Characteristics of The Three Arms.

Course In Organization and Tactics.
Lecture No. 13.

By Captain TENNEY ROSS,
7th Infantry.

December 12, 1904.

Department Military Art,
Infantry & Cavalry School.

STATE COLLEGE PRESS.

CHARACTERISTICS OF THE THREE ARMS.

Lecture No. 13.

Each of the three arms, composing the line of the army, has, on account of its training and equipment, peculiarities or characteristics, which better adapt it for the performance of certain work than either of the other two. A knowledge of these characteristics is essential if one would avoid the error of using an arm for a duty, which might, with greater facility and less expenditure of time, energy and money, have been performed by one of the others. Incidents are not. lacking where the improper and unnecessary use of an arm has greatly reduced its efficiency. 'The outpost duty, which the Army of the Potomac was called upon to perform in the early part of the Civil War, was excessive and unjustifiable. In this connection the Quartermaster General of the Army said in his report: "Such data as can be obtained, leads to the conclusion that much of the loss of horses in the Army of the Potomac, during the first two years of th.e War, was brought about by mistaken ideas as to the proper use of cavalry. The amount of picket duty performed by mounted men, was out of all proportion to their numbers or the necessities of the case. Worn out troopers, lounging in muddy and frozen saddle kits, on half starved horses, characterized the outpost duty of the Army during the winter of 1861 and 1862.''

On the other hand, circumstances may make it necessary for an arm to temporarily assume the role of another.

During the recent insurrection in the Philippine Islands the scarcity of cavalry made it desirable to form mounted detachments of infantry at many of the stations of the Army. These detachments rendered necessary and almost indispensable services.

INFANTRY.

Both numerically and in the effect of its action, infantry is the most important of the three arms. Since the introduction of firearms, its development has kept pace with the improvements of its weapons, until today its prominence is such that armies are judged by the standard of their infantry, and no deficiency in its numbers or morale can be counter-balanced by any extraordinary efficiency of the other arms.

Modern infantry is so trained, armed and equipped as to adapt it for offensive or defensive action and at either a halt or in motion. It can maneuver and fight over ground that is impassable for the mounted soldier, and unit for unit it can be raised, equipped and trained. into a state of efficiency, much quicker and at a considerably less cost than either of its contemporaries. When once raised, the expense of its maintenances is small as compared with that of the other two arms.

Perhaps partly on account of the celerity with which infantry can be raised and equipped, a dangerous idea has obtained credence with a number of our people as well as with some of our lawmakers, that, as a nation, we have no need for a standing army. It is thought that the multitude of patriots, who in time of war, will respond to the call to arms? can safely be relied upon to form an efficient army in a very short time. The disasters, whieh attended the operations of the Union forces, during the early part of the Civil War, refute this notion, and our later experiences in the war with Spain eertainly emphasize the dangers and. disadvantages of mobilizing large.

bodies of partly trained troops. It was fortunate for the United States that in this war its adversary was only a third rate military power and that our navy and small regular army were in the highest possible state of efficiency.

The proper tactical handling of a mixed force does not contemplate the independence of any one arm, although infantry in its -maneuvering and action is more nearly independent than either cavalry or artillery. It is, however, less mobile than either of the-m, since its rate of march must conform to the paee of the individual soldier. At drill it marches at the rate of 100 yards per minute, or about three and four-tenths miles per hour, but while advaneing to the attack, outside of the fire zone, not more than three miles per hour can be expected of it. Advancing while firing, but without seeking cover, its pace would be reduced to about 40 yards per *minute and it would cover only 20 yards per -minute while advancing by rushes.

On the march infantry will, on good roads and under favorable conditions, average three miles an hour while actually marching, Heat, head winds, driving rains from the front, rough roads, mud, sand, dust, snow and ice, all tend to reduce its speed in varying degrees, but if marching on good roads, intense cold will quicken its pace.

Its average rate of marching, including halts, is from two and one-half to two and three--quarter miles an hour, but the size of the column and other conditions may render a greater rate than two miles an hour impossible.

In its effective action, infantry is limited only by the range of its rifle, which in these days somewhat exceeds 2,500 yards.

