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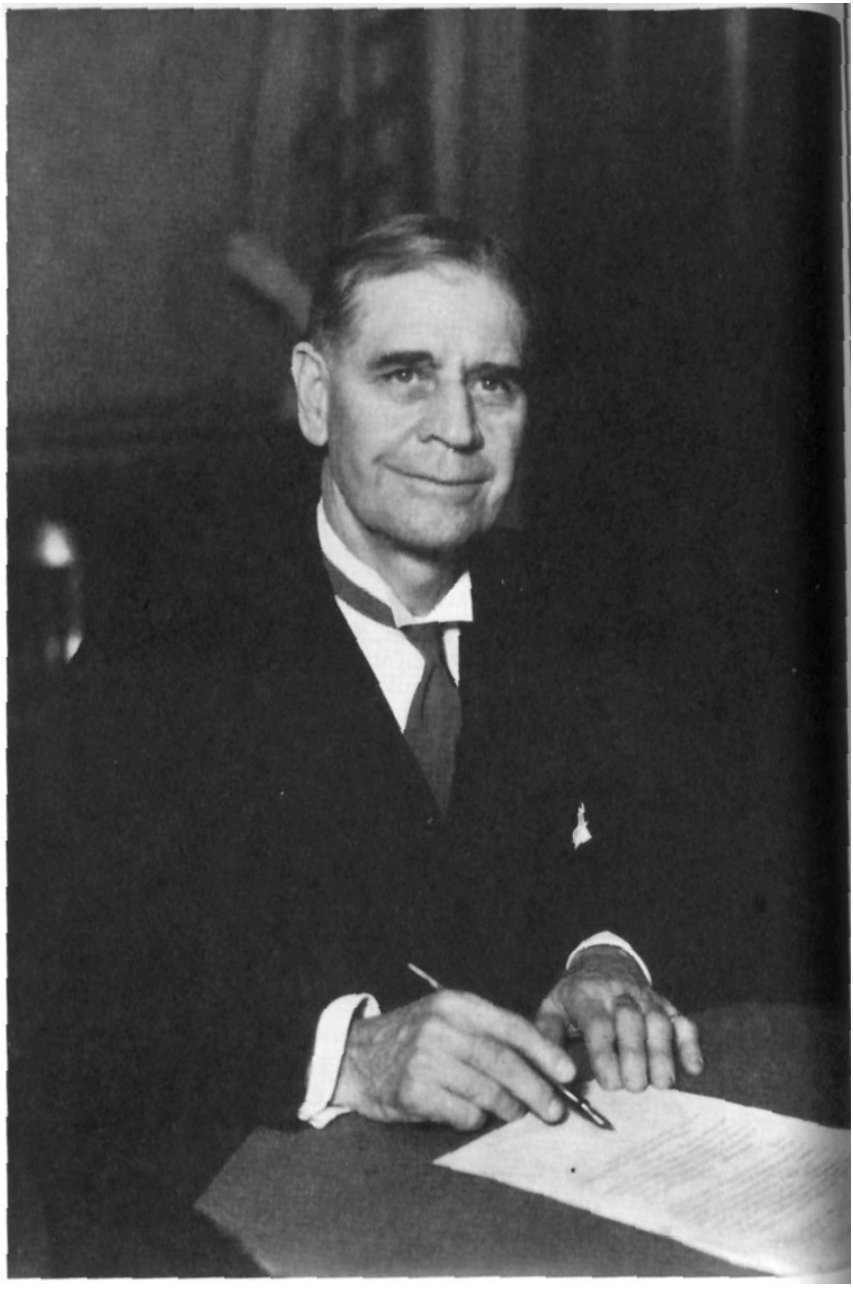

HONORABLE GEORGE HENRY DERN
SECRETARY OF WAR

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HONORABLE GEORGE HENRY DERN SECRETARY OF WAR

George Henry Dern, who was appointed Secretary of War on March 4, 1933, was born in Dodge County, Nebraska, on September 8, 1872. He graduated from the Fremont (Nebraska) Normal College in 1888 and attended the University of Nebraska in 1893-94.

Later he engaged in mining in Utah and rapidly rose to prominence in the gold mining field. Together with Mr. Theodore P. Holt, he is the joint inventor of the Holt-Dern ore roaster, a widely used mining process which has done much for the gold mining industry.

He served as a member of the Utah State Senate from 1915-1923; was a member of the State Council of Defense during the World War and was Governor of Utah from 1925-1932.

The Field Artillery wishes the new Secretary of War a very successful administration.

THE ARTILLERY PREPARATION FOR ATTACKS AND THE RUPTURE OF DEFENSIVE ZONES

BY GENERAL FREDERIC CULMANN, French Army
Translated by Major Basil H. Perry, Field Artillery

FRENCH ARTILLERY DOCTRINE PRIOR TO 1914

DURING the first weeks of the war, the French artillery applied the precepts laid down in the decree of December 2, 1913, on the subject of field service, and in the Provisional Drill Regulations of September 8, 1910.

The document of 1913 fixing the combat doctrine read thus:

"It was taught until a few years ago that the first duty of the artillery was to gain fire superiority over the hostile artillery, and that thereafter its role was to consist in *preparing* the infantry attacks by overwhelming with projectiles the objectives assigned for these attacks, prior to the entry into action of the infantry.

"It is now recognized that the essential role of the artillery is to *support* the attacks of the infantry."

Thus the preliminary artillery struggle was no longer sought for; moreover it was judged impossible, for the hostile batteries being masked would be invisible so long as they remained silent. In order to discover them and to adjust fire on them, it would have been necessary to turn to the aviation; but the latter was as yet little developed. To be sure, a few attempts had been made at firing centers, but with the aim of adjusting *one* battery, not a mass of artillery.

Under these circumstances an attempt was made to force the opposing batteries to open fire by *threatening* them *by the infantry attack*. Then they would reveal themselves by the flashes of their discharges and by the clouds of dust raised by the blasts of the pieces; at least it was believed that it would be thus, for positions of deep defilade, far in rear of the crests, were not envisioned.

The decree of 1913 said further:

"The preparation of attacks should not be independent of the action of the infantry because artillery fire has only a restricted efficacy against a protected adversary, and because *in order to*

lead that adversary to disclose himself, it is necessary to attack with infantry."

It was admitted then that artillery ought to aim at the *defender*, not the *obstacle*. In addition to which the 75 projectile has only slight effect in overturning ground; and the French Army as a whole, in 1914, had at its disposal only 104 rapid fire howitzers of 155 caliber, furnished with an old tube dating from 1881, and 84 old (1890) howitzers, caliber 120; both, especially the latter, of range inferior to that of the field gun. Thus therefore the decree of 1913 did not treat of the problem of the offensive against an entrenched enemy; it slighted it.

In any event, as much in order to "excite" the hostile masked batteries as in order to force the sheltered defender to show himself, the infantry, in attacking, had to serve as bait; but, for it, this form of tactics could end in nothing but bloody and useless sacrifices.

Besides, in France, only "the war of movements" was believed in. No account was taken of the fact that operations themselves clearly offensive did not preclude for certain armies, a defensive sufficiently prolonged to permit real organization of the ground. That is exactly what happened in August, 1914, in the German Armies of Lorraine and of the Ardennes. Forming the pivot of the great turning movement across Belgium, they remained immobile at first and then progressed by bounds. Even in the armies of the marching wing, the advance guards assumed a defensive attitude at the beginning of the battle; their mission in accordance with their regulations being to protect the assembly of the mass, rather than to reconnoiter the enemy.

At the beginning of the hostile attack, the German sharpshooters did not disclose themselves. They remained concealed in their trenches. They opened fire only when the French artillery was forced to lengthen its fire in order not to risk hitting its own infantry—that is to say. when the latter was still about 400 meters from its objectives. Then the intrenched sharpshooters, with their modern rapid fire armament, delivered a fire more than sufficient to destroy the assailing infantry.

Thus the Germans found themselves practicing this theory of the older Moltke: "The most skillful form of war is the strategic

offensive combined with the tactical defensive," a theory whose application was peculiarly facilitated by the French tendency to attack always and everywhere.

As for the Field Regulations of 1910, it was nearly silent on the question of fire against infantry, but it went to great lengths on the methods of employment in the fight against artillery. Moreover its teachings led to a parsimonious engagement of the batteries in position. It recommended "a provident economy so that the commander may always have some unengaged." Far from praising concentrations of fire, it called attention to "this fact, that in concentrating the fire of many batteries on a narrow front, the useful effect in a given time is not proportionately increased." Finally it urged "neutralization" but "by a relatively small number of projectiles."

* * * *

INSTRUCTIONS OF THE GENERAL, COMMANDER-IN-CHIEF, MODIFYING THE TACTICAL REGULATIONS

These sketchy tactics, against which, even before the war, some farseeing artillerists (1) raised their voices in vain, did not stand up under the test of the first battles. As early as the 24th of August, 1914, General Joffre sent a note to the armies in which he said:

"The lesson to be drawn from the war up to the present is that attacks are not being executed in close liaison by the infantry and the artillery.

"Each combined operation is made up of a series of partial operations which have for their object the taking of a point of support. Each time that it is necessary to take possession of a point of support, the attack must be *prepared* by the artillery, the infantry must be held back and the assault must be made from a distance such that the objective surely can be reached. Every time that the assualt has been initiated at too great a distance and before the action of the artillery has had time to make itself felt, the infantry has fallen under machine-gun fire and has suffered losses which could have been avoided. . . ."

Three days later, the 27th of August, General Joffre sent a second note, reiterating the same criticism and setting forth the procedures to be employed thereafter:

". . . . up to the present time that liaison (artillery-infantry)

(1) Among others, Lieutenant-Colonel (later Marshal) Fayolle, General Herr, Major Culmann.

has not been obtained. While the one has attacked with too great rapidity, the other has often been engaged with slowness, hesitation and *parsimony*. To this principal error are chargeable the majority of the losses suffered by our infantry.

"On the other hand the action of the batteries is insufficiently coordinated. The impression has often been gained that batteries enter the engagement separately and fire on the sole initiative of their captains.

"There is need for a more general employment of fire with the 75mm gun at very long ranges with buried trail spade (2). This has met with success in many army corps.

"Finally we should imitate our adversaries who use airplanes to a great extent in preparing for attacks. These airplanes fly over the terrain in advance of the front and permit the artillery to take under its fire, at the extreme range of its pieces, our columns and establishments, without our being able to determine, even approximately, the locations of the batteries.

"Now that contact has been gained along the entire front of our armies, the number of airplanes necessary for strategic reconnaissance has diminished considerably. The army commanders will place therefore in the future at the disposal of the corps commanders, a certain number of airplanes which shall be appropriately employed: 1st, to discover objectives; 2d, to give to batteries all the information necessary for the execution of fire."

These two notes which revolutionized the doctrine of combat as conceived in peace times by the French infantry and artillery, were put into operation beginning with the battle of the Marne.

* * * *

CAUSE AND CHARACTER OF THE STABILIZATION OF THE FRONT

None of the belligerents desired stabilization but nevertheless all had to submit to it, on all fronts. It is necessary to analyze the causes of this stagnation which was at first imposed, then was exploited as a tactical medium, and also in order *to prepare for war during the war*.

The check inflicted on the pursuit by the Allies after the Battle of the Marne, and the combats which took place during the race to the sea, showed, as ten years previously the war in Manchuria had shown, the great capacity for resistance of the defensive. In

(2) By burying the spade the range of the 75mm reached 8,000 meters (instead of 5,500) which frequently permitted counterbattery against the German heavy howitzer of 150 cm.

Beginning with the battle of the Marne long ranges have been used, notably in the army commanded by General Foch, and the Germans believed that they had in front of them heavy artillery!

the face of modern armament the attack was incapable of gaining a decision when artillery means were insufficient, especially when they were but little greater than those of the opposing troops. After some insignificant fluctuations in the line, the battle soon broke up into local combat, violent and deadly, then a few days later it ended in stagnation. At the end of a week or two the artillery, alone or nearly so, still fought on. The infantry, worn out and enfeebled by its losses, instinctively entrenched on the very line the luck of the struggle had left it. The enemy did the same, and soon trenches, at first discontinuous and later continuous and preceded by a net-work of wire, developed opposite each other; the war of position began.

Therefore it was *fire power*, not fortification, *which was the principal cause of the stagnation*. This fact was often forgotten during the course of the war.

Moreover, since the fronts were being extended rapidly, in one direction to the sea, in the other to Switzerland, all possibility of maneuver was taken away from the Command, and suddenly it found itself faced with the essential problem of the battle field: *to break a front held by invisible sharpshooters and machine-gunners, armored by the ground, guaranteed against surprise by the networks of wire*. Years were necessary to create the necessary artillery and to test methods leading to the solution.

Although it was favored in France by the narrowness of the theater of operations, stabilization likewise took place on other, larger, fronts: in Austria, Italy, in the Balkans, just as in Manchuria, where, however, space was limitless! In open terrain, the Command could, by maneuver or by a happy choice of the direction of the main blow, facilitate the task of the troops; but it never knew how to spare them the bloody effort. For them the attack was always frontal. Their job became more and more difficult during the war, as automatic weapons were developed, placed in echelons and camouflaged; as fortifications, conforming to the infantry dispositions, stretched in depth and became more and more capable of resistance.

* * * *

ARTILLERY PREPARATIONS FROM THE END OF 1914 TO THE SUMMER OF 1917

In the first phase of the war of position, during nearly three

years beginning in December, 1914, the Allies sought to break the front by continually increasing the power, the range, and the rapidity of fire of their artillery, by engaging it in denser and denser masses, by providing munitions in ever increasing amounts, and by lengthening the preparations. During this time attempts were made to destroy everything, and the enormous quantity of explosive projectiles fired transformed the ground attacked into a series of joined craters. The Battle of Champagne (1915) marked quite clearly the first step in this brutal employment of force—the Somme (1916) showed the advantages and the inconveniences of the system—the Aisne (Spring 1917) proved that the power of the means employed, although surpassing that of previous offensives, was still insufficient—la Malmaison (Autumn 1917), where the density of artillery cannon deployed was again considerably increased, made quite evident the practical impossibilities of these methods of attack.

The following table shows the characteristics of these four battles from the point of view of the artillery preparation.

		Champagne Sept. 22, '15	Somme June 24, '16	Aisne April 7, '17	la Malmaison Oct. 17, '17
Front of attack		35 km.	15 km.	about 40 km.	about 10 km.
Duration of preparation		3 days	7 days	10 days	6 days
Number of 75 guns		1100 or 1 per 32 m.	444 or 1 per 34 m.	2000 or 1 per 20 m.	624 or 1 per 16 m.
Number of heavy pieces		872 or 1 per 40 m.	645 or 1 per 23 m.	1947 or 1 per 21 m.	986 or 1 per 10 m.
					1 per 6 to 7 m.
Number of trench mortars			360 or 1 per 42 m.	1650 or 1 per 25 m.	270 or 1 per 35-40 m.
Ammunition Consumption	Dates	22-27 Sept.	24 June-10 July	7-16 April	17-23 Oct.
	75mm	1,387,370 rounds	2,013,648 rounds	?	17,500 tons
	heavy pieces	295,800	519,165	?	36,000 tons
	trench mortars		?	?	15,000 tons

The density of the deployed artillery tripled in two years; from one light and heavy piece per 18 meters of front, it rose to one piece per 6 or 7 meters. The same amount was employed in the other great battles of the second semester of 1917, by the French as well as by the English. The proportion of heavy artillery, although in 1915 less than that of the light artillery, soon became clearly greater. This fact demonstrated the increasing importance placed on destruction fires, on long range harassing and interdiction fires on the rear areas of the battlefield. The marked

proportional decrease evident at the Aisne was not voluntary, but caused by the insufficiency of industrial production: the Commander-in-Chief hoped to use 900 155mm howitzers; he had but 428.

The duration of the preparation increased from 3 to 6 or 7 days. On the Aisne it was to be five days, but had to be successively increased up to ten days, because of bad weather which frequently made impracticable terrestrial and aerial observation, and consequently the adjustment and control of artillery fires.

The violence of the preparation is measured by the fact that the tonnage of various projectiles on each running meter of hostile front was some 400 kilograms in the Champagne, 900 on the Somme, 6000 to 7000 at la Malmaison and in the battles of that same time: Flanders (July 31, 1917), Verdun (August 20).

As the total consumption of ammunition increased, the consumption per piece also increased: in the Champagne the 75mm batteries fired on the average 420 rounds per piece per day. On the Somme, 640; and this figure was slightly exceeded at la Malmaison (3). Consequently cannon became worn out and industrial production had to be increased.

This general evolution having been indicated, let us consider the particular lessons which each of the above four battle-types furnish.

The Battle of Champagne—The previous offensive in Artois (May 7, 1915) had already permitted the conclusion to be drawn that:

"After a well conducted preparation, the infantry can advance without great difficulty, and, if its attack takes place on a sufficiently wide front, it is possible to make the break-through (4).

"The great difficulty for the infantry begins when the action of the artillery is no longer powerful."

The battle of the Champagne, and all the other battles up to the end of the war, confirmed the correctness of these remarks:

1st—The range and power of the artillery assure the success of attacks, limit their depth, determine the phases of the action.

(3) The heaviest expenditure of the war amounted to 1500 rounds per piece per day.

(4) In Artois, the 33d Corps (General Petain) crossed in two hours the hostile defensive organization and progressed several kilometers. But the adjacent corps could not advance. The break-through was made then only on a front too narrow (6 kilometers) to permit the exploitation, and 33d Corps found itself isolated, sticking out like a sore thumb.

2nd—The greatest difficulty is not in piercing the front, but really in progressing beyond it to a sufficient depth and with such rapidity that the decisive victory may be obtained, before the hostile strategic reserves come into the picture.

In Champagne, the first German position was made up of three to five lines of trenches, laid out in a network 500 meters in depth. It was the assault on this position that the French artillery prepared.

But, at a distance of 3 kilometers to the rear the Germans had organized a second position on the reverse slope, preceded, on the covering crest, by a system of observation posts which were protected by machine gun nests. Such an undertaking was heretofore unknown. On this position the French artillery executed only a sketchy preparation; moreover, as it lacked howitzers, it would have been difficult, if not impossible, to effectively place fire on the reverse slope.

The infantry brilliantly captured the first position, then, intoxicated by its success, threw itself forward resolutely but thoughtlessly, and wrecked itself against the second.

On the wings of the attack, the Germans held strongly. The French infantry therefore rolled up like a wave between two unbreakable pillars, contracted, narrowed its front to a point, and made a simple "pocket" in the hostile dispositions. The Germans, during their great offensives of the spring of 1918, obtained the same negative result.

The lessons drawn from the battle of the Champagne exerted a strong influence on the battle of the Somme.

The Battle of the Somme—Whereas the battle of the Champagne sought an immediate break-through, the battle of the Somme consisted of two successive phases: first the wearing down of the enemy, and then the break-through to great depth and the exploitation with the object of reaching the hostile communications in the vicinity of Cambrai and Maubeuge. But only the first phase took place. In November the bad weather made it obligatory to stop the operations: mud sealed the doom of the battle.

Describing this initial period, General Joffre wrote on June 21, 1916, to Generals Douglas Haig and Foch: "We must expect to

fight a long and severe battle the conclusion of which will be marked by attrition of the means which the enemy will have been able to assemble in this theater of battle."

He indicated as the means to be employed: *"successive efforts against well defined objectives."*

Thus the tactics of combat was tending towards the formula: "the artillery destroys, the infantry occupies." In effect, in order not to play the enemy's game in a battle of attrition, it was necessary to economize on infantry, and in order to do that, the task must be made easier for it by utilizing to the utmost the destructive power of the artillery.

Consequently the Command limited itself to seeking certain initial success, limited in depth by the range of the light artillery, and consolidated as soon as possible by the organization of the ground—then a second success of the same order, etc.,—each of the offensive bounds being preceded by a new artillery preparation analogous to the first.

This offensive went forward like a machine, heavily, slowly. It was dependent on the road and the 60cm railroad. It was necessary to reestablish across the torn-up terrain a minimum of communications, to carry forward the heavy artillery still armed almost entirely (8/9th) with rather old and immobile materiel designed 40 years previously for siege warfare, to reconstitute stocks of ammunition, to organize transportation, etc., and these operations took weeks. During this time, the enemy made good his losses, reinforced himself, organized, and finally presented to the attack, fortifications as resistant as before. The problem of the offensive therefore was always revived in the same form, without the initial success having facilitated later success.

