

NUMBER TEN.

GENERAL SERVICE & STAFF COLLEGE
LECTURES.

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AUG 28 1906

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MODERN IMPROVEMENTS
IN FIRE ARMS AND THEIR TACTICAL
EFFECTS.

BY

Captain J. C. Dickman, 5th Cavalry.

Instructor, Department of Tactics.

SEPTEMBER 20, 1902.



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IN FIRE ARMS, AND THEIR TACTICAL EFFECTS.

Of the two hundred and fifty thousand soldiers assembled at various camps in the United States within a few months after the outbreak of the *Spanish-American War*, all but the regulars and one regiment of volunteer cavalry were armed with the Springfield rifle, caliber 45, single loader, and firing black powder.

Smokless powders and high power magazine rifles at that time were no longer in the experimental stage. Even second class powers were provided with them, and their value had been fully established in several wars. Nations, however, as well as individuals, are slow to take up expensive new ideas unless forced thereto by keen competition or bitter experience. No troops of the United States had ever been in armed conflict with an enemy using smokless powder and magazine rifles, but, in a war at our doors, such weapons had for several years been in use by Spanish troops. When the storm of war broke after a long period of muttering, barely ten per cent. of our troops were armed with modern rifles; and it is doubtful, when dismounted regular cavalry was preferred to the best volunteer infantry available, whether the question of arms was even considered. Who ever made that decision probably builded better than he knew.

The attempt by one of the regiments of the Santiago expeditionary force to use black powder ammunition brought the great disadvantages thereof into such bold relief that the question was settled for all time.

The changes which have been made in the armies of all civilized nations within the last ten years, and the effects thereof, may be considered under the following heads:

1. Smokeless powder;
2. High power rifles;
3. Reduced caliber;
4. Flat trajectory;
5. Magazine systems of loading.

In recent years a great variety, of smokeless powders, or of smoke-weak powders, as the Germans call them, has been developed. Without going into the details of their manufacture it suffices to say that they all tend to produce approximately the same result as to high pressure and absence of smoke. The effects of the combustion are invisible to the human eye, but not to the photographic eye of the camera. The inventor who shall contrive to modify the wave lengths of the explosion so as to bring them within the range of the optic nerve, may consider his fortune as made. At present, all that can be discovered under the most favorable circumstances, is a light haze, which is soon dissipated. This has led to some interesting tactical results. The old rule of aiming at the lower line of smoke has, of course, disappeared. Sharpshooters placed in trees or clumps of bushes, or behind rocks, or other covering objects, no longer fear betrayal by the tell-tale puff of smoke. The party advancing to the attack will be in an uneasy frame of mind, for every tree and rock will be suspected of concealing sharpshooters. If the enemy has sufficient instruction and discipline not to expose himself to view, it will be very difficult to locate intrenchments and lines of deployed troops. Skillful construction and concealment of trenches, adoption of inconspicuous uniforms, and the masking of guns so as to conceal the flash of discharge, are devices used in recent wars. To these may be added deception by simulating fire of cannon at situations where there are none, and by exposing a few men, thus drawing the fire of the attack upon places where it can do little or no damage. For the attack, there will be no mantle of smoke to hide the horrors of the battle field or afford cover for the movement of bodies of troops. The moral effect of suffering severe loss without knowing whence it comes, and consequent inability to reply to the enemy's fire, is also very great. The difficulties of reconnaissance are vastly increased, and more men than ever will have to be sacrificed in order

to obtain information. For the Cavalry and Mounted Infantry, especially, this will be a serious matter. The enemy will either remain in concealment, in which case a false report would be made, or else will wait until a sufficient number of mounted men have passed through the line to make it worth while to take them in. The features indicated above were developed to a high state of perfection in the recent South African War, and undoubtedly a certain amount of imitation in that line will be met with in future wars and even in field maneuvers. The attack, of course, endeavors to neutralize these advantages by greater skill in reconnoitering, neutral tints in uniform, accuracy in shooting, the general use of field glasses and telescopes, the employment of balloons, etc.

