.

RELATIVE STRENGTH OF THE ENGLISH, FRENCH, AND RUSSIAN NAVIES.

ENGLISH NAVY.

Class of Ship.	Steam.			Sailing.	Total of Steam and Sailing.
	Afloat.	Building or Converting.	Total.	Afloat.	
Liners	48	12	60	16	76
Frigates	34	16	50	13	63
Block Ships	9	...	9	...	9
Iron-cased Ships	...	4	4	...	4
Corvettes	16	5	21	3	24
Sloops	80	15	95	...	95
Small Vessels	27	...	27	...	27
Gun Vessels and Gun Boats	171	21	192	...	192
Floating Batteries	8	...	8	...	8
Transports	15	...	15	...	15
Mortar Vessels	4	...	4	...	4
Total	412	73	485	32	517

FRENCH NAVY.

Class of Ship.	Steam.			Sailing.	Total of Steam and Sailing.
	Afloat.	Building.	Total.	Afloat.	
Liners	33	4	37	9	46
Frigates	34	13	47	28	75
Iron-cased Ships	2	3	5	...	5
Corvettes	17	2	19	13	32
Avisos, &c.	86	3	89	46	135
Gun Boats	39	29	68	...	68
Floating Batteries	5	4	9	...	9
Transports	31	...	31	...	31
Total	247	58	305	96	401

RUSSIAN NAVY.

Class of Ship.	Steam.			Sailing.	Total of Steam and Sailing.
	Afloat.	Building.	Total.	Afloat.	
Liners	13	9	22	16	38
Frigates	18	3	21	...	21
Corvettes	11	11	22	...	22
Small Vessels	30	...	30	...	30
Gun Boats	112	25	137	...	137
Transports	8	...	8	...	8
Total	192	48	240	16	256

TACTICS—as distinguished from strategy, is the art of handling troops. Sect. 7 *Act* May 8, 1792, prescribes the tactics established by Congress in 1779, as the rules for the exercise and training of the militia.

Act of March 3, 1813, requests the President to cause to be prepared and laid before Congress a military system of discipline for the infantry of the army and militia of the United States.

Act of May 12, 1820, prescribes that the system of discipline and field-exercise, that is or may be ordered for the infantry, artillery, and riflemen of the regular army shall be the same for the respective corps of the militia.

Act of May 18, 1826, authorizes the Secretary of War to have prepared a complete system of cavalry tactics, and also a system of exercise and instruction of field-artillery, including manœuvres for light or horse artillery, for the use of the militia of the United States, to be reported for consideration or adoption by Congress at its next session.

Act of March 2, 1829, provides for the distribution of 60,000 copies of the abstract of infantry and light infantry and rifle tactics, and also 5,000 copies of the system of instruction for field-artillery prepared pursuant to *Act* of 1826.

Tactics of Gustavus Adolphus and his contemporaries.—Gustavus Adolphus, the greatest captain of his time, originated new principles in the art of war, which in their essence still subsist. His advent marks a fixed and certain epoch in the history of tactics. There are four ideas originated by him, which overthrew the tactics of his predecessors. 1. He gave in combats a greater, but not an absolute influence to the musket; and united in order of battle heavy and small arms. 2. He increased the mobility of his troops by breaking up heavy masses, and thus also diminished the destructive effects of an enemy's fire. 3. He ranged the different arms according to their intention, and thus established facility in manœuvring as well as their mutual capacity to aid each other. 4. He restored individual activity, which had all but ceased to exist, particularly in cavalry, since the invention of powder.

Gustavus Adolphus conceived and executed all his projects himself. He was at the same time an infantry, cavalry, and artillery soldier. He was a lover of mathematics and natural philosophy, and did not disdain to hold a pencil and compass. The order of battle of the Swedes consisted, according to circumstances, in a formation of two or three lines ranged parallel to each other or in echelons upon the wings, the cavalry behind the infantry or upon its wings. The cavalry was proportionably very numerous. It fought in four ranks. The infantry was ranged in six ranks. The batteries of artillery were massed and masked. In assaulting Germany, Gustavus had two hundred pieces.

Tactics before and during the war of the Spanish Succession.—At this epoch there were great men, but no one like Gustavus took a giant step in tactics. The art was at a stand during more than a hundred years notwithstanding the rapid succession of wars, and the reiterated occasions such wars offered to genius. In this world it is not events which produce changes, but superior minds which control events. Gradually, however, the musket became the only arm of infantry, and the pike was entirely discontinued. Thus the possibility of infantry, defending themselves against cavalry vanished, and in order to restore the equilibrium, the epieus or half-pike was introduced. Each infantry man carried one at the beginning of the 17th century. This order was general. It succeeded against the Turks, but cruelly impeded the mobility of infantry.

The bayonet appeared for the first time in the Netherlands in 1647, and essentially contributed to the discontinuance of the pike. At first this arm was very unhandy, as it was necessary to take it from the musket before firing. Under Charles XII. this was remedied, and in the Prussian army in 1732, the front rank was armed with a bayonet during the fire. In 1740 at the battle of Molwitz the three ranks were thus provided.

To appreciate the spirit of the tactics of this time, it is necessary to study the campaigns of Turenne and Luxembourg, and those of Prince Eugene and Marlborough. The principal characteristic of the tactics of this epoch consisted in the attack of the whole line at the same time, and consequently of the general opening of a battle upon all points at once. A part of a line was rarely maintained in position during the attack of other portions. The importance of echelons was not appreciated, or it was not known how to use them in the oblique order. Manœuvres, however, improved, but very slowly. Hence open fields of battle were generally preferred. If accidents of ground were sought, it was for the purpose of establishing lines of defence. Marches were executed, ordinarily, by many columns, each consisting of a single arm. There was therefore little reciprocity of action, and even in camps the same marked separation was preserved.

Tactics of Frederick the Great and his contemporaries.—Frederick found the art of war in a singular state. A great man—a born captain was indispensable to raise this art from the dust under which it had been trampled and all but stifled by a miserable formalism. The active genius, the living courage, the free will which had signalized the combats of ancient times had disappeared; the musket had become a powerful arm, but pedantry had seized upon the order of battle; all merit consisted in forms, and cavalry rendered useless in action had become only the furniture of parades.

The great merit of Frederick consisted in recognizing the spirit of his age, and giving it a new bent. When Frederick appeared in camp, he found the musket in general use. He occupied himself in perfecting it. He fixed the depth of infantry at three ranks, and thus were seen deployed those long and thin lines which later took with the art of moving them the denomination of tactics of lines.

Frederick required of his cavalry but two things: 1, Promptitude in surprising an enemy; and 2, United and violent attacks to overthrow and annihilate him. For these reasons he exacted the exclusive use of the sabre in cavalry, which soon disdained the gun as useless and unworthy of a true cavalier. All movements were executed regularly but

rapidly. Frederick also occupied himself with perfecting artillery. He diminished the weight of field-pieces, and drew a marked line of separation between field and siege pieces.

The American Revolutionary War fixed attention specially upon the manner of fighting in dispersed order. This order of battle, in consequence of the difficulties of a wooded country, played here the principal part, and it may be affirmed that skill as marksmen—an important part of the true system of light infantry or rifle tactics—dates from that period.

Tactics during the French Revolution, and its immediate effects.—This epoch of tactics is distinguished by perfecting individual action, and renewing the force of infantry in the shock of battle, by dispensing with long thin lines which were in part replaced by the order in mass. From the French Revolution was born the principle that all citizens are equal, and all owe service to their country. As the first consequence of this principle arose the general and legal obligation of devoting one's self to the military service. This obligation put in movement an aggregate of moral forces which could not otherwise have been collected in armies. But in spite of the enthusiasm of the people, (at least at first,) the absence of military instruction and discipline was everywhere seen. It was necessary that generals should endeavor to create a new tactics.

Tactics then, for the first time, adapted itself to the national character of the soldier, and bent its forms to that character. It was impossible to harmonize the heavy tactics of lines with republican ardor. Instead, therefore, of losing their time in making soldiers machines, the *wise generals* preferred the machines already made. It was indispensable to create a more easy mechanism of sub-divisions, and they naturally determined upon formations in small masses, whilst the order in lines was gradually abandoned. Each republican, feeling himself called to defend his country, considered national interests as his own proper interest. It was not sufficient for him to occupy simply a place in the ranks, he wished to fight individually and with his own proper hands. The stamp of the *tirailleur* was thus impressed on every Frenchman by that ardent will, which was carefully maintained in giving full liberty to the highly pitched energy and courage of the soldier. But where it was necessary to break strength by strength, all were reunited in masses, and disputed the honor of dying in the foremost rank for the republic. These two systems (although they later took the name of systems) brought about the simple mechanism of the new French tactics, the essence of which is concentrated in the system of skirmishers and the system of masses.

A general tactics for all arms is a chimera. An army is composed of infantry, cavalry, artillery, and engineer soldiers. The three first are separate *arms*. Each of these arms must have its particular tactics. But the tactics of those arms, when united, is simply the proper use of each arm by the general-in-chief according to ever-varying circumstances. Each arm ought to think itself invincible. This moral element, or, what is the same thing, a courage developed by discipline, is the most essential quality of a soldier. No one will deny that this moral element is increased in offensive movements. The more infantry attacks with the bayonet, the more cavalry is employed in the charge, the more artillery is brought within range of grape, the greater will be the valor of the soldiers of all arms. Infantry is the great body or nucleus of all armies. An army which possesses good infantry may repair all its losses in war. Light infantry requires a more developed instruction, more corporal dexterity, more circumspection and intelligence than infantry of the line. To march in masses is the duty of the latter. To act in isolated positions under all circumstances of personal danger, is required of the former. All good infantry, whether light or heavy, is at home in close or distant combats. The distinctive characteristic of infantry of the line is a regular, bold, and decided march upon an enemy, in closed ranks, *en muraille*, with a heavy fire when commanded, and *sang-froid* under all circumstances. The distinctive characteristic of light infantry should be skilfulness as marksmen, circumspection, capacity to act independently, indefatigability in occupying an enemy for hours, and even days, incommoding him at long distances, destroying him at short, shunning pressure and attacking anew when pressure ceases, knowing no difficulties of ground, advancing boldly, but when too adventurous uniting smartly for safety, again to resume the independent movements of skirmishers as soon as the danger has disappeared.

In attack as in defence, infantry has three ways of fighting: 1, as skirmishers; 2, by the fire in masses; 3, by the bayonet. All three modes in their reciprocal action experience a great number of modifications, which must depend upon the skill of the tactician. He must thoroughly understand the advantages and disadvantages of the open and close order. He must be able to apply either the one or the other, according to circumstances, and always keep in view the practicability of passing from one to the other. Soldiers ranged in line elbow to elbow are, as it were, tied together, and the will of the whole is controlled by the commander. This is the order in line of battle. If the line be broken into companies or divisions, and ranged one behind the

other, we have the order in column, and this order is important in manœuvring. (*See* MANŒUVRES IN COMBAT.)

The combat as skirmishers is in open or dispersed order. Almost all combats of infantry are begun by skirmishers. It is important, therefore, that infantry of the line as well as light infantry should be instructed as skirmishers. Nothing is so useful in concealing from an enemy our force and intentions than throwing forward skirmishers. If the skirmishers are skilful they may for a long time occupy an enemy, and meanwhile the great body of the army concealed behind the curtain thus formed may present themselves unexpectedly at a decisive point. (Consult *prescribed Tactics for Manœuvres of Infantry of the Line and Light Infantry; Cavalry Tactics; Artillery Tactics;* and *De la Tactique des Trois Armes, Infanterie, Cavalerie, Artillerie,* par C. DECKER.)

TAKE. In a military sense, to take is to make prisoner, or to capture. It has also a meaning in field movements, viz., to adopt any particular formation, as to "take open order."

To take ground to the right or left, is to extend a line, or to move troops in either of those directions.

To take down, is to commit to paper that which is spoken by another.

To take the field, is to encamp, to commence the operations of a campaign.

To take up the gauntlet, is to accept a challenge.

TAMBOUR—is a stockade or timber wall, loopholed, made with two faces, forming a salient angle at the gorge of a work, to serve as a retrenchment or to cover the staircase, with a ditch in front, and sometimes with a half roof sloping to the rear, to protect the defenders from hand-grenades and splinters of shells. (*See* BUILDINGS, *Defence of.*)

TAMP. To pack the excavation of a mine, after the charge has been deposited.

TAMPION or TOMPION. Plug, stopper—iron and copper; lead plate for covering shot holes; muzzle cover of a mortar; small circular bit of hard wood, sheet iron, or stiff paper for covering the claying of a rocket; (BURNS.)

TANGENT—in trigonometry, is the straight line which touches a circular arc at one of its extremities, and is terminated by the production of the radius passing through the other extremity. The arc and its tangent have always a certain relation to each other, and when one is given in parts of the radius the other can always be computed by means

of an infinite series. Let ϕ denote an arc, and tan. ϕ the tangent of the arc ϕ; we have the following series:

$$\phi = \text{tan. } \phi - \tfrac{1}{3} \text{ tan. } {}^3\phi + \tfrac{1}{5} \text{ tan. } {}^5\phi - \tfrac{1}{7} \text{ tan. } {}^7\phi +, \text{ \&c.,}$$

$$\text{tan. } \phi = \phi + \frac{\phi^3}{3} + \frac{2\ \phi^5}{3.5} + \frac{17\ \phi^7}{32.5.7} + \frac{62\ \phi^9}{32.5.7.9} +, \text{ \&c.}$$

For the manner of using sines, cosines, and tangents, *see* LOGARITHMS; SURVEYING; TABLE; TRIGONOMETRY.

TANG. The tang of the breech of a musket is the projecting part by which the barrel is secured to the stock.

TANGENT-SCALE—(sheet brass,) *flanch* 0.5 inch wide, cut to fit the base-ring of the piece; upper edge cut into notches for each $\frac{1}{8}$ degree of elevation.

TABLE OF TANGENT-SCALES FOR FIELD-GUNS AND HOWITZERS.

ELEVATION.	GUNS.		HOWITZERS.		
	6-pdr.	12-pdr.	12-pdr.	24-pdr.	32-pdr.
	in.	in.	in.	in.	in.
1° 15′	0.256	0.333	0.252	0.28	0.331
2°	1.025	1.334	0.945	1.138	1.310
3°	2.051	2.670	1.870	2.271	2.618
4°	3.077	4.006	2.791	3.400	3.920

TAR, &c. Charcoal is made in the simplest way by digging a hole in the earth, or choosing some old well or gigantic burrow, and filling it with piles of wood, arranging them so as to leave a kind of chimney down the centre. The top of the well is now covered over, excepting the chimney, down which a brand is dropped to set fire to the wood. The burning should proceed very gradually, and be governed by opening or shutting the chimney-top with a flat stone; for the wood should smoulder, and never attain to a bright red: it will take from two days to a week to make charcoal. The tarry products of the wood drain to the bottom of the well.

Tar is made by burning larch, fir, or pine, as though charcoal had to be made; dead or withered trees, and especially their roots, yield tar most copiously. A vast deal is easily obtained. It collects at the bottom of the pit, and a hole should be cleanly dug there into which it may drain. *Pitch* is tar boiled down. Turpentine is the juice that the living pine, fir, or larch tree secretes, in blisters under the bark; they are tapped to obtain it. Resin is turpentine boiled down. *Tar* is absolutely essential in a hot country to mix with the grease that is used for the wagon-wheels. Grease, alone, melts and runs away like water: the office of the tar is to give consistence. A very small proportion of tar suffices, but, without any at all, a wagon is soon brought to a stand-

still. It is, therefore, most essential to explorers to have a sufficient quantity in reserve. Tar is also of very great use in hot dry countries for daubing over the wheels, and the woodwork generally, of wagons. During the extreme heat, when the wood is ready to crack, all the paint should be scraped off it, and the tar applied plentifully. It will soak in deeply, and preserve the wood in excellent condition, both during the drought and the ensuing wet season. It is not necessary to take the wheels off, in order to grease the axles. It is sufficient to bore an auger-hole right through the substance of the nave, between the feet of two of the spokes, and to keep a plug in the hole. Then, in order to tar a wheel, turn it till the hole is uppermost; take the plug out, and pour the tar in; (GALTON'S *Art of Travel.*)

TARGET. Practice at target-firing is essential to make a soldier. To obtain from the new small-arms the great results which they promise it is necessary: 1. That the soldier should know the different parts of the arm, or its nomenclature, how to take it apart and put it together, and the best method of keeping it in good order. This instruction should be given by sergeants and corporals under direction of the officers of the company; (*see* ARMS.) 2. The soldier must be taught the prescribed method of loading his arm. 3. The rules for firing must be known to him, that is to say, he must be taught the use of the hausse, or to regulate his arm according to the distance of the enemy; (*see* HAUSSE.) 4. He must be taught to estimate distances in order to apply the rules for firing; (*see* the method practised at Vincennes given p. 609.) 5. He must know how to aim. 6. He must hold the musket in the position his instructor prescribes, and aim with ease; preserve the body steady, but not constrained; resist the recoil; and not incline the rear sight to the right or to the left. If the rear sight, when raised and held upright, give the proper elevation for say 900 yards, and it then be inclined to the right although the aim is in such position taken with the 900 yards' sight, yet the elevation is actually lowered, and the bullet would, therefore, not only fly to the right of the object, but fall short from want of sufficient elevation. The more the sight is inclined, the greater will be the loss of elevation. Another cause of inaccuracy in aiming arises from aiming with a coarse front sight. Such an aim causes the line of sight to pass to the right or left of the front sight, and the ball consequently to go to the opposite side of the object from the side of the coarse sight by which we aimed. The elevations for different ranges being marked for a fine sight, therefore when it is necessary to use the coarse sight for a greater distance than the elevation used, the proper allowance must be made in aiming. 7. In pulling the

trigger, in no manner to derange the musket. The soldier must acquire the habit of pulling the trigger when, in *raising* the piece, the sights cover the bull's-eye. Most of these details, it is obvious, will be better taught without wasting cartridges. When the soldier has been, however, sufficiently instructed in the simulated fire, to accustom him to the noise of the actual fire, it is necessary to begin with the explosion of caps, observing that he preserves his arm immovable as previously taught. To accustom him to the effect of the recoil, it is necessary to fire some blank cartridges.

Such are the gradual steps to be followed in practical firing, and by taking them better marksmen will be made than by passing men without previous preparation from the school of the soldier to target practice. After the soldier has been practised at firing at the target within the efficacious range of his arm, and has acquired the habit of estimating distances, without great errors; when he has been taught to fire at a mark changed at every fire, the distance of which he must estimate, he may be sent as a skirmisher against an enemy. He will know the range and use of his arm. He will appreciate its great power. The instruction of the soldier would not, however, be complete if he had been exercised only in firing singly. He must be accustomed to the *gêne* that he experiences in the ranks, to movements of his comrades, to the smoke which covers the front of the troops, to obeying the commands of the officer who directs the fire. The execution of the fire by platoon, by rank and by two ranks, upon squares, which indicate the effect of the fire, is a necessary instruction above all to officers, who learn in these exercises to direct and command firing, to estimate the relative value of different fires, and to judge of the importance of a simultaneous fire at proper moments. The whole instruction in firing may be given to the sergeants, corporals, and soldiers of a battalion without injury to other necessary instruction, and without hindrance of any duties in the course of a year.

The means of instruction adopted at Vincennes claim attention, in consequence of the manifest advantages of practising at ranges judged by the soldier himself. After attaining some proficiency as a marksman at specified distances, the soldier is taught to estimate distances as if before an enemy. From a squad of 16 men under a non-commissioned officer, four out of the 16 men are taken and posted at distances of 50, 100, 150, and 200 metres, facing the remainder of the men, who observe such details of each man's dress as can be distinguished at the several distances respectively. Having carefully noticed the differences which exist, the instructor practises the men at distances that are un-

known to them, in order that they may apply the knowledge that they have gained by observation of dress at known distances. After the soldiers have been sufficiently practised in this way, their correctness in judging distances is subjected to another test. A man runs forward, and places a target at some distance unknown to the men; each man is then called upon in turn to name the distance, and the answers are recorded in a book. This kind of practice takes place at all distances, particularly between 500 and 1,000 paces, and is continued till all are moderately skilful. Firing then begins at distances unknown to the men, and those who are most successful are rewarded with promotion, and become the instructors of others. In order that the knowledge imparted at Vincennes may be extended to the whole army, at least one *sous-officier* is brought there from each regiment.

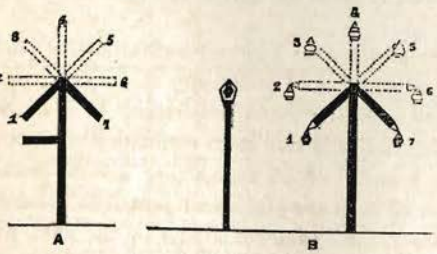
The new rifle musket and new rifle have an equal range, and greater precision than field-artillery, and a company of marksmen can produce an equal effect in the field at less cost than a battery of artillery. At 650 yards, for instance, almost every shot will take effect on horses and men attached to a battery. It will follow that the artillery must be more carefully covered in battle. (Consult *Instruction provisoire sur le tir à l'usage des bataillons de Chasseurs à pied.* *See* ARMS; FIRING; HAUSSE; STADIA.)