However, because they were irresistible and constantly renewed, these attacks finally caused grave uneasiness in the German High Command, as evidenced in the Memoirs published after the war. If the battle could have been continued, it probably would have been crowned with decisive victory. But this fact was misunderstood in French parliamentary and even military circles, and was the beginning of the eclipse of Marshal Joffre.

The battle of the Somme furnishes a good example showing

the major inconveniences of artillery preparations lasting several days, a week, and sometimes longer.

I.—*Strategic surprise was impossible*.

Modern means of transportation, railroads or automobiles, with high speed and great cargo capacity, permitted the defender to direct toward the menaced front the flow of numerous reinforcements within two or three days; that is to say in considerably less time than was demanded by such an artillery preparation.

The assailant thereupon found in front of him, not the very much reduced effective strength usually occupying the stabilized sectors, but instead considerable forces: never fought from *strength to weakness*, as he expected to do, no matter how much he exaggerated, in his estimate of the situation, the formidable capacity for frontal resistance of the defensive. Thus he became uneasy about taking a first position even indifferently reinforced, and found it impossible to take the second, for on the latter the defender always had time to bring up powerful reinforcements.

II.—*Long preparations were strictly dependent on atmospheric conditions: their duration was not predictable*.

It is a well known fact that in the north of France the periods of good weather are extremely short. Therefore preparations a week long always ran the risk of being extended, even in summer, by days of fog or rain, during which observation (aerial and terrestrial), and consequently destruction fires, are impracticable. In fact almost all the preparations of the war. up to 1918. have had to be extended by three, or four days beyond the time originally allowed. But when the results initially obtained were considered, the previous fires had to be renewed, and the consumption of ammunition rose.

III.—*During the artillery preparation, the defender preserved, to an appreciable extent, his liberty of action*.

In reality the destructive fires were localized during several hours on the same points: but everywhere else in the position, traffic and the work of repair were almost without risk—from which there were important consequences.

Every battery too violently attacked could displace during the interruptions of the hostile fire and take a new position where it had a chance to remain ignored perhaps until the moment of the

assault. It was thus that taking more and more advantage, in each of the battles of 1915 to 1917, of the mobility of their artillery, the Germans succeeded in guarding their precious reserves of fires, destined to break our attacks. If they were able to operate in that manner, it was because even for an experienced aerial observer it was difficult and slow work to report with precision whether or not an emplacement previously the object of counter-battery was still occupied: on both sides of the front line there were numerous examples of empty emplacements on which the artillery rained projectiles for many days.

So far as it was concerned, the infantry of the defense, not being paralyzed by the fire of the attacking batteries, could repair its shelters, or, if these were insufficiently resistive, construct others, making full use of slopes, ditches, sunken roads, etc. Likewise it could abandon its torn up trenches and cleverly organize shell holes in which machine gunners or combat groups lay in ambush on the day of the assault. Frequently the German infantry operated in this manner on the Somme.

Although small in themselves, these changes of detail applied progressively to the emplacements of small units of infantry and of artillery during the preparatory bombardments extending over 5 days, a week, or even more, finally acquired considerable importance. This transformation from one initial disposition, solid but *known* to the assailant, to another less resistant, but for the most part *unknown* to him, was pregnant with bloody surprises on the day of the assault. It was in order to afford some measure of defense in such a case that use was made of rolling barrages and zone fires—although they did not provide absolute protection.

IV.—*The inconveniences of long preparations were accepted because the infantry desired that everything in front of it be destroyed*.

But the destruction of hostile batteries was difficult not only because of their mobility but for technical reasons. In order that a cannon be put out of service, it is necessary that one of its essential parts, irreplaceable from the spare parts on hand in the battery, be broken. This result cannot be obtained unless an explosive shell bursts close to the cannon aimed at, and unless at

that instant other circumstances are favorable. These several conditions are simultaneously fulfilled only by chance—a lucky shot. In fact, *the efficacy of the explosive shell, even with perfectly adjusted fire, varies considerably from one shot to the next*, and this is the reason that the Germans had more vigorously built up the ammunition supply of their 15cm howitzers than that of their 77mm field gun (to a total of 1,750 rounds as against 1,300, respectively).

Infantry shelters were innumerable and the assailing artillery could not dream of demolishing all of them. Many among them were invisible and remained unknown.

As a resumé, general destruction was impracticable no matter how long and methodical the preparation may have been; however formidable the expenditure of ammunition.

V.—*Prolonged preparations finally changed terrain, already cut up by a dense lacework of trenches and communicating trenches, into a vast field of almost contiguous shell-craters. Across this chaos, movements were extremely difficult, especially in rainy weather*.

The displacement of artillery became then very laborious and slow, as likewise was the transportation of ammunition. At Verdun the intensity of fire was frequently limited by the insufficiency of supply; the division artillery could not be provided with more than 250 75mm projectiles per day. On the Somme, beginning in September, the caissons could no longer get through, and the British as well as the French found it necessary to bring up ammunition on horse or mule back.

Moreover, the great shell craters made by heavy shell finally were filled with loose earth which the rains transformed into liquid mud, and men, slipping therein, risked death by drowning.

The Battle of the Aisne.—The battle of the Aisne was a lively reaction from the slowness of the Battle of the Somme. The French Command expected a rupturing attack of one or two days' duration, then an exploitation of unlimited duration.

Although in denser mass than in the previous offensives, the artillery was insufficient in quantity, because it was planned to execute the preparation simultaneously on several successive positions to a depth at times attaining 14 kilometers! Thus the

objectives were too numerous for the cannon in line and for the ammunition provided. "Their eyes were too big" said artillerists everywhere.

Moreover there was neither strategic nor tactical surprise.

The first was made impossible by long delays which the organization of the ground for the offensive to take care of all guns necessitated: the offensive was put off for two months. The preparation which began the 7th of April and was to last five days, was prolonged until the 16th because of bad weather.

As for tactical surprise, the Germans found on a captured French noncommissioned officer an order which told them the date and hour of the assault.

The results were a complete strategic check, in spite of some dearly bought tactical success, and, a short time thereafter, the dangerous demoralization of the French infantry.

The Battle of la Malmaison.—In order to combat this demoralization, and to continue the instruction of the army, the Commander-in-Chief, General Petain, ordered some less difficult attacks predicated on strict economy of infantry. These were the Battles of Flanders (31st of July, 1917), Verdun (20th of August), la Malmaison (23d of October). All presented the same characteristics and were patterned on the slow but sure progress of the Battle of the Somme, but the amount of artillery engaged was two or three times as great, and consumed six to seven times as much ammunition (5). The objective chosen was two or three kilometers only from the line of departure, that is to say within the effective range of division artillery. Consequently:

—the infantry was protected by artillery fires throughout the entire course of its forward movement—even beyond the position to be taken:

—in general it arrived at that position even before the enemy had had time to arrive to counterattack it:

—when the counterattack took place, the infantry was already installed; it was well in hand, had organized its system of fires, and during this time it was covered by the barrage fires of its artillery. The German counterattack battalions fell therefore

(5) The effective strength of artillery troops exceeded that of the infantry.

under the combined fires of automatic weapons and rapid fire cannon; they suffered great losses without having been able to obtain any result.

But these processes entailed a formidable material effort.

At la Malmaison, during the only day of the attack, the consumption of ammunition reached the totals of:

5,200 tons of 75 mm. shell
7,200 tons of heavy shell.

During the six days of the preparation there was fired a total of:

17.500 tons of 75 mm. shell
36,000 tons of heavy shell
15,000 tons of trench bombs

} amounting to 7 tons per meter of front.

This was about 80,000 tons, the capacity of 266 trains of 30 cars each. The total ammunition brought up for the battle was about 100,000 tons. Before the beginning of the preparation, it took thirty-six days to provide the initial supply of ammunition.

Now the maximum daily output of the industry was, for the entire army, about 230,000 75 mm. shell (say 1,600 tons) and 50,000 155 mm. shell (say 2,250 tons).

The cost of the Battle of la Malmaison was about 500 million francs, say 40 to 50 million per running kilometer of front to be taken (6).

All that in order to conquer some ten kilometers of front, two or three kilometers in depth.

From these statements some impossibilities appear: the richest country, possessing the most powerful industries, and most abundantly furnished with strategic raw materials (which demands the freedom of the seas), would be incapable of feeding with silver, cannon, and ammunition, a battle of this type, if it were to be threatened on a wide front and had to fight to the bitter end.

The limited objective attacks of the second half of 1917 showed the main weakness of the methods used during the three years of stabilization, by magnifying the contrast between the *immensity of the effort* and the *mediocrity of the result*.

(6) The Battle of Verdun (20th of August, 1917) cost 700 millions.

(*To be continued*)

FRENCH MEDIEVAL ARTILLERY

THROUGH THE COURTESY OF COLONEL ROBERT R. McCORMICK, THE CHICAGO TRIBUNE

FRANCE began to develop artillery in a serious way in the second half of the XIVth century. In competition with other powers who in that period were beginning seriously to organize their manufacture and handling of cannon, the King of France created a high crown officer called "Le grand maitre d'artillerie"—grand master of artillery—to take charge of and push the development of the new arm whose importance was just beginning to be appreciated.

The next item in the record of French artillery development is the admission that the Germans invented the "anse"—trail—and that this new and valuable detail did not appear in French artillery until considerably later, under Henry IV. That is not by any means the only time the art of building and firing cannon on this side of the Rhine has trailed the Teuton artillery, as subsequent history will show.

French artillery, like that of other countries, in its early period used balls of metal and stone. As the science developed, the balls increased in size until they reached a weight of 200 pounds and more.

Charles VII greatly developed artillery, and for an understandable reason. It was one of his chief elements of strength against the feudal lords who disputed his authority. With artillery he was easily able to batter down the stone walls of their castles and reduce them to submission. Louis XI followed suit. His became the best artillery in Europe, not excepting the German. He became the proud possessor of 12 big bronze cannon, fond pets which became famous as the "twelve peers of France"—just as Charles V of Spain later owned "twelve apostles." Charles V, by the way, achieved artillery supremacy by casting his cannon in Flanders and importing German artillerymen to serve them. These he used effectively against the German king himself.

Henry II set up a classification for cannon in 1552 which he called the "Six calibres de France." This classification remained in force up to Louis XIII. By that time it had become so old-fashioned

that what in 1574 had been the best artillery in all Europe, became by 1633 an outdated institution and once more well behind the Germans. This tendency to achieve something good and then rest too long on past laurels becomes evident several times in the history of French artillery. Some experts say the old habit prevails right now and that almost all of France's artillery today is World War artillery; that France more than the other big powers is unwilling to spend money on developing and manufacturing new types of guns and depends too heavily on her ability to turn out new weapons if and when another emergency arises. That is an accusation impossible to prove, of course. France like any other nation naturally keeps as secret as possible its newest artillery developments, and like other nations relies on developing model guns of the newest type on which to manufacture in series whenever the necessity may come.

From the time in the first half of the 17th century when the French fell behind their trans-Rhine neighbors and on nearly up to our own time, artillery owed most of its development to the Germans and the Flemish.

In 1765 General de Gribeauval reduced the six French artillery models to four, namely "campagne, siege, place, and cote." This classification remained in use to 1825 with slight modifications. The chief changes during this period came in the Revolution and in the First Empire under Napoleon. These changes were (1) separating the artillery from the infantry (1795) and (2) militarizing the artillerymen by creating a "train d'artillerie" (1800).

In 1829 the "conducteurs," those men who dragged the cannon about, were assimilated with the "servants," those who served the pieces. Henceforward they were all cannoneers. At the same time caissons were adopted so that artillerymen could ride with their guns instead of running alongside. This innovation made the "batterie montee" as it was called, almost as fast moving as the "batteries a cheval." In the latter the cannoneers rode on horseback alongside their pieces. There were no more batteries whose cannoneers trudged on foot except in the case of sieges and artillery parks.

German artillery once more led the way by adopting a simpler

method of classifying the types of artillery. It recognized two types; (1) field artillery and (2) fortress artillery. France on the other hand—as late as 1883 had its artillery cut up in: two imperial guards regiments, one with its artillerymen mounted on caissons and the other riding horseback: 15 regular regiments with its artillerymen riding the caissons; one regiment of pontoniers; four regiments whose artillerymen rode horseback; two "regiments du train;" 10 companies of mechanics; six companies of artificers; and one company of armorers.

In 1883 France admitted the superiority of the simpler German system and adopted it in essentials.

The French principle regarding artillery during the World War was to rely on it very heavily. French regulations were preoccupied with the dominance of fire power. They sacrificed mobility for firing capacity. They still do. The French principle of warfare today is based on the idea of being able to throw more shells and faster into the enemy positions than the enemy can return. A report of the French army commander to the Minister of War, since the war, states plainly that "of the two elements in warfare, fire and movement, fire is preponderant."

That clearly states the French attitude. It contrasts sharply with the German postwar theory that mobility is the principal need of an army. The German army since the war exalts mobility, not only because Germany's army is limited in numbers and especially in heavy artillery, but probably more because it experienced the possibilities of warfare of movement on its eastern front against the Russians and has come to believe that the next war will not necessarily be a trench war.

The French, as so many times in the past, cling to what they learned in the last war and seem unwilling to trust any new ideas very far. The French dictum is that "in order to advance in spite of the enemy it is necessary to have superiority of fire." French disinclination to sacrifice soldiers plays a considerable part in its leaning towards heavy artillery fire.

With fire power as the essential of their doctrine, the French have greatly increased the fire power even of their cavalry, which is equipped not only with automatic rifles and machine guns, but also with the famous 75's and with 105's. A French cavalry

division has become merely a highly mobile form of an infantry division.

Further conservatism is indicated by the fact that the French divisional artillery is divided into that used for "close support" and that for "general action." The Germans in addition have allotted special infantry batteries to regiments and have distributed artillery even to infantry battalions and companies.

A British military expert in summing up his impression of the French and German postwar armies says he feels "the French are unduly influenced by the lessons and conditions of 1914-1918 on the western front, with its closed flanks, unwieldy numbers and enormous armaments, while the German horizon is widened by a well-balanced appreciation of the experience on their eastern and southeastern fronts." He adds that the British have a natural inclination to prefer the German doctrine to the French, because of the former's attention to the principles of surprise, mobility, and concentration.

Being so influenced by World War experiences and giving such emphasis to fire power, it is natural that the French should give artillery the chief place in their theory of warfare. They give sentimental homage to the infantry but "their real respect is for the artillery." As one neutral expert has expressed it, "for it is, in their minds if not in their words, the decisive arm." This same critic goes on to say he interprets "the underlying idea of the French to be that the artillery mass is to be the modern form of Napoleon's guard. While the divisional artillery is horse-drawn, there are some 18 regiments of Portée artillery, each of 36 guns, and these would probably be used by the higher command as a strategic reserve which could be switched by road to the sector chosen for the decisive attack, there to overwhelm the resistance by its intensity of bombardment."

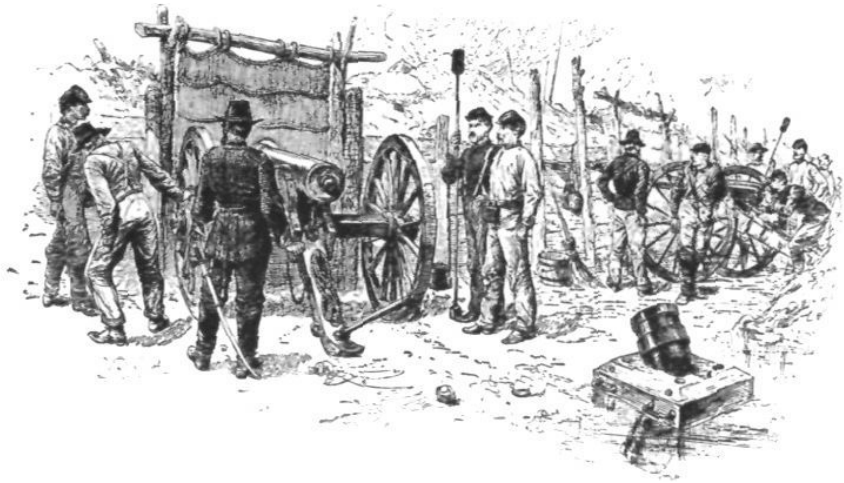
In brief, the French army of today is a large and powerful, but slow moving steam roller of fire which is meant to slowly push back any opposing army as it did in 1918.

The French infantry division of today has, besides three infantry regiments, an artillery regiment of nine batteries or 36 guns, and a field howitzer regiment of six batteries or 24 guns. Both these regiments are horsedrawn. The infantry division also

has a squadron of cavalry, another of aircraft for reconnaissance, and detachments of engineers and pioneers. The mechanical field artillery and heavy artillery as well as tanks are army corps troops. The French army has 18 regiments of motorized field artillery. The guns are carried on trucks and constitute a powerful reserve of fast moving fire power.

Regarding the French army's use of artillery: The French artillery is used to protect and support the infantry and their targets are chiefly the enemy's machine guns. By contrast, the British idea is to have the tanks deal with the machine guns under the protection of the artillery.

Just as the Germans had one gun in the World War that received special mention, the Big Bertha that shelled Paris, so the French had one that won the admiration of the world. It was the field piece known as the 75. But the 75 is no new cannon. Invented in the latter part of the last century, it had already helped win one war before the big one came along, namely the first war between the Bulgarians and the Turks. The Bulgarians were equipped with French 75's. The 75 is said by military experts to be still unbeaten in its calibre and is expected to figure heavily if another war happens along within the next few years.



OUR NEW PACK ARTILLERY

SUCCESSOR TO THE HISTORIC MOUNTAIN HOWITZER

BY CAPTAIN E. C. GOEBERT, Ordnance Department

THE history of mountain artillery reaches nearly as far back as the origin of mobile artillery. Almost since the inception of the gun and its carriage as an instrument of warfare, armies of the world have been faced with the problem of its use in mountainous country.

The artillery pieces used for the solution of the usual field problems, if effective weapons, are of such weight that they are prohibitive in mountain warfare even if they can be disassembled in the field, since the weight of the individual elements is too great for transportation on pack animals, the mode of travel universally agreed as necessary in mountain passes. At Perpignan in the 15th century small caliber guns and carriages divisible into parts for transportation in pack were made. This, as nearly as can be found, is the first record of the creation of mountain artillery. Much of the early history and development of mountain artillery is contained in an article *L'Artillerie De Montagne Dans Les Armees Europeennes* by Ch. Beckerhinn, published in 1884, and it is from this source that most of the early historical data in this article has been obtained.

The progress of the development of mountain artillery by the French as recorded seems to have been slow until during the period of the War of the Spanish Succession in the 18th century when some special guns and carriages were constructed for use in the Pyrenees. These guns were one pounders weighing about 110 lbs. and about 5 feet, 6 inches in length. The carriage being constructed of wood was light since the entire unit and twelve rounds of ammunition were transported on one mule. From the one pounder gun the next step was toward a howitzer of large bore and shorter tube which appeared as a four pounder weighing 165 lbs. and about 3 feet, 3 inches long. In 1757 an amusette (a swivelled and stocked gun firing solid, ball shot) was constructed for mountain use which fired a 2.2-lb. projectile. The gun weighed 220 lbs. and was 21 calibers in length. The Portuguese successfully used this weapon during the war with Spain in 1760.

It was not until 1790-1800 that special detachments of artillery for mountain warfare were formed in the French Army. These units were used in the war in upper Italy and were equipped with three pounders. The guns were light in weight and were mounted on bracket trail carriages which were later replaced by one-piece carriages with trough-shaped trails which, when in firing position, were loaded with rocks and earth to reduce the recoil of the gun and carriage.

The carriage was found to be entirely too light and was replaced by a heavier unit which for transportation was subdivided into the gun, the wheels and the carriage, three loads in all. In this weapon the gun weighed 165 lbs. and the carriage 176 lbs.

A new unit made its appearance in 1803. It was a three pounder, weighing 176 lbs. mounted on a 110-lb. carriage, and while the guns gave fairly good results they were small and the fire power was considered inadequate. These results led to the development successively of four, eight and twelve pounder guns and 6- and 8-inch mortars, all of which in turn and after lengthy experiments, were abandoned due to the great number of pack animals required for their proper transportation.

By the year 1884 the French had standardized on three sizes of mountain weapons, a three pounder gun, a six pounder gun and a 5½-inch mortar.

The Austrians seemed to have been later than the French with the development of this class of artillery. The first of their guns were known as "falconets" and were used in the Corsican expeditions in 1730. The small field pieces used by the frontier regiments of Croatia and Slavonia were used as mountain artillery during the Seven Years War (1756-1763) since the falconets of three and six pounders were considered as inadequate artillery for the purpose.