Apropos of neutral tints in uniforms, to take this opportunity to mention the fact that many persons have an altogether erroneous idea as to the most important advantage of inconspicuous colors. They seem to think that the principal object is to make it difficult for the enemy to draw a bead on individual wearers of such uniforms. This is true to a certain extent, although modern battles are fought at great distances, but the greater advantage lies in the fact that it places the wearer in a good condition to make a reconnaissance of the enemy, at the same time making it difficult for the enemy to discover him. A scout in dark uniform, opposed to one in drab, would nearly always be discovered first, and the latter by earlier information would give his commanding officer the initiative. In the struggle for the survival of the Attest the advantage of neutral colors has been known for thousands of years; yet, such is the tenacity of conservatism, that they have not yet been universally adopted for field uniforms.

The pressure of the gasses derived from smokeless powders is so much greater than was the case with black powder that of the many kinds of breach mechanism, the bolt system is almost the only one to survive. It has also been found necessary to increase the thickness of the barrel, especially near the seat of the cartridge, and to improve the quality of steel. With our latest rifle the initial velocity is double what we used to have in the Springfield, resulting in a corresponding increase in range and penetration. High power in a rifle can be attained, no matter what the calibre may be, by mak-

ing a proportionate increase in the strength of the parts. But this brings us up against two other difficulties. The weight of a military rifle must not exceed a certain number of pounds, on account of the fatigue it imposes on the bearer. The velocity of recoil of the rifle is determined by multiplying the weight of the bullet by its initial velocity and dividing the product by the weight of the rifle. The force of the blow of recoil is proportional to the weight of the rifle multiplied by the square of the velocity of recoil. Now, since it is desirable to have great sectional density of the projectile to enable it to overcome the resistance of the air, and as great initial velocity is necessary to obtain a flat trajectory, there was only one way of keeping the recoil of military rifles within bounds, and that was by reducing the calibre.

The history of portable fire arms shows a continuous reduction of caliber, from over three quarters of an inch in 1630 to one quarter of an inch in the most modern rifles. For various reasons it is believed that the limit of reduction has been reached with rifles of 6.5 mm. caliber, (about one quarter of an inch), of the Daudeteau type. With smaller calibers still greater initial velocity is obtainable; but the powder pressures increase enormously and approach dangerously close to the limit, about 60,000 pounds to the square inch, whereas the remaining velocity of the bullet diminishes very rapidly, owing to the resistance of the air. Until a steel of greater tensile strength can be found it will therefore hardly be profitable to indulge in further reduction of caliber.

The greatly desirable property sought for in modern military rifles is flatness of trajectory. The greater the initial velocity of a bullet the more space it will pass over in a given time, other things being equal; consequently, the flatter will be the trajectory. To express the degree of flatness of the trajectory we measure its greatest departure from the line of sight, or the highest ordinate of the curve. In comparing different rifles the length of the highest ordinate for the various ranges will give an accurate idea of the power of the rifles. Practically all nations, have adopted calibers of between 7 and 8 mm., and the powers of their rifles are about the same; very few have gone below 7 mm., which is the caliber of the Spanish Mauser.

The advantages of increased flatness of trajectory are so evident that they do not need elucidation. For purposes of comparison we have drawn the trajectories of three rifles: (1) The Springfield Rifle as a type of the black powder rifles; (2) The U. S. Magazine Rifle (Krag-Jorgensen), representing the type now most in use; (3) The Daudeteau Rifle, caliber 6.5 mm., representing the limit in reduction of caliber. The curves of the trajectories afford a graphic illustration of the great advance made since the introduction of smokeless powder. The following are some of the principal data pertaining to these three rifles:

	SPRINGFIELD.	U. S. MAGAZINE.	DAUDETEAU.
Bullet.	500 gr.	220 gr.	154 gr.
Powder.	70 gr.	34-42 gr.	51 gr.
V_0	1300 ft.	2000 ft.	2733 ft.
V_{1000}	712 ft.	_____
V_{1100}	792 ft.	1010 ft.
V_{2000}	_____	527 ft.	660 ft.
Highest Ordinate, 700 yds.	17 +	10.5 ft.	5.25 ft.
“ 1100 yds.	_____	37.7 ft.	21.32 ft.
“ 2000 yds.	228 ft.
Pressures.		38,000 lbs.	48,500 lbs.
Penetration, in pine.		45.8 in.	59 in.