TATTOO OR TAPTOO. Drum-beat and roll-call at night.

TEAMSTERS. That to each regiment of dragoons, artillery, and mounted riflemen in the regular army there shall be added one principal teamster with the rank and compensation of quartermaster-sergeant, and to each company of the same, two teamsters, with the compensation of artificers; (*Act* March 3, 1847.)

TELEGRAPH, (*Universal.*) It consists of an upright post of moderate height, of two movable arms fixed on the same pivot near the top of it, and of a mark called an indicator on one side of it, merely to distinguish the low numbers 1, 2, 3, from the high numbers, 7, 6, 5. Fig. 228, A represents the telegraph exhibiting the sign 17, the other positions of which the arms are capable being dotted. Fig. 228, B represents the telegraph fitted up to make nocturnal signals. One lantern,

FIG. 228.



called tne central light, is fixed to the same pivot upon which the arms move. Two other lanterns are attached to the extremities of the arms. A fourth lantern, used as an indicator, is fixed on the same horizontal

FIG. 229.

TABLE OF THE SIGNS OR COMBINATIONS.

Positions.	Appearance.		Positions.	Appearance.	
	By Day.	By Night.		By Day.	By Night.
1			25		
2			26		
3			27		
4			34		
5			35		
6			36		
7			37		
12			45		
13			46		
14			47		
15			56		
16			57		
17			67		
23			STOP		
24			FINISH		

level with the central light at a distance from it equal to twice the length of the arm, and in the same plane nearly in which the arms revolve. Hence the whole apparatus consists of two fixed and of two movable lights—four in all. The number of telegraphic signs, combinations, or changes which this telegraph is capable of exhibiting is shown in Fig. 229, and one of those, No. 4, in the day telegraph is liable to be confounded with the post and should not, therefore, be used. The number is, however, amply sufficient for telegraphic communication whether by alphabet or by reference to a telegraphic dictionary of words and sentences. The indicator, both by day and night, is merely a mark and nothing more, and the central light by night and the post by day are also merely guides to the eye. The signs of the telegraph are in reality, therefore, only composed of combinations of two movable bodies by day and two lights by night. It has been ascertained by experiment that the arms for day signals should be about 1 foot in length per mile in order to be distinguished by a common portable telescope. By the above rule, a telegraphic arm of six feet in length may suffice for stations six miles apart, but it is better to add a little to these dimensions. The width of the arm need not exceed $\frac{2}{13}$ of its length. The indicator should be of the same width, but only $\frac{1}{2}$ of the arm in length. The height of the post should be such that movable objects near it should not obscure the indicator or arms when the telegraph is erected in the field. The telegraphs hitherto constructed on this principle are of two sizes: one having arms of $5\frac{1}{2}$ feet in length, with the lantern pivots placed $6\frac{1}{2}$ feet from the centre of motion; the other having arms $2\frac{1}{2}$ feet in length only, with the lantern pivots 3 feet 2 inches from the centre of motion. The latter are perfectly portable, as the whole apparatus does not weigh more than 34 lbs. In clear weather these small telegraphs make signals distinctly visible at a distance of three miles.

In cases of emergency, where the portable telegraph is not with an army, it has been ascertained by experiment that the most expeditious and satisfactory arrangement will always be to copy the regular construction as closely as circumstances will permit. A post, with two planks for the arms fixed externally on each side of the post, each worked merely by a couple of strings without pulleys, will constitute a day telegraph, and the addition of lanterns will convert the same simple apparatus into a night telegraph. In both cases the arms must be counterpoised by wood or iron, and also by weights in some rude manner, which must not impair the clearness of the telegraphic signs. (Consult *Aide Memoire to the Military Sciences by British Officers.* *See* SIGNALS.)

TENAILLE—is a low work, constructed in the main ditch, upon the lines of defence, between the bastions, before the curtain, composed of two faces, and sometimes of two flanks and a small curtain.

TENAILLONS—are works sometimes found constructed in an old fortress, on each side of the ravelin—the short faces being traced, on the prolongations of the faces of the ravelin, from the counterscarp of its ditch; the long faces being directed for flanking defence, to about the middle of the faces of the bastions.

TENAILLONS (*Demi*)—are very similar to tenaillons, excepting that their short faces are directed, perpendicular to the faces of the ravelin, about one-third or one-half down from the flanked angle.

TENT. (*See* CAMP.)

TERRE-PLEIN—is a name given to any space which is level, or nearly so; thus, the area on the rampart, between the banquette and the interior slope of the rampart, is called the terre-plein of the rampart.

TÊTE-DU-PONT. A field-intrenchment covering a bridge. (*See* REDAN.)

THEODOLITE. A surveying instrument for measuring the angular distances between objects projected on the plane of the horizon. In accurate surveying, when the instrument used for observing angles is a sextant or reflecting circle, or such that its plane must be brought into the plane of the three objects which form the angular points of the triangle to be measured, the altitudes of the two distant objects above the horizon of the observer must be determined, and a calculation is then necessary to reduce the observed angles to the plane of the horizon. With the theodolite this work is unnecessary. (Consult SIMMS' *Treatise on Mathematical Instruments;* DAVIES' *Surveying.*)

TIER SHOT. Grape shot sometimes so called.

TIGE ARMS. Sometimes called pillar breech arms. Arms with a stem of steel, screwed into the middle of the breech pin, around which the charge of powder is placed. The ball enters free and rests upon the top of the pin which is tempered, and a few blows with a heavy ramrod forces the ball to fill the grooves of the rifled arm. This invention was an improvement by Capt. Thouvenin on Delvignes' plan of having a chamber for the powder smaller than the bore. Capt. Minié's invention superseded the tige arms, by means of a bullet which is forced to fill the grooves by the action of the charge itself at the instant of explosion. (*See* ARMS; RIFLED ORDNANCE.)

TIMBER. Sawed or hewn timber is measured by the cubic foot, or more commonly by board measure, the unit of which is a superficial foot 1 inch thick. Usual rule for measuring round timber: multiply

the length by the square of one-fourth the mean girth, for the solid contents, or $\frac{L\,C^2}{16}$; L being the length of the log, and C half the sum of the circumferences of the two ends. (Consult *Ordnance Manual.*)

TOISE—is 2.132 yards. Reduction of old French toises to metres; 1 metre = 39.37079 English inches.

Toises.		Metres.		Eng. Yards.
1	=	1.949	=	2.132
5	=	9.745	=	10.660
8	=	15.592	=	17.056
10	=	19.490	=	21.320
100	=	194.900	=	213.200
500	=	974.500	=	1,066.000
1,000	=	1,949.000	=	2,132.000

TOOLS. The French ordinance of 1831 prescribes the following camp tools: reaping-hook, scythe, axe, shovel, mattock, and bill-hook. Each tool has a leather case and a shoulder belt, in order that it may be carried by the men. (*See* Utensils.)

TOPOGRAPHICAL ENGINEERS. (*See* Engineers, *Topographical.*)

TOPOGRAPHY—is the art of representing and describing in all its details the physical constitution, natural or artificial, of any determined portion of country; in making maps and giving a descriptive memoir. Military topography differs from geography in seeking to imitate sinuosities of ground; it represents graphically and describes technically commanding heights, water-courses, preferable sites for camps, different kinds of roads, the position of fords, extent of woods. It enumerates the resources that a country offers to troops and the difficulties which are interposed. By means of colored maps and other conventional signs, military topography presents before the eyes of a general much that is necessary to guide his operations. (Consult Bardin. *See* Reconnoissance; Surveys, *Military.*)

TOWER BASTION—is one which is constructed of masonry, at the angles of the interior polygon of some works; and has usually vaults or casemates under its terre-plein, to contain artillery, stores, &c.

TRACING. (*See* Outline.)

TRADE. Licenses to trade with Indians shall not be granted to any but citizens of the United States, unless by express direction of the President; (*Act* April 29, 1816.) The superintendent of Indian affairs in the Territories, and Indian agents under the direction of the President

of the United States, may grant licenses, not exceeding seven years, to trade with Indians; which licenses shall be granted to citizens of the United States and none others, taking from them bonds with securities, in the penal sum not exceeding five thousand dollars according to capital employed, and conditioned upon the due observance of the laws regulating trade and intercourse with Indian tribes. The superintendents and agents shall return to the Secretary of War, within each year, an abstract of the licenses granted, to be laid before Congress at the next session thereof; (*Act* May 6, 1822.)

Unlicensed trade punishable by forfeiture of merchandise, a fine not exceeding one hundred dollars, and imprisonment not exceeding thirty days; (*Act* March 30, 1802.) Receiving, or purchasing from any Indian, in the way of trade or barter a gun, any instrument of husbandry, or article of clothing, except skins or furs, punishable by forfeiture not exceeding fifty dollars and thirty days' imprisonment; (*Act* March 30, 1802.) The purchase of horses from Indians without license from the superintendent or other person authorized by the President to grant licenses, punishable with forfeiture not exceeding one hundred dollars for every horse purchased; (*Act* March 30, 1802.) No agent, superintendent, or other person authorized to grant licenses to trade or purchase horses shall have any interest or concern with any trade with Indians, excepting for and on account of the United States, under penalty of forfeiture not exceeding one thousand dollars and imprisonment not exceeding twelve months; (*Act* March 30, 1802. *See* WAR.)

TRAIL-HANDSPIKE—for field-carriages, 53 inches in length. (Hickory, or young oak.)

TRAIN. At the beginning of the French Revolution, artillery, engineer, and other supplies, and hospital trains were conducted by hired drivers. These men had neither military pride nor honor. They were cowardly and insubordinate, deserted in combats, cut the traces of their horses, and sought personal safety by abandoning equipages. On march and in camp or cantonments they were not unfrequently drunk and neglected their horses. These evils were corrected by enrolling them under the name of soldiers of the artillery train and equipages. They were given officers, a uniform and arms, and have since rivalled other corps of the army in zeal, courage, and devotedness. The artillery train now forms a part of the artillery, and is commanded by artillery officers. The train of provisions and ambulances is composed of squadrons and companies. The squadrons are commanded by a captain, and the companies by a lieutenant. Each soldier conducts two harnessed horses. He is armed with a pistol and a small sword.

In 1850 the corps of military equipages in France consisted of a central bureau for wagon parks at Vernon; of two arsenals of construction at Vernon and at Chateauroux; of three arsenals for repair in Algiers; and three companies of workmen. The soldiers properly belonging to the train made four squadrons. (Consult BARDIN and LE COUTRIER.) The quartermaster's department in our army is charged with wagon trains, but neither enlisted soldiers as workmen or drivers have yet been added to the department. (*See* CONVOY; QUARTERMASTER'S DEPARTMENT; WAGON.)

TRANSFERS. Officers of engineers are liable to be transferred, at the discretion of the President, from one corps to another, regard being paid to rank; (ART. 63.) During the recess of Congress, the President may, on the application of the Secretary of the proper department and not otherwise, direct, if in his opinion necessary for the public service, that a portion of the moneys appropriated for any one of the following branches of expenditure in the military department, viz.: For the subsistence of the army; for forage; for the medical and hospital department; for the quartermaster's department—be applied to any other of the above-mentioned branches of expenditure in the same [military] department; (*Act* March 3, 1809.) No appropriation for the service of one year shall be transferred to another branch of expenditure of a different year; (*Act* May 1, 1820.)

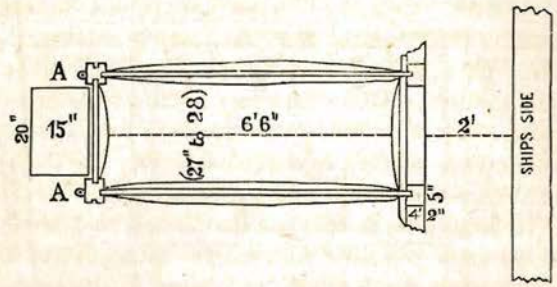
Nothing in the act of March 3, 1809, shall authorize the President to direct any sum appropriated for fortification, arsenals, armories, custom-houses, docks, navy-yards or buildings of any sort, or to munitions of war, or to the pay of the army or navy, to be applied to any other object of public expenditure; (*Act* March 3, 1817.) But the President, under the restrictions of the act of May 1, 1820, may transfer from one head of appropriations for fortifications to that of another for like objects; (*Act* July 2, 1836.)

TRANSPORTATION. (*See* QUARTERMASTER'S DEPARTMENT; SUPPLIES; TRAIN; WAGON.)

By Sea.—For transportation by sea, make an inventory of the number of articles, the weight of each, and the total weight of each kind, leaving room for remarks. In estimating the weight, increase the total by one half the weight of the small articles, such as accoutrements, tools, &c., which occupy considerable space in proportion to their weight, and apply for vessels sufficient for the transportation of the whole weight. Inventories of articles on each vessel should be made in duplicate, one copy being kept by the master of the vessel, the other by the person having the stores in charge. (*See* EMBARKATION.)

Horses.—The following arrangements on the English horse-transport steamer Himalaya, Capt. McClellan, gives as a model: Two rows of stalls, with the rear ends 2′ at least from the vessel's side, are arranged on each deck. These stalls (Fig. 230) are each furnished with movable side-boards, a movable breast-board, and a fixed tail-board, all padded; the side-boards on both sides, the tail-board next to the horse and nearly to the bottom of the stall, and the breast-board on top and on the side next the horse. The padding used consists of felt, or raw hide, (the

FIG. 230.



latter objectionable on account of the odor,) stuffed with cow's hair wherever the animal can gnaw it, with straw in other parts. It is from 2″ to 3″ thick. The feed-troughs are of wood, bound on the edges with sheet-iron or zinc, and attached to the breast-boards with two hooks. The breast and side-boards ship in grooves. Fig. 230 represents the horizontal projection of one stall. In front of each head-post a halter-ring A is placed, and over this near the top of the post is a hook, to which the sea-halter is hung when not in use. The feed-troughs, head-boards, and stalls are whitewashed and numbered.

FIG. 231.

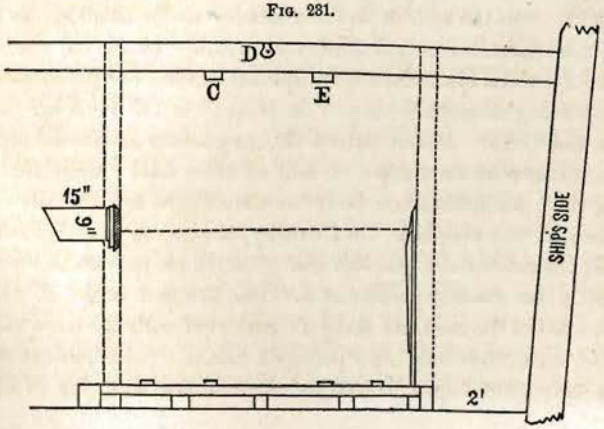
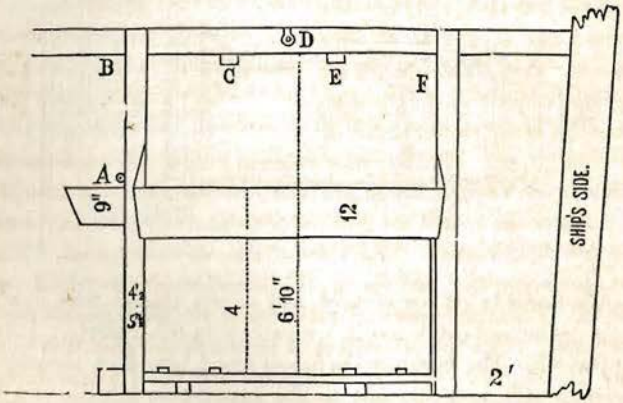


Fig. 231 represents a section of one of these stalls through the axis. The flooring is raised above the deck on battens, and is divided into separate platforms for every two stalls, so that it can easily be raised to clean the deck beneath; 4 strong battens are nailed across to give the animals a foot-hold.

Fig. 232 is a section through the side-boards of a stall, and shows the dimensions of the timbers and height of side-boards, as well as the manner of inserting them in their grooves. *B* is the hook for hanging

FIG. 232.

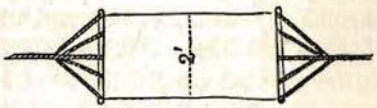


up the sea-halter. This halter is made of double canvas, 2′ wide, and has two ropes, which, being fastened one to each post, keep the animal's head still, and prevent him from interfering with his neighbor. *C* and *E* are battens for securing the ropes of the slings, shown in Fig. 233. *D*, bolts, for the same purpose, when the sling is of the form represented in Fig. 234. On the spar deck, the stalls are under sheds, every 8 stalls forming a separate set, so that they can readily be moved about when the decks are to be cleaned. Water-proof curtains are provided for the front and rear; a passage way of at least 2′ is left between the sheds and the bulwarks. When practicable, a staging is erected alongside, that the horses may be walked on and off the vessel; when this cannot be done, they are hoisted on board in the sling, a small donkey engine being used for the purpose. In this way, horses may be shipped or unloaded at the rate of one per minute. The slings are of canvas, of the shape and dimensions represented in Figs. 233 and 234. For hoisting in and out the horses, the sling is provided with a breast strap and breeching. On the main and orlop decks the sling ropes are attached to the bolts; on the spar deck to battens. It was intended to adopt the

sling represented in Fig. 234, as diminishing vibration. At sea, the sling is used only when the animals show signs of weakness in bad weather, in which case about 1″ play is given to the sling, as it is only intended to prevent the horses from falling. To place the horses in the stalls, all the side-boards are removed except the one at the end of the row; a horse is then walked along to the last stall, and the other side-board put in, and so on with all the rest. They should be placed in the same order that they are accustomed to stand in the stable or at the picket rope. If it becomes necessary to remove a horse from his stall during the voyage, the breast-board is taken away, and he is walked out. All wooden parts are washed with some disinfecting compound, or simply whitewashed. Chloride of zinc is freely used. The decks are washed every day, and the stalls cleaned after every feed, especially at 7 P.M. From the spar and main decks, the stale passes off through the scuppers; from the orlop deck it passes to the hold, and is pumped out by the engine. On the Himalaya not the slightest disagreeable odor could be detected. The feed-troughs and horses' nostrils are washed every morning and evening with vinegar. A scraper, brush, and shovel are allowed to every eight stalls. A guard always remains over the horses, and in case of necessity a farrier or non-commissioned officer is sent for. Great attention is paid to ventilation. The orlop deck, although hotter than the others, appears to be the most favorable one for the horses.

FIG. 233.

FIG. 234.



So long as cleanliness is preserved, the commander of the vessel does not interfere as to the hours for feeding, which are usually at 6 and 11 A.M. and 5½ P.M. If any horse refuses his food, the fact is at once reported. A supply of forage is always carried on board the ship. The horses drink condensed steam. The ration at sea was established at 10 lbs. of hay, 6 lbs. of oats, half peck of bran, and 6 galls. of water, as a maximum; but it is generally considered this is too great, and that ⅔ the allowance except the water, would be ample, as it is found there is great danger from over-feeding at sea. No grain is given the day the horses come on board, but simply a mash of bran, which is considered the best habitual food at sea. For the men, bunks and hammocks are generally used. Standing bunks are found to be very objectionable, on

account of the difficulty of keeping them clean. Hammocks are regarded as preferable for men in good health, while many officers consider it best to provide neither hammocks nor bunks, but to allow the men to lie down on the fore-decks, with their blankets and overcoats. When the transports are numerous, each one should have on the starboard and larboard, and on a broad pendant at the top of the mainmast, an easily distinguished number. By means of these numbers, which are marked on the bills of lading, the disposable resources of the expedition are known at any time. Vessels carrying some particular flag should be specially appropriated for the transportation of powder, fire-works, and ammunition, which may be separated from the pieces.

Disembarkation.—If it becomes necessary to transship, or leave any articles upon the vessels, the fact should be carefully noted on the manifests. The ships' crews load and unload, using for these purposes the yard-arms and tackle. It is ordinarily sufficient to furnish them with rollers and skids, in order to place the articles convenient to the tackle. Under some circumstances, it becomes necessary to establish bridge abutments, sheers, gins, &c. For the want of the ordinary means, a temporary crane may be established. To do this a long mortise is cut in a beam about $\frac{1}{3}$ of the distance from its end, and upon the ground is fixed a framework, furnished with a strong vertical pin. The beam is laid on this frame with the pin in the mortise, like an ordinary pintle, but in such a way that the ends of the beam can be raised and lowered. The shortest part of the beam is then turned towards the load, and the different weights being slung to it, are raised by lowering the opposite end, previously raised to make the lashing shorter. The beam is then turned around on its pintle until the weight is in the proper position, when it is lowered gently and unlashed. If a tree or beam fit for the purpose cannot be obtained, several small pieces may be lashed and pinned together.