The arms of the foot soldier are the rifle and the bayonet. The military rifles, at present in the hands

of the infantry of the six or eight foremost military powers differ but little in weight, range or trajectory. Most of the improvements in military firearms, made during late years, have tended to lower the trajectory, increase the penetration, simplify and expedite loading, and in the case of rifles to reduce the weight of the weapon. The United States has not been backward in the adoption of improvements and it is claimed by our Ordnance experts that the United. States Magazine Rifle, Model 1903, now being manufactured for our service, is in many respects, superior to any other military rifle in the world. If, as is said, this rifle is so constructed as to make jamming impossible, it is eertainly a big step i-n advance.

The U. S, Magazine Rifle, Cal. 30, Model of 1903, including the rod bayonet, weighs 8.939 pounds or nearly two pounds less than the rifle of 1898 together with the sword bayonet and its scabbard. The total length of the 1903 model is 43.43 inches; that of the model. of 1898 is 49 inches. The barrel of the new rifle is 24.206 inches in length or about 6 inches shorter than that of the rifle now in use. A wooden guard or cover, extending from the rear sight to the upper band, incases the barrel and prevents the hands from coming into contact with any metal parts that may become heated by rapid or continuous firing,

Like the rifle of 1898 the new model can be used either as a single loader or a magazine rifle. 'Twenty three aimed shots have been fired from it in one minute, used as a single loader, and twenty-five shots in the same time, when using the magazine. Cartridges for the new rifle will be supplied in clips, each clip holding five rounds, The cartridges weigh about 450 grains each and differ from the small arm ammunition now issued in that each cartridge shell h-as a groove in its head to provide for the extraction of the cartridge or the ejection of the empty shell,

In connection with the new rifle, a rod bayonet has been designed to 'take the place of the sword bayonet now carried by our infantry. This rod bayonet consists of a rod of highly tempered steel, about one fourth of an inch in diameter, with a flanged point or head,

When "fixed' ' it projects 10 inches beyond the muzzle of the rifle and is held rigidly in place by a catch which fits into a groove in the bayonet. When '"unfixed" it slides back into the stock and the same catch, working in another groove in the bayonet, prevents it from slipping out.

Nearly all nations arm their foot soldiers with some kind of bayonet, In most eases it is of the sword variety. The ob j ect of the bayonet is to provide the soldier with a weapon for defensive or offensive action. at close quarters, so that he will not be entirely helpless should his ammunition become exhausted. Although some undoubted military authorities have from time to time advocated that the bayonet be abandoned, it isdoubtful if it will ever be entirely disearded. Its possession certainly adds to the morale of the soldier and its cause a corresponding depression when he confronts an enemy who is thus equipped.

Aside from its character as a weapon, the sword bayonet has proven of great utility in other ways. At Santiago, where, owing to the exigencies of the service, coffee was issued unground, the soldiers used the hilt of the bayonet to break up the beans and make it possible to extract the essence. As a can opener its use in the field has been general and in. eonjunction with the lid of the meat can it has proven a convenient intrenehing tool. It certainly seems that, other things being equal, the soldier armed with a bayonet like those at present in use, would

have a decided advantage over one equipped with the rod. bayonet described above. The only disadvantages of the sword bayonet, so far developed, are its weight, about 1.4 pounds, including scabbard, and the difficulty sometimes experienced in quickly withdrawing it from the human body. The first is hardly sufficient to warrant its rejection and the second could no doubt be overcome by slightly changing the shape of the blade,

Europe, profiting by the lessons of the Russian-Turkish War, has generally recognized the value of hasty and some for-m of intrenching tool now forms part of the equipment of the Continental infantryman. We have, at various times, issued in-trenching tools to our infantry but for some reason or other, their use has been discontinued. It is said that in Manchuria, both the Russian and the Japanese infantry carry shovels and picks as religiously as they do their rifles, and certainly if the sword bayonet is to be replaced by the rod bayonet, an intrenching tool form a part of the i-mpedimenta of our infantry,

The act-ion of infantry consists of fire action, shock action and a combination of the two. Of these is the more the latter is its complement, and infantry incapable of shock action at the proper time, would rarely obtain important results.