Austria did not consider mountain artillery as a separate type in 1753 since at that time history shows their artillery divided into three classes: field, siege and fortress. In the latter part of the 18th century, about 1794, the Austrians, like the French, created separate units of mountain artillery which were equipped with light bronze guns of one and three pounders mounted on light bracket trail carriages made of wood. The axles and wheels

were removable from the carriage for pack transportation.

The development of English mountain artillery parallels that of the other European nations except in one interesting point. The rocket as a new weapon of warfare was introduced to the nations of Europe by the English as a result of experience with the Orientals in India in 1780. It had been known to the Oriental nations for a long time previous to this date but its effectiveness was not known to Europe. The English believed that in the rocket they had the much-sought-for solution of mountain artillery. Attempts were made to perfect its use for this purpose and as a result nothing was done for a considerable period of time toward the further development of the gun or howitzer for mountain use. As late as 1804 the English were developing rockets. These at first were for incendiary purposes only and some of them were successfully used in 1806 at Boulogne and again in 1808 at the siege of Copenhagen.

The rocket has an interesting history which, while not directly bearing upon the subject of this article, nevertheless is of sufficient importance to mention. It was the rocket which led directly to the development of shrapnel. Although the rocket was at first for incendiary purposes only, shortly after its introduction to Europe a Danish artillery officer conceived the idea of placing a hollow projectile at the front end so that a missile instead of fire could be thrown. In 1814 an Englishman, Congreve, filled the hollow projectile with slugs and thus created the shrapnel used by the English at the Battle of Waterloo.

The delay caused by the rocket experiments found the English as late as 1850 with no solution of a caliber of artillery suitable for mountain use. As is inferred in the following quotation taken from the fourth part of "Aide Memoire—the Military Sciences," published by a committee of the Corps of Royal Engineers: "Various opinions have been entertained on the subject of mountain artillery and the service it is capable of rendering to an army. By some the lighter guns usually employed, and especially those carried on mules, have been considered to be utterly worthless, by others their value has been overrated. It cannot for a moment be supposed that any such artillery in any possible number can be compared in effect with good field batteries

capable of overcoming all the ordinary difficulties of ground, but in the mountains, excepting in the immediate vicinity of the great roads which traverse them, the best equipped field artillery is liable to become paralyzed by obstacles that it cannot master, and to be rendered not only useless but a cause of serious embarrassment to the troops to whom it is attached."

There is given in Table I a tabulation with respect to mountain artillery in the European countries in 1870:

TABLE I

Name of Country	Size in lbs.	Caliber in mm	Wt. of Gun and Breech in lbs.	Velocity f. s.	Range yds.	Type Carriage	Weight without Gun, lbs.
Austria	3	74.12	181	770	2453	Bracket trail	207
France	4	86.50	220	737	2620	One Piece	257
Italy	5 1/3	86.50	220	880	2180	One Piece	251
Switzerland	4	84.45	227	783	2180	One Piece	251
Russia	4	86.86	222	762	2507	One Piece	343

In 1829 the French had discovered that the most satisfactory weapon for mountain artillery was a 12-lb. howitzer. Had they adhered to their expressed belief and concentrated upon this one weapon much time would have been saved in the development of this type of artillery. There is a record that Austria in 1844 adopted the 12-lb. howitzer as its only mountain weapon as likewise did the British in 1860.

France, Austria and England, however, changed their views for no other reason than that they were not able to produce a satisfactory light vehicle which could be transported and it was not until about 1880 that the English introduced the first gun and carriage which could be taken apart into acceptable loads for pack transportation.

The early history of American mountain artillery is rather vague. Tousard, in his "Artillerists Companion" published in 1809, describes mountain artillery of European pattern but is silent as to anything distinctly American. In 1860 John Gibbon, 1st Lt., 4th Artillery, U. S. Army, described mountain artillery of the American Army as a 12-lb. howitzer on a carriage formed like the field gun carriage but much smaller (Fig. 1). The checks or trunnion arms were formed as part of the trail. The axle tree was of wood which, as he stated, lessened the recoil and gave an elasticity to the whole carriage, better to resist the shock of firing.

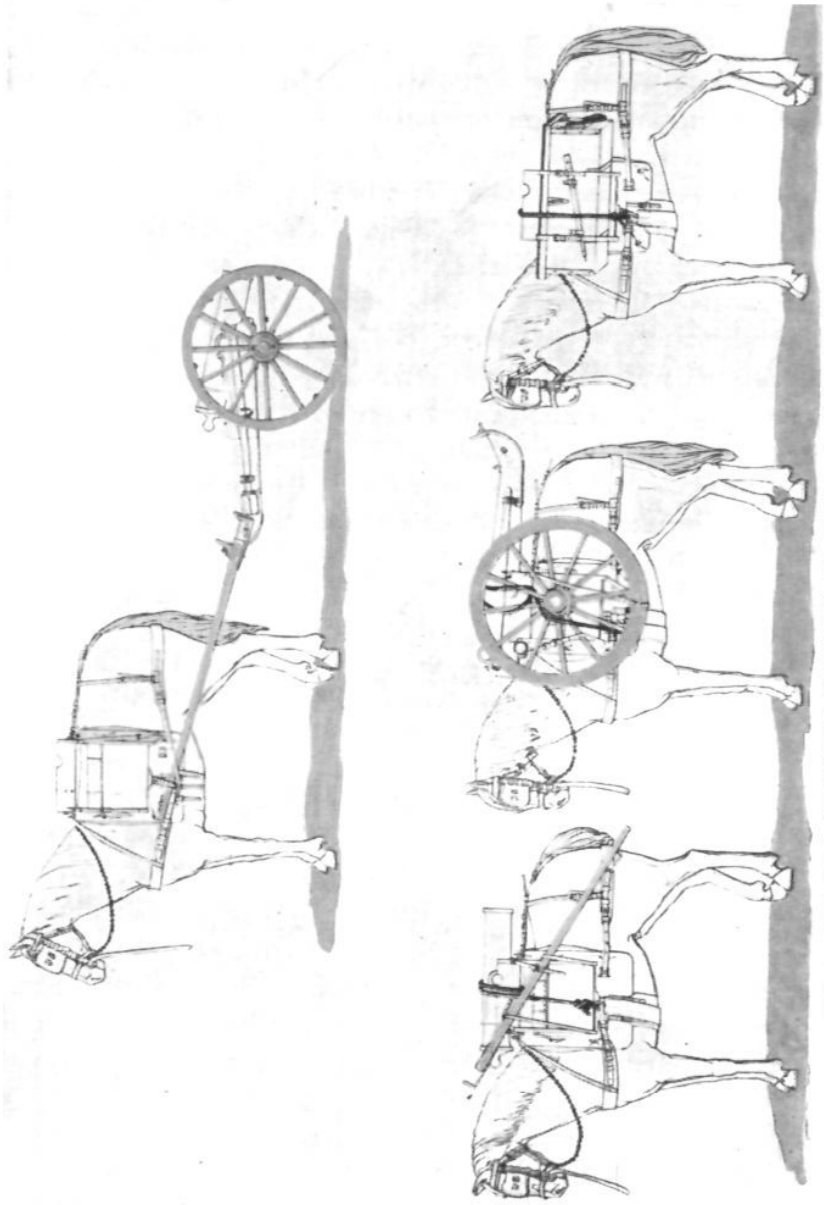


FIG. 1—THE 12-LB. MOUNTAIN HOWITZER OF THE U. S. ARMY IN PACK, 1841.

The wheels of the carriage described by Gibbon were 38 inches in diameter. The carriage for transportation over rough ground was packed on two mules, number one carried the howitzer and shafts, 251 lbs., and number two the carriage, 295 lbs. Where it was possible to travel on the wheels, shafts were provided for attachment to the trail and one mule was used in draft.

Capt. Lawrence L. Bruff, of the Ordnance Department, in his "Ordnance and Gunnery" published in 1896, described the Hotchkiss mountain carriage for the 3.6-inch field mortar as the American mountain artillery (Fig. 2). The flasks of this carriage were made of steel strengthened with angle iron and with transoms and trail plate. The axle was solid and the wheels had bronze hubs. Ropes were used to check recoil by tying them around the spokes of the wheels and passing them over the trail. The Hotchkiss carriage was a two-mule pack load, the mortar weighing 255 lbs. and the carriage 220 lbs. Shafts were provided for attachment to the trail for draft transportation on its wheels.

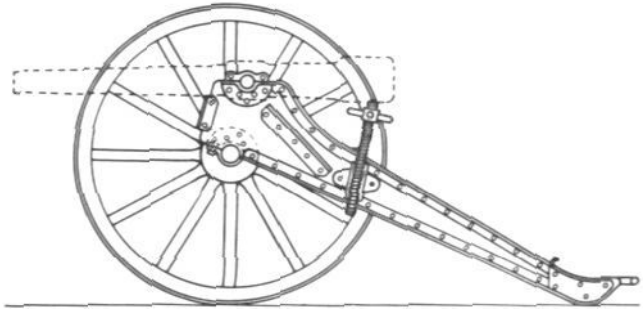


FIG. 2.—THE HOTCHKISS 12-LB. MOUNTAIN GUN.

Lissak in 1907 described the Vickers-Maxim mountain gun as the mountain artillery used by the United States Army. The weapon, secured from the English about 1898, was a 2.95-inch howitzer. It was of American and British manufacture and separated into four pack loads; the gun and breech, the cradle including recoil mechanism, the trail, and the wheels and axle. The cradle load was the heaviest and weighed 243 lbs. The general characteristics of the unit (shown in Fig. 3), are as follows: muzzle velocity, 920 ft./sec.; weight of ammunition, 12.5 lbs./rd.; maximum range, 4,825 yds.; length of recoil, 14 inches; maximum elevation, 17°; depression, -10°; traverse, 0°; total weight of gun and carriage, 909 lbs.

The gun is cylindrical in form forged with two lugs, one on each side at the breech end. To these lugs are attached the piston rods of the recoil mechanism. There are two finished collars on the gun tubes; one close to the muzzle, the other midway of the tube, which act as bearing surfaces when the gun recoils in the cradle. On the bottom of the tube is a lug which slides in a groove in the cradle and thus acts to take the torque due to the rifling twist when the piece is fired.

The breech has an interrupted screw thread and is operated by the handle on the left side which rotates the block open and swings it clear for loading. A recoil mechanism of the hydro-spring type is used consisting of two cylinders, one on each side of the cradle and cross connected by a by-pass at the rear end. The force of recoil is absorbed by throttling oil from one side of the piston to the other and compressing the counter-recoil springs which act to return the gun to battery at the end of recoil. A buffer is provided to take the shock of counter-recoil.

The cradle, which is a bronze casting, consists of three cylinders with parallel axes, the center cylinder for the gun and those on the right and left for the recoil mechanism. The trail is built-up of two side plates braced with cross transoms. At the rear is the spade and hand-spike hole while at the front are the bearings which take the tubular axle.

The elevating mechanism consists of a simple worm-wheel quadrant into which the worm operates from the elevating hand wheel through a gear train mesh. Traverse is obtained by shifting the trail by means of a hand spike. The spade area provided is not sufficient and, to prevent excessive rearward motion of the carriage in firing, brake

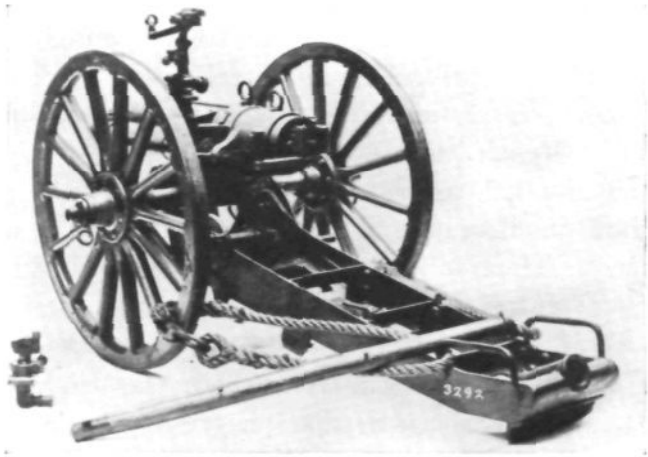


FIG. 3.—THE 2.95-INCH VICKERS MAXIM MOUNTAIN HOWITZER.

ropes which fasten to the trail and loop around the wheel felloes are provided. These ropes are clearly shown in Fig. 3.

In 1908 the Ordnance Department produced a pilot mountain howitzer and carriage which was designated as the 3-inch mountain howitzer and carriage, model 1908. Tests were made with this model and as a result it was redesigned and a second pilot, the model of 1911, was constructed. The general characteristics of this model are muzzle velocity, 900 ft./sec.; range, maximum, 5,570 yds.; weight of projectile, 15 lbs.; maximum elevation, 40°; depression, -5°; traverse, 6°; length of recoil, 37 inches at 0° elevation, 14 inches at 40°; weight of gun and carriage, 1,124 lbs.

The unit was carried in five pack loads: (1) the howitzer and breech, (2) the cradle and recoil mechanism, (3) the trails, (4) the axle and top carriage, and (5) the wheels and shield. The maximum pack load was the trails which weighed 239 lbs.

The howitzer separated from a sleigh by a latch at the rear end which, when opened, allowed the tube to be raised and unhooked at the front. The slides were on the sleigh which was carried assembled to the cradle as a part of its pack load. The carriage was equipped with a demountable shield composed of four sections which were carried in pack on the wheel animal.

An interesting point of difference between the model of 1908 and that of 1911 was the construction of the trails. In the 1908 model the trail was built-up of tubular sections. The total length of the trail was 94 inches and was jointed to fold to a 47-inch pack-load length. The 1911 trails were made of flat plate riveted into a box section. The length was also 94 inches folding to a 47-inch pack load.

From 1911 on through 1913 and 1914 the pack equipment for the 3-inch mountain howitzer, model 1911, was under development. Then followed the World War in Europe with a subsequent entry of the United States into the conflict on April 6, 1917.

During the World War there was no pressing demand for mountain artillery so that progress was delayed in the development of this type of artillery nor was it considered sufficiently

important during the year of adjustment following the Armistice on November 11, 1918.

In the Fall of 1919, to be exact on September 12th, the subject of pack artillery was again revived and a special subcommittee was appointed by the Chief of Ordnance to consider specifications for the design and manufacture of this type of artillery. The committee made its recommendations on October 28, 1919, and, based upon them, designs were completed and manufacture of the pack howitzer, model 1920, was directed (Fig. 4).

Two units of this model were built and designated as No. 1 and No. 2. They were completed early in 1921, and after preliminary proof-firing at Rock Island Arsenal were shipped to the Aberdeen Proving Ground where they arrived in March of 1921.

The general characteristics of these units were as follows: caliber, 75mm; muzzle velocity, 900 ft./sec.; weight of projectile, 15 lbs.; maximum range, 6,600 yds.; length of recoils, 0° elevation, 28 inches, 45° elevation, 18 inches; maximum elevation, 45°; depression, -5°; traverse, 5°; weight of howitzer and carriage, 802 lbs. The units were designed for four-load pack consisting of (1) the howitzer and breech, (2) cradle and recoil mechanism, (3) trail, (4) wheels and axle. The cradle and recoil mechanism were the maximum load and weighed 234 lbs. which was nine pounds over the maximum load of 225 lbs. provided in the specifications.

The object of the design was to obtain a howitzer which was capable of firing the 75mm divisional gun shell and shrapnel, at a maximum range of 5,000 yds. Two howitzers with the necessary bore and chamber dimensions to meet these requirements were designed and built for the carriage.

The No. 1 howitzer had a side-sliding breech block and provisions were made for attachment of a muzzle brake. It weighed 208.8 lbs. without the muzzle brake and 218 lbs. with the brake attached. The No. 2 howitzer had a screw-type breech block similar to the design used on the 3-inch mountain howitzer, model 1911. There was no provision for muzzle brake and the howitzer complete with breech mechanism weighed 185 lbs.

The two carriages were identical in general principles except in the following respects: The No. 1 carriage had the opening

for attachment of the axle at the forward end of the trail cut at 25° with the horizontal to permit assembly of the axle while the trail was resting on the ground and before the wheels were attached. The No. 2 carriage had the axle fastening open directly under the trail on a vertical line which required assembly of the wheels to the axle and then placing the trail down over the axle.

The trunnions of both carriages were located to the rear of the center of gravity of the tipping parts which resulted in an unbalanced load in elevating about the trunnions. This had to be compensated for by the introduction of equilibrators into the design. Artillery design practice in the United States had up to this time very little experience in equilibration and as a result the springs which were designed for the No. 1 carriage proved unsuccessful and were replaced by a drum on the elevating pinion shaft. To this was fastened a small wire rope which exerted a turning effort on the elevating pinion shaft by a pull applied by a helical spring contained in a flanged steel case riveted to the side of the trails.

There were two lengths of trails provided for the test with the carriages. The recoil mechanism was a St. Chamond type hydropneumatic with variable recoil control which gave 28 inches long recoil and 18 inches short recoil. The proving ground test of these carriages brought out many defects, some of which are here extracted from the report:

The spades were not of proper shape and consequently would not seat in firing without first digging them in. The trunnion latches were not positive and disengaged in firing. The extractor failed to eject the cartridge case. The breech operating handle on the No. 1 howitzer interfered with the range quadrant so that the block could not be opened or closed with the quadrant in place. The trail hand-spike socket interfered in pack. An interference existed between the pack fastening ring on the end of the recoil mechanism and the trail transom at about 31° elevation. The method of wheel fastening was not positive.

These defects could have readily been corrected and were not considered serious, and in June, 1921, it was recommended that the No. 1 carriage be sent to the pack artillery at Camp Stanley, Texas, to be tested in pack on a 500-mile march. On August 15,

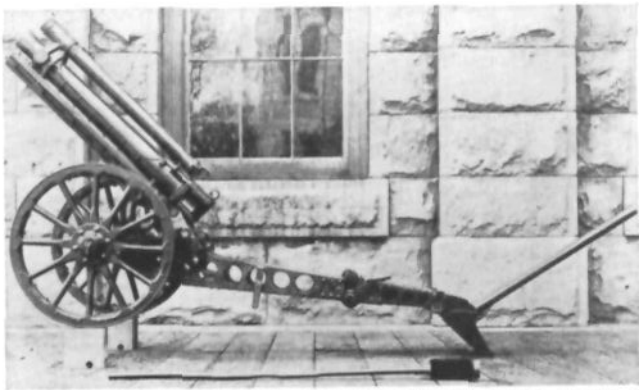


FIG. 4.—THE 75MM PACK HOWITZER, MODEL 1920, LONG TRAIL.

FIG. 5.—THE 75MM PACK HOWITZER, MODEL 1922 E, TYPE A.

1921, it was decided that studies of a new design be undertaken to correct the faults of the 1920 model and to embody such new features as were found desirable as a result of the experience gained with the carriages tested.

To complete the history of the model 1920, 75mm pack howitzer carriage, on June 26, 1923, the Field Artillery definitely recommended that this model be not considered for adoption as a standard for the using service.

The new specifications as proposed for the next design were as follows: caliber, 75mm; muzzle velocity, 900 ft./sec.; weight of projectile, 15 lbs.; maximum range, 6,600 yds.; maximum length of recoil, 28 inches; trail to be in two sections, forward not to exceed 48 inches, total length not to exceed 70 inches; stable with maximum charge at 15° elevation; breech to clear the ground in recoil at all elevations below 38°; wheel base (width of tread) 29 inches; elevation, 45° if possible; traverse, 5°; number of loads, 4; maximum weight of load, 225 lbs.

The design resulting from these specifications was designated the 75mm pack howitzer, model 1922, type A (Fig. 5). A wooden model was constructed but it never went beyond this stage for reasons which will follow. On May 4, 1922, a memorandum was received by the Ordnance Department from the Office of the Chief of Field Artillery which requested that the development of the model 1922, type A, be held in abeyance pending further study of the entire problem of pack artillery.

The solution of the pack howitzer problem up to this time had been undertaken on the basis of the use of four animals for pack with a maximum limitation of 225 lbs. load per animal. This had naturally placed a definite limitation on the maximum permissible weight of the unit and directly limited the weapon to a comparatively low muzzle velocity for the weight of projectile specified.

Based upon studies of the progress and line of thought of several European nations which had returned to the solution of the problem of mountain artillery after the World War, the Office of the Chief of Field Artillery expressed a view which can best be explained by quoting in part from an official memorandum on the subject:

"The tendency abroad, noted from study of what reports are available, is toward the development of a light field gun or howitzer of medium power which is normally transported in draft by one or more animals in tandem, but which may, when the occasion requires, be broken into six or eight loads of greater weight than those for which we strive, but which are nevertheless packable.