Railroad Transportation.—In railroad transportation, when several trains are required, they should be in proportion to the power of the engine employed, and full loads should be placed on them. The men are provided, before starting, with provisions to last during the trip, which should be cooked and carried in the haversack. The canteens are filled with water; the French, in warm weather, mix brandy with it. As the horses can eat in the wagons, even whilst the train is in motion, hay (pressed if possible) should be distributed at the rate of about 8, 14, or 24 lbs. per horse, according as the trip is to last less than 12, between 12 and 24, or more than 24 hours. A feed of oats (half a ration, 6 lbs.) is carried in bags, and placed in the baggage wagons. It should

not be given to the horses on the road, but after they have arrived at the terminus. The horses are carried in cattle-cars, or, if possible, in box-cars, which are covered. They are provided with bars at the doors to prevent the horses from backing out when the doors are opened. By taking care to keep the horses quiet, however, these bars may be dispensed with. The saddles, &c., the valises of the driver, and the bags of oats, are placed in the baggage cars, which should be provided with brakes. The "*materiel*" is carried on trucks or common platform cars. The troops should be at the station at least two hours before starting. The horses should have finished feeding about two hours previous to their arrival at the station, as they are then more docile. The baggage should arrive half an hour before the troops, under charge of an officer, and be loaded under the direction of the employés of the road.

The cars for artillery should be arranged as near as possible in the following order: 1st, a baggage wagon; 2d, a truck carrying the beams, platforms, &c.; 3d, the horse-cars; 4th, the cars for the men, one at least of which should be provided with a brake; 5th, trucks loaded with materiel; 6th, baggage cars (with brakes) loaded with saddles, &c. Cars with brakes should always be placed at the head and tail of the train. Guards should be detailed and so stationed on the train as to preserve order both when in motion and during stoppages. The commanding officer should pay especial regard to the wishes of those having the train in charge, and enforce an observance of the road regulations in his command. On arriving at the station, the commander at once divides his command and materiel into the portions to occupy the different cars.

Horses.—An officer is detailed to superintend the embarkation of the horses. He furnishes each car with two bundles of litter, and places forage along the long side of the car opposite to the door. A non-commissioned officer is charged with loading the saddles, &c. The men are, under an officer, formed into detachments proportional to the importance of the *materiel* to be embarked.

As soon as a truck has received its load, the wheels of the different trains are locked together with cord from .5 to .6 inch in diameter, chocks are placed under the wheels and nailed to the floor, and the stability of the whole secured by tying the carriages to the rings of the truck. Straw ropes, or other means, are made use of to prevent friction between the parts.

The men, with their knapsacks and arms, are divided, under the superintendence of an officer, into portions corresponding to the capacity of the cars. Each division is conducted promptly to the car it is to

occupy, the men entering first going to the end farthest from the door, and so on. They seat themselves, holding their arms between their legs, the stock or scabbard resting on the floor. Fire-arms should never be laid on the seats or stood in corners, except when leaving the cars at the principal stopping places and stations.

Inspecting.—Immediately before starting, the commanding officer and conductor of the train inspect the cars to ascertain that every thing is in order. They should see that the couplings of the car containing the "*materiel*" are short enough to insure the contact of the buffers. The officers then enter the car assigned to them.

Regulations.—The men are strictly prohibited putting their heads or arms out of the car while it is in motion; passing from one car to another; uttering loud cries of any kind; and from leaving the cars at the station before the signal for doing so is given. The men with the horses, keep them from putting their heads outside the car. They feed them with hay from the hand, until they get used to the motion, hold them by the bridle or halter, and quiet their fears whilst the locomotive is whistling. In case of any accident, they make a signal outside the car, by waving a handkerchief. If at any station the commander deems it necessary for the men to leave the cars, after the time indicated by the conductor, he informs the officers of the length of the halt. The officers remain in the vicinity of the cars containing their men, in order to direct and govern their movements. The guard posts sentinels wherever it is necessary, especially at the doors, to prevent the men from gathering near or opening them. At a given signal on the bugle, the men leave the cars in order, and without side-arms. The men in the horse-cars get out over the side. If it becomes necessary to open the doors of these cars, the door-bars are first placed in position. About the middle of the trip, as near as possible, the police-guard and men with the horses, are relieved. At each halt of more than ten minutes, the commander, or some other officer, and the conductor inspect the cars and especially those which carry the ammunition wagons. Five minutes before starting a bugle-call gives the signal for entering the cars. At the station immediately preceding the terminus, the horses are bridled, and the forage is collected and formed into one bundle for each car. During feeding time there should be at least one man to every two horse-cars. In general, oats should be distributed only after the horses leave the cars. Hay is fed by hand by the drivers whilst the train is in motion. In ordinary weather, the horses are watered only when the trip exceeds twelve hours; and even in this case they need but little, and a single ordinary-size pailful suffices for two horses.

Unloading.—To prevent accidents, it is well to provide one or several movable bridges for discharging the horses, which are carried on the train. They are about sixteen feet long, a little wider than the car door, and are provided with hand-rails or ropes, movable at will. The bridge is supported at its upper extremity by a movable trestle of a height corresponding to the sill of the door, and the cars are unloaded by passing them in succession in front of this bridge; or, by fixing to the forepart of the bridge two strong flanges of iron which rest upon the floor of the car, the bridge may be applied in succession to each of the cars to be unloaded.

The non-commissioned officers in charge of the freight cars, immediately on arriving at the station, unload it as originally divided in the cars by the inverse means used to load it. As soon as the horse-cars reach the proper position, the men fix the movable bridges, open the doors, and bring the horses out in the inverse order in which they entered. If the horses have to be taken out of the same door they entered, the first two are backed out, and the rest follow after making a half turn. As soon as a rear team is disengaged it is taken to the place where the harness is deposited, and harnessed to a carriage which is conducted to the park, where the harnessing is completed. (Consult GIBBON; MCCLELLAN.)

TRAVELLING ALLOWANCE. Where any commissioned officer is obliged to incur any extra expense in travelling, and sitting on general courts-martial, he shall be allowed a reasonable compensation for such extra expense actually incurred, not exceeding one dollar and twenty-five cents per day to officers who are not entitled to forage, and not exceeding one dollar per day to such as shall be entitled to forage; (*Act* March 16, 1802.) (*See* ORDNANCE; TRAVELLING FORGE.)

An officer, who travels not less than ten miles from his station, without troops, escort of military stores, and under special orders in the case from a superior, or summons to attend a military court, shall receive ten cents a mile; or if he prefer it, the actual cost of his transportation, and of his field-allowance of baggage for the whole journey, provided he has travelled in the customary reasonable manner; (*Regulations for the Quartermaster's Department.*)

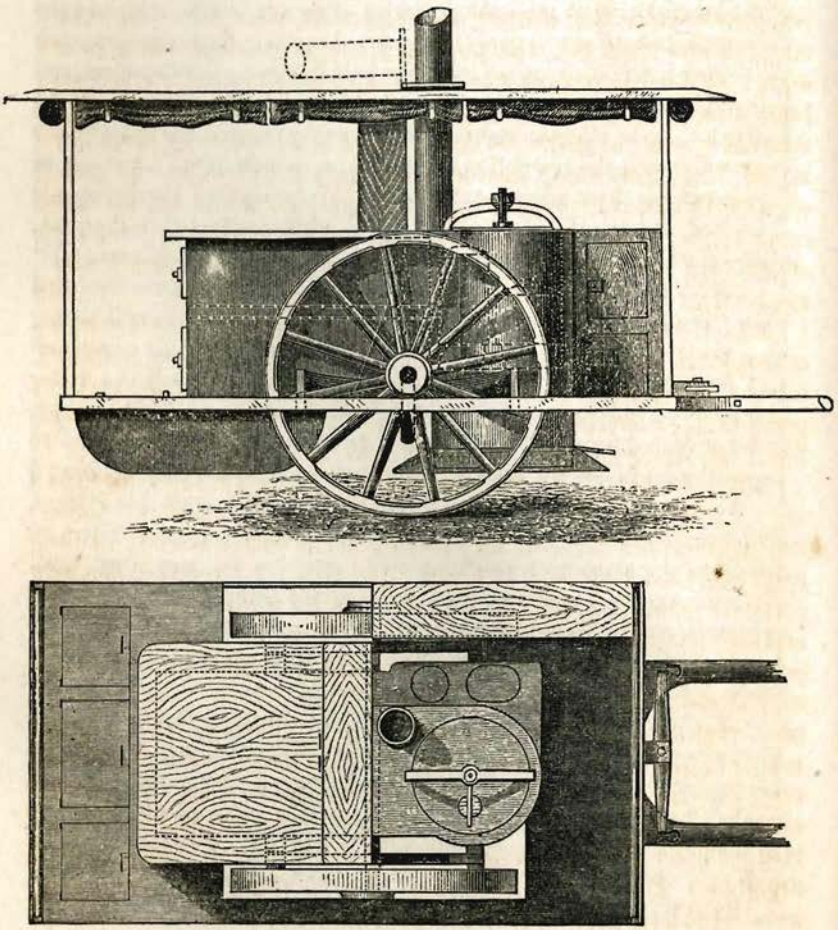
Whenever any officer or soldier shall be discharged from the service, except by way of punishment for any offence, he shall be allowed his pay and rations, or an equivalent in money, for such term of time as shall be sufficient for him to travel from the place of his discharge to the place of his residence, computing at the rate of twenty miles to a day; (*Act* March 16, 1802.)

TRAVELLING-FORGE. (*See* ORDNANCE.)

TRAVELLING-KITCHEN. Marshal Saxe, it is believed, first suggested the idea of cooking while marching, so as to economize the strength of soldiers; have their food well cooked in all weather, and avoid the numerous diseases caused by bad cooking, and want of rest. Colonel Cavalli, of the Sardinian artillery, has with the same laudable motive embraced a kitchen-cart in the improvements suggested by him to replace the wagons now in use, (*see* WAGON;) and an attempt is here made to elaborate the same idea of a travelling-kitchen, designed for baking, making soup, and other cooking, while on a march.

Fig. 235 represents a cart, 12½ feet long, mounted on two 6-feet

FIG. 235.



wheels, and covered with a very light canvas roof with leather-cloth curtains. A large range or stove forms the body of the vehicle; its grate is below the floor, its doors opening on a level with it. A *Papin's digester* is inclosed above the grate, in a flue whence the heat may pass around the double-oven in the rear, or straight up chimney, as regulated by dampers. At the side of the digester, over the grate, is a range, suited to various cooking vessels. The top of the oven forms a table nearly 5 feet square, at which three cooks may work, standing upon the rear platform. A foot-board passes from this platform to the front platform, where the driver and a cook may stand. Stores may be placed in the lockers at the side of the range, and under the rear foot board. The chimney may be turned down, above the roof, to pass under trees, &c., and may be of any height to secure a good draft. By bending the axle like that of an omnibus, the vehicle may be hung without danger of top-heaviness. Cooking vessels, more bulky than heavy, may be suspended from the roof, over the range, when not in use. The digester may have a capacity of 100 gallons, and an oven, of 60 to 75 cubic feet, would be quite adequate to the cooking for 250 men; or the dimensions of the cart may be smaller, and each company of 100 men might have its own travelling-kitchen, which would also furnish oven and cooking utensils for camp.

TRAVERSES—are portions of parapets, which cross the breadth of the covered-way, at the salient and re-entering places of arms. Other traverses are also placed between these, where necessary, to afford proper protection. Traverses are thrown up, to bar enfilade fire, along any line of work or passage which is liable to it.

TRAVERSE TABLE—is the tabulated form in which the northing, southing, easting, and westing are made on each individual course and distance in a traverse, for the purpose of finding readily, by inspection of the table, the difference of latitude and departure of any particular course and distance. Traverse tables afford a simple means of land-surveying, with compass and chain. If the sum of each adjacent pair of distances perpendicular to a meridian (*departures*) without survey, be multiplied by the northing or southing between them, in succession round the figure in the same order, the difference between the sum of the *north* products and the sum of the *south* products will be double the area of the tract. The *meridian distance* of a course is the distance of the middle part of that course from an assumed meridian. Hence, the double meridian distance of the first course is equal to its departure. And the double meridian distance of any course is equal to the double meridian distance of the preceding course, plus its de-

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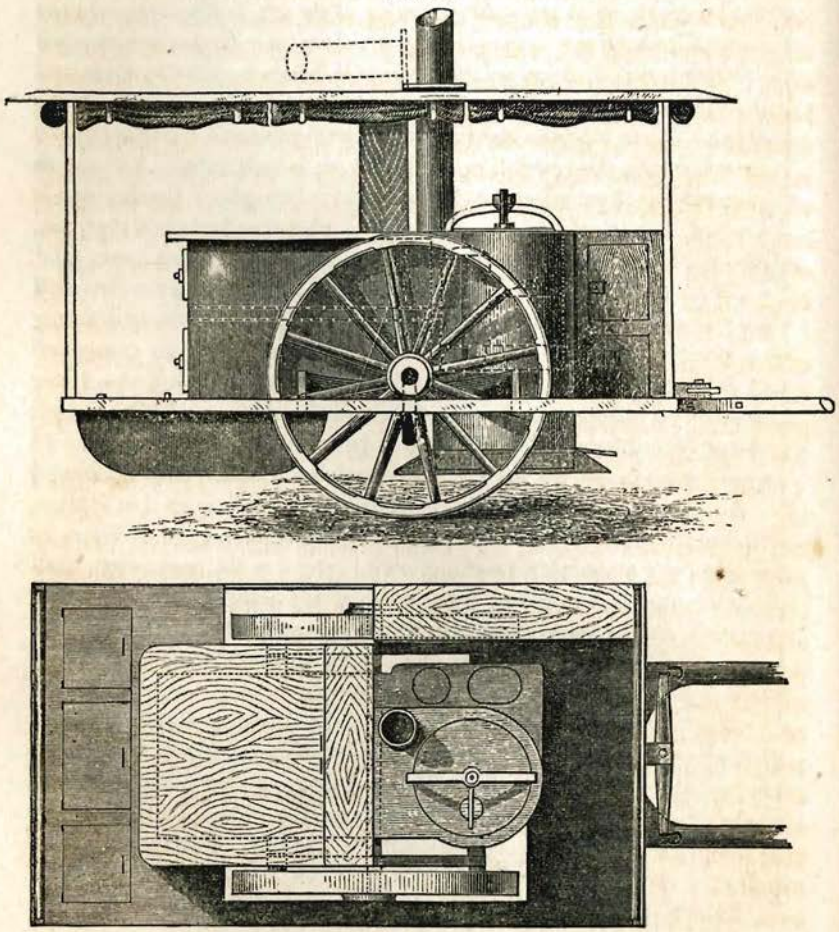

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parture, plus the departure of the course itself, having regard to the algebraic sign of each.

Then to find the area: 1. Multiply the double meridian distance of each course by its northing or southing. 2. Place all the *plus* products in one column, and all the *minus* products in another. 3. Add up each column separately and take their difference. This difference will be *double* the area of the land. In balancing the work, the error for each particular course is found by the proportion: as the sum of the courses is to the error of latitude, (or departure,) so is each particular course to its correction. When a bearing is due east or west, the error of latitude is nothing, and the course must be subtracted from the sum of the courses before balancing the columns of latitude. And so with the departures. Let it be required to find the contents of a piece of land, of which the following are the field-notes:

STA.	COURSE.	DIS.	STA.	COURSE.	DIS.
1	N. 46½° W.	20 chains.	4	S. 56° E.	27.60 chains.
2	N. 51¾ E.	13.80 "	5	S. 33½ W.	18.80 "
3	East	21.25 "	6	N. 74½° W.	30.95 "

CALCULATION.

Stations.	Courses.	Dist. Chains.	Diff. Lat. N. +	Diff. Lat. S. —	Departures. E. +	Departures. W. —	Balanced. Lat.	Balanced. Dep.	D. M. D. +	Area. +	Area. —
1	N. 46¼ W.	20.00	13.77	—	—	14.51	+ 13.38	— 14.56	14.56	202.0928	
2	N. 51¾ E.	13.80	8.54	—	10.84	—	+ 8.61	+ 10.81	10.81	93.0741	
3	East.	21.25	—	—	21.25	—	—	+ 21.20	42.82	—	
4	S. 56° E.	27.60	—	15.44	22.88	—	— 15.29	+ 22.82	86.84	—	1327.7836
5	S. 33½ W.	18.80	—	15.72	—	10.31	— 15.63	— 10.36	99.30	—	1552.0590
6	N. 74½ W.	30.95	8.27	—	—	29.83	+ 8.48	— 29.94	59.03	497.6229	
Sums.....		132.40	30.58	31.16	54.97	54.65				792.7898	2879.8426
				30.58	54.65						792.7898
	Error in northing,			.58	.32	Error in westing.					2)2087.0528
											1043.5264

ANSWER—104 Acres, 1 Rod, 16 Perches.

(Consult *Tables and Formulæ* by Capt. T. J. LEE, Top. Engineer.)

TREATY. No purchase, grant, license, or other conveyance of lands or of any title or claim thereto from any Indian nation, or tribe of Indians within the bounds of the United States, shall be of any validity in law or equity, unless the same be made by treaty or convention, entered into pursuant to the constitution. Penalty not exceeding forfeiture of $1,000 and 12 months' imprisonment for violation of this act. Provided, nevertheless, that any agent or agents of any State, who may be present at any treaty made by United States authority, in the presence and with the approbation of the United

States commissioners, may propose to, and adjust with, the Indians the compensation to be made to them for land claims within such States, extinguished by the treaty; (*Act* of Congress.)

TRENCH. The communications, boyaux or zigzags, as well as the parallels or places of arms opened by besiegers against a fortification are trenches. They are from 6 to 10 feet wide and about 3 feet deep. To *open* the trenches, is to break ground for the purpose of carrying on approaches towards a besieged place.

TRESTLE OR TRESSEL. The form of a trestle is the same as a *carpenter's horse*, that is, a horizontal beam supported by four legs. (*See* BRIDGE.) The horizontal beam, termed the cap or ridge beam in trestles used for field-bridges, is usually of eight-inch scantling, and from twelve to sixteen feet long. The legs are of four and a half inch scantling; they have a spread towards the bottom, the distance between them across being equal to half the height, and lengthwise of the cap, their inclination is one-twelfth of the height. They are fastened to the cap, about 18 inches from the ends, by nails; the side of the cap and the top of the leg being properly prepared for a strong, accurate fit. The legs are connected either in pairs, or else all four by horizontal pieces of three-inch scantling; sometimes diagonal pieces, going from the top of one leg to the bottom of the opposite one, are used.

Bridges or trestles are principally useful in crossing small streams not more than six feet deep. The trestles should not be placed farther apart than sixteen feet between the ridge beams; the balks should jut at least one foot beyond the ridge beams. The action of the current is counteracted by attaching each trestle to two cables stretched across the stream above and below the bridge. Another plan consists in making a network of tough twigs or cords around the legs near the bottom, and filling it in with broken stone. (Consult MAHAN.)

TRIALS—shall be carried on only between the hours of eight in the morning and three in the afternoon, except in cases which, in the opinion of the officer ordering the court, require immediate example; (ART. 75.) No officer, non-commissioned officer, or soldier shall be tried a second time for the same offence; (ART. 87.) And no person shall be liable to be tried and punished by a general court-martial for any offence which shall appear to have been committed more than two years before the issuing of the order for such trial, unless the person, by reason of having absented himself, or some other manifest impediment, shall not have been amenable to justice within that period; (ART. 88.)

All trials before courts-martial, like those in civil courts, are conducted publicly; and in order that this publicity may in no case be

attended with tumult or indecorum of any kind, the court is authorized, by the Rules and Articles of War, to punish at its discretion, all riotous and disorderly proceedings or menacing words, signs, or gestures, used in its presence; (ART. 76.)

The day and place of meeting of a general court-martial having been published in orders, the officers appointed as members, the parties and witnesses, must attend accordingly. The judge-advocate, at the opening, calls over the names of the members, who arrange themselves on the right or left of the president, according to rank; (ART. 61.)

The members of the court having taken their seats and disposed of any preliminary matter, the prisoner, prosecutor, and witnesses are called into court. The prisoner is attended by a guard, or by an officer, as his rank or the nature of the charge may dictate; but during the trial, should be unfettered and free from any bonds or shackles, unless there be danger of escape or rescue. Accommodation is usually afforded, at detached tables, for the prosecutor and prisoner; also for any friend or legal adviser of the prisoner or prosecutor, whose assistance has been desired during the trial; but the prisoner only can address the court, it being an admitted maxim, that counsel are not to interfere in the proceedings or to offer the slightest remark, much less to plead or argue. The judge-advocate, by direction of the president, first reads, in an audible voice, the order for holding the court. He then calls over the names of the members, commencing with the president, who is always the highest in rank. He then demands of the prisoner, whether he has any exception or cause of challenge against any of the members present, and if he have, he is required to state his cause of challenge, confining his challenge to one member at a time; (ART. 71.) After hearing the prisoner's objections, the president must order the court to be cleared, when the members will deliberate on and determine the relevancy or validity of the objection; the member challenged retiring during the discussion.