It is the endeavor of infantry, acting on the offensive, to obtain such a superiority of -fire over its adversary as to keep its own 'losses at a minimum and enable it to approach close enough to the enemy to carry his position by assault. On the defensive, superiority of fire is sought in order to delay the assailant's advance, break up his formation and pave the way for the counter attack, Although campaigns may be decided by marching and superior strategy,

battles are seldom decisive unless real or threatened shock action supplements the fire of the infantry and artillery,

To be efficient, infantry must be able to deliver an effective fire on the enemy and at the same time so conduct itself as to avoid ruinous losses in return, It must also be able, at the proper moment, to resort to shock action. To attain these ends it is necessary that the soldier be armed with a serviceable rifle and trained in marksmanship and fire diseipline. A bayonet must be given him as a weapon of last resort and he must know how to use it to the best advantage.

He must carry on his person at least 120 rounds of ammunition and ample provision. must be made to replenish his supply while under fire. Last but not least his equipment must include an intrenehing tool fro-m which, in the field, he should never be separated.

The question of ammunition supply on the firing line is one whieh is now engaging the attention of some of the brightest military minds and various appliances have been devised to accomplish this purpose.

None of these has as yet undergone the test of actual warfare and the United states has done no more than plan for regimental and battalion ammunition wagons, These wagons will transport the ammunition, which will be packed in bandoleers, each holding 60 rounds, from the tram to some convenient point in rear of the line, whence it will be carried forward by hand.

In the light of recent progress, it is appropriate to consider the use of machine guns as one of the functions of infantry. A machine gun may be defined as consisting of any number of breech loading,

rifled. barrels, grouped about an axis, or arranged in a horizontal line. These barrels may be loaded and. fired in continuous succession, or by volleys, by mea-ns of suitable machinery, at the breech, to which power is applied by either crank and gearing or by levers, Only is used. and the empty shells are automatically ej ected. Formerly, whenever -machine guns were used at all they were attached to the artillery or operated by detachments of that arm. It is thought now 'chat their manipulation belongs more properly to the infantry, and. that each battalion should have at least one machine gun permanently attached to it and at all times under the immediate direction of the battalion commander,

In accordance with this view, the War Department directed that a series of tests be undertaken for the purpose of ascertaining what variety of maehine gun is best adapted to our needs. These experiments resulted in the selection of the Vickers Sons and Maxi-m Automatic Machine Gun, caliber 30, on wheeled mount. Ninety of these guns are now being manufactured under the direction of the Ordnanee Department, one for each of our battalions of inf an-try.

While there is no doubt as to the value of machine guns as an aid to infantry acting on the defensive, the advantage of their use in an attack is denied by many authorities, who claim that the results of their use in this manner at Santiago have been greatly exaggerated, Also that the conditions in that battle were so unusual as not to furnish a just ground for the conclusion that they are desirable in Most taetieians advise their use with advance and rear guards and with cavalry on raids etc. Like other weapons, whose possibilities have been increased by recent improvements, their value still remains largely problematical,

CAVALRY.

The chief characteristic of cavalry is its great mobility or its ability to travel long distanees in comparatively short periods. At a walk cavalry moves at the rate of about four miles an hour, its maneuvering trot is at the rate of eight miles an hour and at a slow trot its speed is six to six and one-half miles an hour. The alternate walk and trot, which is becoming more and more the route pace of cavalry, is about five miles an hour, The maneuvering gallop is at the rate of twelve -miles an hour. It is only near the consummation of a charge or in an emergency that the full or extended gallop, at the rate of sixteen miles an hour, is taken

Mobility is the characteristic which enables cavalry to take advantage of fleeting opportunities that would vanish before infantry could strike. It enables it to safely operate at long distances from its main army and renders it of great value for harassing the retreat of a beaten enemy and changing his orderly withdrawal into a complete rout.

Only the relatively great cost of raising and maintaining it, about five times that of infantry, the long training necessary, to make it efficient and the difficulty of providing it with well chosen mounts, and supplying it in the field, prevent it fro-m becoming much more important numerically. No general can long continue successful unless his army possesses its proper proportion of good and efficient cavalry. Without it he can seldom know what his enemy is doing nor can he prevent his opponent from learning his plans and movements.

Its lack makes it difficult for the victor to reap the full fruits of victory and. for the vanquished to conduct his retreat in an orderly manner, if the cavalry of the pursuing force is numerous and energetic.