Examination of the table shows that for the man of average height the Daudeteau rifle gives a continuous dangerous space up to 700 yards, if the rifle be fired six inches from the ground.

The energy of projectiles increases as the square of the velocity. . For this reason small-caliber bullets with high velocity have greater striking force than larger bullets with lower velocity. Penetration depends upon velocity, sectional density, and hardness of the bullet. It has increased enormously; however, hard wood trees a foot or more in diameter still afford protection, except at very short ranges. At a distance of 10 yards the Daudeteau bullet perforates a half inch soft steel plate, punching out a round button which is burning hot. "The bullet is badly deformed and hardly anything remains of it except the envelope. The lead is melted by the heat and scattered in all directions. This is one of the reasons why portable steel shields are not considered to be of advantage. The man behind the shield may be protected if it be heavy enough, but his neighbors to the right and left are liable to injury from glancing bullets or the fragments of those striking squarely.

The question of the stopping power of small caliber bullets does not seem yet to be definitely settled. On the one hand we read of wonderful cures, of the small list of fatalities, and of the rush of wounded savages up to the muzzles of the rifles; on the other, the advocates of the small caliber furnish us official reports of experiments on cadavers and on animals of large size, setting forth the terribly destructive effects of small bullets at high velocity. The former insist upon dum-dum bullets in hunting large game or in fighting savages; the latter retail the exploits of celebrated hunters who have killed elephants and hippopotamuses with single shots from a 6.5mm. carbine, death being instantaneous. It is believed that when our troops shall have completed their campaigns in Mindanao, the reports of our officers will furnish decisive information on this important subject.

The Firing Regulations of the European armies prescribe that aim be taken at the foot. Our own Drill Regulations also are quite explicit in establishing the same rule.

The German Regulations make an exception when the range is less than 275 yards, which is the lowest sight on the Mauser rifle, and when the height of the object is less than half the height of a man. In this latter case the men are ordered to aim a certain distance (one or two apparent heads)

below the bottom of the object. Another exception is made at ranges which correspond exactly to the elevation used, or which are rather greater; in this case the center of the object may be aimed at.

In our Firing Regulations we find (par. 762) the following: "When the enemy approaches within the continuous dangerous space of the rifle, no further changes in the adjustment of the sight should be made as his distance varies. If the troops are firing standing, an elevation of 250 yards, if firing lying down, an elevation of 300 yards should be permanently adopted, and 'aim taken first at the waist and then somewhat lower as the distance decreases. This rule is defective, for it only provides for fire while the enemy is upright and advancing.

Unless the soldiers clearly understand that by aiming at the foot we mean that the whole of the object shall appear above the front sight, many of the shots will go high at ranges less than the lowest range marked on the rifle. Most rifles are not marked below about 300 yards, which is the reason for the above rule of the Germans. The same was true of our rifle a few years ago, and it led to a lot of bad shooting at short range by troops who had not been carefully instructed.

Captain Mayne, in his *book on Infantry Fire Tactics, endeavors to demonstrate by elaborate calculations and tables of figures that it is of great advantage to aim at the foot of the object in all cases. His list of reasons look very much like special pleading, or as though they had been serched for and discovered after the rule had been made. One really good reason, which is omitted by Mayne, used to be that the foot affords the best defined objective, the line of demarkation with the ground being always quite distinct. But now that soldiers are adopting drab uniforms, this reason also loses much of its force.