Sufficient causes for challenge are:—the expression of an opinion relative to the subject to be investigated; having been a member of a court of inquiry which gave an opinion; or of another general court-martial, in which the circumstances were directly investigated; or of another general court-martial in which the circumstances were investigated incidentally and an opinion formed thereon; prejudice, malice, or the like. The privilege of challenge is not confined to the prisoner; for there may be sources of prejudice in favor of the prisoner as well as against him, and urgent motives that may sway to acquit, as well as condemn. When the prisoner and prosecutor decline to challenge

any of the members, or where the causes of challenge have been disallowed, the judge-advocate proceeds to administer to the members of the court, the oath prescribed by the 69th Article of War, which is in the following words: "You, A. B., do swear, that you will well and truly try and determine, according to evidence, the matter now before you, between the United States of America and the prisoner to be tried; and that you will duly administer justice according to the provisions of 'an act establishing rules and articles for the government of the armies of the United States,' without partiality, favor or affection: and if any doubt shall arise, not explained by said articles, according to your understanding and the custom of war in like cases: and you do further swear, that you will not divulge the sentence of the court, until it shall be published by the proper authority: neither will you disclose or discover the vote or opinion of any particular member of the court-martial, unless required to give evidence thereof, as a witness, by a court of justice in due course of law. So help you God." The oath is taken by each member holding up his right hand and repeating the words after the judge-advocate. After the oath has been administered to all the members, the president administers to the judge-advocate, the particular oath of secrecy to be observed by him, and which, as prescribed by Article 69, is as follows: "You, A. B., do swear that you will not disclose or discover the vote or opinion of any particular member of the court-martial, unless required to give evidence thereof as a witness, by a court of justice in due course of law, nor divulge the sentence of the court to any but the proper authority, until it shall be duly disclosed by the same. So help you God."

The oath taken by the president and members contains a twofold obligation to secrecy: 1st, That they will not divulge the sentence of the court, until it shall be published by proper authority; and, 2d, That they shall not disclose or discover the vote or opinion of any particular member of the court-martial, unless required to give evidence thereof by a court of justice, in a due course of law. Both these obligations have their foundation in reason and good policy.

No sentence of a general court-martial is complete or final, until it has been duly approved. Until that period it is, strictly speaking, no more than an opinion, which is subject to alteration or revisal. In this interval, the communication of that opinion could answer no ends of justice, but might, in many cases, tend to frustrate them. The obligation to perpetual secrecy, with regard to the votes or opinions of the particular members of the court, is likewise founded on the wisest policy. The officers who compose a military tribunal are, in a great

degree, dependent for their preferment on the President. They are even, in some measure, under the influence of their commander-in-chief —considerations which might impair justice. This danger is, therefore, best obviated by the confidence and security which every member possesses, that his particular opinion is never to be divulged. Another reason is, that the individual members of the court may not be exposed to the resentment of parties and their connections, which can hardly fail to be excited by those sentences, which courts-martial are obliged to award. It may be necessary for officers, in the course of their duty, daily, to associate and frequently to be sent on the same command or service, with a person against whom they have given an unfavorable vote or opinion on a court-martial. The publicity of these votes or opinions would create the most dangerous animosities, equally fatal to the peace and security of individuals, and prejudicial to the public service.

The oath which is taken by the judge-advocate, contains the same obligation to secrecy, except so far as it relates to the person who has the approving or disapproving of the sentence of the court. It is not inconsistent with his oath or duty, for the judge-advocate to communicate to the proper authority, his views of the proceedings of the court.

The judge-advocate is, however, bound by oath, as well as the members of the court, to maintain the strictest secrecy with regard to the votes or opinions of individuals for the reasons above stated. The oath taken by the members of the court commences with these words: "You, A. B., do swear that you will well and truly try and determine, according to evidence, the matter now before you, between the United States of America and the prisoner to be tried;" (ART. 69.) The expression, "prisoner," in the singular number, seems to imply that the swearing, and consequently the trial, should in each case be separate. That course should therefore be pursued.

Application to delay the assembling of the court, from the absence or indisposition of the witnesses, the illness of the parties, or other cause, should be made, when practicable, to the authority convening the court; but application to put off or suspend the trial may be urged with a court-martial, subsequent to the swearing of the members. It may be supported by affidavit, and the court, in allowing it to prevail, must be satisfied, if the cause be absence of a witness, that the testimony proposed to be offered is material, and that the applicant cannot have substantial justice without it. The points, therefore, which each witness is intended to prove, must be set forth in the application, and it must also

be shown that the absence of the witness is not attributable to any neglect of the applicant.

A precise period of delay must be applied for, and it must be made to appear that there is reasonable expectation of procuring the attendance of the witness by the stated time; or, if the absence of a witness be attributed to his illness, a surgeon, by oral testimony, or by affidavit, must state the inability of the witness to the court, the nature of his disease, and the time which will probably elapse before the witness may be able to give his testimony. The court must obviously be adjourned at any period of its proceedings, prior to the final close of the prosecution and defence, on satisfactory proof, by a medical officer, that the prisoner is in such a state, that actual danger to his health would arise from his attendance in court; and where the prisoner is so ill as to render it probable that his inability to attend the court will be of such continuance as to operate to the inconvenience of the service, either by the detention of the members of the court from their regiments, or from other cause, the court may be dissolved by the authority which convened it. Though the prisoner may have been arraigned, and the trial proceeded with, the prisoner, on recovery, would be amenable to trial by another court. The illness of the prosecutor would, in few cases, justify the suspension of the trial, excepting, perhaps, for a very limited period; all prosecutions before courts-martial being considered at the suit of the United States, or an individual State, as the case may be. The court being regularly constituted, and every preliminary form gone through, the judge-advocate, as prosecutor for the United States, desires the prisoner to listen to the charge or charges brought against him, which he reads with an audible voice, and then the prisoner is asked, whether he is guilty or not guilty of the matter of accusation.

The charge being sufficient, or not objected to, the prisoner must plead either: 1st, Guilty; or 2d, Specially to the jurisdiction, or in bar; or 3d, The general plea of *not guilty*, which is the usual course where the prisoner makes a defence.

If from obstinacy and design the prisoner stand mute, or answer foreign to the purpose, the court may proceed to trial and judgment, as if the prisoner had regularly pleaded *not guilty*, (ART. 70;) but if the prisoner plead *guilty*, the court will proceed to determine what punishment shall be awarded, and to pronounce sentence thereon. Preparatory to this, in all cases where the punishment of the offence charged is discretionary, and especially where the discretion includes a wide range and great variety of punishment, and the specifications do not show all the circumstances attending the offence, the court should

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receive and report, in its proceedings, any evidence the judge-advocate may offer, for the purpose of illustrating the actual character of the offence, notwithstanding the party accused may have pleaded guilty; such evidence being necessary to an enlightened exercise of the discretion of the court, in measuring the punishment, as well as for the approving authority. If there be any exception to this rule, it is where the specification is so full and precise as to disclose all the circumstances of mitigation or aggravation which accompany the offence. When that is the case, or when the punishment is fixed, and no discretion is allowed, explanatory testimony cannot be needed.

Special pleas are either to the jurisdiction of the court, or in bar of the charge. If an officer or soldier be arraigned by a court not legally constituted, either as to the authority by which it is assembled, or as to the number and rank of its members, or other similar causes, a prisoner may except to the jurisdiction of the court-martial. Special pleas in bar go to the merits of the case, and set forth a reason why, even admitting the charge to be true, it should be dismissed, and the prisoner discharged. A former acquittal or conviction of the same offence would obviously be a valid bar, except in case of appeal from a regimental to a general court-martial. Though the facts in issue should be charged to have happened more than two years prior to the date of the order for the assembling of the court-martial, yet it is not the province of the court, unless objection be made, to inquire into the cause of the impediment in the outset. It would be to presume the illegality of the court, whereas the court should assume that manifest impediment to earlier trial did exist, and leave the facts to be developed by witnesses in the ordinary course. A pardon may be pleaded in bar. If full, it at once destroys the end and purpose of charge, by remitting that punishment which the prosecution seeks to inflict; if conditional, the performance of the condition must be known; thus, a soldier arraigned for desertion, must plead a general pardon, and prove that he surrendered himself within the stipulated period.

No officer or soldier, being acquitted or convicted of an offence, is liable to be tried a second time for the same. But this provision applies solely to trials for the same incidental act and crime, and to such persons as have, in the first instance, been legally tried. If any irregularity take place on the trial rendering it illegal and void, the prisoner must be discharged, and be regarded as standing in the same situation as before the commencement of these illegal proceedings. The same charge may, therefore, be again preferred against the prisoner who cannot plead the previous illegal trial in bar.

A prisoner cannot plead in bar that he has not been furnished with a copy of the charges, or that the copy furnished him differed from that on which he has been arraigned. It is customary and proper to furnish him with a correct copy; but the omission shall not make void, though it may postpone the trial. If the special plea in bar be such that, if true, the charge should be dismissed and the prisoner discharged, the judge-advocate should be called on to answer it. If he does not admit it to be true, the prisoner must produce evidence to the points alleged therein; and if, on deliberation, the plea be found true, the facts being recorded, the court will adjourn and the president submit the proceedings to the officer by whose order the court was convened, with a view to the immediate discharge of the prisoner. The ordinary plea is *not guilty*, in which case the trial proceeds. The judge advocate cautions all witnesses on the trial to withdraw, and to return to court, only on being called. He then proceeds to the examination of witnesses, and to the reading and proof of any written evidence he may have to bring forward. After a prisoner has been arraigned on specific charges, it is irregular for a court-martial to admit any additional charge against him, even though he may not have entered on his defence. The trial on the charges first preferred, must be regularly concluded, when, if necessary, the prisoner may be tried on any further accusation brought against him. On the trial of cases not capital, before courts-martial, the deposition of witnesses not in the line or staff of the army, may be taken before some justice of the peace, and read in evidence, provided, the prosecutor and person accused are present at the same, or are duly notified thereof. The examination of witnesses is invariably in the presence of the court; because, the countenance, looks, and gestures of a witness add to, or take away from, the weight of his testimony. It is usually by interrogation, sometimes by narration; in either case, the judge-advocate records the evidence, as nearly as possible, in the express words of the witness. All evidence, whatever, should be recorded on the proceedings, in the order in which it is received by the court. A question to a witness is registered before enunciation; when once entered, it cannot be expunged, except by the consent of the parties before the court; if not permitted to be put to the witness, it still appears on the proceedings accompanied by the decision of the court. The examination in chief of each particular witness being ended, the cross-examination usually follows, though it is optional with the prisoner to defer it to the final close of the examination in chief. The re-examination by the prosecutor, on such new points as the prisoner may

have made, succeeds the cross-examination, and finally, the court puts such questions as in its judgment may tend to elicit the truth.

It is customary, when deemed necessary by the court, or desired by a witness, to read over to him, immediately before he leaves the court, the record of his evidence, which he is desired to correct if erroneous, and, with this view, any remark or explanation is entered upon the proceedings. No erasure or obliteration is, however, admitted, as it is essentially necessary that the authority which has to review the sentence, should have the most ample means of judging, not only of any discrepancy in the statements of a witness, but of any incident which may be made the subject of remark, by either party in addressing the court.

Although a list of witnesses, summoned by the judge-advocate, is furnished to the court on assembling, it is not held imperative on the prosecutor to examine such witness; if he should not do so, however, the prisoner has a right to call any of them. Should the prisoner, having closed his cross-examination, think proper subsequently to recall a prosecutor's witness in his defence, the examination is held to be in chief, and the witness is subject to cross-examination by the prosecutor. Although either party may have concluded his case, or the regular examination of a witness, yet should a material question have been omitted, it is usually submitted by the party to the president, for the consideration of the court, which generally permits it to be put. The prisoner being placed on his defence, may proceed at once to the examination of witnesses; firstly, to meet the charge, and secondly, to speak as to character, reserving his address to the court, until the conclusion of such examination. The prisoner, having finished the examination in chief of each witness, the prosecution cross-examines; the prisoner re-examines, to the extent allowed to the prosecutor, that is, on such new points as the cross-examination may have touched on, and the court puts any questions deemed necessary. The prisoner, having finally closed his examination of witnesses, and selecting this period to address the court, offers such statement or argument as he may deem conducive to weaken the force of the prosecution, by placing his conduct in the most favorable light, accounting for or palliating facts, confuting or removing any imputation as to motives; answering the arguments of the prosecutor, contrasting, comparing, and commenting on, any contradictory evidence; summing up the evidence on both sides, where the result promises to favor the defence, and, finally, presenting his deductions therefrom.

The utmost liberty consistent with the interest of parties not before

the court and with the respect due to the court itself, should, at all times, be allowed a prisoner. As he has an undoubted right to impeach, by evidence, the character of the witnesses brought against him, so he is justified in contrasting and remarking on their testimony, and on the motives by which they, or the prosecutor, may have been influenced. All coarse and insulting language is, however, to be avoided, nor ought invective to be indulged in, as the most pointed defence may be couched in the most decorous language. The court will prevent the prisoner from adverting to parties not before the court, or only alluded to in evidence, further than may be actually necessary to his own exculpation. It may sometimes happen, that the party accused may find it absolutely necessary, in defence of himself, to throw blame and even criminality on others, who are no parties to the trial; nor can a prisoner be refused that liberty, which is essential to his own justification. It is sufficient for the party aggrieved, that the law can furnish ample redress against all calumnious or unjust accusations. The court is bound to hear whatever address, in his defence, the accused may think fit to offer, not being in itself contemptuous or disrespectful.

It is competent to a court, if it think proper, to caution the prisoner, as he proceeds, that, in its opinion, such a line of defence as he may be pursuing would probably not weigh with the court, nor operate in his favor; but, to decide against hearing him state arguments, which, notwithstanding such caution, he might persist in putting forward, as grounds of justification, or extenuation, (such arguments not being illegal in themselves,) is going beyond what any court would be warranted in doing. It occasionally happens, that, on presenting to the court a written address, the prisoner is unequal to the task of reading it, from indisposition or nervous excitement; on such occasions, the judge-advocate is sometimes requested by the president to read it; but, as the impression which might be anticipated to be made by it, may, in the judgment of the prisoner, be affected more or less by the manner of its delivery, courts-martial generally feel disposed to concede to the accused the indulgence of permitting it to be read by any friend named by him, particularly if that friend be a military man, or if the judge-advocate be the actual prosecutor. Courts-martial are particularly guarded in adhering to the custom of resisting every attempt on the part of counsel to address them. A lawyer is not recognized by a court-martial, though his presence is tolerated, as a friend of the prisoner, to assist him by advice in preparing questions for witnesses, in taking notes, and shaping his defence.

The prisoner having closed his defence, the prosecutor is entitled to

reply, when witnesses have been examined on the defence, or where new facts are opened in the address. Thus, though no evidence may be brought forward by the prisoner, yet should he advert to any case, and, by drawing a parallel, attempt to draw his justification from it, the prosecutor will be permitted to observe on the case so cited. When the court allows the prosecutor to reply, it generally grants him a reasonable time to prepare it; and, upon his reading it, the trial ceases.

Should the prisoner have examined witnesses to points not touched on in the prosecution, or should he have entered on an examination impeaching the credibility of the prosecutor's evidence, the prosecutor is allowed to examine witnesses to the new matter; the court being careful to confine him within the limits of this rule, which extends to the re-establishing the character of his witnesses, to impeaching those of the defence, and to rebutting the new matter brought forward by the prisoner, supported by evidence. He cannot be allowed to examine on any points, which, in their nature, he might have foreseen previously to the defence of the prisoner. The prosecutor will not be permitted to bring forward evidence to rebut or counteract the effect of matter elicited by his own cross-examination; but is strictly confined to new matter introduced by the prisoner, and supported by his examination in chief. A defence, resting on motives, or qualifying the imputation attaching to facts, generally lets in evidence in reply; as, in such cases, the prisoner usually adverts, by evidence, to matter which it would have been impossible for the prosecutor to anticipate. The admissibility of evidence, in reply, may generally be determined by the answer to the questions: Could the prosecutor have foreseen this? Is it evidently new matter? Is the object of the further inquiry to re-establish the character of the witnesses impeached by evidence (not by declamation) in the course of the defence, or is it to impeach the character of the prisoner's witnesses? Cross-examination of such new witnesses, to an extent limited by the examination in chief, that is, confined to such points or matter as the prosecutor shall have examined on, is allowed on the part of the prisoner. (*See* CHALLENGE; COURT-MARTIAL; JURISDICTION. Consult MACOMB.)

TRIGGER. It has blade, tang or finger-piece, and hole for screw. (*See* ARMS.)

TRIGONOMETRY. Ordinary trigonometrical tables contain the logarithm of the sines, cosines, tangents, and cotangents for every ten seconds; but if the values of any one of the four be computed for the different angles between 0 and 90°, the values of all the others will be obtained at the same time. Thus, since cos. A = sin. (90° — A), a table

of the values of the sine is also a table of the values of the cosine; and since tan. A = sin. A ÷ cos. A, the logarithm of the tangent of any angle is obtained by subtracting the logarithm of the cosine from the logarithm of the sine, and the logarithm of the cotangent by subtracting the logarithm of the sine from that of the cosine. It is usual to designate the semi-circumference of a circle whose radius is 1 by π = 3.14159265.

The solution of triangles is the proper object of trigonometry, and if tables contain the logarithms of the sines, cosines, tangents, and cotangents to every minute or smaller division of the quadrant, the means will be easy of applying such tables to each particular case; as, of the six parts of which a triangle consists, it is known from geometry that when any three except the three angles are known, all the rest are determined.

Plane Trigonometry.

A, B, C, the three angles; a, b, c, the three sides respectively opposite to them; R, the tabular radius; S, the area of the triangle; $p = \frac{1}{2}(a + b + c)$.

Right-angled Triangles: A being the right angle.

$$a = \sqrt{b^2 + c^2}\ ;\ b = c\,\frac{\text{tang. } B}{R} = a\,\frac{\text{sin. } B}{R}$$

Oblique-angled Triangles:

$$\frac{a}{\text{sin. } A} = \frac{b}{\text{sin. } B} = \frac{c}{\text{sin. } C}$$

$$\text{Tang. } \tfrac{1}{2}(A - B) = \text{tang. } \tfrac{1}{2}(A + B) \times \frac{a - b}{a + b}$$

$$c = \sqrt{\left((a - b)^2 + \frac{4\,a\,b\,\text{sin.}^2\,\frac{1}{2}C}{R^2}\right)} = \sqrt{\left(a^2 + b^2 - \frac{2\,ab\,\text{cos. } C}{R}\right)}$$

$$\text{Cos. } \tfrac{1}{2}A = R\sqrt{\frac{p\,(p-a)}{b\,c}}\ ;\ \text{Sin. } \tfrac{1}{2}A = R\sqrt{\frac{(p-b)\,(p-c)}{b\,c}}$$

$$S = \tfrac{1}{2}\,a\,b\,\frac{\text{sin. } C.}{R} = \sqrt{p\,(p-a)\,(p-b)\,(p-c)}$$

General Formulæ:

$$R.\ \text{sin. } (a \pm b) = \text{sin. } a\ \text{cos. } b \pm \text{sin. } b\ \text{cos. } a.$$
$$R.\ \text{cos. } (a \pm b) = \text{cos. } a\ \text{cos. } b \pm \text{sin. } a\ \text{sin. } b.$$
$$R.\ (\text{sin. } a \pm \text{sin. } b) = 2\ \text{sin. } \tfrac{1}{2}(a \pm b)\ \text{cos. } \tfrac{1}{2}(a \pm b).$$
$$R.\ (\text{cos. } a + \text{cos. } b) = 2\ \text{cos. } \tfrac{1}{2}(a + b)\ \text{cos. } \tfrac{1}{2}(a - b).$$
$$R.\ (\text{cos. } a - \text{cos. } b) = 2\ \text{sin. } \tfrac{1}{2}(a + b)\ \text{sin. } \tfrac{1}{2}(a - b).$$
$$\frac{\text{sin. } a + \text{sin. } b}{\text{sin. } a - \text{sin. } b} = \frac{\text{tang. } \frac{1}{2}(a + b)\,\text{cot. } \frac{1}{2}(a - b).}{R^2}$$

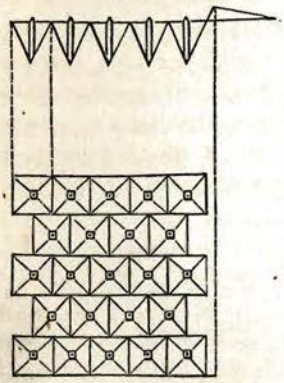
$$\text{sin. } \tfrac{1}{2}a = \sqrt{\left(\frac{R^2 - R\,\text{cos. } a}{2}\right)}\ ;\ \text{tang. } \tfrac{1}{2}a = R\sqrt{\left(\frac{R - \text{cos. } a}{R + \text{cos. } a}\right)}$$

Chord of $A = 2$ sin. $\frac{1}{2}A$.