Undoubtedly the practical annihilation of Napoleon's cavalry contributed largely to the disastrous ending to his invasion of Russia and he failed to secure the greatest effect from his victories at Lutzen and Bautzen because he had not sufficient cavalry to pursue his beaten enemy, After the battle at Leipsic his cavalry was weak and consequently lost all track of the allies for days, while their cavalry kept them completely informed of his every movement,

The action of cavalry consists of shock action, mounted, fire action mounted and dismounted and detached action, Prior to the Civil War mounted shock action constituted the principal dependence of cavalry. Since that time dismounted fire action has to a large degree displaced it for both defensive and offensive operations especially when the cavalry is opposed by infantry or artillery. However mounted shock action has not become obsolete: on the contrary many occasions must arise in the future, both on the battlefield and in connection with detached action, when it would be a serious mistake not to resort to it.

When used, its effect depends on weight and speed, supplemented by the use of the sabre, lance or revolver in the ensuing melee. The two former weapons are essentially for use in shock action while the latter, the revolver, has also in several instances been very successfully employed in conjunction with the rifle in dismounted fire action, ''At Guntown, Mississippi, in 1864, Forrest 's Confederate Cavalry repulsed a well conducted attack of Union infantry, by using rifle fire until the assailants -were within close pistol range and then opening fire with revolvers.'' Now on account of the rapidity with which the modern carbine or rifle can be loaded and. fired, it

is hardly likely that under similar circumstances recourse would again be had to the less accurate revolver fire.

The lance has never found favor in our service although for years it was the weapon most relied upon by the cavalry of Europe, where today it still retains some of its former prestige. Its friends claim that, like the bayonet in the hands of infantry, it improves the morale of the troops armed with it and lessens the confidence of the enemy unless he is similarly supplied, Also, that when cavalry equipped with the lance encounters in a charge, other cavalry armed with the sabre, the greater length of the lance will give its users the advantage, that in mounted action against infantry lying prone, it will do better execution than the sabre. On the other hand it is evident that in a hand to hand encounter, unlike the sabre or revolver, it is practically useless. It is certainly a nuisance in a close or wooded country, and cavalry on outpost or reconnaissance are much more conspicuous with, than without it.

In the same manner the relative merits of the sabre and the revolver have been exhaustively discussed by our officers, and with an equally indefinite result, The War Department, pursuing a safe course, has equipped the cavalry with both of these weapons so that in any event it will be at no disadvantage. The only arguments against continuing the sabre as part of the trooper's equipment are its weigh-t, which is hardly sufficient to cause its rejection and the fact that its bright parts, by reflecting the sun's rays, tend to disclose the presence of the troops while they are yet so distant from the enemy that he would not otherwise discover them. It should not be difficult to manufacture sabres with a bronze or other dull finish and thus obviate this very disadvantageous feature.

The modern cavalryman is armed with the magazinc riflle or carbine and trained in marksmanship and dismounted. maneuvers as assiduously as is his comrade in the infantry, The range of the carbine is al-, most as great as that of the rifle and its trajectory is but little higher. Its possession greatly enlarges his field of usefulness and enables him to perform. effectively many duties which he would be unable to accomplish without it. It makes his most important fun&ion, detached action, safe and possible by giving him an independence of movement he could not otherwise obtain.

It is the present intention of the War Department to eventually replace the carbine in the hands of the cavalry, with the new U. S. Magazine Rifle, As above stated this rifle is fitted with a rod bayonet, consequently our cavalryman. when equipped -with this new arm, will be capable of shock action dismounted, something never before required of him,

Mounted fire action with the carbine has seldom been resorted to in the past and probably will never be necessary again. Its use could only be justified when the nearness and dash of the enemy makes it unsafe to dismount and impossible to gather the necessary momentum for a charge. Even on these rare occasions, the modern revolver would be a more convenient and accurate weapon,

The detached action of cavalry is now by far its most important role, Acting detached, it screens the -movements of its own army from the knowledge of the enemy and discovers and reports the operations and intentions of its opponents. All scouting and re-, connoitering performed by cavalry, as well as raids conducted by it, are forms of detached action in which cavalry excells.