"Our own conception of this weapon as exemplified in our latest design, is a howitzer of light weight and low power, broken into four loads which can, without undue fatigue to the animals, be habitually packed.

"The point of particular interest in this tendency abroad is the design of pack material of considerably greater power than we have considered. This increase in power is utilized in either an increase in range, as for example in the Krupp, Japanese and Schneider designs, or in an increase in the weight of the projectile as in the case of the Schneider 105mm howitzer, the British pack howitzer and the Italian pack howitzer, as compared with our own design."

Thus was the path opened for reconsideration of the entire problem of design of a suitable piece of artillery for mountain use. A new line of thought was injected into the problem which from this time on progressively developed into one of the most efficient pieces of artillery designed for use in the United States Army.

Contrary to usual practice, calculations and study drawings were made and based upon and around these, tentative specifications, in part as follows, were written in June of 1922 for the 75mm pack howitzer, model 1922, type B: caliber, 75mm; weight of projectile, 15 lbs.; muzzle velocity, 1,250 ft./sec.; maximum range, 9,000 yds.; weight of howitzer, 220 lbs.; weight of breech, 120 lbs.; carriage, box trail axle traverse; elevation range, -5° to +45°; recoil constant 32 inches, no recoil pit to be required; traverse, 5°; stable with normal charge at +10° elevation; total weight in traveling position, 1,310 lbs.; ground clearance under carriage, 13.5 inches; length of trail center line of axle to spade, 96 inches; pack loads, 6 distributed as follows: (1) tube (howitzer) 220 lbs., (2) cradle and breech 210 lbs., (3) sleigh (recoil

mechanism) 220 lbs., (4) front trail, 220 lbs., (5) rear trail and counter weight 220 lbs., (6) wheels and axle 220 lbs.

A wooden model of this carriage was built and carefully studied by all concerned and as a result recommendations were made which required a restudy of the design principally for the purpose of relocating the centers of gravity of the various loads to make them more adaptable for pack loading.

The corrected design was designated as the model 1923E, type B, and was authorized for manufacture on February 5, 1923. The unit was finally completed at Rock Island Arsenal in February, 1924. It is interesting to note that when completed the unit weighed in traveling position for draft 1,375 lbs. and that the pack loads, as finally arranged, weighed as follows: (1) tube-howitzer, 224 lbs., (2) cradle and top sleigh, 215 lbs., (3) bottom sleigh and recoil mechanism, 215 lbs., (4) front trail, 215 lbs., (5) rear trail and axle 180 lbs. Shafts and single tree for draft and accessories brought the total weight to the 1,375 lbs. total weight in draft.

After preliminary proof firing and a short road test at Rock Island the unit was sent to Aberdeen Proving Ground where it arrived late in April, 1924. The tests of the weapon were initiated in May and shortly after they began the top and bottom sleigh failed. The desirability of a fixed spade was also recognized and as a result the carriage was returned to Rock Island in August for redesign of the elements that failed and the spade. The carriage had proved so successful, however, that a second unit was ordered which embodied some few minor changes which in no way affected the principles of the design.

The proving ground tests of the modified No. 1 and the No. 2 units showed them to be acceptable and in August, 1925, the No. 1 carriage and its howitzer were sent to the Pack Artillery Board at Fort McIntosh, Texas, where it was tested in pack on the aparejo and later on the new Phillips pack saddle which became available in the latter part of 1925.

In July, 1925, two more of these units, the No. 3 and No. 4, were ordered manufactured. These units were built with slight improvements over the two which had preceded them but were identical in principle of design since it was now recognized that

at last an efficient mountain weapon had been found. These units were designated as the 75mm pack howitzers, M. 1923 E2.

The two units M. 1923 E2 were shipped to Aberdeen Proving Ground in the latter part of 1926 and from there to Fort Robinson, Nebr., for test by the Pack Artillery Board after which they were standardized to replace the 2.95-inch Vickers-Maxim mountain gun on September 22, 1927.

In October, 1927, the Pack Artillery Board recommended the adoption of the Phillips pack saddle as the standard, and fully to determine its suitability as well as to test thoroughly the howitzer and carriage a 500-mile march was ordered.

On July 31, 1928, an outfit made up of 75mm pack howitzers of 1923 models, four in all, together with ammunition and accessories, packed part on aparejo and part on Phillips saddles, left Fort Robinson. The route of the march was to Fort Meade, S. Dak., by way of Hot Springs and Buffalo Gap, S. Dak. Upon arrival at Fort Meade a 150-mile circuit was made through the Black Hills which included a climb of Harvey Peak over a rugged mountain trail. When this circuit was completed the unit returned to Fort Robinson by way of Hermosa, Custer and Hot Springs, S. Dak. The march was completed on September 4, 1928.

After certain adjustments and relocation of the loads on the saddles, the Phillips saddle was finally adopted as standard on March 15, 1929.

The 75mm pack howitzer M1 is illustrated in Figure 6. The materiel is designed to be separated into units suitable for pack transportation and for draft by two mules in tandem. The howitzer is so arranged that the tube is separated from the breech ring for transportation in pack.

All possible weight within reasonable limits has been placed in the recoiling parts to increase the ratio of weight of these parts to weight of projectile which results in reduced firing stresses on the carriage and the consequent reduction to a minimum of the length and weight of the trail.

When assembled the howitzer tube attached to its breech ring rests in a bottom sleigh which slides in a cradle. The cylinders of the hydropneumatic recoil mechanism are permanently fastened

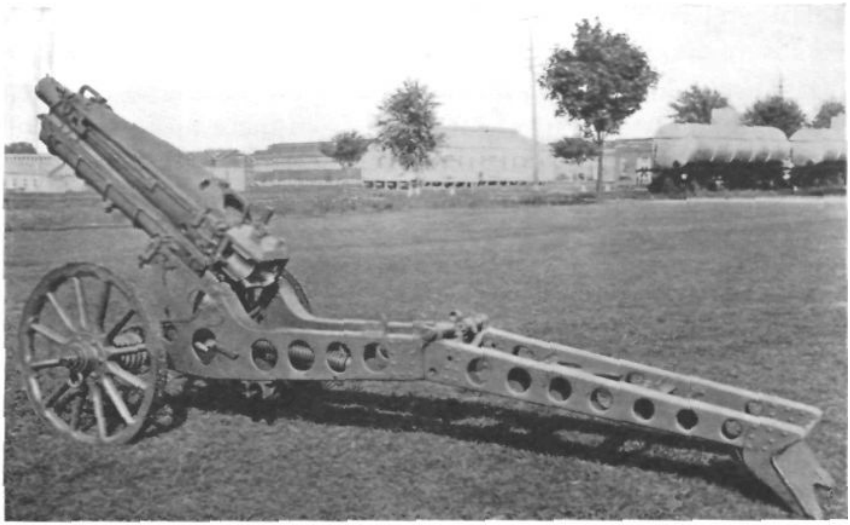


FIG. 6.—THE 75MM PACK HOWITZER, M1, THE STANDARD IN THE U. S. ARMY.

underneath the bottom sleigh and recoil with it. The piston rod is locked at the front end to the cradle which is a nonrecoiling part. Over the top of the howitzer tube is placed a top sleigh which locks into the bottom sleigh and is also an element of the recoiling parts.

The elevating rockers, two in number, are permanently trunnioned to the front trail section and the cradle assembles to and is locked into these rockers. The front end of the front trail section assembles and is locked to the axle traversing mechanism. The rear trail section is jointed to the front trail section by means of a lock. The general characteristics of the weapon are as follows: weight of projectile, 15 lbs.; muzzle velocity (maximum), 1,250 ft./sec.; maximum range, 9,200 yds.; elevation, 45°; depression, 5°; traverse, 5°; recoil, 32 inches; height of bore above the ground at 0° elevation, 27.5 inches; ground clearance in animal draft, 10.5 inches. Pack loads (Fig. 7): (1) howitzer tube with muzzle cover and 1 lifting bar, 229 lbs.; (2) front trail and 1 lifting bar, 243 lbs.; (3) cradle, top sleigh and 1 lifting bar, 228.5 lbs.; (4) rear trail, sight and accessories, 248 lbs.; (5) bottom sleigh with recoil mechanism, 1 lifting bar, 2 oil cans and 1 oil can carrier, 224.6 lbs.; (6) wheels and breech block, 217.5 lbs.; making a total in all of 1,390.6 lbs. Weight in firing

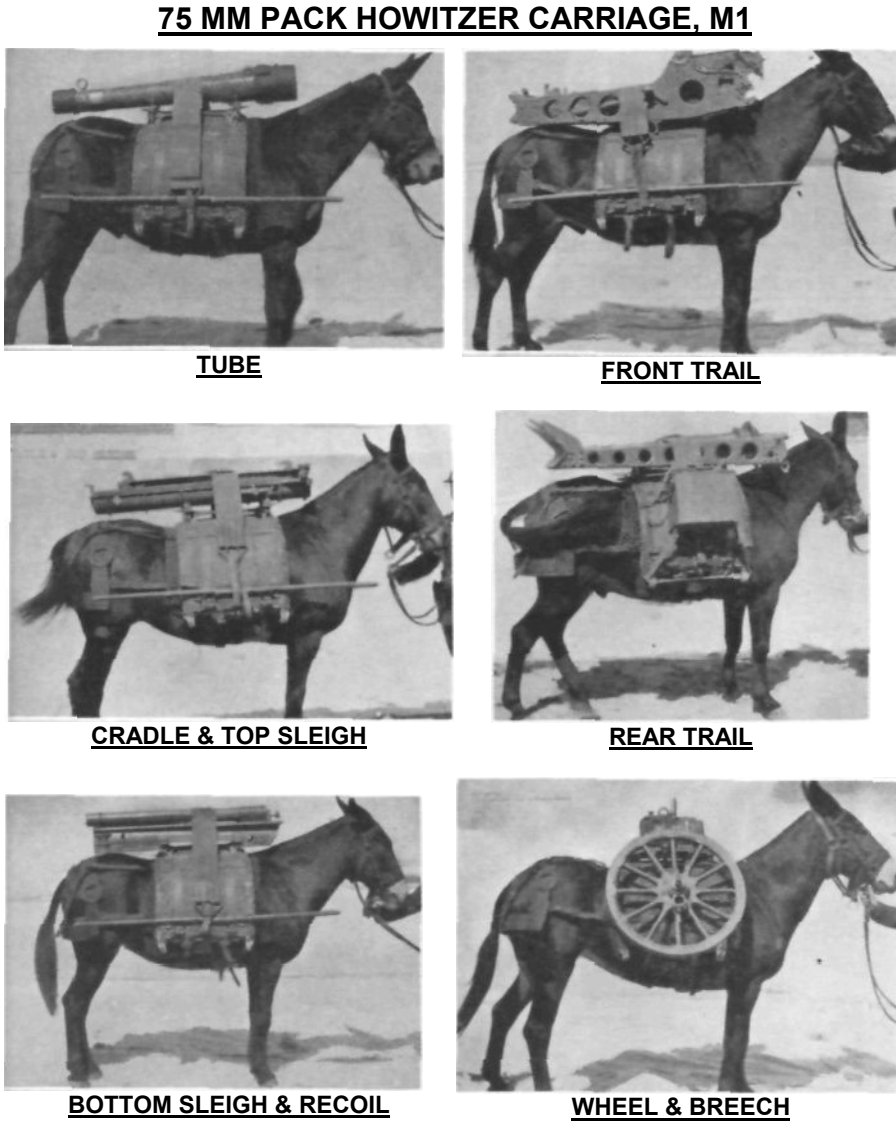


FIG. 7.—THE 75MM PACK HOWITZER, M1, ARRANGED IN PACK LOADS.

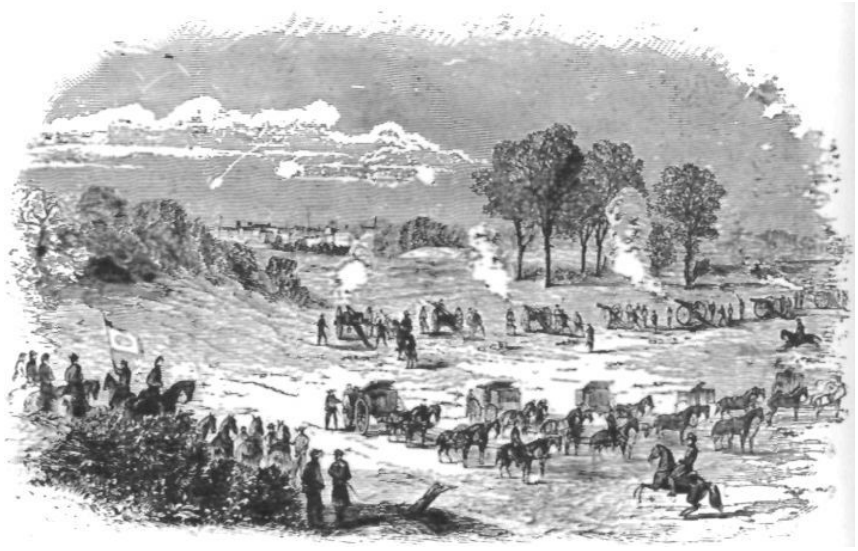
position, 1,269 lbs.; weight arranged for animal draft, 1,471 lbs.

On the basis of pounds of weight of weapon per yard of range, the new 75mm pack howitzer ranks as one of the most efficient breech loading artillery weapons yet designed as the following table shows:

TABLE II

	Wt. in Firing Position, lbs.	Range yds.	Lbs. yd. range
75mm Pack Howitzer, M1	1269	9200	.137
75mm Gun, Mod. 1897 (French)	2657	9200	.289
75mm Gun. Mark I	3280	14880	.220
75mm Infantry Mortar, M2	375	2000	.188
Vickers-Armstrongs 2.95-inch M. 1929	1526	9850	.155
Skoda 75mm 1928	1550	9700	.159
Schneider 75mm 1919	1507	9058	.166

The solution of the problem of mountain artillery has been a long and most difficult one. It is believed that the resultant carriage with perhaps minor changes as time goes on will hold its place among efficient modern artillery for some years to come.



THE 12-GUN BATTERY

BY MAJOR A. R. HARRIS, Field Artillery

IN EVERY good book on tactics of field artillery in this or any other country, some such phrase as this is encountered time after time: "Maximum effect can be attained usually by attacking the objectives with *sudden and powerful concentrations* of fire." The purpose of this article is to examine the reasons for the above statement, and if the reasons seem satisfactory, to seek the means of putting the idea into execution.

In searching for reasons, let us consider for a moment the limitations of the artillery projectile at the point of burst. As we all know, the effect of a bursting shell is principally horizontal. Any one *standing* within, say, twenty yards of the bursting shell is quite likely to get hurt. But also any one with all parts of his anatomy below the surface of the ground—in a fox whole or shell hole for instance—is relatively safe. He may get hit with a few falling splinters, but as the force of these will be spent, they will not do him much damage. Also he *may* get a direct hit, but the chances of this tragedy are about one in 30,000 or so. So we can reiterate, if he is in a shallow hole he is relatively safe from artillery fire.

Now with a single battery adjusting by means of overs and shorts and then searching through a zone of quite a great depth, how many of the enemy are going to be injured during the firing? Warned by the fire for adjustment, a goodly number of them will undoubtedly have sought friendly holes. Others will have dug holes of their own—and a man can dig quite rapidly when his life depends on it. Still others will have moved off to the right or left flank to comparative safety. And in consequence the net result will be very few injured when the fire for effect is finally delivered. The moral effect of this type of firing is not great.

We have all seen the same thing in counter-battery firing. A few hostile shells drop in front of a battery in action. Then a few shells drop in rear of it. If the battery can possibly cease firing for a time, the command "cease firing" is given and the men are allowed to scatter a few hundred yards on either flank of the battery. There they loll about smoking and resting until the enemy has completed his "shoot." Thereupon they return to their

guns, brush off the dirt and mud, and go merrily along with their firing—none, or very little, the worse for the counter-battery firing. To be sure the battery has been "neutralized" for a short length of time, but only for a time. It can, in the majority of cases, resume firing with about the same efficiency as before, none, or very little, the worse from the experience. Now let us assume that instead of "telegraphing its blows" by means of an adjustment of fire, the enemy had suddenly—without warning—put down a concentration for one or two minutes not with one battery, but with three—all guns firing at the maximum rate of fire, about six rounds per gun per minute. If the fire is at all accurately adjusted, some of the personnel are going to get hurt before they can seek cover or move off to the flank of the battery. And the battery is going to be crippled or partially neutralized, until replacements arrive, maybe for weeks or months. Seventy-two rounds per minute falling unexpectedly in a small area are bound to cause damage. When the firing is over, the hostile battery will not be able to fire as efficiently as before. It will have been neutralized, and partially destroyed—because destruction of personnel is quite as effective as destruction of materiel. And the moral effect of these *short, sudden, powerful* concentrations is undoubtedly tremendous.

We all know that the above mentioned heavy concentration is extremely easy to put down. All we need is the accurate locations of the hostile battery, our own three batteries and some check points. These data can easily be obtained from a map or an improvised firing chart. The fire for adjustment on a check point and the subsequent transfer of fire on to the battery are extremely easy of accomplishment.

If a *sudden and powerful* transfer of fire is so effective against a hostile battery, why will it not be just as effective against the targets usually fired on by light artillery, machine guns, groups of men, O. P.'s, working parties, reserves, etc., etc.? The answer of course is that it will be—but the question now arises: how can a "sudden and powerful concentration" be put down—in a meeting engagement for instance—on a staff party which suddenly appears on a hill 3,000 yards away and remains there for only three or four minutes.

Nothing could be simpler—provided the proper preparations have been made. If the battalion commander, immediately upon going into position, prepares concentrations for all possible points where the enemy, including the staff party, is likely to appear, the solution is at hand. If the time is, let us say, 8:00 a. m., and the area where the staff party shows itself has been selected and plotted on the map is a possible target area and numbered Bn-37, the battalion commander simply commands:

"All batteries. Fire Bn-37, maximum rate, from 8:02 to 8:03."

The batteries, which have already registered and have already prepared the data for a transfer of fire to the target area Bn-37, have only to set off the required data and fire six rounds per gun as rapidly as they can, beginning at 8:02 a. m. If the point where the staff party appeared has been properly located and the transfer of fire properly made, the staff party is in for a few casualties. There will not be the usual warning given by fire for adjustment. There will be no opportunity to seek cover or scatter. The staff party will simply have to "take it."

In the same manner, fire on any other target suitable for light artillery can be put down in the form of "sudden and powerful concentrations." The time will seldom be longer than a minute or two for a single concentration. Even tanks may be attacked in this manner. For example, a tank is seen rapidly approaching the area which is marked Bn-42 on the map or firing chart. The command would be: "All batteries prepare to fire Bn-42 at my command. 6 rounds. Maximum rate."

When the tank is about to enter "goose egg" Bn-42, the bat talion commander would command: "Fire."

Naturally the above system presupposes that the areas selected by the battalion commander for possible concentrations are the areas that will logically be occupied by the enemy, or the points that tanks will, in all probability, have to pass over.

This system of fire consists in the battalion commander's planning concentrations for every sensitive point in his normal zone just as soon as he goes into position. He must pick out these points, identify them to his staff, have them located (just as accurately as possible) on the map or firing chart, give each a number, and have all batteries figure a transfer of fire for every concentration. The technique for all of the above is prescribed in

Volume II of the Field Artillery Manual. In no other way can "sudden and powerful concentrations" be put down. The majority of points selected will not be occupied by a target when they are selected. But when a target does appear, no time is lost in figuring data. Consequently the "sudden" part of our formula has been provided for. Also by using the entire battalion for every concentration the *"powerful"* part of our formula has been attended to.

Of course the battalion now becomes a twelve-gun battery, and the battery commanders will have little to do in actually conducting fire. They will fire for registration every few hours and supervise the figuring of data and the functioning of their batteries. They will probably have an officer observing the fire, but it is doubtful whether this observer will be able to identify his own rounds, unless they are far out of the concentration area. In this connection there will always be in every battery three or four high school or college graduates who can be taught to figure transfers of fire as rapidly as targets are announced. Although the battery commanders will probably not do much observing, the normal zone will be under observation at all times and by the highly trained battalion staff. When all possible target areas have been plotted, the battalion staff at the O. P. will probably be reduced to one observer with a map or panoramic sketch and a telephone—but he will be able to bring down *sudden* and *powerful* concentrations anywhere in his front at a moment's notice. Where no good single observation post exists, several observers will probably report what they observe to a conductor of fire at the C. P. Also all plotted concentrations will be sent to the Liaison officers who can also request battalion concentrations by number.