TROOP. A company of cavalry. A particular beat of the drum.

TROPHY. Flags, colors, &c., captured from an enemy, and shown or treasured as a token of victory. Among the ancients, a trophy consisted of a pile or heap of arms taken from the vanquished troops, and raised by the conquerors on an eminence on the field of battle. As these were usually dedicated to some of the gods, it was considered sacrilege to demolish a trophy.

FIG. 236.



TROUS-DE-LOUP—or trapholes; are rows of pits in the form of inverted cones. They should be either 2½ or 8 feet deep, so as not to be serviceable to the enemy's riflemen. They should be traced in a checkered form, and a strong pointed stake should be driven in the middle of each, (Fig. 236.) (*See* OBSTACLES.)

TRUCK. The casemate truck weighs 600 lbs., and is designed for transporting guns in casemate galleries. The *store truck* weighs 80 lbs; it is a common hand truck used for moving boxes.

TRUNNION. Short cylinder projecting from a piece of ordnance by which it rests upon its carriage. (*See* ORDNANCE.)

TRUSS. (*See* CARPENTRY.)

TUMBLER. (*See* ARMS; LOCK; MAYNARD'S *Primer*.)

U

UNDER. The correlative of over. (*See* COMMAND; OBEDIENCE; OVER; SUPERIOR.)

UNDRESS. Authorized habitual dress, not full uniform. The French designate the full dress as, *grande tenue;* the undress, as *petite tenue*.

UNIFORM. Prescribed dress. The President shall have power to prescribe the uniform of the army; (ART. 100.)

UNMILITARY. Contrary to rules of discipline; unworthy of a soldier.

UNSPIKE. (*See* SPIKING.)

UPBRAID. Any officer or soldier, who shall upbraid another for refusing a challenge, shall himself be punished as a challenger; (ART. 28.)

UTENSILS—for camp and garrison are styled camp and garrison equipage, and are furnished by the quartermaster's department. The regulations allow: a general officer, three tents in the field, one axe and one hatchet; a field or staff officer above the rank of captain, two

tents in the field, one axe and one hatchet; other staff officers or captains, one tent in the field, one axe and one hatchet; subalterns of a company, to every two, one tent in the field, one axe and one hatchet; to every 15 foot and 13 mounted men, one tent in the field, two spades, two axes, two pickaxes, two hatchets, two camp kettles, and five mess pans. Bed sacks are provided for troops in garrison, and iron pots may be furnished to them instead of camp kettles. Requisitions will be sent to the quartermaster-general for the authorized flags, colors, standards, guidons, drums, fifes, bugles and trumpets. The prescribed cooking utensils are evidently not adapted to field-service. The soldier is made too dependent on a baggage train. Some tools deemed necessary for service in the French army are also omitted in the enumeration of camp equipage furnished to the United States troops. (*See* TOOLS.)

V

VALUE. (*See* WEIGHTS.)

VANGUARD. Advanced guard.

VEDETTES OR VIDETTES. Sentries upon outposts, so placed that they can best observe the movements of an enemy, and communicate by signal to their respective posts and with each other.

VELOCITIES. (*See* INITIAL.) *Measurement of distances by sound.* The *velocity* of *sound*, in one second of time at 32° Fahrenheit in dry air, is about 1,090 English feet. For any higher temperature, add 1 foot for every degree of the thermometer above 32°. The measurement of distances by sound should always be made, if possible, in calm, *dry* weather. In cases of wind, the velocity per second must be corrected by the quantity, $f \cos. d$; f being the force of the wind in feet per second, and d the angle which its direction makes with that of the sound. Or, in general, in dry air,

$$v = 1{,}090 \text{ feet} + (t° - 32°) \pm f \cos. d.$$

VELOCITY AND FORCE OF WINDS.

Velocity in miles per hour.	A wind, when it does not exceed the velocity opposite to it, may be denominated	Velocity per second.	Force on a square foot.
		feet.	lbs.
6.8	a gentle, pleasant wind	10	0.129
13.6	a brisk gale	20	0.915
19.5	a very brisk gale	30	2.059
34.1	a high wind	50	5.718
47.7	a very high wind	70	11.207
54.5	a storm or tempest	80	14.638
68.2	a great storm	100	22.872
81.8	a hurricane	120	32.926
102.3	a violent hurricane, that tears up trees, etc.	150	51.426

VENT. The opening or passage in fire-arms, by means of which the charge is ignited. The diameter of the vent is two-tenths of an inch in ordnance, except the eprouvette, which is one-tenth. The vents of brass guns are bored in vent pieces of wrought copper, which are screwed into the gun.

VERDICT. (*See* FINDING.)

VETERAN. An old soldier. Twenty years' service in the army entitles an enlisted soldier to the privileges of the army asylum. (*See* ASYLUM.)

VETERINARY. Veterinary surgeons are alone competent to treat grave cases of wounds and diseases in horses. Officers, however, may prevent accidents by watchfulness, recognize the existence of ailments, and by prompt care frequently relieve the horse entirely.

Limping.—The particular lameness is distinguished at a walk by observing that if a fore foot is lame, the horse raises the corresponding fore quarter before putting his foot to the ground. If a hind foot, he raises the hind quarter. At a trot, the contrary takes place. The horse should be watched in passing over ground of different degrees of hardness. For all lameness not connected with the shoe, prescribe rest, cold bathing, poultices. When there is pain in the joints, with swelling of the tissues, rub with spirits.

Lameness from shoeing may proceed: 1st, from *pricking*. If the nail be at once withdrawn, and the pricking is not deep, the lameness is not immediate. It is necessary, however, to enlarge the opening, introduce the essence of turpentine and dress with pledget, or lint coated with the same substance; act in the same way if the wound is old, after having taken out the nail, and cleared away to the bottom of the opening.

2. *Bleyme*, or inflammation in the foot of the horse between the sole and the bone. It is recognized by a red spot. Clear away the evil to the bottom, and dress as above. To prevent a return of the disease, it is perhaps necessary to clear away to the bottom of the offensive part for several successive shoeings.

3. *Solbature* is caused by the iron resting on the sole, or by a hard body introduced between the iron and the sole: clear the wounded part, apply a pledget coated with turpentine and retained in its place by a splint. Readjust the shoe.

4. *Burnt sole* is caused by an iron being applied when too hot and held too long. Act as in case of solbature.

These accidents from shoeing are all shown by limping. The precise seat of the accident is ascertained by pinching with the farrier's

pincers. If the horse is to march, attach the shoe with but few nails, simply to hold it in its place.

Founder.—There is great heat in the foot without apparent cause. The horse walks with difficulty, resting on the heel; he shows discomfort, want of appetite, fever. It is necessary to unshoe him; cut the horn of the hoof to the quick towards the toe; even make it bleed; bathe with cold salt water; envelop the whole foot with linen soaked in vinegar to the crown; later, rub hard from the ham to the knees with essence of turpentine and camphorated spirits: diet, bran with water. The horse must not march.

Chaps, serosity of limbs.—These exact cleanliness, washing with warm water and a little spirit of wine, and towards the termination of the ailment, with sub-acetate of lead.

Injuries.—At the least appearance of tumor stop the development of inflammation by washing with fresh water, vinegared or salted. Strengthen the tissues by friction with brandy, united with soap or camphor. Take off the load. Put on the saddle in such a way as to leave a space between it and the tumor. If the ailment increases, notwithstanding these precautions, it is necessary to relieve the horse from all weight, continuing the washings and rubbings. If the tumor still increases, open it. When opened wash the wound once a day only; do not remove the pus entirely; prevent its contact with the air by means of oakum or lint. When the wound begins to heal, its cicatrization may be hastened by washing with sub-acetate of lead. When from their appearance tumors of the withers and loins seem to be soft and inclose red water, cut the hair smooth and apply a blister ointment, which it is rarely necessary to renew. When a horse is wounded under the tail, clean the wound and put in it the *unguentum populi.* For slight contusions from kicking, use twice a day the *unguentum populi*, and then rub the upper part with camphorated spirits. If the pain is severe, bleed and foment with warm mallows water.

Internal affections.—The ordinary symptoms are: dry and frequent cough, uneasiness and sadness, disgust of food, falling off; alteration of flank; hair not smooth; fever. Separate the horse from others; put him to diet on bran, attending to the prescriptions of the veterinary surgeon. Examine the eyes, gently reversing the eylids, pass the hand into the mouth of the horse; if the eye is red and the mouth very hot, bleed the horse, drawing from him 8 lbs. of blood; leave him two hours without eating; rub him down well, cover him and give him some injections; replace his allowance of oats with warm barbotage of barley-flour as much as possible. For want of appetite it is sufficient

sometimes to sprinkle the forage with salt water. If the horse, in rising or lying down, looks at his flanks with an unquiet air he has colic. In this case it is often sufficient in order to cure him to rub hard with rumpled linen upon the belly, and apply injections of decoctions of mallows or lettuce. If an hour or two after the first trouble the colic is not over, call a veterinary surgeon; death may take place in a short time. If a horse tries often to urinate, and shows pain, it is retention of urine. Recourse must be had to emollient injections, and to nitrated drinks. In certain diseases of the breast prompt succor is necessary. In grave cases, in the absence of the veterinary, put blisters or setons upon the breast, and bleed.

The necessary tools, &c., are: syringes, bistouries, tape and needles to setons, dry oakum, camphorated spirits, soap, nitre, essence of turpentine, liquid, sub-acetate of lead, foot ointment, and *unguentum populi.* (*See* GLANDERS; HORSE. Consult *Memorial des Officiers d'Infanterie et de Cavalerie;* SKINNER'S *Youatt.*)

VICE-PRESIDENT OF THE UNITED STATES. Using contemptuous or disrespectful words against, punishable by cashiering or otherwise at the discretion of a court-martial; (ART. 5.)

VICTUALS. Whosoever shall relieve the enemy with money, victuals, or ammunition, or shall knowingly harbor or protect an enemy shall suffer death, or such other punishment as shall be ordered by the sentence of a court-martial; (ART. 56.)

VILLAGES. Cavalry, the better to preserve their horses, should occupy villages whenever the distance of the enemy, and the time necessary to repair to its post in battle, will permit. Their quarters should be preferably farmhouses or taverns having large stables. Posts are established by the colonel or commanding officer, and the squadrons conducted to their quarters by their respective captains. Where in an exceptional case regular distributions are not made, the resources which the household assigned as quarters presents are equally divided. About two hours after their arrival the squadrons in succession water their horses and then give forage. Cavalry and infantry also should, when thus cantoned near an enemy, occupy, wherever it can be done, houses which will hold an entire company or some constituent fraction of a company, and at break of day stand to their arms. When in the same cantonment, cavalry should watch over the safety of the cantonment by day and the infantry by night; and in the presence of an enemy they should be protected by an advance guard and natural or artificial obstacles.

VINEGAR. On board ship vinegar is essential to the comfort of

horses, and should be freely used by sponging their mouths and noses repeatedly, and also their mangers. A small portion of vinegar drank with water supplies the waste of perspiration of men in the field. It is better than rum or whiskey; it allays thirst, and men who use it avoid the danger of drinking cold water when heated, and are not fevered as they are too apt to be by the use of spirituous liquors; (Dr. RUSH.)

VIOLENCE. Any officer or soldier who shall offer any violence against his superior officer, being in the execution of his office, on any pretence whatsoever, punished by death or otherwise, according to the nature of his offence; (ART. 9.) Violence to any person who brings provisions to the camp, garrisons, or quarters to the forces of the United States employed in any part out of the said States, punishable in like manner; (ART. 51.)

VOLUNTEERS. Whereas sundry corps of artillery, cavalry, and infantry now exist in several of the States, which by the laws, customs, or usages thereof, have not been incorporated with, or subject to, the general regulations of the militia; such corps shall retain their accustomed privileges, subject, nevertheless, to all other duties required by this act in like manner with the other militia; (*Act* May 8, 1792.) (*See* CALLING FORTH MILITIA; and MILITIA.)

This class of uniformed militia exists in every State of the Union. It is a regular, unpaid force, composed generally of men engaged in such private business operations, as must always prevent their being employed except in their immediate vicinage. But in cases of riot, or the defence of their own firesides, town or city, experience has shown it to be a most reliable organization. There is, however, another class of troops, also called volunteers, which have from time to time been raised by Congress for temporary purposes. Such troops are properly United States and not State troops. The manner in which their officers are to be appointed is therefore always designated by Congress. The act of May 28, 1798, authorized the President to appoint the company officers of such volunteers; the act of June 22, 1798, directed that the field-officers of such volunteers should be appointed by the President and Senate; the act of May 23, 1836, directed that the officers of volunteers then raised, should be appointed in the manner prescribed by law in the several States and Territories to which such companies, battalions, squadrons, regiments, brigades, or divisions shall respectively belong; the act of March 3, 1839, applies the same provision to the volunteers then authorized; the act of May 13, 1846, contains the same provision as to appointment of officers; and the act of June 26, 1846, authorizes the President, by and with the advice and consent of the Senate, to

appoint such number of major-generals and brigadier-generals as the organization of such volunteer forces (raised by the act of May 13, 1846) into brigades and divisions, may render necessary; and in case the brigades or divisions of volunteers at any time in the service shall be reduced in number, the brigadier-generals and major-generals herein provided for shall be discharged in proportion to the reduction in the number of brigades and divisions.

There should, then, be no question that these volunteers are United States troops raised by Congress under its constitutional authority to raise and support armies; but, strangely enough, the officers have been usually commissioned by their respective States. It becomes, therefore, an important question to ascertain, if possible, by experience, whether the advantages which attend raising armies in this particular way are not greatly counterbalanced by its disadvantages; whether the efficiency of such an irregular force is in any degree commensurate with its cost; and whether deaths, diseases, discharges, and other casualties do not in such a force accumulate in such numbers as to deprive the Government of the moral right thus uselessly to sacrifice the citizens of the country.

The statistics of the Mexican war, published by Congress, (Doc. 24, House of Representatives, 31st. Congress, 1st Session,) furnish the following startling facts:—

Regular Army.	Aggregate Force.	Length of Service.
Old establishment,	15,736	26 months.
Additional force,	11,186	15 "

The old establishment of the regular army, with an aggregate of 15,736 men during 26 months' service, lost by discharges for disability 1,782 men; by ordinary deaths, 2,623 men; and by deaths from wounds in battle, 792 men.

The additional regular force, with an aggregate of 11,186 men during 15 months' service, lost by discharges for disability 767 men; by ordinary deaths, 2,091 men; and by deaths from wounds in battle, 143 men.

The volunteer force, with an aggregate of 73,532 men during an average of 10 months' service, lost by discharges for disability 7,200 men; by ordinary deaths, 6,256 men; and by deaths from wounds in battle, 613 men.

The number of wounded in battle were: In the old establishment, 1,803 men; in the additional regular force, 272 men; and in the volunteers, 1,318 men. The number of deserters were, in the whole regular force, 2,849 men; and in the volunteer force, 3,876 men.

These statistics require no commentary to show the waste of life and money in employing volunteers. But without explanation they do not show the numbers of each description of force engaged in the different battles of Mexico, or how, with such a large aggregate of forces employed in Mexico, Taylor's battles were fought with never more than 6,000 men, and Scott had at his disposition only about 11,000 men for the march from Puebla and the capture of the city of Mexico. An analysis of the aggregates of forces engaged in those battles is therefore necessary, to ascertain by whom they were won, and this will lead to a subsequent inquiry, which will show why such ostentatious aggregates furnished so small a body of men for the great operations of the war.

Regular Army.—Ex-Doc. 24, House of Representatives, 31st Congress, 1st Session, shows that the old regular force on the frontier of Texas, May, 1846, at the commencement of the war was 3,554 men present and absent. This force alone under Taylor fought the battles on the Rio Grande, with an aggregate loss of killed in battle and died of wounds, of 72 men. There were wounded in the same affairs 147 men.

May 24, volunteers began to arrive on the Rio Grande. August 1, General Taylor reports that the volunteer forces ordered to report to him are much greater than he can employ, and regrets that one division of volunteers should not have been encamped at Pass Christian, where it could have been instructed; (Doc. 119, House of Representatives, 29th Congress, 2d Session.)

For the march from Camargo upon Monterey, General Taylor organized a force of volunteers of about 3,000 men, and about the same number of regulars. The volunteers lost 74 men killed and died of wounds in the battle of Monterey, Sept. 21, 22, and 23, 1846, and had 218 men wounded. The regulars lost in the same battle 68 men, and had 150 men wounded.

At the battle of Buena Vista, Feb. 22 and 23, there were engaged 517 regulars and about 4,400 volunteers. The loss of the regulars 8 killed and died of wounds, and 36 wounded; the loss of the volunteers 269 killed and died of wounds, and 372 wounded.

At the siege of Vera Cruz, March, 1847, there were 6,808 regulars and 6,662 volunteers. The loss of the regulars 10 killed and died of wounds, and 26 wounded; the volunteers lost 2 killed and 25 wounded.

At Cerro Gordo, April, 1847, there were 6,000 regulars and 2,500 volunteers. The loss of the regulars was 61 killed and died of wounds, and 201 wounded; the loss of the volunteers 38 killed and died of wounds, and 152 wounded.

At Contreras, Churubusco, San Antonio, and San Augustine, August 19 and 20, 1847, there was an aggregate of 9,681 of old and new regulars and marines, and 1,526 volunteers. The regulars lost in killed and died of wounds 137 men, and 653 wounded; the volunteers lost 52 men killed and died of wounds, and 212 wounded.

At Molino del Rey, September 8, 1847, there were 3,251 regulars engaged. Lost 195 men killed and died of wounds; 582 wounded.

At Chapultepec, and the capture of the city of Mexico, September 12, 13, and 14, 1847, the whole army for duty was 8,304 men. Regulars 7,035 men; volunteers 1,290 men. The regulars lost 144 killed and died of wounds, and 434 wounded; the volunteers 44 killed and died of wounds, and 239 wounded.

In all other incidental affairs and skirmishes, mostly with guerilla parties of the enemy during the whole war, the aggregate losses of the regulars were 65 killed and died of wounds, and 163 wounded; the loss of volunteers 62 killed and died of wounds, and 130 wounded.

Having thus analyzed the losses in battle of the regulars and volunteers, and given the numbers of each engaged in the important battles of the war, the inquiry recurs: why, with an aggregate of 73,000 volunteers and 26,922 regulars reported as being employed during the war, so small a body should have been at the disposition of commanders for marching against the enemy.

The first reason was undoubtedly the defective plan of campaign upon which the war was begun. Immediately after the victories of Palo Alto and Resaca de la Palma, the public mind was inflamed. The volunteer system caused great numbers to flock to the standard of the country. The pressure upon the Administration was great for their reception. General Taylor was flooded with volunteers for whom he could find no employment. A plan of campaign was therefore devised in Washington, for marching on New Mexico, marching on Chihuahua, marching on Monterey, and marching on California, with different detachments, thus hastily collected together without taking the necessary measures to organize and instruct the troops, and without first providing the *materiel* indispensable for such long marches. The plan was therefore defective in all those respects, but still more defective in its predominant idea of striking at remote frontiers of the enemy instead of marching on his capital. It was like pricking the fingers of man instead of pointing a dagger at some vital part.

The second and paramount reason why with such large aggregates of forces mustered into service so few were employed in battles, is the failure of the law to provide for a well-digested system of national de-

fence prepared in peace, which would enable Congress and the Executive to meet any crisis in foreign affairs. This want caused the reception into service of 12,601 volunteers for 3 months at the beginning of the war with Mexico. These lost 16 men killed in battle and died of wounds; 129 by ordinary deaths, 922 by discharge, and 546 by desertion. Those killed in battle belonged to the Texas horse and foot, and they alone were engaged with an enemy.