With the disappearance of smoke from the battlefield, and the introduction of rifles with very flat trajectories, new features are brought to bear on the question of the best point of aim; there is a great deal to be said in favor of aim at the center:

(1) By aiming at the center there naturally is greater probability of hitting the object than by aiming at the top,

side, or bottom. This is true whether the distance be known or only estimated.

(2) By aiming at the foot of an object we utilize only the upper half of the cone of fire, the nucleus of which would be directed against the legs of marching men or of cavalry, that is, against the least vulnerable part. We thus lose one half of the bullets (excepting ricochets which are problematical). It is claimed that the ground is better swept in front than in rear of the enemy's front line, which is a very erroneous conception, for even if it were true in the general case, the ground would be swept without profit, for there is nobody there. It is, on the contrary, much more desirable to produce deep dangerous zones behind the enemy's front, thus reaching the supports and threatening the reserves, without losing efficiency against the front.

(3) It can be shown that the depth of the horizontal shot group is reduced one-half when the angle of the line of sight with the ground is equal to the normal angle of fall of the bullet. At 200 yards the angle of fall is 11 min. 19 sec., or about 1 on 304; the angle of the line of sight for standing men aiming at the foot of a target would be about 1 on 128 more than twice as large as the angle of fall of the trajectory. This consequence of aiming at the foot diminishes very rapidly as the range increases, the angle of sight becoming smaller, while the angle of fall increases. Thus, at 500 yards the angle of fall is 46 min., and the angle of sight only 11 min. The influence of this angle on the beaten zone may therefore be disregarded beyond 500 yards.

(4) General Paquié calculates that with standing men aiming at the feet of an enemy 250 meters distant, the beaten zone would be 60 per cent. smaller than with the same men kneeling and aiming at the center; and that kneeling men aiming at the foot, instead of at the center, would lose 40 per cent. of their efficiency. He shows conclusively that the dangerous space, in the territory occupied by the enemy, is much greater when the line of sight is approximately parallel to the ground than when aim is taken at the foot by standing or kneeling men. To aim at the foot of large objects such as columns of troops he considers a mistake, forfeiting the better chance of hits by aiming at the center.

(5) Formerly the lines of standing or kneeling men firing at each other were soon enveloped in smoke; hence the order to aim at the feet, or at the lower line of smoke. All this has of course disappeared. With the general adoption of smokeless powder this reason for aiming at the foot no longer has any weight.

(6) It is claimed that men in action will invariably take a full sight and that therefore it is necessary to accustom them to aiming at the foot. This is a negation of the careful instruction in target practice required of troops and not very encouraging to good shots. It is to be suspected that here is where the original foundation of the rule lies. Somebody who found that his troops fired high, without aiming, from the hip or even while running, prescribed the rule of always aiming at the foot of the enemy. This gave something quite definite to aim at, and with the short range of the old guns, the calling down would lead to a considerable angle of improvement for the poor shots.

The question of the best point of aim is so intimately connected with other questions that it is difficult to find a rule admitting of general application. In regular warfare in civilized countries there will seldom be an opportunity for individual fire at targets of the height of a man. Troops on the defensive will fire from trenches, or the larger parts of their bodies will be otherwise concealed and sheltered. Attacking troops will furnish targets of the height of a running man only for brief moments. The advantage claimed for aiming at the foot in that if too full a sight be taken there is still a chance of making a hit, disappears when the height of the object is habitually reduced to that of a man lying down. The fight will be decided by the damage which troops exposing only a small portion of their bodies will inflict on each other, the final charge and occupation of the enemy's position being merely the visible evidence of victory. As a rule, the attack has been paralyzed, or the defender has begun to leave the position, before the counter charge or the charge is resorted to.

In savage warfare for which we must also be prepared, aiming at the feet of the charging fanatics would not stop the rush; they must be hit in a vital spot. Similarly, if during the last 300 yards of a cavalry charge aim be taken only at the

horses' hoofs, the chances of repelling it would be greatly diminished. Experienced hunters of large game always search for a vital spot.