Of course, opponents of this system will naturally, and rightfully ask:

"Can the battalion commander, aided by his staff, locate on a map or firing chart, accurately enough for practical purposes, the areas where he desires future concentrations to be placed?" With a good map there should be no difficulty. And a well trained staff can do wonders with a firing chart—for instance, getting the direction from the Battalion Reference Point, the distances by means of the range finder, and the relative sites by the aiming circle or B. C. instrument.

In this connection the writer admits that he has never been able to work a range finder accurately. And he has never seen an officer who could. But he has seen enlisted men, who were kept constantly on this duty and drilled intelligently, who produced surprisingly accurate results with this greatly maligned instrument.

Although he has very little data on which to base his argument, the writer believes that a *well trained* battalion staff will plot, immediately upon going into position, 15 or 20 possible target locations an hour and average less than 3 per cent error in range and less than 5 mils error in deflection. The transfer of fire will also produce errors. Fifty per cent of the time these errors will be compensating. (Unfortunately 50 per cent of the time, however, they will be accumulative). But with three batteries firing, the probability of getting some shells into the target area would seem to be very good. A well trained, intelligent, and resourceful staff will soon reduce errors. For instance, if the battalion remains in position for more than a few hours, some such refinement as an accurately measured short base line would enable the target areas to be located very accurately. From that time on, practically the only errors would be those produced in the transfer of fire.

This system is not original or new. It was used in principle most effectively by the French Fourth Army in the defense in the vicinity of Rheims in July, 1918. In this action the French retired voluntarily from their main battle position to their reserve battle position leaving strong-points to force the attackers to advance along certain channels. These channels were covered by prepared artillery concentrations, and were under constant observation by artillery observers. As the Germans advanced, they simply moved from one artillery trap to another. These traps were sprung by some hidden artillery observer simply saying into a telephone some such command as: "Fire Bn-37." This command brought down sudden and powerful concentration. By the time the attackers arrived at the reserve battle position, the artillery had won the day—the attack had broken down because of the losses and disorganization inflicted by the artillery fire.

This same system can be used just as effectively in the meeting engagement or the attack as in the defense. The foregoing discussion has been limited to the battalion, but there is no reason why regimental or brigade concentrations cannot be used with even greater effect. The system requires good staff work and great ingenuity, also good O. P.'s. There are perhaps many objections to this system. Undoubtedly many details will have to be perfected. But it does accomplish one thing. It enables the artillery to attack its objectives with *"sudden* and *powerful* concentrations," and for that reason alone, deserves the intelligent consideration of all artillerymen.

The following questions and answers may clear up some points that the writer has been unable to bring out in the foregoing discussion:

Q. The previous discussion seems to refer to small target areas only. What happens when a large force covering a large area is to be taken under fire?

Ans. If possible, the large area is divided up into smaller areas and short but distinct concentrations are fired one at a time and in no particular order, until the entire area has been covered. The *sudden* and *powerful* effect is lost if a battalion spreads its fire over a large area. The above mentioned method naturally leaves part of the area free from fire for some time. However, when the fire does come down, its viciousness will undoubtedly make up for lost time.

Q. As the battery commanders will practically never conduct fire in battle, will it be necessary to teach them all the different methods of adjusting fire?

Ans. Yes. They will need to know all the methods for registration, for fire for destruction, for use when the battery is acting alone, etc.

Q. When ammunition is scarce some targets aren't worth the expenditure of one minute's fire or 72 rounds; what happens then?

Ans. Fire is put down for half a minute, or 36 rounds—but at the maximum rate.

Q. How does the battalion commander organize his staff to plot those 15 or 20 target areas per hour?

Ans. A good organization is suggested on page 366, Vol. II of the Field Artillery Field Manual.

Q. How are the target areas designated to the batteries?

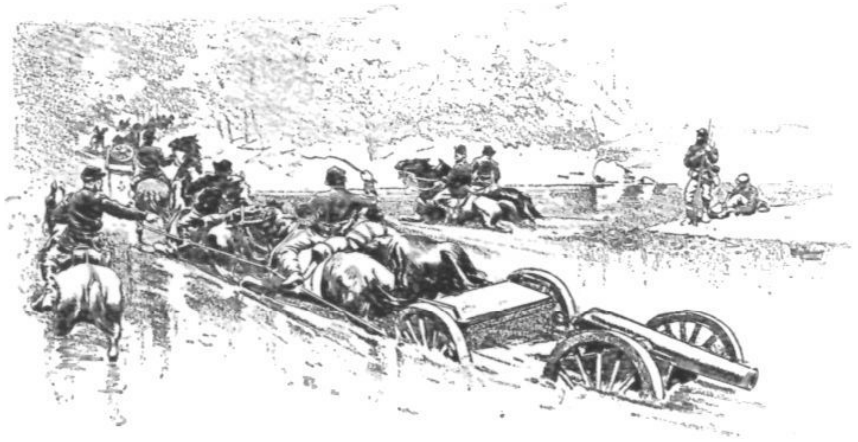
Ans. A good way is by coordinates; in case no map is available, a common system of coordinates must be prescribed by the Battalion Commander for the firing chart.

Q. Do the battery O. P.'s have to be plotted?

Ans. No, but naturally the battery positions do.

Q. What is there new about this system anyway?

Ans. Nothing—except perhaps the frank admission that any fire on the battlefield except a *sudden* and *powerful* concentration is wasteful and inefficient, and that a *sudden* and *powerful* concentration *cannot* be put down by anything less than a battalion employing a transfer of fire or corrected map data.



FORT HOYLE

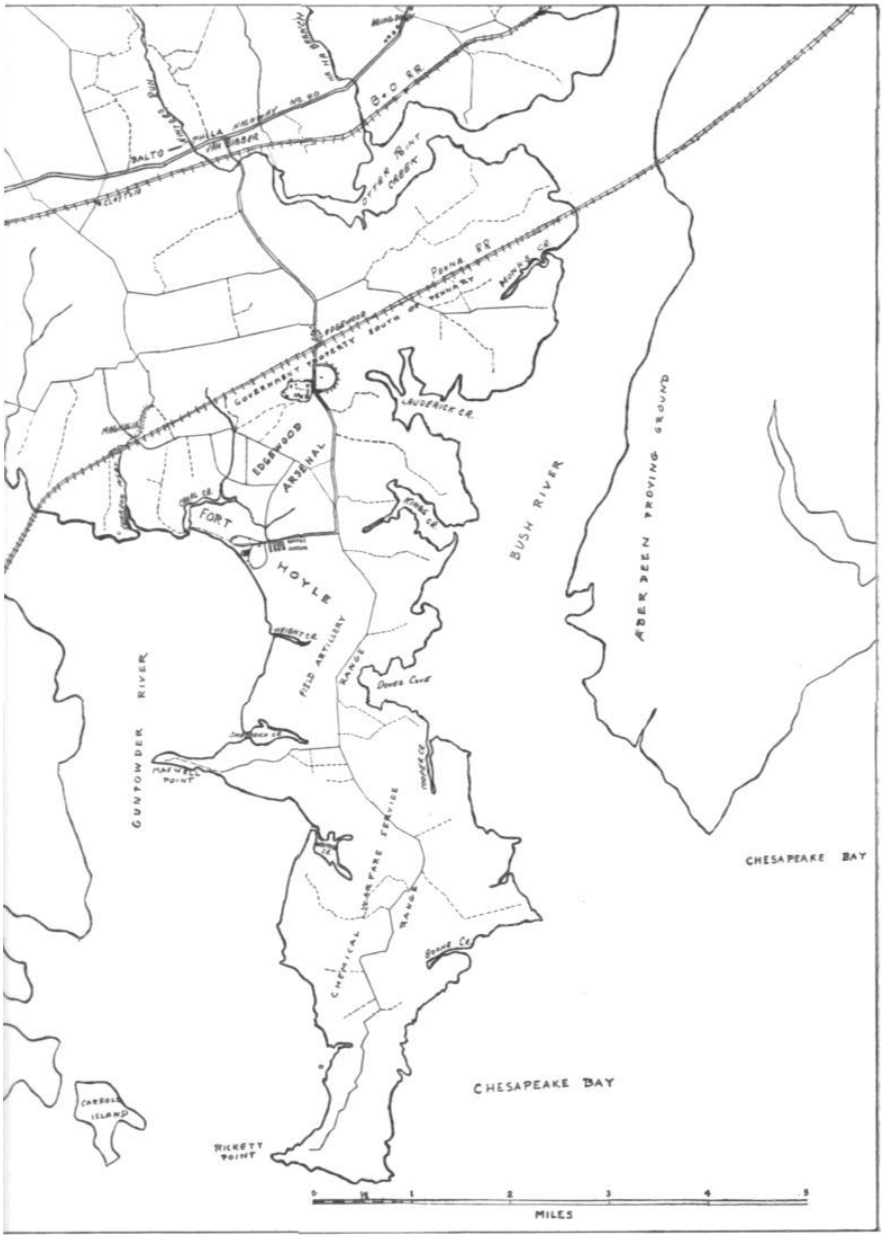
BY MAJOR J. M. EAGER, 1st F. A. Brigade

DURING the War, the Government, by proclamation of the President, purchased a large water-front area in Harford County, Maryland, called Aberdeen Proving Ground, for the proof and testing of ordnance materiel.

The southern part of this area, known as Gunpowder Neck, separated from the Proving Grounds proper by the broad Bush River, became the testing and manufacturing area for the Trench Warfare Section of the Ordnance Department.

Gunpowder Neck is a peninsula eight miles long and averaging two miles wide, jutting in a southerly direction into Chesapeake Bay between the mouths of the Gunpowder and the Bush Rivers. These rivers are over a mile wide where they flow into the bay although they are only small streams where they run through the hills of "hinterland" Maryland, before reaching the flat lowlands of the tide-water strip. The peninsula is about 20 miles north of Baltimore. The main line of the Pennsylvania Railroad from New York to Washington forms the northern boundary of Gunpowder Neck, and a little further north and parallel to its tracks are the main New York-Washington B. & O. line and the two main highways between those cities—No. 40 Highway, which crosses the Susquehanna at Havre de Grace and the No. 1 Highway which crosses the big river at the Conowingo Dam. So the place is by no means far from civilization, although this is sometimes hard to realize, especially when one can hear the wild ducks, geese and swans quacking vociferously and raising a most unmilitary commotion right out in front of quarters as they are doing this moonlight evening while I am writing these lines.

Gunpowder Neck is mellow in historical interest. The first white settler was Thomas O'Daniel to whom a part of it was granted in 1663 by Lord Baltimore. Captain John Watterson, a native of the Isle of Wight and a surgeon by profession, settled here in 1666. About 1719 Colonel James Maxwell acquired land on Gunpowder Neck and under a re-survey, the property was patented by the name of "Maxwell's Conclusion," indicating that his estate covered several older grants as well as the vacant land.



MAP OF FORT HOYLE AND VICINITY.

Colonel Maxwell was in command of the militia forces that guarded the frontier, for at that time all Maryland, except areas on Chesapeake Bay, was a savage wilderness, spoken of as "The Forest" and inhabited by the Susquehannough Indians. There was a chain of forts from the Susquehanna to the Potomac to protect the settlers. But in Maryland the larger estate owners were gentlemen who dealt fairly with the Indians and as a result there was very little trouble. Labor in Maryland in the early days was obtained by indenture from England, although some African slaves were procured. Much of the indenture labor was skilled as can be seen by the fine early buildings and furnishings.

Gunpowder Neck in later days was purchased by General Cadwalader who left his mother and wife here while he went to the Mexican War. It was from his descendants that a large part of the reservation was purchased by order of Woodrow Wilson in 1917. Major Harry Gilmor, who accompanied General Jubal A. Early on his raid from Petersburg, drove away General Cadwalader's horses and burnt the Gunpowder Bridge.

The Cadwaladers lived in grand style and their estate was famous for its hunting preserves and arboretum. Many rare, beautiful and exotic trees are still growing near the ruins of the old Cadwalader house at Maxwell's Point out on the range. Boxwood hedges were transplanted from here to Arlington when the tomb of the Unknown Soldier was built.

Among the famous visitors to Gunpowder Neck were General Scott, General Cadwalader's commander-in-chief during the Mexican War, Daniel Webster and Grover Cleveland.

In 1921 the newly organized Chemical Warfare Service was given the Gunpowder Reservation for its school and arsenal, but the Ordnance Department was still permitted to shoot high powered weapons over and on to the lower part of the peninsula. At this period the Chemical activities of the U. S. Army, scattered throughout the United States, were closed down and all the Chemical Warfare establishments were concentrated on Gunpowder Neck at the newly organized Edgewood Arsenal, where considerable construction was undertaken, particularly in the nature of factories and warehouses.

In the autumn of 1922 the War Department, due to the necessity

of having an artillery range in the 3rd Corps Areas, turned over a part of Gunpowder Neck to the Field Artillery. Thus on October 7, 1922, the Field Artillery acquired a new post which was named Fort Hoyle in honor of that famous old artilleryman, Brigadier General Eli D. Hoyle, who had just died a few weeks before. The 6th Field Artillery and the Headquarters of the 1st Field Artillery Brigade moved to Gunpowder Neck from Montauk Point, where they had been quartered since returning from their adventures in France.

The boundaries of the two posts were defined in War Department General Orders and the range area was also divided between Fort Hoyle and Edgewood Arsenal, so that each had "all rights, privileges and responsibility" over its part of the range. Both posts use the whole range for their work, but always consent is obtained before using the other fellow's part of the range. When the Field Artillery fires our impact or target area is necessarily always on Edgewood Arsenal territory. Likewise, when the Chemical Warfare fire their mortars, their gun positions, or emplacement area, as it is called here, are often on Fort Hoyle ground. Demonstration and tactical exercises for the Chemical Warfare School are frequently held on our area on account of accessibility and better facilities for observation.

Fort Hoyle and Edgewood Arsenal also share staff officers and services; for example the Quartermaster belongs to Fort Hoyle and the Surgeon belongs to Edgewood Arsenal; the Engineer Officer and Veterinarian to Fort Hoyle, and the Signal Officer to the C. W. S.

If the reader should enter the reservation in the usual place, i. e., on the north boundary, and if he should drive through the reservations to Rickett's Point on the southermost tip of the range, he would first traverse Edgewood Arsenal proper, then Fort Hoyle proper, then the part of the range which is controlled by the Commanding General, Fort Hoyle, then the part of the range controlled by the Commanding Officer, Edgewood Arsenal. In Edgewood Arsenal he would pass the Chemical Warfare School and Headquarters areas which belong exclusively to the C. W. S., and the golf course which belongs to Edgewood Arsenal, but is used also by the Field Artillery golfers; then the

Quartermaster and Ordnance buildings which are on Edgewood Arsenal ground but are under the jurisdictions of the Commanding General, Fort Hoyle. Upon crossing the boundary into Fort Hoyle he would pass the Aviation Field which is used in connection with the work of both posts; then the barracks area where all the troops, including the 1st Chemical Regiment are quartered. The moving picture building is used by both posts as are also the chapel, library, gymnasium, athletic fields and pistol ranges. Although the jurisdiction seems involved, the arrangement is working very smoothly at present. After all, is it not so that friction is less apt to result from difficult situations than from difficult personalities?

Fort Hoyle is particularly important as a Field Artillery post for two reasons: first, it is the only Field Artillery range in the Third Corps Area except Tobyhanna, which now is used exclusively by the National Guard; second, its nearness to Edgewood Arsenal enables the Field Artillery to work with the Chemical Warfare Service on experimentation, tactics, and training with smoke and gas ammunition as well as with gas masks.

Not only do the 6th Field Artillery and the 16th Field Artillery (from Fort Myer) do their service firing at Fort Hoyle, but also the Field Artillery reserve regiments and officers of the Third Corps Area and many from the Second Corps Area come here for their firing and active duty training. Furthermore, the Field Artillery CMTC and ROTC Camps here have become regularly established summer institutions.

Thus we see that the Fort Hoyle range is important. The range itself is by no means perfect. It is small, flat, mostly heavily wooded or swampy, and often overcrowded with assorted military activities. But a tremendous amount of improvement work has been done on it so that now it is one of the best equipped ranges in the Field Artillery. The flatness and the woodiness have been overcome in great part by the erection of huge O. P. towers from which groups of students can observe and conduct fire. The platforms on these three O. P. towers are 53 feet above the ground and accomodate about 30 people. They are roofed so that firing can proceed in almost any kind of weather. The two newest towers were made from salvaged water

towers from Edgewood Arsenal, which were carried piece by piece out to the range and set up in desirable locations. The flooring, roofing, ladders and central cores, however, are of wood which was cut on the range and sawed at our own salvaged saw mill.

OBSERVATION TOWER FOR CONDUCT OF FIRE.

The range is also equipped with one of the best forward O. P. concrete and steel dugouts in existence. This dug-out is 40 feet long and 10 feet wide, with a ceiling consisting of two layers of railroad rails covered by 5 feet of earth. The front wall is concrete, 2 feet thick, reinforced horizontally and vertically by railroad rails. The rails were salvaged from an abandoned spur of the Pennsylvania Railway. Slits along the front of the dug-out permit 20 persons to observe, and each slit is long enough so a B. C. telescope can be used. The entrance is "U" shaped in plan, so fragments of bursting shell cannot possibly get in. The dug-out is lighted by electricity from a storage battery and it is contemplated making it gas proof. It is the masterpiece of Lieut. George M. Cole and Battery "C", 6th Field Artillery, who toiled long and hard on it; one of their greatest difficulties being its distant and inaccessible location, far down the range near the target area.

The range is also equipped with three sets of concrete battery emplacements for firing shell. They are of a design somewhat different from the three-wall type, being "V" shape in plan. The

concrete walls which protect the cannoneers and executive are pierced with small holes for the lanyards and a slit for the executive. There is also a concrete arc and permanent log for the gun trails. Two more sets of concrete emplacements are to be constructed which will give a greater range and a possible angle "T" of 780 mils.

In addition to areas which were not wooded when the range was taken over, forty acres of impact fields have been cleared of tall and second growth timber, roads have been built connecting the O. P. towers and gun positions, and various trails cut to facilitate tactical work.

The machine gun and 37 m/m ranges have been considerably improved and are now excellent for stationary, moving and antiaircraft firing.

A permanent underground cable system connects O. P.'s and range guard posts with a hollow tile telephone exchange house made of salvage with a permanently installed switch board, also salvaged. Furthermore, there is always wireless communication with the good ship "Ward," a launch whose chief function is to save picknickers, canoeists, fishermen, and other trespassers from the perils of artillery fire.

In order to provide facilities for very accurate firing, the whole range has been re-surveyed and new markers installed at bench marks. Twenty-four targets have been accurately plotted and arrangements made to procure meteorological data from nearby Aberdeen Proving Grounds.

DOOR OF DUGOUT.

Most of this work was done last winter under direction of Colonel Laurin L. Lawson, Commanding Officer of the 6th Field Artillery, who first obtained authority to put in 10,000 man-days of improvement work on the range in order to have proper facilities to carry through summer training. Many more than

QUARTERS OF THE COMMANDING OFFICER, 6TH FIELD ARTILLERY.

that number of hours were needed. But even more remarkable than the amount of physical labor expended on the range are the quantity and variety of materials obtained without expense to the Government through Colonel Lawson's ingenuity and persistance.

In the northwest part of the Fort Hoyle reservation there is an area about 1 mile long by ½ mile wide known as San Domingo Field. This area for a long time was more or less waste land due to the fact that it was separated from the rest of the post by a marsh and Canal Creek. So last year, Colonel Lawson built a concrete abutment bridge with steel I-beam girders across Canal Creek at its mouth, and a road along the beach. In order to build this road it was necessary to make a retaining wall and to fill in large quicksand areas with gravel. The materials for the retaining wall were salvaged concrete blocks, dynamited from cellars of abandoned buildings, and salvaged drums filled with gravel. Thus a fine drill field and area for R. S. O. P.'s has been made available.

These operations were accomplished by the 6th Field Artillery while their usual garrison duties and training were going on. All officers and enlisted men of the regiment helped directly or indirectly with the various projects and a diversity of talents was developed which certainly enhanced the military value of the individual officers and enlisted men, making them better and more

versatile soldiers. The following are some of the specialties in which many individuals gained experience: Logging, saw milling, concrete work, bridge building, carpentering, painting, steel construction, cable laying, road grading and building, tile construction, etc.