Upon the declaration that war existed by the act of Mexico, Congress, however, authorized the President to accept volunteers for twelve months or for the war. He accordingly received 27,063 men of this class for twelve months. They lost during their service, killed in action or died of wounds, 439 men; by ordinary deaths 1,859 men; by discharges 4,636 men; and by desertion 600 men. Some of this class of volunteers rendered most effective service at Monterey, Buena Vista, Vera Cruz, and Cerro Gordo. The great mistake committed in regard to them was in receiving them for the short period of twelve months. Generally mustered into service in June, 1846, they were entitled to discharge in June, 1847, at a moment when their services were much needed, in order to strike a decisive blow at the capital of Mexico. Every effort was made to re-engage them, but without success; and General Scott, who had been employed to conduct military operations on the line from Vera Cruz to the capital, reluctantly put over 3,000 of these men in march from Jalapa to the United States in May, 1847, when he had ascertained that his column was not likely soon to be reinforced by more than 960 army recruits, and the services of those volunteers for the short remainder of their time could therefore no longer be usefully employed. Meanwhile the Administration, having late in 1846 awakened from its dream of conquering a peace, by directing blows against remote extremities of Mexico, had at last adopted the plan of striking at the vitals of their enemy. General Scott was put in command. Some volunteers were at once mustered into service for the war, but in insufficient numbers. Out of the whole force raised for the war, General Scott only received in time for his operations a regiment from New York, two from Pennsylvania, and one from South Carolina, and one company under Captain Wheat, who alone re-engaged themselves from the whole number of twelve-months volunteers; and these were the only regiments of volunteers, which took part in the battles in the valley of Mexico, and the capture of the city, September 14, 1847, which secured the conquest of peace. The whole volunteer force raised for service during the war with Mexico, (but with the exceptions stated, too late for important military operations,) were 33,596

men. They lost 152 men killed and died of wounds; ordinary deaths 4,420; discharges 3,890 men; and desertions 2,730 men. Of the 152 who were killed in battle or died of wounds, 134 belonged to the regiments mentioned as being with General Scott. It was not until Dec., 1847, months after the occupation of the capital, that other volunteers for the war reached Gen. Scott's head-quarters in the city of Mexico.

The same want of administrative ability was shown by the War Department in despatching regulars to the seat of war. Doc. 24, H. of R., 31st Congress, 1st Session, exhibits an aggregate of 15,736 men of the old regular regiments, and 11,186 men of the new regular regiments—in all 26,922 regulars—employed during the war, and yet the largest regular force employed at any one time against the enemy was less than 10,000 men. Let us endeavor to ascertain how this happened.

It has been seen that the whole regular force on the frontiers of Texas at the beginning of the war was 3,554 men, and that this force fought the battles of Palo Alto, Resaca de la Palma and Fort Brown in May, 1846. In September, this force had not been largely increased; for, at the battle of Monterey, Taylor had only about 3,000 regulars.

In February and March, 1847, the regular force employed both at Buena Vista and at Vera Cruz had been increased to 7,425 men. And in April, 1847, at Cerro Gordo, and on the line to Vera Cruz and at Tampico, the whole regular force did not exceed 8,000 men. These all belonged to the old regular regiments. Meantime, February 11, 1847, Congress passed an act for raising one regiment of dragoons, and nine regiments of infantry. But none of these troops reached Gen. Scott's head-quarters at Puebla, until July and August, 1847. The last detachment came up August 6, and Gen. Scott marched on the city of Mexico, August 7, 1847, with only 2,564 new regulars. The forces which took part in the battles in the valley of Mexico were then:

Old regular regiments	6,446 men.
New regular regiments	2,365 "
Marines	271 "
Volunteers	1,569 "
	10,651 men.

The greater part of the additional force of regulars raised for the war, as well as the very large numbers of volunteers raised for the same purpose, were not, it thus appears, put at the disposition of military commanders, until final success in battles had already been accomplished. The following tables, giving losses by regiments, &c., are from the report of the adjutant-general of Dec. 3, 1849:

GENERAL *view of the subjects of inquiry, showing the aggregate of the regulars and volunteers employed during the Mexican war, with their average duration of service, and the casualties incident to each description of force.*

	FORCES EMPLOYED & MUSTERED INTO SERVICE.		DISCHARGES.				DEATHS.									WOUNDED IN BATTLE.				
	Aggregate number of officers and men.	Average length of service during the war.	By expiration of service.	For disability.	By order, and civil authority.	Aggregate number of discharges.	Killed in battle.		Died of wounds.		Total killed and died of wounds.		Ordinary.		Accidental.	Aggregate number of deaths—officers and men.	Officers.	Men.	Aggregate.	Resignations.	Desertions.
							Officers.	Men.	Officers.	Men.	Officers.	Men.	Officers.	Men.							
		Mos																			
Old establishment.....	15,736	26	1,561	1,782	373	3,716	41	422	22	307	63	729	49	2,574	189	3,554	118	1,685	1,803	37	2,247
Additional force.....	11,186	15	12	767	114	893	5	62	5	71	10	133	36	2,055	30	2,264	36	236	272	92	602
Aggregate of regular army.	26,922	....	1,573	2,549	487	4,609	46	484	27	378	73	862	85	4,629	169	5,818	154	1,921	2,075	129	2,849
VOLUNTEER FORCE.																					
General staff.....	272	....	.....	.....	47	47	1	....	....	....	1	.....	16	.....	....	17	....	.....	.....	48	.....
Regiments and corps.....	73,260	10	50,573	7,200	1,969	9,169	46	467	....	100	46	567	(*)	*6,256	192	7,061	129	1,189	1,318	279	3,876
Aggregate of regular and volunteer forces.....	100,454	....	52,146	9,749	2,508	13,825	93	951	27	478	120	1,429	101	10,885	361	12,896	283	3,110	3,393	456	6,725

* In the reports of the deaths of volunteers of ordinary disease, officers are not discriminated.

RECAPITULATION OF LOSS IN BATTLE OF THE REGULAR ARMY, BY REGIMENTS AND CORPS, IN THE CAMPAIGN OF 1846.

REGIMENTS AND CORPS.	KILLED IN BATTLE.			WOUNDED.			Aggregate in killed and wounded.	DIED OF WOUNDS.		
	Officers.	Men.	Total.	Officers.	Men.	Total.		Officers.	Men.	Total.
General staff	.....	.....	.....	1	.....	1	1	.....	.....	.....
Engineers	.....	.....	.....	1	.....	1	1	.....	.....	.....
Topographical engineers	.....	.....	.....	2	.....	2	2	1	.....	1
1st regiment dragoons	3	14	17	.....	11	11	28	.....	.....	.....
2d " "	2	17	19	.....	19	19	38	.....	.....	.....
1st regiment artillery	.....	1	1	.....	6	6	7	.....	1	1
2d " "	.....	2	2	1	8	9	11	.....	1	1
3d " "	.....	5	5	2	26	28	33	1	3	4
4th " "	.....	5	5	1	16	17	22	.....	4	4
1st regiment of infantry	.....	12	12	3	28	31	43	2	.....	2
2d " "	1	.....	1	.....	.....	.....	1	.....	.....	.....
3d " "	5	15	20	3	36	39	59	1	1	2
4th " "	2	15	17	2	30	32	49	2	4	6
5th " "	.....	9	9	4	36	40	49	.....	3	3
7th " "	.....	2	2	3	12	15	17	1	.....	1
8th " "	2	10	12	8	51	59	71	.....	10	10
Corps not specified	3	.....	3	.....	.....	.....	3	.....	.....	.....
Total in campaign of 1846.	18	107	125	31	279	310	435	8	27	35

RECAPITULATION OF LOSS OF REGULAR ARMY, IN THE CAMPAIGN OF 1847.

REGIMENTS AND CORPS.	KILLED IN BATTLE.			WOUNDED.			Aggregate in killed and wounded.	DIED OF WOUNDS.		
	Officers.	Men.	Total.	Officers.	Men.	Total.		Officers.	Men.	Total.
General staff	1	.....	1	2	.....	2	3	....	....	....
Surgeons	.....	.....	....	2	.....	2	2	1	....	1
Engineers	.....	.....	....	5	5	10	10	....	....	....
Topographical engineers	.....	.....	....	1	.....	1	1	....	....	....
Ordnance	.....	5	5	2	20	22	27	....	1	1
1st regiment dragoons	.....	14	14	3	39	42	56	1	....	1
2d " "	1	8	9	6	31	37	46	....	5	5
3d " "	....	7	7	4	9	13	20	....	....	....
Regiment mounted riflemen	2	24	26	11	144	155	181	2	15	17
1st regiment artillery	4	25	29	5	108	113	142	1	1	2
2d " "	1	21	22	3	160	163	185	2	19	21
3d " "	3	13	16	2	82	84	100	....	13	13
4th " "	2	20	22	3	81	84	106	....	4	4
1st regiment infantry	....	....	....	....	....	....	....	....	....	....
2d " "	3	25	28	9	120	129	157	1	1	2
3d " "	....	20	20	4	101	105	125	....	4	4
4th " "	2	25	27	6	88	94	121	1	15	16
5th " "	5	36	41	8	170	178	219	2	11	13
6th " "	....	34	34	5	128	133	167	2	19	21
7th " "	2	18	20	3	59	62	82	....	13	13
8th " "	....	34	34	13	158	171	205	2	29	31
9th " "	1	10	11	5	64	69	80	....	....	....
10th " "	....	....	....	1	....	1	1	....	....	....
11th " "	2	10	12	4	42	46	58	....	....	....
12th " "	....	4	4	4	33	37	41	....	....	....
13th " "	....	....	....	....	....	....	....	....	....	....
14th " "	....	6	6	7	15	22	28	....	4	4
15th " "	2	11	13	6	97	103	116	1	....	1
16th " "	....	....	....	....	....	....	....	....	....	....
Voltigeurs	....	9	9	14	146	160	169	2	....	2
Marine corps	1	6	7	4	24	28	35	....	....	....
Artillery recruits	....	....	....	....	9	9	9	....	....	....
Corps not specified	1	12	13	....	11	11	24	....	....	....
United States navy	....	1	1	1	9	10	11	....	....	....
Aggregate in the campaign of 1847.	33	398	431	143	1,953	2,096	2,527	18	154	172
Aggregate in the campaign of 1846.	18	107	125	31	279	310	435	8	27	35
Aggregate of regular army killed and wounded in 1846 and 1847.	51	505	556	174	2,232	2,406	2,962	26	181	207

RECAPITULATION OF LOSS IN BATTLE OF THE VOLUNTEER FORCES IN THE CAMPAIGN OF 1847, AND AGGREGATE OF THEIR LOSSES IN 1846.

REGIMENTS AND CORPS.	KILLED IN BATTLE.			WOUNDED.			Aggregate in killed and wounded.	DIED OF WOUNDS.		
	Officers.	Men.	Total.	Officers.	Men.	Total.		Officers.	Men.	Total.
Indiana brigade, staff	.....	.....	.....	1	.....	1	1	.....	.....	.....
Mississippi rifles	2	38	40	5	51	56	96	....	3	3
1st regiment, Illinois	3	26	29	2	23	25	54	....	1	1
2d " "	10	37	47	6	68	74	121	....	2	2
3d " "	.....	1	1	1	15	16	17	.....	.....	.....
4th " "	1	3	4	5	39	44	48	....	8	8
Texas company	2	12	14	1	1	2	16	....	....	....
2d regiment, Indiana	3	29	32	8	28	36	68	....	....	....
3d " "	1	8	9	4	52	56	65	....	....	....
Regiment Kentucky cavalry	1	26	27	4	29	33	60	....	...	...
1st regiment, Kentucky	.....	3	3	1	9	10	13	....	2	2
2d " "	3	41	44	3	54	57	101	...	2	2
Regiment Arkansas cavalry	2	15	17	1	31	32	49	....	2	2
1st regiment, Pennsylvania	.....	17	17	2	47	49	66	.....	.....	.....
2d " "	.....	7	7	6	107	113	120	....	10	10
Regiment, South Carolina	5	22	27	21	195	216	243	....	26	26
1st regiment, Tennessee	.....	1	1	3	4	12	13	...	1	1
2d " "	2	13	15	1	38	39	54	....	3	3
Regiment, Georgia	.....	2	2	.....	8	8	10	.....	.....	.....
2d Regiment, New York	2	25	27	19	137	156	183	....	19	19
California volunteers	.....	.....	.....	1	1	2	2	.....	.....	.....
Missouri volunteers	1	6	7	5	38	43	50	....	4	4
Santa Fé volunteers	.....	.....	.....	.....	4	4	4	.....	.....	.....
Louisiana volunteers	.....	5	5	1	5	6	11	.....	.....	.....
Spy company	.....	.....	.....	1	4	5	5	.....	.....	.....
Maryland volunteers	1	6	7	1	3	4	11	..	.....	.....
Virginia volunteers	.....	1	1	.....	4	4	5	.....	.....	.....
Incidental loss	4	7	11	.....	14	14	25	.....	.....	.....
Corps not specified	.....	1	1	1	1	2	3	.....	.....	.....
Chihuahua rangers	.....	.....	.....	.....	1	1	1	.....	.....	.....
Texas rangers	.....	.....	.....	1	4	5	5	.....	.....	.....
1st regiment, New York	.....	.....	.....	1	.....	1	1	.....	.....	.....
Sailors, marines, and California volunteers	1	2	3	.....	4	4	7	....	....	....
New York and California volunteers	.....	1	1	.....	.....	.....	1	....	....	....
Aggregate in campaign of 1847	44	355	399	111	1,019	1,130	1,529	....	83	83
Aggregate in campaign of 1846*.	5	70	75	20	207	227	302	1	9	10
Aggregate of volunteers killed and wounded in 1846 and 1847.	49	425	474	131	1,226	1,357	1,831	1	92	93

* The losses in 1846 were: April 28, 10 men of Capt. Walker's Texas rangers. September 21, 22, and 23, at Monterey, among the Maryland and District of Columbia battalion volunteers; 1st regiment, Tennessee; 1st regiment, Ohio; Louisiana volunteers; 1st regiment, Kentucky; Mississippi rifles and Texas volunteers. Dec. 6, California volunteers, under General Kearney. Dec. 26, Missouri volunteers, under Colonel Doniphan.

VOTES. (*See* FINDING.)

W

WAD—WADDING. Ring wads (or *grommets*, as they are called in the naval service) increase the accuracy of fire, and are preferred where the object is to keep the ball in its place. They consist of a ring of rope yarn, with two pieces of strong twine tied across it at right angles with each other. The ring is the full diameter of the bore. These wads may be attached with twine to the straps, or to the balls; or inserted like other wads after the ball. Wads, for firing hot shot, may

be made of *hay*, wrapped with rope yarn, and are made in the same manner as junk wads for proving cannon. (Consult *Ordnance Manual.*)

WAGON-MASTER. The quartermaster-general is authorized to employ from time to time as many forage-masters and wagon-masters as he may deem necessary for the service, not exceeding twenty in the whole, who shall be entitled to receive forty dollars per month, and three rations a day, and forage for one horse; and neither of whom shall be interested or concerned directly or indirectly in any wagon or other means of transport, employed by the United States, nor in the purchase or sale of any property procured for or belonging to the United States, except as an agent of the United States; (*Act* July 5 1838, Sec. 10.)

WAGONS—are used by armies for the transportation of subsistence, other military stores, baggage, ammunition, sick and wounded. The different purposes for which they are used require differences in details which demand thought and study. In an able memoir, *Sur Divers Perfectionnements Militaires*, par J. CAVALLI, Col. d'Artillerie, (*Paris*, 1856,) it is proposed that all the different carriages for army transportation should be on *two large wheels*, and that there should be only two different models for the height of the wheels. The number of models for carriages is thus reduced to seven at most, which might be substituted for the wagons on four wheels now in use. The different vehicles used by the French in campaign, according to the recent work of M. LEON GUILLOT, *Sur Legislation et Administration Militaire*, are: the four-wheeled military wagon, made and lined with sheet-iron, specially intended for the transportation of bread and other important necessaries, but also adapted for ambulance purposes, as its interior admits the placing of four boards for the accommodation of the sick; the ammunition wagon and campaign forge for the artillery; and the ambulance wagon used in service by the French army in the East in 1854. The latter is suspended on six springs and has four wheels; it carries five persons, three upon the front seat, which is uncovered and rests on the wagon, while in the interior there are two places for reclining, each on a movable bed.

According to M. Vauchelle, the vehicles for administration purposes on four wheels should be the ordinary wagon and a light wagon, both covered with water-proof cloth; the first would serve for the transportation of bread, and also for medical and hospital stores, &c.; the second, suspended upon springs, should be specially devoted to hospital purposes. He would have, besides, ammunition wagons and field-forges; all on four wheels drawn by four horses, and conducted each by two

soldiers. The maximum capacity of the wagon, according to Guillot, should be for 1,200 rations, weighing about 1,900 lbs. This burden is the mean between that for 1,000 rations weighing about 1,700 lbs. prescribed by Vauchelle, and that for 1,600 rations weighing about 2,650 lbs. adopted, notwithstanding the opposition of M. Vauchelle, by the French minister of war. If, for all these vehicles on four wheels drawn by four horses, there be substituted carts or two-wheeled vehicles, according to the models prepared by Cavalli, the four-wheeled vehicles carrying only 2,200 lbs., will give place to the carts carrying each 3,300 lbs.; that being only one-half of the burden of carts loaded in the same way now used in European commerce drawn by two horses. Under the proposed system, then, for an army of 100,000 men the number of vehicles, &c., would experience the following reductions:

860 wagons	would be reduced to	. .	573 carts.
3,268 conductors	"	" .	1,092
3,820 horses	"	" . .	1,277

If meat and forage are also to be transported for the army, and these articles are omitted in the foregoing calculations, then, supposing an army of 100,000 men has 30,000 horses, the proposed system would reduce

2,567 wagons to .	. 1,711 two large wheeled carts.
9,804 conductors to	3,276 conductors.
11,460 horses to .	. 3,831 horses.

The carts proposed by Col. Cavalli are the following: 1. A dray for the transportation of heavy loads for the artillery and engineer trains, intended as a substitute for the platform or block carriage, and also for the siege truck. This dray weighs about 1,540 lbs.; it will carry a piece of ordnance weighing 7,500 lbs. suspended under it in place of its corbeille, and has been drawn by two horses at a trot from the glacis to the citadel, and by three horses over the ramps of the ditch of the citadel from which it had been lowered. The corbeille of this dray will carry 80 shells, and its flooring 60, weighing in all 8,000 lbs. The usual weight to each horse in the field, however, should not exceed 2,200 lbs. This dray is suitable for all heavy and embarrassing weights, and the division between the load below and that upon the superior bed is so arranged as to maintain the bars in a stable equilibrium without liability to be overturned, and without exerting any pressure upon the horse. 2. The ammunition cart, covered or uncovered, with two large wheels and having a movable water-proof cover, is designed to replace the present ammunition and battery wagons. It will hold 24

cases of powder, 120 lbs. each, of which about 18 would be filled up. The interior void of this cart is about 35 cubic feet. 3. The spring cart is of the same form as the ammunition cart, and differs from it only in being on springs. It is intended principally for the transportation of provisions and articles easily spoiled, as ammunition; and in cases of need as an ambulance. 4 and 5. Two models of carts for ambulances and other purposes drawn, one by two horses and the smaller by one horse; these two vehicles have also only two large wheels, and are not liable to upset. They are intended as substitutes for the ambulance wagon and other wagons. Two persons may be placed in front, and six behind, four of whom may recline on beds suitably arranged at the sides. The smaller cart will answer for two or three persons at most, only two of whom can recline. The smaller carts may also be issued to commanding officers and staff officers entitled to wagons. 6 and 7. The *kitchen-cart*—one to a battalion for 1,000 soups, or a smaller one for 250 soups. The two differ from each other only in length. They should be provided with boilers *a la Papin* with an interior fire-place. These constitute the body of the cart, the superior part of which is furnished with plank to be used as a table. At the extremity of the cart there are two foot boards upon which the cooks may rest while working during the march. Papin's digester is essential to cook well and rapidly. The interior arrangement of the fire-place which is suited to baking is very economical in fuel. The kitchen-cart is otherwise like the preceding. (*See* TRAVELLING-KITCHEN.)

Model No. 2, or even Nos. 4 and 5, will answer for the sutler. A field-forge may be readily placed in the rear of model No. 2, by means of a movable fire-place and bellows. It is proposed to harness to each vehicle intended as a transport two horses, in file; each cart has one conductor not mounted. The importance of the *travelling-kitchen* will be manifest to all soldiers. The cooking is done on the march. The soup is ready at the moment of halting. The strength of the soldier is economized; his food is well cooked in any weather; and numerous diseases, caused by bad food and want of rest, which too often decimate armies, will be avoided by its introduction into service. (*See* AMBULANCE; BAGGAGE; CONVOY.)

WAITERS. (*See* SERVANTS.)

WAR. The right of making war, as well as of authorizing reprisals, or other acts of vindictive retaliation, belongs in every civilized nation to the supreme power of the state. The exercise of this right is vested by the Constitution of the United States in Congress. A contest by force between independent sovereign states is called a *public* war. A

perfect war is where one whole nation is at war with another nation, and all the members of both nations are authorized to commit hostilities against the other, within the restrictions prescribed by the general laws of war. An *imperfect* war is limited as to places, persons, and things—such were the limited hostilities authorized by the United States against France in 1798. Grotius calls a civil war, a *mixed* war; but the general usage of nations regards such a war as entitling both the contending parties to all the rights of war as against each other, and even as respects neutral nations. A formal declaration of war to the enemy was once considered necessary to legalize hostilities between nations. The usage now is to publish a manifesto, within the territory of the state declaring war, announcing the existence of hostilities, and the motives for commencing them.