Captain Mayne states that the savages in the Soudan were always shot down at from 30 to 50 yards from the British squares, and from this fact he draws the conclusion that the troops should be instructed to aim at the foot. A more obvious inference, and one which would have been more profitable subsequently, was that the troops were sadly deficient in the rudiments of a rifleman's education.

The prescribed regulation of aiming at the foot of the object can be changed only by orders from the highest authority; but when a revision comes up for discussion it will be well to consider the advantages of the following simple rule, *Aim under the center*. By the center in this case as applied to individual objects, we do not mean a mathematical point but the central or vital portion of the objective, in other words, the most vulnerable part or trunk. This rule which is based on the practice of expert skirmishers under the old system, would be universal in its application, whatever the range, objective, or nature of fire. For small objects within the limiting range of individual fire, we see that it becomes the same thing as aiming under the foot. Within 300 yards no changes of sight would be necessary, unless the object is very small. With kneeling or upright objectives this method of aiming would not only give increased chances of a hit, but would also furnish large limits for errors in estimation of distances and greatly increase the dangerous zone in the territory occupied by the enemy. It is to be observed in this connection that aiming at the foot does not permit of any under-estimation of distance, for the shots would nearly all fall short. For this reason soldiers are cautioned not to underestimate the distance.

All the powers have long ago adopted the magazine system of loading, wholly or in part. The principal varieties are the tubular magazine below the barrel or in the butt, the magazine around or under the breech, and the clip. The general drift is toward the clip system; the French are considering the abandonment of the tubular magazine. Our Ordnance Department is also working towards a modified

clip system. In the defense, with presumably ample ammunition, it is not necessary to use the rifle as a single loader at all. For the attack, the clip system presents certain difficulties resulting from inability to carry more than a certain number of cartridges, which have not yet been overcome. Some maintain that the magazine should be held in reserve until the crisis of the battle; others claim that there is no advantage in magazine fire and that the manipulation of the cut-off adds a useless complication at the most exciting moment of the fight.

Experiments have also been made with automatic rifles, but so far they have not been adopted. The enormous consumption of cartridges this would entail brings up the question of ammunition supply with increased importance : something will be said on this subject in a future lecture..

The changes in Tactics indicated, by long experience in South Africa are being thoroughly discussed by the British Army and new drill regulations are under tentative consideration. The following points seem to be the ones requiring the most attention: (1) Instruction in reconnaissance, scouting, advance guard and outpost duty; (2) use of cover; (3) practice in widely extended operations; (4) increased employment of mounted troops skilled in the use of firearms; (5) skill in rifle firing.

From all accounts the British troops were quite ignorant of or extremely careless in the performance of the service of security and information. Their experience should be a warning to us. The use of cover was highly developed by the Boers, not only by individuals but also in the concealment of trenches and batteries. These things were known and had been taught before, but it takes a war like this from time to time to show up the great advantages that may be secured in that way.

The British army has long been suffering from a factor which is felt by us to a less degree, and which is inherent in the form of government, namely, the contracted space available for drill, target practice and field exercises. It will now probably secure authority to use all the ground, regardless of enclosures, in certain designated maneuver districts, the slight damage at seasons of the year when there are no crops

above ground being assessed by-boards of officers and paid for without delay. It will be a long time before we can hope for such scope in our maneuvers.

The American idea of cavalry has received its great and final recognition. The feats of the Boer mounted riflemen have astonished the world and will have great influence on the instruction of European cavalry. The carbine will cease to be regarded as a secondary weapon or even as an incumbrance by mounted troops and the advocates of the *arme blanche*.