The various operations or projects were alloted to batteries of the 6th Field Artillery under selected officers, some of the more important being:

Battery "A" constructed the Beach Road to San Domingo Field under the supervision of Capt. Wm. J. Egan.

Battery "F" constructed the concrete gun emplacements with Lieut. James E. Holley in charge.

Headquarters Battery, 1st Battalion, under Lieut. Chas. D. Daniel, made San Domingo into a drill ground.

Headquarters Battery, 2nd Battalion, did the survey work under direction of Capt. Victor R. Woodruff.

Battery "C", commanded by Capt. Leo T. McMahon, built the forward OP dug-out.

Regimental Headquarters Battery, under the supervision of Lieut. Chas. L. Dasher, cleared the trees and undergrowth from parts of the range.

Service Battery, with details from other units, erected the O. P. towers under the direction of Capt. R. C. Mallonee, who was also General Assistant to Colonel Lawson for the other projects.

Major General Paul B. Malone, Commanding General, 3rd Corps Area, approved the projects and made available $1,300.00 which was used for materials that could not possibly be obtained by salvage, principally cement.

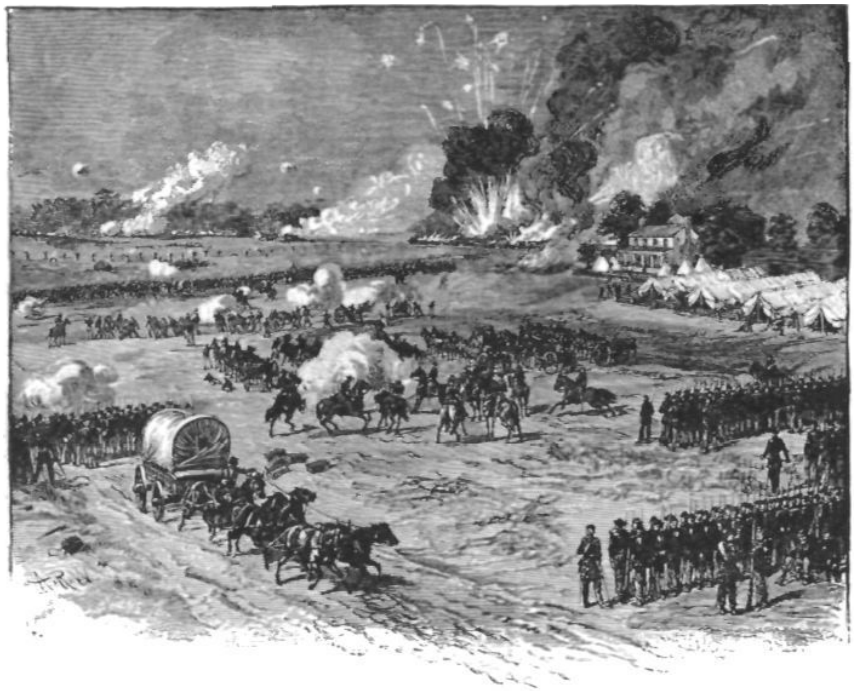
In addition to the range and drill field, a great deal has been done, and is being done, towards making the post a better place to live in. The stable area now has concrete drainage ditches and brick or concrete floors in the stalls; a new athletic field with a commodious grandstand is being built; work on a new War Department theater has just started under direction of the new Commanding General, E. D. Scott; the fatigue work of grass cutting—and Fort Hoyle has extensive grassed areas—is being attended to by a flock of 40 recently acquired sheep; the ten

blinds for duck shooters have been put in excellent shape, and a number of row boats built for retrieving game and setting out wood or live decoys; a skeet-shooting course has been constructed on San Domingo Field, and several other projects have been started.

A lot of work has been done on enlarging and improving existing quarters, and arranging new sets of quarters for officers and non-commissioned officers.

For recreation we have about everything: swimming, hunting, fishing, riding, polo, tennis, golf, baseball, basketball, soccer; and Lieutenant Gruenther, who has just reported for duty should be able to improve the technique of our contract bridge players after his experiences with Messrs. Culbertson and Jacoby.

All in all, Fort Hoyle as a station is decidedly an asset to our arm, and any Field Artilleryman who receives orders to report to this post may feel assured that he is by no means "out of luck."



MARCHING ARTILLERY

BY CAPTAIN W. F. PRIDE, 18th Field Artillery

THE Second Battalion, 18th Field Artillery (less Batteries D and F) recently returned to its home station at Fort Des Moines, after a period of three months in the field at Camp Ripley, Minnesota. During the summer the battalion marched 764.7 miles at a rate of almost exactly 5 miles per hour. It is believed that a brief account of this march may be of interest to Field Artillery officers as to the methods employed, rates of march, etc.

The battalion left Des Moines, May 23, 1932. Conditioning of animals started about the last of March and was accomplished by long daily periods at a walk, in draft. The wagon train was conditioned in the same manner with a load of sandbags, averaging 1,500 pounds to each wagon. Each day there was a short period of trotting. The average daily march did not exceed fifteen miles. The roads in the vicinity of Des Moines afford plenty of short, steep hills that were utilized to the fullest extent.

In this connection it may be of interest to remark that a four line team that has been worked as a team all winter can be conditioned much quicker and with less trouble than a team in which the wheelers have done all the work. If the two pair are not in the habit of working together it takes them a long time to steady down and work as a unit. Furthermore, teamsters should have frequent opportunity to drive a four line team and learn the capabilities and limitations of their animals.

Prior to the start of the march, fire control instruments, wire, trunk lockers, officers' trunks, and other odds and ends were shipped to Camp Ripley by rail. Reel carts were marched empty of wire. Section rolls containing blankets, mosquito bars, etc., were carried on trails in harness sacks.

Each battery had its normal amount of materiel and transportation on the march. Battery E had four complete gun sections, battery reel, and light wagon. Headquarters Battery had two battalion reels, a light wagon and an ambulance converted into a radio wagon. The wagon train consisted of four escort wagons drawn by mules and two drawn by horses.

The battalion was issued one Liberty truck and one GMC. These carried kitchens and the advance detail. Field ranges were used. The advance detail was under command of the Battalion Supply Officer, who also acted as Advance Agent, and consisted of mess sergeants, cooks, kitchen police, supply sergeants, and personnel of battalion headquarters. This detail gave the final police to each campsite and then jumped ahead to the next one. A few private cars were taken that accommodated personnel for whom room was not available in the trucks. When the battalion arrived in camp, kitchens were already established. The animals were unharnessed, backs were massaged and legs rubbed, after which the men and officers were given coffee and rolls and horses were groomed. Any man takes better care of his animals when his stomach is full.

No one was allowed to smoke during the hourly halts. These were devoted to the care of animals. Each vehicle had a bucket of water and the animals' eyes and nostrils were sponged during the halts.

It had been the practice in this battalion to loosen cinches during the halts. That practice was stopped during this march as it was believed that when a saddle has once been properly seated it should be left alone until the completion of the march. It is my personal belief that more sore backs develop when cinches are frequently loosened than when they are not.

On the march to Camp Ripley First Call was habitually blown at 4:00 A. M. and the first organization left not later than 5:00 A. M. It was followed by the second organization in ten minutes. The wagon train followed the last organization without distance.

The route and daily marches were as follows: Fort Des Moines to a farm near Ankeney—Iowa State College at Ames—Jewell—Wall Lake State Park—Goodell—Forest City. The first Sunday was spent at Forest City. The distance marched the first week was 130.6 miles at a rate of 5.01 miles per hour. All rates mentioned in this article are based on actual time from campsite to campsite and include all halts and interruptions unless otherwise specified.

From Forest City we crossed the state line and camped at Kiester, Minnesota. During the night and next day it rained

and the march from Kiester to Minnesota Lake was over muddy roads. The Liberty truck was hauled out of mud holes by horses four times during the day. At one time it required five pairs to do the job. The distance was 27.8 miles. From Minnesota Lake the route led to a farm about six miles south of Mankato—St. Peter—Arlington—Silver Lake. The distance for the second week was 143.2 miles at a rate of 4.67 miles per hour.

The remainder of the route was from Silver Lake to Dassel—Carnelian Lake—Sauk Rapids—Royalton—Camp Ripley. The battalion arrived at Camp Ripley, Friday, June 10th.

It is interesting to compare the last week of this march with the last week of the return trip. From Silver Lake to Camp Ripley was 98.2 miles which was covered in five days at a rate of 5.04 miles per hour.

The total distance marched was 372 miles in 17 marching days at an average rate of 4.893 miles per hour.

During the summer the battalion marched about 200 miles in the performance of its duties, maneuvers and service practice.

On the return march First Call was blown at 3:00 A. M. and the first organization marched at 4:00 A. M. This was done due to the season and the anticipated heat. Due to the early hour of breaking camp, horses were not watered in the morning but were watered somewhere along the road, either from a stream or from canvas tanks. A halt would be made just long enough for watering.

Saturday, July 23d, the battalion marched to Little Falls where it camped in a Fair Grounds over Sunday. This was only ten miles from Camp Ripley but it allowed us to make Sauk•Rapids, approximately 30 miles from Little Falls, on Monday. The marches for the first week were as follows: Little Falls—Sauk Rapids—Carnelian Lake—Cokato—Glencoe—Gaylord—St. Peter. At Cokato the battalion narrowly escaped a cyclone that destroyed a farmhouse about two miles from camp. The week-end was spent in St. Peter. The distance marched during the week was 143.5 miles at a rate of 5.23 miles per hour.

The route during the second week was from St. Peter to the farm south of Mankato—Minnesota Lake—Kiester—Forest City—Goodell—Dows. The distance for the week was 146.1 miles at a rate of 4.96 miles per hour.

The last three days of the march the battalion made 92.8 miles as contrasted with 98.2 miles in five days on the march to Camp Ripley. On the last day the battalion marched from Ames to Fort Des Moines, a distance of 40 miles. A noon halt was made from about 10:00 A. M. to 1:00 P. M., during which animals were unharnessed, groomed, watered, and fed. The time consumed in this halt was deducted when figuring the average for the day. The route for the last three days was Dows—Jewell—Ames—Fort Des Moines.

The total distance marched on the return trip was 392.7 miles in sixteen marching days at a rate of 5.11 miles per hour.

The average length of daily march on the trip to Camp Ripley was 21.88 miles and on the return trip 24.54 miles.

No records were shattered and no attempts were made to do so. The march was made under normal circumstances, with issue equipment and horses of average age, i. e., the average was well over twelve years. The battalion was not marched as a unit except through the city of Des Moines and upon entering and leaving Camp Ripley. Battery commanders were allowed to set their own gaits. The times and distances on which the figures quoted herein are based were taken from Battery E which had a cyclometer on one of its caissons. These figures coincide almost exactly with those of the automobiles accompanying the column and inasmuch as the batteries alternated in leading each day the figures should be a fair average. The battalion commander rode with each unit for about an hour each day. The roads were about 50-50: gravel and pavement.

One animal was evacuated on the way to Camp Ripley—an old timer that had given trouble in years past. Four were evacuated on the return trip. One, a mule, was over twenty years old and had been a spare most of the way up and back. He returned as far as Ames under his own power. One horse had been on I. and I. Report in the spring but had been rejected. The other two were accidental cases of lameness that might have occurred at any time. These three were hauled the last ten miles into Fort Des Moines. All other horses and mules were tired but serviceable the morning after arrival. Each vehicle came in with its full complement of animals.

If I may be permitted to draw a few conclusions I would like to submit the following:

1. Conditioning of animals can best be done by long periods at the walk, up and down hill. These periods should be interspersed with short intervals at the trot to develop wind and endurance.

2. Teams should be accustomed to working together throughout the year. I would urgently recommend that whenever wagon transportation is employed around a Post that the four animals composing the team be required to go out. This makes more work for the driver but the results are decidedly worth while when it becomes necessary to take the field.

3. On arrival in camp the men should be given some refreshment. The care of animals will benefit vastly thereby.

4. Watering animals in the early morning hours is a waste of time and effort. They can be watered much more profitably during the march, provided they do not have to stand for some time after drinking.

5. As a general principle it may be stated that the sooner a march is completed the better.

All of which is in conformity with existing regulations, but how frequently do we see those regulations violated. It seems futile to spend eight hours marching twenty-five miles under a Texas sun in January, yet I have done it and I know many others have had the same experience.

I was a Cavalryman for ten years before I transferred to the Field Artillery and I have no reason to regret my years in either Arm. I still think that the horse can go places and do things that no mechanical contrivance that has ever been invented, or ever will be invented, can equal, but I am also willing to admit, and gladly, for who desires to subject dumb animals to the horrors of the battlefield, that the age of motorization has come. However, it is well to remember that many organizations are still horse-drawn and several hundred miles from their range. Therefore it behooves all of us not to forget the horse and mule and to still study his capabilities and limitations. In a plea that this thought may reach you I have written this brief account of what a horse drawn outfit can do.

FIELD ARTILLERY TRAINING AT WEST POINT

BY MAJOR JOSEPH S. TATE, Field Artillery

THE aim of the United States Military Academy is, and always has been, to give its graduates certain fundamentals of training and character as will enable them to perform their duties in any branch of the Service to which they may be assigned, after a few months' commissioned training.

Due to the many subjects that a cadet must study, it never has been the intent of the authorities to turn out a "finished officer," fully in command of the technical requirements of the different arms.

From time to time one hears slight criticisms coming from the Service, both from graduates and non-graduates, that there is a certain technical deficiency in the cadet upon joining his branch of the service; with an inquiry as to why after four years, with his technical training, a young graduate is not able to perform all of his technical duties immediately upon reporting.

With the thought in mind of answering these comments, it is believed a short description of the Field Artillery instruction of the cadet would prove interesting to the Field Artillery in general.

FOURTH CLASS TRAINING

During the winter of the cadets' first year they receive fourteen hours' indoor instruction in the duties of the individual cannoneer. They are taught Direct and Indirect Laying, the use of the gunner's quadrant and range scale, the setting of the fuze setter, and as much as possible on materiel. The French 75mm materiel is used solely.

They are given what amounts to the old "First Class Gunner's Examination" upon completion of this instruction.

THIRD CLASS TRAINING

In the summer, the Third Classmen receive five hours' outdoor instruction on the work of the Gun Squad and a few minutes work on Fire Control Instruments. This is all they receive in Field Artillery from the middle of April of their Fourth Class Year until October of their Second Class Year.

SECOND CLASS TRAINING

Cadets receive three hours' instruction as drivers and chiefs of

section in Mounted Drill. Primarily this is to initiate them into the difficulties of handling smoothly, a pair and a team, and in addition to give them an idea of the rules governing the control of gaits, and the necessity for maintaining the prescribed gaits evenly.

Following this, two lectures are given on the general subject matter of Field Artillery Gunnery; the relation of Field Artillery to other arms; the great desirability of knowing the basic tactics and technique, not only of their own, but of all branches of the Service.

Then follow sixteen hours of section room work on the theory of gunnery, covering: the laying of a battery by the aiming point and offset method; the aiming circle and Y azimuth method; the registration on a base point and shift to target; the differentiation between fire for destruction (Percussion Precision Adjustment Procedure), and neutralization of an area (Bracket Adjustment Procedure); the dispersion scale, probability, and their application to, and basis for, the "Rules of Thumb" used in firing; the sequence of commands; terrain and blackboard Firing.

These sixteen hours are completed early in March. The mission of this instruction is to prepare the cadet as well as possible for the service firing held during the following summer.

FIRST CLASS TRAINING

For a period of five days, the First Classmen receive actual instruction at the Firing Point, (approximately three and a half hours a day). It is the aim to given each cadet one Percussion Precision and one Percussion Bracket Problem with the 37mm (L. E.) sub-calibre gun mounted on the 75mm tube; and one shrapnel (75mm) Problem. They are now allowed twenty-eight rounds of 37mm shell and sixteen rounds of 75mm shrapnel each.

The observation is axial, the instruction is naturally elementary, with the intent of giving the cadet confidence and showing him that theory works out in practice. Practically all problems are based on an initial adjustment on a Base Point, with subsequent shifts therefrom.

There are certain demonstration problems fired by the instructors, which in 1932 at Fort Bragg, included lateral observation;

"K" transfers; high burst ranging; direct fire at fast moving targets; and a few rounds of 240mm howitzer adjusted by sound ranging, with an opportunity of observing the sound ranging methods.

There follow five days' field work in the vicinity of West Point during which two batteries, their details, and the battalion detail function. The number in each group of cadets is such as will permit the details of cadets to each "Key position" throughout the battalion, down to include the chiefs of section.

During these five days of field work the cadets are in the field three half days, two full days, and over one night.

On all but the over-night problem two horse drawn batteries are used; on the over-night problem one horse drawn and one tractor battery are utilized, in an effort to give the comparison on the two methods of transportation. However, due to lack of light Motor Transportation the Detail of the tractor drawn battery is horsed.

During this period the cadets are rotated in their assignments so that they have one day's duty with a gun battery (the instructor explaining the various duties of the battery executive); one day at one of the battery Observation Posts (where the instructor covers the duties of the B. C., Reconnaissance Officer, building up of firing chart, etc.); one day on one of the communication sections; one day at the battalion C. P., radio station, and message center; and one day assigned to the "topographic section of the battalion detail." This is simply an extemporized section in which they receive instruction in resection methods, the establishment and use of an orienting line, etc.

To practically each "key job," in which a cadet finds himself, is an officer or enlisted instructor from whom the cadet receives all information concerning his duties.

It may be seen from this that it is not to be expected that the cadet can assimilate all this information to the extent of being able to go out and function in all these capacities; but he has had the entire picture—the requisite team play—presented to him in a most practical manner.

The tactical situations are so drawn up as to have a continuity of action, instead of requiring a new mental adjustment daily.

So much of the training of a cadet is pure theory, that every effort is made to prove that the theories studied in the section room are borne out in the field in their practical application.

On the over-night problem, the Battalion sets out as part of a rear guard which is called into action. After the initial reconnaissance and occupation of position, the situation changes calling for a reconnaissance that afternoon for a five thousand yard displacement that night.

The battalion has certain fire missions, concentrations, etc., (which have been figured during the afternoon, while the reconnaissance parties are out), which have to be fired from the original positions. The battalion is released for displacement about ten P. M., the new positions occupied, batteries layed, one mission fired (blanks), and the command is bivouaced for the night. In the morning a check is made to show that the batteries are correctly layed as desired by means of the topographic and reconnaissance work of the previous afternoon.

Another instance of the efforts made to make the instruction conclusive is the following. Cadets from the topographic section set up near the battery, perform an Italian or British resection, locating their board; shoot a ray to the base piece, plotting it in. The cadet battalion reconnaissance officer establishes an orienting line. The cadet B. C. measures the base angle to a prominent target; the cadet executive (using the base angle on the orienting line) lays the base piece, the cadet gunner lays and opens the breach—and there is the base piece pointing at the target. A definite proof that "it works."