During the second war between the United States and Great Britain, it was determined by the Supreme Court that enemy's property, found within the territory of the United States on the declaration of war, could not be seized and condemned as prize of war, without some legislative act expressly authorizing its confiscation. The court held that the law of Congress declaring war was not such an act. It is stated by Sir W. Scott to be the constant practice of Great Britain, on the breaking out of war, to condemn property seized before the war, if the enemy condemns, and to restore if the enemy restores.

One of the immediate consequences of the commencement of hostilities, is the interdiction of all commercial intercourse between the subjects of the states at war, without the express license of their respective governments. It follows, as a corollary from this principle, that every species of private contract made with an enemy's subjects during the war is unlawful, and this rule is applied to insurance on enemy's property and trade; to the drawing and negotiating of bills of exchange between the subjects of the powers at war; to the remission of funds in money or bills to the enemy's country; to commercial partnerships, which, if existing before the war, are dissolved by the mere force and act of the war itself, although as to other contracts it only suspends the remedy. But it is the modern usage not to confiscate in war the enemy's actions and credits, and the 10th article of the treaty between the United States and Great Britain, in 1794, stipulates, "that neither the debts due from individuals of the one nation to individuals of the other, nor shares, nor moneys which they may have in the public funds, or in the public or private banks, shall ever, in any event of war or national differences, be sequestered or confiscated; it being *unjust* and *impolitic* that debts and engagements contracted and made by individuals, hav-

ing confidence in each other and in their respective governments, should ever be destroyed or impaired by national authority on account of national differences and discontents.

A person who removes to a foreign country, settles himself there, and engages in the trade of the country, furnishes by these acts such evidences of an intention permanently to reside there, as to stamp him with the national character of the state where he resides. In questions of *domicile* the chief point to be considered is the *animus manendi;* and if it sufficiently appears that the intention of removing was to make a permanent settlement, or for an indefinite time, the right of domicile is acquired by residence even of a few days. In general, the national character of a person, as neutral or enemy, is determined by that of his *domicile*; but the property of a person may acquire a hostile character, independently of his national character, derived from personal residence. Thus if a person enters into a house of trade in the enemy's country, or continues that connection during war, he cannot protect himself by mere residence in a neutral country; so also, the produce of an enemy's colony or other territory is to be considered as hostile property so long as it belongs to the owner of the soil whatever may be his residence.

In the modern law of nations, the right of *postliminy* is that by virtue of which persons and things taken by an enemy in war, are restored to their former state, when coming again under the power of the nation to which they belonged. The sovereign of a country is bound to protect the person and property of his subjects; and a subject, who has suffered the loss of his property by the violence of war, on being restored to his country can claim to be re-established in all his rights, and to recover his property. But this right does not extend in all cases to personal effects or movables, on account of difficulties of identification.

The rights of war in respect to an enemy are in general to be measured by the object of the war. No use of force is lawful except so far as it is necessary. Those who are actually in arms and continue to resist may be killed; but the inhabitants of the enemy's country who are not in arms, or who, being in arms, submit and surrender themselves may not be slain, because their destruction is not necessary for obtaining the just ends of the war. Those ends may be obtained by making prisoners of those taken in arms, or compelling them to give security that they will not bear arms against the victor for a limited period or during the war. The killing of prisoners can only be justified in those extreme cases where resistance on their part, or on the part

of others, who come to their rescue, renders it impossible to keep them. *Cartels* for the mutual exchange of prisoners of war are regulated by special convention between the belligerent states, according to their respective interests and views of policy. Sometimes prisoners of war are permitted, by capitulation, to return to their own country upon condition not to serve again during the war, or until duly exchanged; and officers are frequently released upon their parole, subject to the same condition. By the modern usage of nations, commissaries are permitted to reside in the respective belligerent countries, to negotiate and carry into effect the arrangements necessary for the purpose.

All members of the enemy's state may lawfully be treated as enemies in a public war; but they are not all treated alike. The custom of civilized nations, founded on the general rule derived from natural law, that no use of force is lawful unless it is necessary to accomplish the purposes of war, has therefore exempted the persons of the sovereign and his family, the members of the civil government, women, children, cultivators of the earth, artisans, laborers, merchants, men of science and letters, and generally all public or private individuals engaged in the ordinary civil pursuits of life, from the direct effect of military operations, unless actually taken in arms, or guilty of some misconduct in violation of the usages of war. The application of the same principle has also limited and restrained the operations of war against the territory and other property of the enemy. By the modern usage of nations, which has now acquired the force of law, temples of religion, public edifices devoted to civil purposes only, monuments of art, and repositories of science are exempted from the general operations of war. Private property on land is also exempt from confiscation, excepting such as may become booty in special cases, as when taken from enemies in the field or in besieged towns, and military contributions levied upon the inhabitants of the hostile country. This exemption extends even to the case of an absolute and unqualified conquest of the enemy's country.

The exceptions to these general mitigations of the extreme rights of war, considered as a contest of force, all grow out of the same general principle of natural law, which authorizes us to use such a degree of violence and such only as may be necessary to secure the object of hostilities. Thus, if the progress of an enemy cannot be stopped, a frontier secured, or the approaches to a town cannot be made without laying waste the intermediate territory, the extreme case may justify a resort to measures not warranted by the ordinary purposes of war. But the whole international code is founded on *reciprocity*. Where, then, the established usages of war are violated by an enemy, and there are

no other means of restraining his excesses, retaliation may be justly resorted to in order to compel the enemy to return to the observance of the law which he has violated. The effect of a state of war is to place all the subjects of each belligerent power in a state of mutual hostility. The law of nations has modified this maxim, by legalizing such acts of hostility only as are committed by those who are authorized by the express or implied command of the state. Such are the regularly commissioned naval and military forces of the state, and all others called out in its defence, or spontaneously defending themselves in case of urgent necessity, without any express authority for that purpose. The horrors of war would be greatly aggravated if every individual of the belligerent states were allowed to plunder and slay the enemy's subjects without being in any manner accountable for his conduct. Hence it is that in land wars, irregular bands of marauders are liable to be treated as lawless banditti, not entitled to the protection of the mitigated uses of war as practised by civilized nations.

The title to property lawfully taken in war may, upon general principles, be considered as immediately diverted from the original owner and transferred to the captor. As to personal property or movables on land, the title is lost to the former proprietor, as soon as the enemy has acquired a firm possession; which, as a general rule, is considered as taking place after the lapse of 24 hours, or after the booty has been carried into a place of safety, *infra præsidia* of the captor. In respect to ships and goods taken at sea, the sentence of a competent court is necessary; while, in respect to real property or immovables, the title acquired in war must be confirmed by a treaty of peace before it can be considered as completely valid. But it may be important to determine how far the possession of immovables, and the property arising out of such possession, extend. Grotius simply says that every kind of possession is not sufficient, but that it must be a *firm possession*, which he explains thus: "as if a country is so provided with permanent fortifications, that the advance party cannot enter it openly without first making himself master of them by force." Bynkershock says: "Possession extends to every thing that is occupied, and what is occupied is placed within our power by the law of nature; but even that is considered as occupied, which is not touched on all sides with our hands or feet. * * * Hence it is not difficult to discern what may be considered as properly occupied in an occupied country. * * If, from the occupation of a strong place, dominion is exercised over the whole country, yet the victor is not considered in possession of those cities, walled towns, and fortresses, which the sovereign still retains."

There are various modes also in which the extreme rigor of the rights of war may be relaxed at the pleasure of the respective belligerents. 1. A general truce or armistice. This amounts to a temporary peace, and it requires either the previous special authority of the supreme power of the state, or a subsequent ratification by such power. 2. A partial truce or limited suspension of hostilities may be concluded between the military and naval officers of the respective belligerent states without any special authority for that purpose, where, from the nature and extent of their commands, such an authority is necessarily implied as essential to the fulfilment of their duties. The terms of the armistice should be free from all ambiguity. 3. Capitulations for the surrender of troops, fortresses, and particular districts of country fall naturally within the scope of the general powers intrusted to military commanders. 4. Passports, safe conducts, and licenses are documents granted in war to protect persons and property from the general operation of hostilities. A license is an act proceeding from the sovereign authority of the state, which alone is competent to decide on all the considerations of political and commercial expediency by which such an exception from the ordinary consequences of war must be controlled. 5. By rules laid down for the government of an army in an enemy's country in the new relation existing between the invading army and the citizens or subjects of the foreign country.

The martial law order of General Scott in Mexico, given in the article LAW, (*Martial,*) played so prominent a part in mitigating the horrors of war, as well as in aiding in the conquest of peace, that a concise history of that remarkable order will here find a fitting place. As early as May, 1846, General Scott presented for the consideration of the Secretary of War a *project* for a law, giving expressly to courts-martial in an enemy's country authority to punish offences, which in the United States are punishable by the ordinary criminal courts of the land. Congress did not, however, act upon the recommendation, and General Scott on the 8th of October, 1846, submitted to Mr. Secretary Marcy the draft of a letter which he recommends should be despatched to each commander of an army now operating against Mexico. "I am aware (he continues) that it presents grave topics for consideration, which is invited. It will be seen that I have endeavored to place all necessary restrictions on *martial law.* 1. By restricting it to a foreign hostile country; 2. To offences enumerated with some accuracy; 3. By assimilating councils of war to courts-martial; 4. By restricting punishments to the known laws of some one of the States of the Union;" (Doc. 59, *House of Representatives,* 30*th Congress,* 1*st Session.*) This

project appears to have met with no favor from the Executive. In letters from General Taylor, dated October 6, and October 11, 1846, he reports the "most shameful atrocities" as having been committed without punishment, and he asks the Secretary of War "for instructions as to the proper disposition of the culprit" in a case of cold-blooded murder at Mónterey. Mr. Marcy replied Nov. 25, 1846: "The competency of a military tribunal to take cognizance of such a case as you have presented in your communication of the 11th ult., viz., the murder of a Mexican soldier, and other offences not embraced in the express provisions of the Articles of War, was deemed so questionable, that application was made to Congress, at the last session, to bring them expressly within the jurisdiction of such a tribunal, but it was not acted upon. I am not prepared to say that, under the peculiar circumstances of the case, and particularly, by the non-existence of any civil authority to which the offender could be turned over, a military court could not rightfully act thereon; yet very serious doubts are entertained upon that point, and the Government does not advise that course. It seriously regrets that such flagrant offender cannot be dealt with in the manner he deserves. I see no other course for you to pursue than to release him from confinement and send him away from the army; and this is recommended."

The foregoing letter of the cautious War Secretary was written a few days after General Scott had been ordered to the theatre of war, to assume the direction of military operations; but in the opinion of the latter, "the good of the service, the honor of the United States, and the interests of humanity" demanded that the numerous grave offences not embraced in the Rules and Articles of War should not go unpunished; and accordingly, upon assuming command of the army in Mexico, he did not shrink from the responsibility which his station imposed. He issued his martial law order. Rigid justice was administered to American and Mexican under that order, and it, beyond all doubt, effected as important consequences as any act performed during his brilliant campaign ending with the conquest of peace. (Consult WHEATON'S *Elements of International Law;* DUPONCEAU'S *Bynkershoek;* GENERAL SCOTT'S *Orders in Mexico.*)

WARRANT. A writ of authority. Warrant officers are such as are immediately below commissioned officers, exercising their authority by warrant only. Cadets are warrant officers. They may be tried by garrison courts-martial; but by the custom of war a court-martial cannot sentence a warrant officer to corporal punishment or reduction to the ranks.

WASHING. To each woman who may be allowed to a corps, not exceeding four to a company, one ration is given; (*Act* March 16, 1802.) They are washerwomen.

WASTE. Waste or spoil committed by troops, either in walks of trees, parks, warrens, fish-ponds, houses or gardens, corn-fields, inclosures of meadows, or maliciously destroying any property whatsoever belonging to the inhabitants of the United States, unless by the order of the then commander-in-chief of the armies of the United States, shall (besides such penalties as they are liable to by law) be punished, according to the nature and degree of the offence, by the judgment of a regimental or general court-martial; (ART. 54.) (*See* AMMUNITION.)

WATCH. The non-commissioned officers and men on board transports are usually divided into three watches, one of which must be constantly on deck.

WATCHWORD. (*See* PAROLE.)

WATER. Daily allowance for a man one gallon for all purposes. For a horse four gallons.

WEDGE—is one of the five simple mechanical powers. It is used sometimes for raising bodies, but more frequently for dividing or splitting them. The power is to the resistance acting perpendicularly on each side of the wedge, as the thickness of the back of the wedge is to the length of the side.

WEIGHTS AND MEASURES.

MEASURES OF LENGTH.

Inches.	Feet.	Yards.	Rods or Poles.	Furlongs.	Mile.
12	1				
36	3	1			
198	16½	5½	1		
7,920	660	220	40	1	
63,360	5,280	1,760	320	8	1

The inch was formerly divided into three parts, called *barley-corns*, and also into 12 parts called *lines*, neither of which denominations is now in common use. Scales and measuring rules are generally divided into *inches, quarters, eighths*, and *sixteenths;* or into *inches* and *decimal parts;* the latter of these divisions is used in the Ordnance Department.

For surveying land: 7.92 Inches = 1 link. } Gunter's chain.
100 Links = 4 poles, or 22 yards, or 66 feet. }

For map-making: Chains are often made of 50 links, each 1 foot in length.

For measuring ropes and soundings: 1 Fathom = 6 feet.
1 Cable's length = 120 fathoms.

For measuring cloth: 1 Nail = 2¼ inches = 1-16th of a yard.
1 Quarter = 4 nails.
1 Yard = 4 quarters.
1 Ell English = 5 quarters.

For measuring horses: 1 Hand = 4 inches.

Geographical measure: 1 Degree of a great circle of the earth = 69.77 miles.
1 Geographical or nautical mile = 1-60th of a degree of the earth = 2,025 yards.
1 Nautical league = 3 miles.

A standard measure has been adopted for the United States, copies of which are distributed to various parts of the country, for the purpose of establishing a uniform system. This standard is measured on a brass bar and copied from the British standard *yard.* For the proportion which it bears to the French *metre*, see below.

FOREIGN MEASURES OF LENGTH.

GREAT BRITAIN.—The Imperial standard yard of Great Britain, adopted in 1825, is referred to a natural standard, which is the distance between the axis of suspension and the centre of oscillation of a pendulum which shall vibrate seconds in vacuo, in London, at the level of the sea; that distance measured on a brass rod, at the temperature of 62° Fahr., is declared to be 39.1393 *imperial inches.*

FRANCE.—*Old system:*

1 Point	= 0.0074 Eng. inches.		
1 Line = 12 points	= 0.08884 "		
1 Inch = 12 lines	= 1.06577 "		
1 Foot = 12 inches	= 12.7892 "		
1 Ell = 43 in. 10 lines	= 46.716 "	= 1.298 yd.	
1 Toise = 6 feet	= 76.735 "	= 2.132 "	

1 Perch (Paris) = 18 feet.
1 Perch (royal) = 22 "
1 League, (common,) 25 to a degree = 2,280 toises = 4,861 yds., = 2.76 miles.
1 League, (post,) = 2,000 toises = 4,264 yds., = 2.42 miles.
1 Fathom (*Brasse*) = 5 feet French = 63.946 inches, or 5⅓ feet Eng., nearly.
1 Cable length = 100 toises = 120 fathoms Fr., = 106⅔ fathoms English.
1 Pace (pas) = ⅘ metre = 26.5 in. nearly.

TABLE FOR REDUCING OLD FRENCH MEASURES TO ENGLISH.

French feet.	English inches.	French feet or inches.	English feet or inches.	French lines.	English inches.	French points.	English inches.
1	12.7892	1	1.0658	1	0.0888	1	0.0074
2	25.5784	2	2.1315	2	0.1776	2	0.0148
3	38.3676	3	3.1973	3	0.2664	3	0.0222
4	51.1568	4	4.2631	4	0.3553	4	0.0296
5	63.9460	5	5.3288	5	0.4441	5	0.0370
6	76.7352	6	6.3946	6	0.5329	6	0.0444
7	89.5244	7	7.4604	7	0.6217	7	0.0518
8	102.3136	8	8.5261	8	0.7105	8	0.0592
9	115.1028	9	9.5919	9	0.7993	9	0.0666
10	127.8920	10	10.6577	10	0.8881	10	0.0740
11	140.6812	11	11.7234	11	0.9770	11	0.0814

NEW FRENCH SYSTEM.—The basis of the new French system of measures is the measure of a meridian of the earth, a quadrant of which is 10,000,000 *metres*, measured at the temperature of 32° Fahr. The multiples and divisions of it are decimal, viz.: 1 metre = 10 decimetres = 100 centimetres = 1,000 millimetres = 39.3707971 English inches, or 3.2809 feet.

Road Measure.—Myriametre = 10,000 metres. Kilometre = 1,000 metres. Decametre = 10 metres. Metre = 0.51317 toise.

TABLE FOR REDUCING METRES TO INCHES.

According to Capt. KATER'S comparison, 1 metre = 39.37079 English inches.

Metres.	Inches.	Metres.	Inches.	Metres.	Inches.	Metres.	Inches.
0.001	0.039371	0.026	1.023641	0.051	2.007910	0.076	2.992180
2	0.078742	27	1.063011	52	2.047281	77	3.031551
3	0.118112	28	1.102382	53	2.086652	78	3.070922
4	0.157483	29	1.141753	54	2.126023	79	3.110292
5	0.196854	0.030	1.181124	55	2.165393	0.080	3.149663
6	0.236225	31	1.220494	56	2.204764	81	3.189034
7	0.275596	32	1.259865	57	2.244135	82	3.228405
8	0.314966	33	1.299236	58	2.283506	83	3.267776
9	0.354337	34	1.338607	59	2.322877	84	3.307146
0.010	0.393708	35	1.377978	0.060	2.362247	85	3.346517
11	0.433078	36	1.417348	61	2.401618	86	3.385888
12	0.472449	37	1.456719	62	2.440989	87	3.425259
13	0.511820	38	1.496090	63	2.480358	88	3.464630
14	0.551191	39	1.535461	64	2.519731	89	3.504000
15	0.590562	0.040	1.574832	65	2.559101	0.090	3.543371
16	0.629933	41	1.614202	66	2.598472	91	3.582742
17	0.669303	42	1.653573	67	2.637843	92	3.622113
18	0.708674	43	1.692944	68	2.677214	93	3.661483
19	0.748045	44	1.732315	69	2.716585	94	3.700854
0.020	0.787416	45	1.771686	0.070	2.755955	95	3.740225
21	0.826787	46	1.811056	71	2.795326	96	3.779596
22	0.866157	47	1.850427	72	2.834697	97	3.818967
23	0.905528	48	1.889798	73	2.874068	98	3.858337
24	0.944899	49	1.929169	74	2.913438	99	3.897708
25	0.984270	0.050	1.968540	75	2.952809	0.100	3.937079

English.

AUSTRIA.—1 Foot = 12.445 English inches = 1.0371 feet.
1 Mile = 4,000 toises = 5 miles, nearly.

PRUSSIA.—1 Rhineland foot = 12.3557 English inches. = 1.0296 feet.
1 Mile = 8,552 yards, English = 5 miles, nearly.

RUSSIA.— 1 Foot = 21.1874 English inches = 1.7656 feet.
For the artillery, the English foot and inch are used.
1 Verst = 2,000 Russian feet = 1,177 yards.

SPAIN.— 1 Foot = 11.1284 English inches.
1 Vara = 3 feet = 0.9274 English yard.
1 League Royal = 25,000 Spanish feet = 4⅓ miles, nearly.
1 Common league = 19,800 do. = 3½ "
1 Judicial league = 15,000 do. = 2⅝ "

MEXICO.— 1 Common league = 15,000 do. = 2⅝ "

SWEDEN.—1 Foot = 11.6865 English inches.

MEASURES OF SURFACE.

Square measure.—144 Square inches = 1 square foot.
9 Square feet = 1 square yard.

Land measure.—30¼ Square yards = 1 square perch or pole.
40 Perches = 1 rood.
160 Perches = 4 roods = 1 acre = 10 square chains (Gunter's) = 4,840 square yards = 70 yards square, nearly.
640 Acres = 1 square mile.

French Superficial Measure.

Old system.—1 Square inch = 1.13587 English square inches.
1 Arpent (Paris) = 100 square perches (Paris) or 900 square toises = 4,088 square yards, or 5-6ths of an acre, nearly.
1 Arpent (woodland) = 100 square perches (royal) = 6,108 square yards, or 1 acre, 1 rood, 1 perch.