Renewed interest in target practice is in evidence everywhere. It is now fully recognized that firing at stationary targets at known distances and under favorable conditions, furnishes only the elementary basis of the instruction of the rifleman. Instead of the spasmodic annual effort to burn up the number of cartridges of the prescribed course great attention will be paid to instruction in field and combat firing under unfavorable conditions as to wind, weather, distance, and duration of objective. More or less practice ought to be held every week in the year, mostly gallery practice of various kinds in winter, and field practice in summer. If we desire to be up to date and maintain our reputation as good shots, rifle practice under improved regulations will have to be greatly stimulated and extended.



A TACTICAL EVOLUTCON.

Lecture and Demonstration before the Faculty and
Students, General Service & Staff College,
September 26, 1903.

—BY—

CAPTAIN JOHN H. PARKER, 28th INFANTRY, U. S. A.

Gentlemen:—

The subject we are to consider today is a proposed system to meet two pressing tactical problems of the Infantry service. These problems are;—

1. Ammunition supply for the firing line in battle.
2. Fire concentration.

At the introduction of fire arms, then imperfectly developed, Infantry was compelled to form in dense masses to resist cavalry charges. With the improvements in the musket the dangers from this source have become less, permitting a more extended order made necessary by the increased efficiency of the opposing fire. The dispersed order of fighting now in vogue has brought its own problems to vex the tactical student. Some of them have been partially solved, while for others no satisfactory solution has been presented. The two we are considering are among the most important, and are two of those for which no satisfactory solution has yet been presented, unless the present experiments may be said to indicate a practicable solution

By the ammunition supply of the firing line in battle is meant the problem of replenishing the partially exhausted supply of a firing line that has become so deeply engaged that it can no longer depend upon the ordinary ammunition trains on account of the fire of the enemy. Ammunition can be transported to the battlefield either in wagons, or by pack trains. Under favorable circumstances these may approach the firing line sufficiently near to supply it directly; but we cannot afford to depend upon this in the general case, since both these methods of transportation present large targets to the enemy, and neither is reliable in the last extremity. Empty belts mean so much that any device which makes their replenishment more certain is worthy of careful consideration.

Fire concentration, by which is meant the power to apply large and accurate increments of fire at will to specified objectives, is a much more serious problem now than it was in the Sixties. Then, a thousand men stood shoulder to shoulder, delivering regular volleys at oral command. The point of aim and the rate of fire could be changed at will. With hammer-like blows the commander could so shake and demoralize his adversaries that the sudden advance of his solid lines might sweep over or bear away those of the enemy. The distance, considered long in those days, was so short that a man of sound wind could easily cover it in one dash, arriving at the line of the enemy in sufficiently good physical condition to defend himself in a hand to hand encounter.

NOW, a regiment is scattered over perhaps 250,000 square yards of ground, and the largest unit of which the fire can be surely concentrated is probably a platoon; certainly it is not larger than a company. The members of even this small body are so scattered that they may not all be able to fire at the same objective, and volleys can seldom be delivered except in a ragged manner which impairs their effectiveness. We have lost the power of delivering by infantry, save under very exceptional circumstances, the regular increments of fire which were so effective in battle a few years ago. To do so with men in the dispersed order of the modern battlefield is a physical impossibility.

But here, where no solution is possible along old lines, it is possible to obtain by mechanical means exactly the kind of intense, controlled, concentrated, and dirigible fire needed.

Various forms of machine guns of rifle calibre, such as the Maxim, the Gatling, and the Colt Automatic, have been so far perfected that their action is reliable, accurate and effective, at all rifle ranges and from three to five hundred yards beyond, using direct fire; while as a high angle weapon they dispute with the mortar its superior value for curved fire. Each of these types of machine guns is the product of American ingenuity. Two of them have been exhaustively tested in our own service, both on the target range and in battle, with satisfactory results. The third has been very effective in the hands of the British Army, notably at Qmdurman. No well informed military man now doubts the efficiency of these weapons, provided that some form of transportation can be found that will make their presence reasonably certain where they can be effectively used.