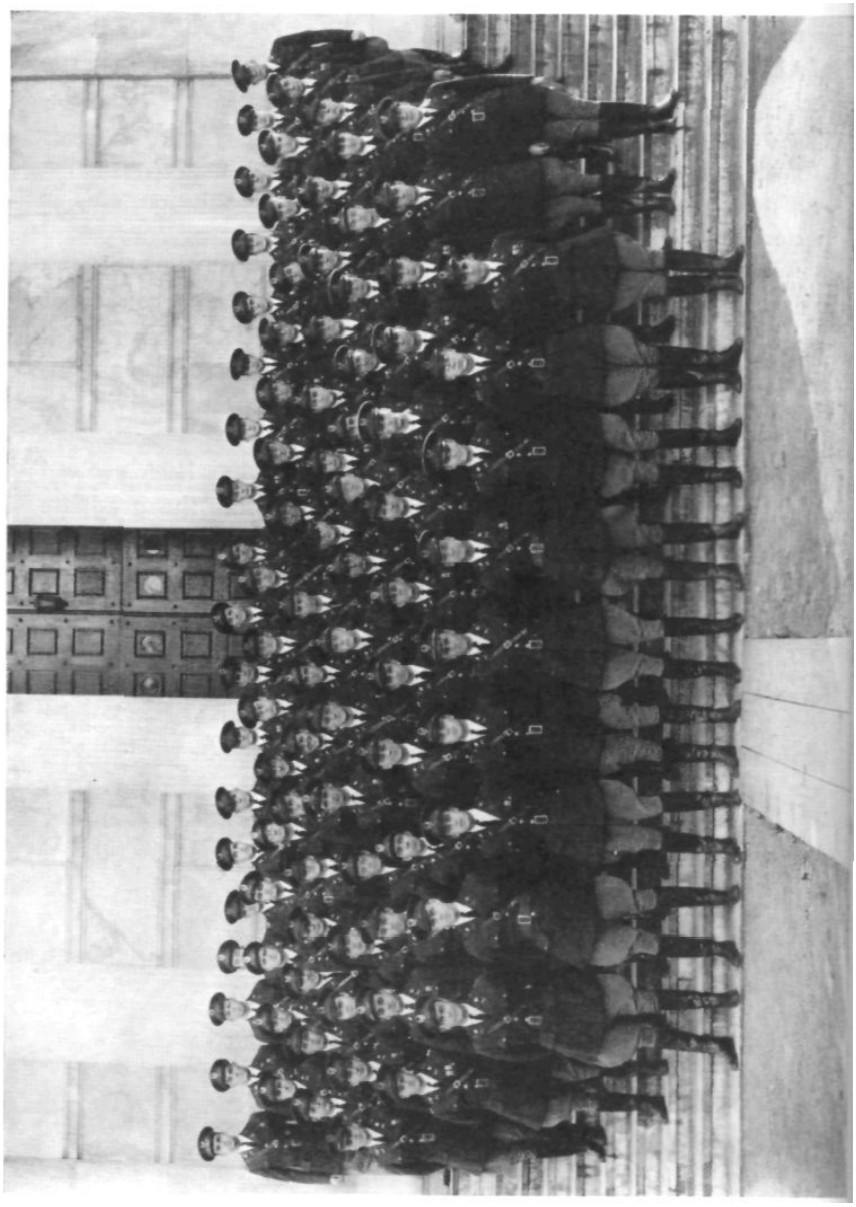
For this instruction is utilized the U. S. M. A., Detachment of Field Artillery, D. E. M. L., organized into a Battalion of two gun Batteries with complete details, and a skeleton Battalion detail. The materiel consists of six batteries of French 75mm and one platoon of 155mm howitzers. The Caterpillar "30" Tractor is used in the motor battery. The radio sets utilized are the S. C. R. No. 171; one G. M. C. ¾ ton truck is used for their transportation. Non-commissioned officers and selected privates are used as instructors in suitable positions. The cadets derive a great deal of benefit from their technical training in the summer period just described. At the close of the summer, the cadets of

the First Class are assigned to a battery which participates in the annual field maneuvers, lasting four days, in which they operate in conjunction with the infantry in battalion problems. This phase of the instruction gives them a rather complete picture of the technical and tactical use of the Field Artillery arm in its elementary phases.

Except for two hours during the First Class winter, when a map problem is given followed by a sand table solution, this is the end of the Field Artillery Instruction.

In all four years there are approximately seventy-seven hours Field Artillery instruction. This is, I believe a fair proportion of the time available for all tactical instruction, as differentiated from their purely academic work. It is not seen how more instruction can be given, or more information assimilated in the time available.

This particular course (for the First Class) has been evolved during the last few years and it is believed that the graduate should be able in a very short time, with the proper assistance from older officers of his unit, to develop into a most useful Field Artilleryman.



THE R. O. T. C. AT PRINCETON UNIVERSITY

BY 1ST LIEUTENANT ALFRED E. KASTNER, Field Artillery

REALIZING that a large number of the younger officers of the Field Artillery are unfamiliar with the accomplishments of the Reserve Officers' Training Corps at the universities there is included in this article information which is as applicable to other R. O. T. C. units as to the Princeton Unit. This information is brought out as the work of the unit at Princeton is discussed.

Princeton University is located in the town of Princeton, New Jersey, where it has been since the year 1756, ten years after the

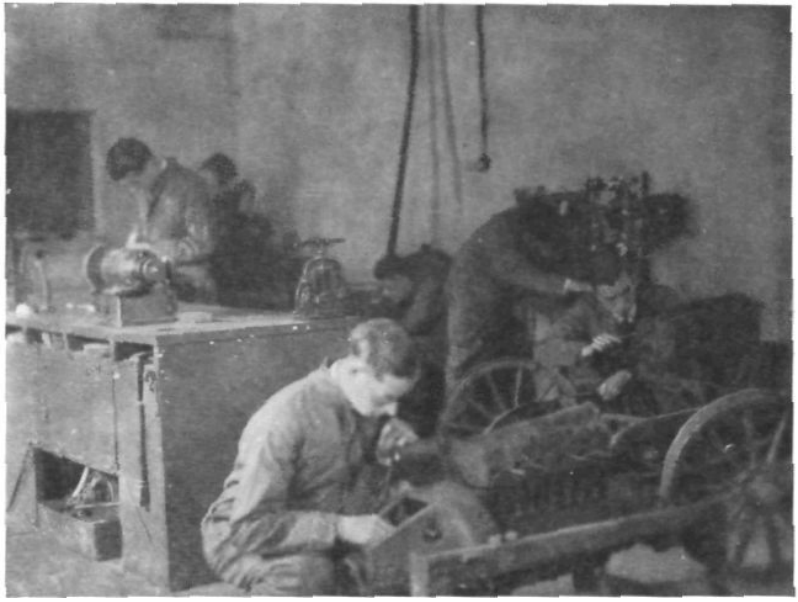
R. O. T. C. STUDENTS FIRING THE 75MM GUN.

original charter had been granted to the trustees. One of the factors involved in the selection of the location was the fact that Princeton was half-way between New York and Philadelphia and upon rising ground, on the line dividing East and West Jersey. The town now has a population of approximately eight thousand persons and is surrounded by an attractive country side of farms, estates and homes of those who find it convenient to commute to New York or Philadelphia.

Interest in military matters at Princeton can be traced to 1913 when the late General Leonard Wood (Hon. L.L.D., 1916) appointed President Hibben of the University chairman of the

Advisory Council on Summer Military Camps, a group of college and university heads whom he had called together. The great enthusiasm for General Wood's "Plattsburg Idea" resulted in the large attendance of undergraduates at the summer camp of 1915, when Princeton's representation was the largest in proportion to undergraduate enrollment of any university. Again at the camp of 1916, fifteen per cent of the undergraduate body, three times that of any other university, were enrolled. An undergraduate petition, for a course of lectures designed to continue the military education inaugurated at the summer camps, was granted. An upper class elective to include general discussion of military history and organization, theory of tactics and elementary strategy was provided. Captain Stuart Heintzelman was detailed by the War Department to take charge of the new elective course at the beginning of the school year in September, 1916.

During the World War every resource of the University was placed at the disposal of the government. In addition to the School of Military Aeronautics, the Students' Army Training Corps, the Naval Training Unit and various small training schools which were established, extensive government research,



CLASS IN GAS ENGINES AT WORK IN MACHINE SHOP.

PREPARING FOR THE ANNUAL SHOW.

notably that in connection with the development and construction of sound ranging apparatus by Professor Augustus Trowbridge, was conducted in Princeton laboratories.

In accordance with the hope of the War Department that military training be continued, the University in 1919 expressed its willingness to maintain a reserve officers' training unit. Field Artillery was selected because the authorities felt that due to their intellectual appeal artillery courses would fit into the academic curriculum better than any other branch of military work. Major John MacMahon was detailed as the first P. M. S. and T. and was followed in turn by Major E. R. Van Dusen and the present P. M. S. and T., Lieutenant Colonel Roger S. Parrott.

Military Science is not required but is an elective course carrying full credit toward an academic degree on the same basis as any other elective in the University curriculum. It is not taken as an extra course but may be selected as one of the five courses comprising the freshman and sophomore schedule. In order that members of the incoming freshman class may have intelligent information of the R. O. T. C. before selecting their courses, a comprehensive booklet describing the unit is sent each candidate accepted for admission before the opening of the college year.

A freshman electing military science is required to continue the course during his freshman and sophomore years, completing the basic course. Under exceptional circumstances, however,

with the approval of the military department and the university authorities he may be permitted to drop the course at the end of the freshman year. A student who has completed the basic course may, with the approval of the department, elect the advanced course, comprising the junior and senior years, upon signing a contract to continue the course to its completion and to attend a six weeks' camp at the end of the junior year. Upon successful completion of the advanced course he is commissioned in the Officers' Reserve Corps. If a student is unable to attend the required camp at the end of the junior year he has not completed one of his elective courses and his degree and commission are withheld until completion of an attendance at camp, usually during the summer following the senior year.

The course throughout the four years for both basic and advanced

OBSERVING ARTILLERY FIRE

students consists of three hours of class room work and two hours of practical work each week. The class room periods are of one hour duration and the work is covered by lectures, recitations and examinations. The practical work consists of one two-hour drill period. The instruction in the classrooms is conducted by the Regular Army instructors. The instruction at drill is conducted by the members of the senior class under supervision of the Regular Army instructors. Thus the seniors are given an opportunity to develop self-confidence, leadership and the ability to handle men. Each under class drills separately, morning drill periods from ten thirty until twelve thirty being utilized as well as afternoon periods.

The camp, which students taking the advanced course are required to attend during the summer following the junior year, is held at Madison Barracks, N. Y. The equipment of the regular army batteries stationed at that post is used. The time is devoted to practical training in all details of field artillery service. The last two weeks are spent in target practice at Pine Plains, thirty miles from Madison Barracks. By rotation in the more important positions of the battery organization every student has an opportunity for development of initiative, leadership and ability to command.

The unit has an enrollment of 620 students. The courses offered at Princeton lead to the degree of Bachelor of Arts or Bachelor of Science in Engineering. As the candidates for the degree of Bachelor of Science in Engineering are required to do summer work which conflicts with the summer camp of the unit, they are not able

COMPUTING DATA.

generally to select Military Science as an elective. Since of the total enrollment of 2,300 students, 2,080 are candidates for the degree of Bachelor of Arts, the unit enrollment consitutes 30 per cent of the available source. An average of 60 per cent of the students completing the basic course are accepted for the advanced course. Each year approximately 100 seniors complete the course.

The unit is organized as a regiment, the students of all classes attending drill on any one day of the week constituting a battery. Each battery is formed, reports are rendered, inspections made and then each class proceeds to its particular drill. Near the end

RIDING HALL AND STABLES.

of the school year the classes are combined and function as a completely equipped battery. The year's work is terminated by an assemblage of the entire regiment for a review and demonstration. Cadet officers from Lieutenant Colonel to Second Lieutenants, inclusive, are appointed by merit from the senior class. Cadet Sergeants are appointed from the junior class and cadet Corporals from the sophomore class.

A uniform of which the student may well be proud has been adopted. Considerable care is exercised to insure uniforms of good quality and fit. Laced boots, olive drab breeches, serge shirts, and mackinaws for cold weather are provided the basic students. The uniforms for the advanced students are tailor made. Boots of the dress type, breeches of a light shade twill, uniform coats of whipcord and Sam Browne belts are worn by the seniors. Each senior has, therefore, the necessary uniform to equip him as a Reserve Officer. The cost of this advanced course uniform is greater than the amount allowed by the government and the additional cost is charged against the student's pay. The wearing of the uniform is required at all drills and at other times is optional.

The plant and equipment at the University are adequate for the accomplishment of the desired results. The artillery building contains stabling facilities for one hundred horses, a riding hall

three hundred by ninety feet, a pistol range, a motor shop, a gun room, in which gun drill is conducted during the winter, and two class rooms. Additional class rooms are provided in other university buildings. There are ninety government horses. A battery of French 75 millimeter guns with complete equipment, one each of several other types of field guns, two tractors, a White reconnaissance truck, an F. W. D. truck, an ordnance repair truck, and additional telephone and fire control instruments comprise the equipment of the unit.

Polo at Princeton is actively sponsored by the R. O. T. C. in cooperation with the Princeton Polo Association to which all players belong. Two fields are available for outdoor play and the riding hall is excellent for indoor play. Polo is, therefore, an all year activity. There are forty-five students playing polo. Varsity, junior varsity and freshman teams play scheduled games with teams of other universities and clubs. In addition interclass and intersquad tournaments give an opportunity for all players to participate in competitive play. The thirty government ponies available for polo are augmented by privately owned ponies of the players.

A varsity pistol team and an R. O. T. C. pistol team are sponsored by the R. O. T. C. Intercollegiate and other matches are fired by these teams, both by telegraph and in direct competition.

An indoor show is held each year in the riding hall under the management of the R. O. T. C. students. Military, gymkhana, and horsemanship events are combined to make an interesting spectacle.

The R. O. T. C. at Princeton is an established part of the University. The Department of Military Science takes its place equally with the other departments of instruction. Its position is indicated by the fact that commissions are presented to successful candidates at the regular commencement exercises, following the presentation of degrees. In addition to other contributing factors, the voluntary feature of enrollment insures a high esprit and an enthusiastic cooperation between the students and the instructors. With the passing of each year the support of the alumni is increased by the newly graduated lieutenants of the Reserve Corps. It is certain that the interest in military matters first felt at Princeton in 1913 will be perpetuated.

BATTLE PRACTICE, 169th FIELD ARTILLERY BRIGADE, 94th DIVISION, U. S. A.

BY MAJOR LEROY M. HERSUM, Field Artillery Reserve

THE officers of the 301st Field Artillery, 303d Field Artillery, and 389th Field Artillery this year were ordered to Fort Ethan Allen, Vermont, for two weeks of active duty the first of August. In accordance with the scheme of progressive training, the 152 officers participating were organized for the period of camp as the 169th Field Artillery Brigade.

The present organization of one brigade each year, comprising two light regiments, one howitzer regiment, and brigade headquarters, is required by the Corps' cycle in training schedules. With this organization and the existing background of training and experience it was felt that this year the various units could carry out a brigade problem that would closely approximate battle practice.

The active officers in most of the reserve artillery regiments in this area have had two weeks' training at camp once every two years since they were commissioned or since the units were established. During the past ten years a variety of policies of reserve instruction have been in effect. Some training schedules have emphasized such fundamentals as the School of the Soldier, Service of the Piece, Dismounted and Mounted Drill, Maneuvers Limbered, and the Care of Horses; these aspects of the program have been appreciated especially by the junior officers. Other periods of active duty have stressed Conduct of Fire, Signal Communications, and Reconnaissance and Occupation of Position by batteries; these, of course, have been of particular interest to the battery officers. Such training schedules, however, have placed the field officers merely in the position of instructors or supervisors of instruction. It has been found comparatively easy to develop efficiency in the junior officers, and it has been found only slightly less easy to train battery commanders. But there has been a big gap between field and battery officers, between tactics and technical operations, between staff duties and battery duties.

The organized reserves presumably will be called into action only for service involving large bodies of troops. Individually trained battery and battalion commanders will be valuable only to

the extent that they have been trained to cooperate with higher commanders, have worked with associated troops, and have familiarized themselves with staff functions. The day of Reilly's Battery is past, so far as the reserves are concerned. It is now clear that the training of reserves, in the Field Artillery at least, should extend to units as high as a brigade or the largest normal organization for an artillery group.

In the First Corps Area, since 1929, the method of training has been as follows: All officers have had certain basic training before receiving their commissions, ordinarily in the R. O. T. C. at Harvard, Yale, or Norwich. Further training is received at troop schools and by means of the extension correspondence courses. A minimum of preparatory work (at least 20 credit hours between October 1 and June 30 immediately preceding the camp—to be raised to 30 hours for the 1933 camps) is required, except in the case of newly commissioned second lieutenants, before an officer can receive orders to attend a summer camp. There is no justification for sending to camp an officer who has not done any military work for a year or more; he merely slows up the whole machine. Furthermore, an officer ordered to camp must be able to fit into the machine with the minimum of friction. At camp primary stress is placed as much as possible on practical field work. It is essential that all preliminary work be completed before the beginning of the camp period in order that no lectures or theoretical instruction need be given at camp except in critique of work done.

The regimental training schedule used this year was based on the theory that by starting slowly it is possible to develop considerable speed toward the end of even so short a period as two weeks. The first part was devoted to group training of individuals; subsequent sections of the program brought the individual into battalion, regiment, and finally brigade organizations.

In addition to his regimental training schedule, each officer receives a training guide directing texts for study and indicating the salient features to be observed in each period of instruction. With the few regular army officers available, instruction must often be left to qualified reserve officers.

The regiments are organized on a war basis, at least with respect to officer assignments. In case of a shortage of personnel,

some officers are assigned double duties. As soon as practical, R. S. O. P. problems are worked, by regiments, without troops. Then a problem is worked with troops, with full regimental, battalion, and battery details for all units, and usually a gun section or carriage assigned to each battery, but road spaces for full units observed throughout. In order to carry out this part of the program, the schedules are so arranged that each regiment in turn has at its disposal all the available troop facilities, the other regiments meanwhile being engaged in work not requiring troops. Finally the point is reached where a brigade problem can be carried out with good prospect of success.

Officers below field grade when qualified by smoke puff are permitted to fire Conduct of Fire problems with service ammunition. Junior officers who have not previously fired service ammunition must qualify with 37mm sub-calibre firing before they are permitted to fire the 75mm gun. Inasmuch as the only sub-calibre range is at the Artillery Range (some twelve miles distant from the Post), the smoke puff range at camp, adjacent to the Post, is used during the first week in order to reduce to a minimum the trips between the camp and the Artillery Range. This year only axial and some lateral firing were attempted. A question may be raised as to the value of field instruction in lateral firing, except to the few officers who are expert and who would be able to fire lateral porblems without special training. It is probable that the general results of this training are not commensurate with the time and effort involved.

All fire control and communication equipment is pooled by the Brigade and issued in full quantity to each regiment in turn; thus every regiment is assured of adequate equipment for this most essential part of the training of officers. The pooling of equipment is one of the principal elements in the success of the camp training; without it even the regular troops could not be utilized so effectively since their own supply of such equipment is entirely inadequate for the expanded organization unless supplemented by the brigade supply requisitioned for the reserve officers' camp.

Now let us assume that we have reached the point where all the regiments have completed several R. S. O. P. problems, have spent three days on the Range with Conduct of Fire, and have devoted the required time to orientation, communications, marching,

and so on. In other words, in this particular tour of duty we are at Thursday noon of the second week. At this time a brigade order (previously worked out by the brigade staff to fit an assumed situation on the Artillery Range) is issued to the regimental commanders. (The areas assigned to regiments are governed by the necessary safety limitations for calibres involved.) The entire 7th Field Artillery (less the 2d Battalion) is available and has been organized along the skeleton lines of a brigade. A platoon of 75mm guns has been given to each battalion of the light artillery regiments and also to the 2d and 3d Battalions of the howitzer regiment (this taking all the material available at the post). The 1st Battalion (389th F. A.) has received a platoon of tractor drawn 155mm howitzers. Sufficient communication material is available, through the efforts of the 7th F. A., to make it possible to lay wire from the brigade down through to all batteries, including, of course, all three regimental and all battalion command posts, observation posts, etc.

The regimental commanders finish reading the order, and after leaving instructions they mount up and move off with the appropriate staff officers and orderlies for reconnaissance. The brigade staff is busy establishing the C. P. and O. P. and the brigade wire net. (A departure from simulated reality was made in placing the C. P. just to the rear of the O. P. in order that staff groups might later observe the firing.)

The regimental commanders issue their orders to the battalion commanders, and in turn the battalion commanders issue their orders to the battery commanders. Each battalion commander has selected one of his battery commanders to take over the gun platoons or howitzer platoons as a battery in his battalion. The other battery commanders proceed to choose positions for hypothetical guns, select O. P.'s, and so on. The problem for the afternoon is only to select position, O. P., and C. P., and to establish communications. Before wire is laid it is necessary, both for reasons of safety and because of Range limitations, to ascertain by means of a careful check that safety rules are not violated by positions selected.

When the positions of the guns, O. P.'s, and C. P.'s have been approved, battery, battalion, and regiment wire is laid. In this particular problem approximately 40 miles of wire are laid and

communications are all checked on Thursday afternoon. The requirements given in the first section of the problem keep everyone busy whether he has actual guns or not. With the computation of coordinates and other details completed, and wires laid and checked, the afternoon's work is concluded.

Inasmuch as the Artillery Range is some twelve miles from Fort Ethan Allen, the troops are returned to their regular unit commanders at the Range bivouac and the reserve officers report back to the Fort for mess.

Thursday evening the second section of the problem is handed to the regimental commanders, outlining further special requirements as to installation and operation of regiments in position, operation and message center files, and authority to open fire, with the necessary additional general information.