European cavalry is classified according to the size of the men who compose it and their mounts, as!,

Sight, medium, and heavy cavalry. Heavy cavalry is made up of large men, mounted on heavy horses and its function is principally mounted shock action, although in emergencies it has been called upon to perform work, more appropiate for light or medium cavalry,

Light men mounted on horses selected for speed, endurance and agility, rather than weight, form the rank and file of light cavalry. Detached action and all that that service implies is the role of the light cavalry,

Medium cavalry consists of men of average size, mounted on horses of medium weight and possessing to some extent the characteristics of both light and heavy cavalry, Probably the best medium cavalry in the world today is that of our own regular army.

Inside of the above classifications, mounted troops are designated, according to equipment and training, as cuirassiers, lancers, hussars and dragoons, Cuirassiers derive their name from the cuirass or breastplate of steel, which they formerly 'wore in battle but which now forms part of their equipment only on occasions of ceremony, Lancers, as their name implies, are armed with the lance as well as the sabre. Nearly all of the English, French and German cavalry use the lance for ceremonies and can properly be termed lancers. The hussar is the light cavalry soldier, so named on account of his training and adaptability for scouting, reconnaissance and other detached work, Dragoons were cavalry so armed and. trained as to be capable of effective action both mounted. and on foot,

These classifications were formerly of much more importance than at present. Now nearly all cavalry, light, medium and heavy, whether they are cuirassiers, lancers? hussars or dragoons are armed with rifles or

carbines as well as the sabre or lance, and are expected to fight dismounted when necessary,

The tendency of both, English and Continental cavalry of late years has been to approach, perhaps unintentionally, nearer to the standard set by American cavalry. Unhampered by traditions, which have retarded the advance of cavalry in Europe? the American trooper, developing under the leadership of daring and enterprising commanders, has initiated many reforms in mounted service and in a way set the pace for the cavalry of other nations, The raids of Stuart, Forrest, Wilson, Grierson and others in the Civil War, opened the eyes of the world to a new and valuable use to which cavalry can be put.

Some European writers have advocated the use of mounted infantry in conjunction with cavalry acting detached and perhaps something of the sort is required to give some European cavalry the resisting power and independence necessary for the proper performance of detached service,
cavalry, however, needs no such support and infantry should not be called upon to perform mounted duty unless scarcity of cavalry makes it imperative. As before stated, this was the case in the Philippine Islands in 1898. Two other notable instances are recorded of the successful and appropriate use of mounted infantry. In 1877 the 5th U. S. Infantry, mounted on ponies captured from the enemy, performed excellent service in the campaign against the Sioux Indians. Again in 1899 a battalion of the same regiment then doing garrison duty in and about Santiago-de-Cuba, was mounted on Cuban horses and greatly aided in the work of restoring law and order in the neighboring country districts. General Kilpatrick's saying ' "that cavalry can fight anywhere except at sea" might perhaps now be modified with respect to our cavalry, since in 1899 in the Philippine Islands it was actually

employed on gunboats and cascos against the insurgents on the Eaguna-de-Bay.

ARTILLERY.

Artillery is primarily divided into heavy artillery and light artillery. The heavy artillery of an army in the field consists of siege guns, batteries of position and the artillery ammunition and supply trains. By batteries of position, are meant any batteries used in any manner for defending or attacking important points when such use requires little or no mobility. Both the Germans and French have organized what are termed regiments of foot artillery. These regiments consist of batteries of very heavy guns each drawn by eight horses and in some instances provided with portable shields for the protection of the gunners, We have but two batteries of siege artillery and these are armed with guns of a somewhat antiquated type. The Ordnance Department is now experimenting with siege ordnance and in the near future we may hope for an improvement along this line.

Light artillery includes field, horse and mountain batteries. Field artillery is again divided according to the caliber of the guns into heavy field batteries and light field batteries. There are twenty-two light batteries in the United States Army, each equipped with four 3.2 inch breech-loading, rifled cannon and eight caissons. Four officers and 120 enlisted men compose the personnel of each battery. On the march the cannoneers of light field batteries either walk beside the guns and caissons or are mounted on the limbers, caissons or off horses,

Horse artillery is -merely light field batteries whose mobility is greatly increased by having their entire personnel mounted on horses and by reducing the number of ammunition chests on each caisson to two, At the present time our organization includes

but two batteries of horse artillery whose armament is indentical with that of our light field batteries.