Their fire action is simply that of the infantry rifle, except that, it is more accurate, more concentrated, and has a considerably longer range. This is owing to the continuous nature of their fire, which can be best compared to the action of a hose. When used against animate objects its effects are visible at a distance considerably greater than in the case of rifles in the hands of infantry; and this continuous quality of fire makes of them the best range finders known.

The system to which your attention is today invited rests upon a single fundamental proposition, which is thought to be so obvious as to require no discussion.

If we can find a means of transporting within the zone of rifle fire a considerable quantity of ammunition, say 600 pounds, then 560 pounds of ammunition with such a machine gun, is worth more than 600 pounds without the gun. In other words, such a gun weighing not over 40 pounds, is worth its weight in ammunition on the battlefield.

This outfit consists of an ammunition and machine gun cart, weighing 140 pounds; a Colt Automatic Gun weighing 40 pounds; a frame weighing 19 pounds, for packing the same on a mule; and three pack mules with standard aparejos. The cart is capable of carrying a load of 1500 pounds. It is provided with four convenient ammunition boxes, in which are packed 6500 rounds of ammunition in such shape as to be conveniently available for either the infantry firing line or the machine gun, as may be determined at the proper time.

The men also carry 1000 rounds on their persons, equally available for either purpose; and they are provided with a portable machine for filling belts, which makes ammunition packed in original boxes quickly available for convenient distribution to the firing line, or for use in the machine gun.

This outfit, therefore, makes normally available, as an emergency reserve, at the disposition of the battalion commander, 7500 rounds of ammunition and one machine gun. Neither of these is provided for by any system whatever at present; and practical tests have demonstrated that this outfit can be easily brought forward by two or three men, over almost any kind of ground, to almost any position that may be designated. It is believed that the possession of such an outfit by a battalion of infantry would give a considerable advantage, when compared with the present inadequate arrangements.

The cart, gun, and 7500 rounds, can be conveniently carried by the three pack mules without imposing an excessive load. The cart, when set up and loaded, can be conveniently moved by a single mule over almost any path or trail. It can also be pushed forward by a couple of men, who will be considerably sheltered behind the load; or it can be moved with equal facility by draft by two men. By the use of the pack frame, designed for that purpose, the cart and gun can be disassembled and packed on the gun mule more quickly than the cargo can be lashed on the other two mules. The record time for the latter operation is 57 seconds. From pack the gun can be placed in action, using the belts carried by the men on their persons, in less than one minute. The ammunition in the boxes is available as soon as the diamond hitch can be unlashd, which requires less than a minute. The cart can be converted into a perfectly stable firing platform by removing its wheels. The frame then rests either on the ammunition boxes or on the ground, and is not disturbed in either case by the recoil. When so fired, the piece may be served by a single man, lying flat on his belly, taking full advantage of natural cover and further protected by the ammunition boxes piled in front of him. These are painted olive drab and are almost invisible at a short distance.

A system of instruction has been experimentally worked out, under the direction of the War Department, for a de-

tachment consisting of a single squad to perform this double duty of ammunition supply and machine gun service for one battalion of infantry, with this equipment. It was proven in the Santiago campaign that a successful organization for such service can be obtained by details from the infantry. Legal authority has been found by which such organizations can be formed and equipped by executive order, without new legislation, and at a total expense of \$67,500 for the complete equipment of every battalion and every squadron in the service, as above indicated.

This experimental detachment is an effort to crystallize the fruits of years of study and some experience in the practical solution of these two cognate problems, into such a standard organization; which organization, it is hoped, may become an integral part of each battalion and each squadron in our service. A manual embracing all the necessary data has been prepared and tested by actual use with a battalion of troops. This detachment, thus equipped, will be exhaustively tested in the maneuvers at Fort Riley this year. The results of this test will be observed by an expert member of the Board of Ordnance and Fortification, and by many officers whose high rank and long experience should make their judgment of its merits conclusive. They will report the results of their observations, with their recommendations to the Board of Ordnance and Fortification, which Board will then, based on these tests, reports and recommendations, decide as to future development and disposition of the proposed organization.