New, or *Decimal system.*—1 Are = 100 square metres = 119.603 square yards.
1 Decare = 10 ares. 1 Hecatare = 100 ares.

MEASURES OF SOLIDITY.

Cubic or *Solid measure.*—1 Cubic foot = 1,728 cubic inches.
1 Cubic yard = 46,656 " " = 27 cubic feet.

Measuring stone.—In different parts of the United States the *perch* of stone denotes a different quantity, but it is usually 24¾ cubic feet.

Measuring wood.—1 Cord is a prism 4 feet square and 8 feet long = 128 cubic feet.

French Solid Measures.

1 Cubic inch = 1.2106 cubic inches, English.
1 Cubic foot = 2091.85 cubic inches, English.
1 Cubic decimetre = 61.0271 " "
1 Stere = 1 cubic metre = 61,027.1 cubic in. = 35.3166 cubic feet = 1.308 cubic yards.

MEASURES OF CAPACITY.

LIQUID MEASURE.

Gills.	Pints.	Quarts.	Gallons.
4	1		
8	2	1	
32	8	4	1

The standard gallon of the United States is the old wine gallon, which measures 231 cubic inches, and contains (as determined by Mr. Hassler) 58,373 Troy grains, or 8.3388822 avoirdupois pounds, of distilled water at the maximum density, (39° .83 Fahr.;) the barometer being at 30 inches.

A cubic foot contains 7.48 gallons.
A box 6 × 6 × 6.42 inches contains 1 gallon.
A box 4 × 4 × 3.61 inches contains 1 quart.

DRY MEASURE.

Pints.	Quarts.	Gallons.	Pecks.	Bushels.
2	1			
8	4	1		
16	8	2	1	
64	32	8	4	1

The standard bushel of the United States is the Winchester bushel, which measures 2,150.4 cubic inches, and contains 543,391.89 Troy grains, or 77.627413 lbs. avoirdupois, of distilled water, under the circumstances above stated.

A cubic yard contains 21.69 bushels.

A cylinder 14 in. diam. × 14 in. deep	}	contains 1 bushel.
Or a box 16 × 16.8 × 8 inches	}	
A box 12 × 11.2 × 8 inches		contains ½ bushel.
A box 8 × 8.4 × 8 inches		contains 1 peck.

N.B.—It will be observed that the pint, quart, and gallon of dry measure are not the same as for liquid measure.

FOREIGN MEASURES OF CAPACITY.

GREAT BRITAIN.—The British imperial gallon measures 277.274 cubic inches, containing ten pounds avoirdupois of distilled water weighed in air, at the temperature of 62°, the barometer being at 30 in. The same measure is used for liquids as for dry goods which are not measured by heaped measure; for the latter, the bushel is to be heaped in the form of a cone not less than 6 inches high, the base being 19½ inches. The old distinctions of wine measure, ale and beer measure, and dry measure are discontinued.

For grain.—8 bushels = 1 quarter = 10.269 cubic feet.
5 quarters = 1 load = 51.347 cubic feet.

For coal or *heaped measure.*—1 sack = 3 bushels = 4.89 cubic feet, nearly.
1 chaldron = 12 sacks = 36 bushels = 58.68 cubic feet.

For timber.—1 load = 40 cubic feet.

Former wine gallon = 231 cubic inches.

Former ale gallon = 282 cubic inches.

Imperial gallon = 277.274 cubic inches, (as above.)

FRANCE.—1 Litre = 1 cubic decimetre = 61.0271 cubic inches = 1.057 U. S. quart = 1.761 imperial pint of Great Britain.
1 Boisseau = 13 litres = 793.364 cubic in. = 3.4344 U. S. gals.
1 Pinte = 0.931 litre = 56.816 cub. in. = 0.98383 U. S. quart.

SPAIN.—1 Wine arroba = 4.2455 U. S. gallons.
1 Fanega (corn measure) = 1.593 U. S. bushels.

MEASURES OF WEIGHT.

AVOIRDUPOIS WEIGHT.

Drams.	Ounces.	Pounds.	Quarters.	Cwt.	Ton.
16	1				
256	16	1			
7,168	448	28	1		
28,672	1,792	112	4	1	
573,440	35,840	2,240	80	20	1

The standard avoirdupois pound of the United States, as determined by Mr. Hassler, is the weight of 27.7015 cubic inches of distilled water weighed in air, at the temperature of the maximum density, (39°.83;) the barometer being at 30 inches.

TROY WEIGHT.

Grains.	Dwt.	Ounces.	Pound.
24	1		
480	20	1	
5,760	240	12	1

The pound, ounce, and grain are the same in Apothecaries' and Troy weight; in the former, the ounce is divided into 8 drachms, the drachm into 3 scruples, and the scruple into 20 grains.

7,000 Troy grains = 1 lb. avoirdupois.
175 Troy pounds = 144 lbs. "
175 Troy ounces = 192 oz. "
437½ Troy grains = 1 oz. "

Foreign Weights.

GREAT BRITAIN.—The imperial avoirdupois pound is the weight of 27.7274 cubic inches of distilled water weighed in air, with brass weights, at the temperature of 62° Fahr.; barometer 30 inches. Therefore,

1 cubic inch of distilled water at 62° weighs 252.458 grains.
0.003961 cubic inch weighs 1 grain.
22.815689 cubic inches weigh 1 Troy pound.

Horseman's weight: 1 stone = 14 pounds.

FRANCE.—*Old system:* 1 Livre = 16 onces = 1.0780 lb. avoirdupois.
1 Once = 8 gros = 1.0780 oz. "
1 Gros = 72 grains = 58.9548 grains Troy.
1 Grain ..... = 0.8188 " "

New system.—The basis of the system of weights is the weight, in vacuo, of a litre, or a cubic decimetre, of distilled water, at the temperature of 39°.2 Fahr.; $\frac{1}{1000}$th part of this weight is a *gramme*, the multiples of which are: 1 Decagramme = 10 grammes: 1 Hectogramme = 100 grammes: 1 Kilogramme = 1,000 grammes. The divisions are: 1 Decigramme = $\frac{1}{10}$th gramme: 1 Centigramme = $\frac{1}{100}$th gramme: 1 Milligramme = $\frac{1}{1000}$th gramme.

1 Quintal = 100 kilogrammes.
1 Millier = 1,000 kilogrammes = 1 ton sea weight, (French.)
1 Kilogramme = 2.204737 pounds avoirdupois.
1 Gramme = 15.433159 grains Troy = 0.03528 oz. avoirdupois.
1 Pound avoirdupois = 0.4535685 kilogramme.
1 Pound Troy = 0.3732223 kilogramme.

SPAIN.— 1 Pound = 1.0152 pounds avoirdupois.
SWEDEN.— 1 Pound = 0.9376 " "
AUSTRIA.— 1 Pound = 1.2351 " "
PRUSSIA.— 1 Pound = 1.0333 " "

MEASURES OF VALUE.

All calculations of value in the military service of the United States are expressed in *Dollars* and *Cents*, although the denominations of *shillings* and *pence* are still in common use as a nominal currency in many of the States.

The standard of gold and silver is 900 parts of pure metal and 100 of alloy, in 1,000 parts of coin. The alloy of gold coin is 25 silver and 75 copper; the alloy of silver is copper.

Weight of Dollar	= 412.5	grains Troy	} Other coins in proportion.
" Eagle	= 258	"	
" Cent	= 168	"	

Relative Mint Value of United States and Foreign Coins.

GREAT BRITAIN	1 Guinea = 21 shillings	= 5.059	dollars.
	1 Sovereign, or 1 pound = 20 shillings	= 4.845	"
	1 Crown = 5 shillings	= 1.08	"
	1 Shilling = 12 pence	= 0.217	"
	1 Penny	= 0.018	"
FRANCE	5 Francs	= 0.932	"
	1 Franc = 20 sous	= 0.185	"
	1 Sous	= 0.0093	"
SPAIN	1 Doubloon, or 1 ounce	= 15.57	"
AUSTRIA	1 Ducat	= 2.275	"
	1 Crown, or rix dollar	= 0.97	"
	20 Kreutzers	= 0.16	"
PRUSSIA	1 Double Frederick	= 8.00	"
	1 Thaler	= 0.693	"
RUSSIA	1 Half-Imperial = 5 roubles	= 3.967	"
	1 Rouble	= 0.75	"
SWEDEN	1 Ducat	= 2.267	"
	1 Specie daler	= 1.042	"
TURKEY	20 Piasters	= 0.82	"

Dimensions of Drawing Paper.

Demy	1 ft.	7½	in. ×	1 ft.	3½	inches.
Medium	1 "	10	" ×	1 "	6	"
Royal	2 "	0	" ×	1 "	7	"
Super royal	2 "	3	" ×	1 "	7	"
Imperial	2 "	5	" ×	1 "	9¼	"
Elephant	2 "	3¾	" ×	1 "	10¼	"
Columbier	2 "	9¾	" ×	1 "	11	"
Atlas	2 "	9	" ×	2 "	2	"
Double elephant	3 "	4	" ×	2 "	2	"
Antiquarian	4 "	4	" ×	2 "	7	"

(*Ordnance Manual.*)

WHEEL. In the simple wheel and axle, the power is to the weight as the radius r of the axle is to the radius R of the wheel.

Or, $P = \frac{w\,r}{R}$.

In a system of wheels and pinions, the power is to the weight as the product of the radii (or number of teeth) $r\ r'\ r''$, &c., of the pinions is to the product of the radii (or number of teeth) $R\ R'\ R''$, &c., of the wheels:

$$P = w \frac{r\ r'\ r''}{R\ R'\ R''}.$$

WHIPPING. Abolished, except for desertion.

WHITING. To make whiting for accoutrements, it is necessary to boil many handfuls of bran enveloped in linen. Dissolve afterwards pipe-clay in this water. Whiten with it when cold. When the buff leather is greasy and does not receive the whiting, scrape it, and apply to it a solution of pipe-clay and Spanish whiting.

Another receipt, calculated for one hundred men, is the following: Pipe-clay, 3½ lbs.; Spanish whiting, 8 ounces; white lead, 4 ounces; glue, 1½ ounces; starch, 6 oz.; white soap, 5 oz. Put the pipe-clay and Spanish whiting in about five gallons of water; wash them and leave them to soak for six hours; 2d, throw out the first water, and replace it by 5½ gallons of pure water; add the white lead, glue, and white soap. Cook them together, taking care to stir constantly the composition. At the moment that the foam shows itself on the surface, withdraw the vessel from the fire without suffering the composition to boil; put then the starch in the whiting, and mix all well together.

WIDOWS AND ORPHANS. (*See* PENSION.)

WILLS, (NUNCUPATIVE.) A nuncupative will, so termed from naming an executor by word of mouth, is a verbal testamentary declaration or disposition. By the common law, it was as valid in respect to personal estate as a written testament. A will could not only be made by word of mouth, but the most solemn instrument in writing might be revoked orally. In a rude and uncultivated age, to have required a written will would have been a great hardship, but with the growth and progress of letters, the reason for permitting a verbal testament diminished in force, until finally an effort to establish such a will by means of gross fraud and perjury gave rise to the provisions of the statute of 29 Charles II., passed in 1676, termed the Statute of Frauds.

The only nuncupative wills now allowed are those made by soldiers and sailors. It appears from the preface to the Life of Sir Leoline Jenkins, that he claimed the merit, at the time of the preparation of the Statute of Frauds, of having obtained for the soldiers of the English army the full benefit of the testamentary privileges of the Roman army. The Roman soldier was indulged with very peculiar rights and immu-

nities, in the way of exemption from the usual rules in respect to wills —*Inter arma silent leges.* In the camp and on the battle-field the testamentary law was silent. Amid the excitement and the perils of warfare the forms prescribed by law for the execution of a will were dispensed with, so that the soldier might declare his last wishes by word of mouth; or if wounded, he wrote with his blood on his shield, or with his sword in the dust; the disposition was held firm and sacred. Julius Cæsar authorized the making of the military testament in any mode, and without prescribed ceremonials. The example thus set was subsequently followed by Titus, Domitian, Nerva, and Trajan, until the usage became thoroughly established. It was extended also to the naval service, and officers, rowers, and sailors were in this respect esteemed as soldiers. This was the foundation of those privileges of soldiers in regard to nuncupative wills, which were allowed wherever the civil law prevailed, and have been very generally adopted among civilized nations. In France, the ordnance *De la Marine* of 1681, first gave special privileges to wills made at sea, and the ordnance of 1735 regulated the celebration of the military testament. The Code Civil has also adopted definite rules in regard to wills made at sea, in time of pestilence, or by soldiers in service. In Holland, when commerce began to be extended to distant voyages, the question arose whether wills made at sea were entitled to any peculiar immunity, and some jurists affirmed that they should be taken as military testaments. The matter was finally resolved in favor of their exemption in case of persons sailing to or returning from the Indies, by the ordinances of the West India Company in 1672 and 1675. In England, by the Statute of Frauds, passed about the same time, the full benefit of the privilege was given, without restriction, to all soldiers and sailors in actual service, and this liberal rule has continued to the present day.

Nuncupative wills, not being regulated by statute as to their mode of celebration or execution, the single question for the judgment of the court is, whether the nuncupation was made by a person entitled to that privilege. The restrictions of the Statute of Frauds were not applied to wills made by "any soldier being in actual military service, or any mariner or seaman being at sea." By the revised statutes of New York it was provided that nuncupative wills should not be valid, "unless made by a soldier while in actual military service, or by a mariner while at sea." The terms of the exception in the statute 1 Vict. c. 26, are, "any soldier being in actual military service, or any mariner or seaman being at sea." The phraseology is slightly different in these statutes; but the rule is substantially the same in all—that the nuncu-

pation is only valid when made by a soldier in actual military service, or a mariner at sea, at the time of the testamentary act. It is not enough to be a soldier or a sailor, but there must be actual service. The military testament was first conceded by Julius Cæsar to all soldiers, but it was subsequently limited by Justinian to those engaged in an expedition—*solis qui in expeditionibus occupati sunt.* The exception was borrowed with the rule from the civil law, and the courts have invariably adhered to the principle that there cannot be actual warfare and the soldier not be engaged *in expeditione.* So also the nuncupation of a mariner to be valid must be made at sea. It is sometimes difficult to determine when the mariner is to be considered at sea. For example, Lord Hugh Seymour, the admiral of the station at Jamaica, made a codicil by nuncupation while staying at the house on shore appropriated to the admiral of the station. The codicil was rejected on the ground that he only visited his ship occasionally, while his family establishment and place of abode were on land at the official residence. But when a mariner belonging to a vessel lying in the harbor of Buenos Ayres, met with an accident when on shore by leave, made a nuncupative will, and died there, probate was granted for the reason that he was only casually absent from his ship. The will of a shipmaster made off Otaheite has also been allowed. The principle upon which the privilege of nuncupation is conceded applies to all persons engaged in the marine service, whatever may be their special duty or occupation on the vessel. As in the army the term "soldier" embraces every grade, from the private to the highest officer, and includes the gunner, the surgeon, or the general; so in the marine, the term "mariner" applies to every person in the naval or mercantile service, from the common seaman to the captain or admiral. It is not limited or restricted to any special occupation on shipboard, but a purser, or any other person whose particular vocation does not relate to the sailing of the vessel, possesses the same right as the sailor. A cook is certainly as much a necessary part of the effective service of a vessel as the purser or the sailor; and there would seem to be no reason why he should be excluded from the advantage of a rule designed for the benefit of men engaged in the marine, without reference to the particular branch of duty performed in the vessel. As well because the wills of soldiers and mariners were excepted from the operations of the provisions of the Statute of Frauds, as for the reason and ground of the exception, and the peculiar character of the military testament, it was never held requisite that their nuncupations should be made during the last sickness. Nor has any particular mode been prescribed in respect to the manner of making the testa-

ment. The very essence of the privilege consists in the absence of all ceremonies as legal requisites—or, as Merlin states the proposition, "their form was properly to have no form." It is true the Roman law prescribes two witnesses; but this, however, did not relate to the essence of the act, but only to the proof. In respect to evidence, we do not follow the civil or the canon law; no particular number of witnesses is required to verify an act judicially, and all the court demands is to be satisfied by sufficient evidence as to the substance of the last testamentary request or declaration of the deceased. This ascertained, the law holds it sacred, and carries it into effect with as much favor and regard as would be paid to the most formal instrument executed with every legal solemnity; (*Decision of the Surrogate of New York City.*) And so, according to numerous decisions, made in Great Britain, quoted by Prendergast, "whenever a military officer on full pay makes an informal will its validity can only be supported by showing the testator to have been on actual military service at the time the will was made. And the result of the decisions appears to be, that an officer serving with his regiment, or in command of troops in garrison or quarters, either in the United Kingdom or the colonies, is not deemed on *actual* military service. To satisfy the meaning of the act of parliament in that respect, he must be on an expedition, or on some duty associated with positive danger."

WINDAGE. The true windage is the difference between the true diameters of the bore and the ball. The loss of velocity caused by a given windage is directly as the windage and inversely as the diameter of the bore, very nearly.

WINDLASS. A machine used for many common purposes. It is a particular modification of the wheel and axle, the power being applied by means of a rectangular lever or *winch*.

WINGS. The right and left divisions of an army or battalion.

WITNESS. All persons who give evidence before a court-martial, are to be examined on oath or affirmation, as follows: You swear, or affirm (as the case may be) the evidence you shall give in the cause now in hearing, shall be the truth, the whole truth, and nothing but the truth. So help you God; (ART. 73.)

On the trial of cases not capital before courts-martial, the deposition of witnesses not in the line or staff of the army, may be read in evidence: Provided, the prosecutor and the person accused are present at the taking of the same, or are duly notified thereof; (ART. 74.) The list of witnesses for the prosecution is sometimes given to the prisoner,

not as a right, but as a matter of convenience, when no evil result is apprehended from it; (Hough.)

The law has not given to courts-martial any power to compel the attendance of witnesses not of the line or staff of the army, even in capital cases. The want of such power might often defeat the ends of justice. A citizen witness is, however, paid his actual transportation or stage-fare and three dollars a day while attending the court and travelling to and from it, counting the travel at fifty miles a day. (*See* Evidence; Trial.)

WOMEN. (*See* Washing.)

WOOD. The most useful timbers in the United States are: the hickory, which is very tough and inflexible; white oak, tough and pliable; white ash, tough and elastic; black walnut, hard and fine-grained; white poplar, soft, light fine-grained wood; white pine and other pines, for building; cypress, soft, light, straight-grained, and grows to a large size; dogwood, hard and fine-grained. The timber growing in the centre of a forest is best.

WORK. (*See* Fatigue Duty.)

WORKING POWER. Working power of men: A foot soldier travels in one minute, in common time, 90 steps = 70 yards. In quick time, 100 steps = 86 yards. In double quick, 140 steps = 109 yards. He occupies in the ranks a front of 20 inches and a depth of 13 inches, without the knapsack; the interval between the ranks is 13 in.; 5 men can stand in a space of 1 square yard. Average weight of men, 150 lbs. each. A man travels, without a load, on level ground, during 8½ hours a day, at the rate of 3.7 miles an hour, or 31¼ miles a day. He can carry 111 lbs. 11 miles a day. A porter, going short distances and returning unloaded, carries 135 lbs. 7 miles a day. He can carry in a wheel-barrow 150 lbs. 10 miles a day. The maximum power of a strong man, exerted for 2½ minutes, may be stated at 18,000 lbs. raised 1 foot in a minute.

A man of ordinary strength exerts a force of 30 lbs. for 10 hours a day with a velocity of 2½ feet in a second = 4,500 lbs. raised 1 foot in a minute = *one-fifth* the work of a horse. Daily allowance of water for a man 1 gallon, for all purposes. (*See* Horse; Measure; &c.)

WORSHIP, (Divine.) It is earnestly recommended to all officers and soldiers diligently to attend divine service, and all officers who shall behave indecently or irreverently at any place of divine worship shall, if commissioned officers, be brought before a general court-martial there to be publicly and severely reprimanded by the president; if non-commissioned officers or soldiers, every person so offending shall, for his

first offence, forfeit one-sixth of a dollar, to be deducted out of his next pay; for the second offence, he shall not only forfeit a like sum, but be confined 24 hours; and for every like offence, shall suffer and pay in like manner; which money, so forfeited, shall be applied by the captain or senior officer of the troop or company to the use of the sick soldiers of the company or troop to which the offender belongs; (ART. 2.)

WOUNDS. (*See* PENSIONS.)

WRONGS. (*See* INJURIES; REDRESSING WRONGS; REMEDY.)

Y

YARD. (*See* WEIGHTS AND MEASURES.)

Z

ZIGZAG OR BOYAUS—are defiladed trenches, run out from the parallels of attack, so as to form a covered road, by which the assailants can approach the fortress. (*See* SIEGE.)