Mountain batteries are light guns especially adapted for use in a rugged country where steep grades, bad roads or the like make it difficult or impossible to maneuver heavier ordnance, The guns of mountain batteries are usually transported upon the backs of mules and horses and the parts assembled. at the time and in the place of their employment. The United States Army is very defficient in mountain artillery. It has only four batteries of that description,

The gun is the main arm of the artillery. For personal defense and to enable them to perform guard duty, artillerymen are armed with the revolver. Sergeants also carry the sabre and in some armies the privates are supplied with a knife. Occasions are rare that would justify an artilleryman in resorting to his individual weapons, as it is his duty, under all circumstances, to operate his gun to the last possible moment. However, when surprised by a charge of cavalry or infantry-, or when out of ammunition and the enemy is close at hand, the side arms of the cannoneer should certainly be used to supplement the action of the infantry or cavalry supports.

Artillery habitually moves at a walk, which, as in the case of the cavalry, is about 4 miles an hour. In urgent cases the batteries may be required to trot for several miles on a stretch. On a forced -march the slow trot alternates with the walk, the resulting speed being about 5 miles an hour, When marching in column behind infantry, the pace of artillery must be reduced to conform to that of the former arm, Light field artillery usually maneuvers at a trot and takes up the gallop only under exceptional circumstances. Horse batteries gallop whenever the conditions are such that it would be required of cavalry,

Artillery is an indispensable arm and its progress and development have kept pace with the advance of the science of war, It is the only arm that can demolish material objeets at a distance, and it alone, if not opposed by other artillery ean greatly damage, and perhaps stop the advance of the enemy's infantry and cavalry, before they reach a point from which an effective return can be made.

The fire of artillery is not affected so much by the personal equation of the troops as is that of the other two arms. When once the gun is properly laid, no individual nervousness on the part of its cannoneers ean reduce its accuracy, and its recoil bruises no shoulder. Moreover, since as a rule, it goes into action at a much greater distance from the enemy than does either of the other arms, its manipulation will be attended with but little excitement. Artillery employs only fire action and its fire is effective only when the pieces are stationary. Although some contend that artillery ean act independently, it is difficult to conceive of a situation, in which it could very well get along without the support of one of the other arms.

Artillery, like cavalry, requires much time to train and equip, All improvements made in material have tended to lengthen the time necessary for its manufacture and to make it more expensive to provide and maintain.

The effective handling of modern field ordnance presupposes a personnel of a high order of intelligence and long and systematic training and instruction in gunnery and tactical maneuvers.

One of the greatest weaknesses in the regular army of th.e United Staes today, lies in its deficiency in the strength of the field artillery. Our thirty batteries, when organized in accordance with a recent War Department order will comprise but 120 guns or

only enough to form the artillery component of one army corps.

A battery of light artillery, in column of sections, occupies about 350 yards of road space, or nearly that required for a battalion of infantry. As said by General Grant in connection with his arrangements after the battle of Spottsylvania, "Artillery is very useful when it can be brought into action, but is a very burdensome luxury when it cannot be used. Before leaving Spottsylvania, therefore, I sent back to the defenses of Washington over 100 pieces of artillery, with the horses and caissons. This relieved the road over which we were to march of more than 200 six-horse teams, and still left us more artillery than could be advantageously used. ''

Field artillery, when provided with telescopic sights, has been used with good results at a range of more than 5000 yards, but it is seldom that an unobstrueted view for more than 3000 yards ean be obtained. At any rate 3000 yards is the extreme range at whieh direct Are will ordinarily be delivered. Beyond this distance it is very difficult, even with the best glasses, to observe the effect of artillery fire.

Depending upon the distance of the artillery from its target, the field, between its position and the enemy, may be divided into three zones. In the first zone the pieces are from 3000 to 2000 yards from the enemy and the fire is at '(long range". Mere, although its own fire is eff eetive, it has but little to fear from that of the opposing infantry. The battery is in the seeond zone and its fire is termed ''medium range' ' when its position is from 3000 to 800 yards from the enemy. Within this zone the fire of the artillery inereases rapidly in effectiveness but the fire of the enemy's small arms causes many easualities among the men and horses, unless they are well protected by cover, Short range fire is that delivered by guns

from positions less than 800 yards from the target. The use of artillery within this third zone is exceptional. Unless the terrane is such that the pieces are well covered, or the object to be attained warrants risking its total annihilation, artillery would not enter upon this zone,

The fire of artillery is classified, as regards trajectory as:

Direct fire, when delivered from guns with service charges at seen objects.

Indirect fire, when delivered over an intervening obstaele at unseen objects, 'This fire was used with good effect by the Boers on several occasions during the recent war in South Africa.

Curved fire, when delivered from guns with reduced charges, and from howitzers with reduced charges at short ranges and service charges at long ranges, at angles not exeeeding fifteen degrees.

High angle, when delivered at
ing fifteen degrees, by howitzers with reduced charges and mortars with service charges,

As regards direetion, artillery fire is classified as: Frontal, -when it is delivered at right angles to the enemy's line and, sometimes, when. delivered straight to its own front,

Oblique, when the direction of the fire is at an oblique angle to the enemy's line,

Enfilade, when it is delivered from positions in prolongation of the enemy's line. Planking fire is that delivered from guns, so placed on the flanks of a defensive position, as to enfilade the enemy as he approaches,

Reverse fire is that delivered so as to strike troops or lines of defense in the rear,

Cross fire is that delivered simultaneously from

guns in different positions so as to cross on or in front of the enemy's line,

The proj ectiles commonly used by artillery are shell, shrapnel and cannister or ease shot, Shell may be classified as eommon shell or torpedo shell,, shell is a hollow, cast iron or steel cylinder with an original head, closed at one end and filled with gunpowder, Torpedo shell differs from a common shell in that gun cotton takes the place of powder as a bursting charge, Percussion shells can generally be used against all troops and material, which may be the target of artillery fire and is the proj ectile commonly employed to destroy buildings, parapets, obstructions, etc. as well as to set fire to towns and houses, It may also be used with good effect against troops in mass or when it is possible to deliver it from positions which enfilade the enemy's line.

Direct hits are necessary when shell. is used against guns, limbers, earthworks, houses, etc., and its effect is then due to percussion, penetration, and the explosive force of the bursting charge. When directed against men or horses attempt is made to have it burst on first graze, in front of the target) and the damage it causes is then due to splinters.. Much of its effect is lost when its first graze is on marshy or soft ground or in a hollow or cut.

Common shell is effective at all ranges up to 4000 yards and has on several occasions been used with good results up to 5500 yards, It is the proj ectile commonly used in ranging even when it is intended to afterward resort to shrapnel, as the smoke from its bursting charge can commonly be seen at long distances.

Torpedo shells are especially designed to search out troops behind cover. Their charge is so placed as to cause the fragments to change direction and

and the eover when the time fuse is cut, so that the shell bursts above and just a little in rear of the parapet. The use of torpedo shells is largely they have yet to stand the test of actual service. On account of the high explosives with which they are charged, it is thought their transportation will be attended with great danger.

Shrapnel differs from common she12 in that it is filled with bullets about one half inch in diameter, and has only a suffi cient bursting charge to rupture the envelope and release the bullets, which then move forward with the velocity which the projectile had at the moment of bursting, The bullets are placed in the ease in circular layers and held in place by "separators", These "separators" are short, cast iron cylinders, so weakened by radial cuts, that they will be fractured by the explosive force of the bursting charge and increase the effect of the shrapnel, by forming additional fragments,

The effect of shrapnel is due to the penetration of the bullets and the fragments of the case and separators. This penetration is small and shrapnel is used only against a living target. It is preeminently the man killing projectile just as the shell is the one best adapted for the destruetion of material obj ects. It can be used at nearly all ranges and has produced good results at over 3500 yards In the first zone of fire, from 3000 to 2000 yards, it is effective, while at the shorter ranges it becomes rapidly more and more decisive until at 1100 yards or under it is absolutely annihilating, if the guns have a free field of fire and are accurately ranged.

Cannister consists of east iron or tin cylinders, packed with bullets, theinterstices being filled with sawdust, res-in or like material, The cylinder or ean is ruptured by the shock of discharge and the bullets scatter

very mueh after the manner of the shot fired from a smooth bore shot gun. It is used for defense at close ranges. Its effect is largely diminished when the ground in front of the guns is rough or soft and prevents riehoehets. Standing crops or brush will also render eannister less effective. Its use is now almost obsolete as the ordinary shrapnel, with its fuse set at zero, will attain all, the results ever claimed for cannister.

Rapid firing guns are single barreled, rifled cannon using ammunition, in which the projectile, charge and primer are combined, so that only one operation is necessary in loading. Their breeeh mechanism is operated by means of levers, so arranged that from five to ten shots may be fired in one minute, In addition to the advantage which their rapidity of fire gives these guns over the ordinary field piece, they are also better adapted for operations in wet weather or for fording streams and and rivers.

Since the charge of their projectile is protected by a metal shell, it is less liable to become damp than when transported, like the ammunition for field guns in canvas bags.

The caliber of these guns varies fro-m X.45 to 3.54 inches. Those of small caliber fire shell only; the larger both shell and shrapnel.

Rapid firing guns will shortly displace the 3.2 inch cannon as the arm for our light field and horse batteries" One or more batteries are already using the new guns and the rest of the field. artillery will be so equipped as soon as they can be manufactured, As regards those qualities which constitute excellence in field ordnance our new rapid firing gun. is unexcelled by any cannon now in use -in any of the armies of Europe,

When in action, within the zone of small arms fire, or when, as is usually the ease on the defensive, they are opposed by a superior force of artillery, guns must have cover, Cover for artillery may be either natural or artificial.

Natural cover consists of any protection whieh the terrane affords and includes marshes, heights, ruts, ledges of earth, etc., which will catch or turn aside projectiles, and hedges, fenees, woods, the reverse side of hills and ridges, etc. , which will conceal the guns and pre-vent the enemy from accurately finding the range,

Artificial cover includes gun pits, epaulments and ordinary intrenchments.

Gun pits, as the name implies, are excavations, about two feet deep and of a sufficent size to eontain the piece and its cannoneers, the excavated earth being banked up in front for additional protection. They afford good cover but limit the free movement and full employment of the guns, besides being more or less conspicuous, They are also difficult to dram in wet weather.

An epaulment is constructed by throwing up an embankment in front of the gun, whieh rests on the natural surface of the ground. The cannoneers are partially sheltered in the pits, made in obtaining earth for the the embankment. Epaulmentn afford a better -field of fire than gun pits, require no draining and allow of greater freedom of action. They afford but partial protection from fire and are more conspicuous than gun pits.

It is only en the defensive -that artillery can take advantage of artificial cover and even then, if the guns are massed in large batteries, tactical considerations will often necessitate its being dispensed with. On the offensive artillery -must depend for protection

on such cover as the ground affords and on the effective handling of its guns.

The education of a soldier, whether he belongs to the infantry, the cavalry, or the artillery, must include a knowledge of how to make the best use of cover at every proper opportunity and his discipline must be such that he will leave it promptly when ordered,

TENNEY ROSS,
Captain 7th Infantry.

December 12, 1904.

QUESTION SHEET

Lecture No. 13.

1. What are the powers and limitations of infantry?
2. How is infantry armed?
3. Describe the action of infantry.
4. What is the pace of infantry under various conditions?
5. State the essential qualities of infantry.
6. Define machine guns.
7. What is the chief characteristic of cavalry?
8. What is the pace of cavalry under various conditions?
9. Describe the action of cavalry.
10. Upon what does the effect of shock action depend?
11. What are the arms of cavalry?
12. What new power will U. S. Cavarly have when armed with the U.S. Magazine Rifle, Cal. 30, Model of 1903?
13. What is now the most important action of cavalry?
14. How is the European cavalry divided and classified?
15. How is artillery primarily divided?
16. What does heavy artillery comprise?
17. What does light artillery comprise?
18. How does horse artillery differ from light field artillery?
19. What is the chief characteristic of horse artillery?
20. What is the arm of artillery?
21. What is the pace of artillery under various conditions3
22. State the powers and limitations of artillery.
23. Describe the zones of artillery fire.
24. Define rapid firing guns,

"Whatever arguments may be drawn from particular examples, superficially viewed, a thorough examination of the subject will evince that the art of war is both comprehensive and complicated; that it demands much previous study, and that the possession of it in its most approved and perfect state is always of great moment to the security of a nation."

WASHINGTON'S LAST ANNUAL MESSAGE.