Friday morning all officers take over the regular troops and move them forward into position in the order of priority stated in the Field Orders. Darkness is assumed to exist between the hours of 8 A. M. and 10 A. M. in order not to subject the regular troops to an unnecessarily strenuous schedule. (Some of the drivers, for instance, are returned for use as cannoneers.) It is hoped that at some time in the near future actual night occupation may be attempted, thus obviating another simulation. Problem time and actual time become the same at 10 A. M. As usual, some delay is caused by last-minute checking of safety limits; but all units are firing or ready to fire at 10.30 A. M.

A conference is held at the brigade O. P. between the regular army instructors and the regimental commanders for ground designation of battalion portions of concentrations and identification of targets and calibration of watches.

After each section has adjusted one gun on its portion of the concentrations, Conduct of Fire problems are assigned within the regiment. Other special missions are sent down from the Brigade O. P. to test the communication system, message centers, and staff work; in fact, numerous envelopes, to be opened at stated times, and outlining hypothetical situations, were issued to the several units in order to see whether the proper dispositions were made of the information.

Concentration No. 1, of all light guns, is located on an enemy

wire and resistance center, to be fired at H plus 15. H hour is announced as 11:30 A. M. Exactly at 11:45 all twelve light guns start firing on this concentration. The effect is highly satisfactory. The guns fire at the rate of six rounds per gun for one minute. Shrapnel is used rather than shell for reasons of safety.

Other fire missions are sent down to individual regiments from the brigade. The targets have to be located by coordinates or by reference to the brigade reference point properly corrected for obliquity of the regimental O. P.'s.

Concentration No. 2, of smoke shell from the 155mm howitzers, two rounds per howitzer per minute, to screen an enemy observation point, scheduled to be fired at H plus 30, is advanced two minutes because of the assumed rapidity of advance of the infantry. It is very effective with the fifteen rounds available. Furthermore, this is the first time a real smoke screen has been placed by artillery on this Range. (Several years ago a smoke screen was attempted with the 75mm guns on a wet, windy day, with only fair success.) There is a tremendous difference in effectiveness between 75mm and 155mm smoke.

Concentration No. 3 is ordered fired at 12.15 P. M. on the area of an expected infantry counterattack. The results are generally good, although a few bursts are somewhat high for effect.

At 12.20 P. M. Concentration No. 1 is ordered repeated at 12.25 P. M. Two nearby regiments receive their orders and start firing promptly, but because of showers during the morning communications with the more distant regiment are slow and this is nearly one minute late in starting. (The question is raised here, of course, of efficiency within message centers.)

A few miscellaneous problems are fired and the command given to cease firing and report quantity and type of ammunition on hand. All reports are in, and march order and close station are given at 12.55 P. M., concluding a most successful problem.

Each year further steps are taken to make the brigade problems realistic. This year the O. P.'s were screened and concealed. Future plans include camouflage of firing batteries, actual night occupation, and possibly night firing.

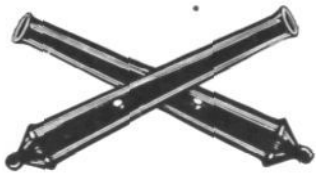
Officers with staff duties were required to make out complete

staff reports. Those officers not with guns or not having staff jobs were busy on Conduct of Fire problems, the computation of data for other concentrations (not to be fired), and other requirements prescribed in the Field Orders.

With so many junior officers who have never seen anything other than Conduct of Fire work, it is manifestly desirable that there should be more demonstrations of this sort, showing the mass effect of the fire power of artillery and giving a correct picture of the true use of artillery in its most crushing effect. A problem of this type is highly useful in welding together the regimental units in a brigade team; and it serves also to arouse in cavalry, infantry, and other reserve officers who have an opportunity to observe the firing a very wholesome respect and understanding of the artillery.

A formal inspection of the work of the 169th F. A. Brigade was made by the Corps Area Commander, General Hamilton, together with General Walker, Colonel Daniel G. Berry, the officer in charge of organized reserve affairs, Colonel W. P. Ennis, G. S. (F. A.), and Colonel Barnes, 7th F. A., the Post Commander.

Such a program as this can be carried out only with the wholehearted support of the regular establishment and the complete cooperation of all the officers concerned. No small measure of credit is due, however, to the senior instructor for field artillery for the First Corps Area, Major R. Townsend Heard, F. A. (DOL), for his initiative, imagination, and tact in planning and bringing to a successful conclusion this battle practice of the 169th Field Artillery Brigade.



NATIONAL GUARD OFFICERS AT FORT BRAGG

At 7:00 P. M. on February 24, 1933, there assembled at the Officers' Club at Fort Bragg, as guests at dinner of General Manus McCloskey, what was probably, collectively, the highest ranking and most diversified assemblage of National Guard officers which has ever been held. They were assembled, under orders, for the purpose of examining and witnessing the operation of the Light Truck-drawn Battery, recently returned from its mid-winter trip and test at Fort Ethan Allen, Vermont.

During dinner the Honorable Mr. Ross Collins, Chairman of the House Committee on Military Affairs, addressed the officers and then the party moved to the assembly room where Major General Leach, Chief of the Militia Bureau, sought to orient the situation and outline the aims and purposes of the gathering. Briefly he explained that the purpose of the meeting was to acquaint these assembled National Guard leaders with a proposal of the Militia Bureau to motorize the light artillery regiments of the National Guard by organizing them as light truck-drawn units and that they were to witness the operation of such a battery the following day. Following the address by General Leach, Colonel Augustine McIntyre, President of the Field Artillery Board, delivered a message to the officers from Major General Bishop, Chief of Field Artillery, spoke on the general subject of motorization, and outlined the program for the next day. He was followed by Lieut. Col. Maxwell Murray, the Field Artillery Board member who has been in direct charge of the test of the Light Truck-drawn Battery who covered the organization of the test battery, the characteristics of the vehicles, the advantages and disadvantages of motorization as developed by the test and the lessons to be learned from the test. The meeting adjourned following forty minutes of motion pictures showing the test battery operating under all phases of its test to date.

The following day started off strenuously with an early reveille for the guests, who received a salute and a Guard of Honor shortly after the sun was well up, and were then taken in the assembled post transportation to a vantage point from which

they viewed the battery moving along a concrete road at its customary open road speed of about thirty miles per hour. By this time the visiting officers had been divided into groups, each group having with it one member of the Field Artillery Board, so that there was someone to whom visitors could go for answers and explanation, for there were many perplexing questions and problems which came to mind during the day.

Following the short glimpse of the battery on the road the guests were taken to a point where they found the battery drawn up for a closer inspection, and the party spent a very busy half-hour looking over this strange organization with which they were probably going to be better acquainted before long. Questions rained upon Board members and battery personnel for thirty minutes and then a halt was called by the issuance of a tactical situation to the Battery Commander. The close-up view of the battery was thus curtailed for the time being, but opportunity for further examination of vehicles and guns was offered at odd moments during the day. For those visitors who remained the second night further opportunity was afforded the next morning while the battery was in park.

The tactical situation took the Battery Commander away at once upon reconnaissance, with his detail, while the remainder of the battery, supposedly two hours behind him on the road but actually present, was taken away from the tactical problem and was required to demonstrate its cross country mobility. Its demonstration covered movements through deeply-rutted greasy clay road, back and forth through a water filled clay mud-hole, across country through sparsely wooded and stumpy ground, movement through rough and sandy ground covered with thick scrub, movement through deep sand, and finally, a climb up a steep slope covered with small stumps and, in places, loose shale rocks.

At the conclusion of the demonstration of cross country movement the battery was put back into the tactical problem, took position and fired at two targets. During this fire opportunity was given the visitors to observe the action of the 75mm gun, M1897 M1E3 with which the battery is equipped. This gun is the "French 75" modified by the addition of high speed wheel bearing and equipped with pneumatic tires.

The conclusion of the firing marked the end of the morning's work and it was followed at once by a welcome lunch, served under canvas in a near by pine grove, by Battery A, 1st Observation Battalion; a most efficiently handled lunch, for the kitchen fed many unexpected, unofficial, but hungry looking observers, and no one was turned away.

The work of the Light Truck-drawn Battery during the afternoon was devoted to the reconnaissance of, movement to, and occupation of, a position some three thousand yards to the front. The visitors were transported to the most advantageous points from which to observe these phases of the problem and during the firing were stationed, as they desired, at the gun position or at the observation post.

Following the firing, which terminated the work with the battery, the visitors were taken to examine such experimental and new standard material as is now in the hands of the Field Artillery Board. This display was of great interest; there are few officers who have been fortunate enough to see the modern standards of our Field Artillery weapons or who have knowledge of the present trends in development, and many of the visitors who came to see the display with one eye on their watches, remained to take the last car back to their quarters.

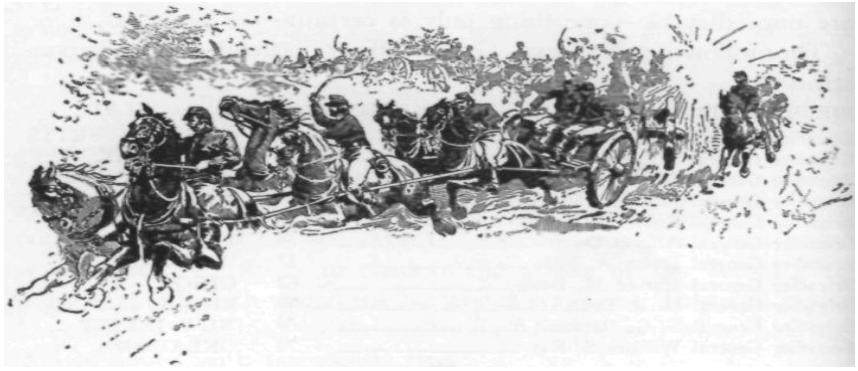
The day was certainly filled with action—both physical and mental. The possibilities and difficulties of operating with motors were quite an eye-opener to many—the ideas, some new and revolutionary, afforded ample food for thought, argument and discussion. The results of gathering these officers at Fort Bragg are unpredictable—one thing only is certain—we progress.

The following National Guard officers attended the demonstration:

FIELD ARTILLERY BRIGADE COMMANDERS	BRIGADE	STATE
Brigadier General Daniel Needham	51	MASSACHUSETTS
Brigadier General William F. Scholl	52	NEW YORK
Brigadier General William S. J. McLean	53	PENNSYLVANIA
Brigadier General James C. McLanahan	54	MARYLAND
Brigadier General Robert J. Travis	55	GEORGIA
Brigadier General Allison Owen	56	LOUISIANA
Brigadier General Irving A. Fish	57	WISCONSIN
Brigadier General Harold M. Bush	62	OHIO
Brigadier General H. R. Dean	68	RHODE ISLAND
Brigadier General S. G. Barnard	69	NEW JERSEY
Brigadier General William S. Key	70	OKLAHOMA

REGIMENTAL COMMANDERS	REGIMENT	STATE
Colonel Roger W. Eckfeldt	102	MASSACHUSETTS
Colonel Harold R. Barker	103	RHODE ISLAND
Colonel Charles G. Blakeslee	104	NEW YORK
Colonel Clarence H. Higginson	105	NEW YORK
Colonel James T. Cassedy	156	NEW YORK
Colonel Eric F. Wood	107	PENNSYLVANIA
Colonel Stephen Elliott	109	PENNSYLVANIA
Colonel William H. Sands	111	VIRGINIA
Colonel William L. Terry	115	TENNESSEE
Colonel L. de Sumpter Lowry, Jr.	116	FLORIDA
Colonel Percy S. McClung	117	ALABAMA
Colonel Shaftall B. Coleman	118	GEORGIA
Colonel Joseph H. Lewis	119	MICHIGAN
Colonel Alvin A. Kuechenmeister	120	WISCONSIN
Colonel Charles C. Haffner, Jr.	124	ILLINOIS
Colonel John F. Williams	128	MISSOURI
Colonel Guy C. Rexroad	130	KANSAS
Colonel Charles A. Davis	131	TEXAS
Lt. Col., Robert O. Whiteaker	132	TEXAS
Major Raymond Phelps (Executive 61 FA Brig.)		TEXAS
Colonel Thomas R. Leahy	134	OHIO
Colonel Carl A. Shem	135	OHIO
Colonel John S. Fishback	139	INDIANA
Lt. Col., Henry B. Curtis	141	LOUISIANA
Colonel Otto A. Sandman	143	CALIFORNIA
Lt. Col., Curtis Y. Clawson	145	UTAH
Colonel Albert H. Beebe	146	WASHINGTON
Colonel Boyd Wales	147	SOUTH DAKOTA
Colonel Carlos A. Penington	148	WASHINGTON
Colonel Herbert L. Bowen	152	MAINE
Colonel Grover C. Wamsley	158	OKLAHOMA
Colonel Charles A. Holden	160	OKLAHOMA
Major William Q. Howell	168	COLORADO

In the absence of General Bishop, who was ill, his executive officer, Lieutenant Colonel R. M. Danford, F. A., was present as the representative of the Office of the Chief of Field Artillery.

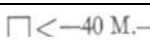
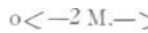


TYPE PROBLEMS

Time Bracket Lateral—Small t

Target Description: Machine guns in the vicinity of a rock. *Mission*: To neutralize. *Type*: Time bracket lateral. *Materiel*: French 75mm, Model 1897. *Visibility*: Excellent. *Initial data obtained*: B. C. scope, parallel sheaf, and range finder range (3600). B. C. on the right. r=3600, R=3600, T=240, S=7, r/R=1.

Initial commands: Aiming point Block House on Signal Mountain, Plateau 14, Drum 100, On No. 2 open 3, Site+10, Corrector 35, No. 2, One Round, 3600.

Commands	*Range*	*Sensings*			*Remarks*
		Deviation viewed from OP but not announced	*Ht. Burst and Range*	*Deflection*	
	3600		A ?	–	Starting with one gun and obtaining low height of burst giving sensings corrector was not changed. No range sensing obtained.
L 40	3600		A+	+	Air burst still low.
R 15 U 5					B. C. should not have raised corrector when bringing in the battery.
BR	3400		A ? A ? A— A ?		S=7. 200-yard range change is being made. 2×7=14. Shift=R 15 (nearest multiple of 5) to stay on the line.
On No. 1 Op 4 D 2 B 1 Rd	3500		A ? G— A+ A ?	Correct	The B. C. sensed the sheaf as a whole as deflection short (line short on No. 3). He opened on No. 1 and fired a volley at the middle of his range bracket to verify the deflection and height of burst.
	3600				Fired as "on the way" received from preceding volley. Volley at 3500 proved satisfactory. B. C. now ready to give command: "zone 3400-3600."

SUMMARY: Errors in initial data—Range 100 yards; Deflection, 30 mils. Time to 1st Range—2 minutes, 10 seconds. Total time: 4 minutes, 25 seconds. Classification, satisfactory.

Percussion Bracket Lateral—Small t

Target Description: Infantry howitzer in vicinity of a stump. *Mission*: To neutralize. *Type*: Percussion bracket lateral. *Materiel*: French 75mm, model 1897. *Visibility*: Excellent. *Initial data obtained*: Measured shift from base point with B. C. scope and range finder range (3500). B. C. on the right. r=3500, R=3500, T=240, S=7, r/R=1.

Initial commands: Base Deflection Right 100, Site+10, Shell Mk. I, Fuze long, No. 2, One Round, 3400.

Commands	*Range*	*Sensings*			*Remarks*
		Deviation viewed from OP but not announced	*Range*	*Deflection*	
	3400	A <—20 M.—>x	?	–	Original sheaf might have been partially converged to increase the probability of obtaining sensings when the battery is brought in (adjustment being made on a point).
L 20	3400	A x	–	–	This burst was observed as considerably short B. C. decided to make 400 yard change.
L 20	3800	A 12 M. x	+	–	Left 30 would have been a better command. Sensings of deflection short was an error. Deflection should have been sensed as doubtful.
BL	3600	A x x x x	– – –	Over	Sheaf sensed as a whole.
R 5 on No. 2 open 3, B 1 Rd	3700	Not fired			B. C. decided to fire one round at the middle of his bracket to verify his deflection adjustment. If he had been satisfied with his deflection he could have given the command R 5 on No. 2 open 3 B 1 Rd zone 3800-3600.

SUMMARY: Errors in initial data; Range, 300 yards; Deflection, 30 mils. Time to 1st Range—1 minute. Total time, 3 minutes, 50 seconds, Classification, satisfactory.

FIELD ARTILLERY NOTES

Test of Light Truck-drawn Battery at Fort Ethan Allen

The light truck-drawn battery returned to Fort Bragg, N. C., on the afternoon of February 7th, completing its trip to Fort Ethan Allen to test the performance of the motor vehicle equipment of the unit under winter conditions in New England.

En route to Fort Ethan Allen the battery averaged daily marches of approximately 150 miles, stopping at Richmond, Fort Myer, Philadelphia, West Point and Watervliet Arsenal on the journey to and from Fort Ethan Allen. On the trip north, opportunity was taken to test the performance of the vehicles at Fort Meade and Fort Humphreys, where the terrain differs from that available for the tests conducted at Fort Bragg.

In general, the roads traversed were excellent, and on such roads the battery demonstrated that it is capable of maintaining an average speed of twenty-two miles per hour, including time for halts. However, on the day's run from Watervliet to Fort Ethan Allen, bad weather conditions were encountered. The

6-WHEEL TRUCK ON OVAL HIPKINS' TRACK TOWING GUN UP STEEP GRADE IN SNOW.

roads between Whitehall, New York, and Ticonderoga were covered with glare ice. As it was raining at the time the battery left Whitehall, this made the road surface extremely slippery and difficult. Twelve miles of this portion of the route extends through the mountains east of Lake George with very steep grades and many curves. While some difficulty was encountered in crossing the two mountains on this section of the route, the battery made steady progress at a decreased speed and no accidents occurred. After crossing Lake Champlain more steep grades and ice covered roads were met in Vermont, but these were also accomplished without particular difficulty. The run from Watervliet to Fort Ethan Allen, because of the difficult road conditions, required approximately ten hours' running time instead of the seven hours' time which would ordinarily be required for a run of this distance. Therefore, under extremely unfavorable conditions of normally good roads, the battery averaged about fifteen miles per hour.

During its stay of two weeks at Fort Ethan Allen the battery was tested over frozen ground, over ground with the surface softened by thaws, and over ground covered by approximately ten inches of dry snow. The work involved a number of short marches, under varying road conditions, and the occupation of various tactical positions on the artillery range. A number of movements across country were involved in the occupation of these positions. The terrain on the range near Fort Ethan Allen is typical of that encountered in mountain foothills in New England. The surface is extremely rough, with many outcroppings of rock. Where the country is not mountainous, small rocky hills abound with fields marked by stone walls and traversed by small mountain streams. Advantage was taken of the opportunity afforded by these streams to test the ability of the motor vehicles in crossing small rivers with frozen banks.

During the entire stay at Fort Ethan Allen, all vehicles were left exposed to the weather in order to stimulate the conditions which would be encountered in field service in cold weather.

No mechanical difficulties were experienced with any of the motor vehicles, and all completed the trip under their own power. Much valuable information was gained concerning the methods

of operation necessary to insure satisfactory performance when operating under winter conditions, and in the efficiency of chains and traction devices in improving the cross country performance of the light motor truck equipment of the battery. During the four weeks' operation of the battery, the total mileage covered was 2,156 miles, of which approximately 400 miles was over the roads and test terrain in the vicinity of Fort Ethan Allen, and 100 miles in the vicinity of Forth Meade and Fort Humphreys.

An Old Regiment of Field Artillery Records Its History

If you, Mr. Veteran, are formerly of Battery "K," First Artillery, or Battery "B," Fourth Artillery prior to February 13, 1901, or of the 2d, 7th, 20th, 21st, 22d, or the 25th separate batteries of the Field Artillery prior to June, 1907, or of the Sixth Field Artillery (Regular Army), the following will be of vital interest.

From time to time there have been written short histories and sketches dealing with the participation of military units in the history of the United States, especially was this true for a period of years immediately following the World War. Most of these writings covered the activities of units in a particular war or sometimes confined themselves to a particular phase of a single campaign.

The Sixth Field Artillery (Regular Army) is now about to present to those interested in military history, and especially to its veterans, a complete history of its career.

The story of this famous regiment commences at West Point, New York in 1798. It is as fascinating a tale as one reads in a book of adventure or romance for it includes both. Old Fort Trumbull—the Delta of "Old Man River"—with Jackson at New Orleans—the Seminole War—Taylor's Army in Northern Mexico—the capture of Mexico City—the Utah expedition—Indian troubles—four long years of Civil War—more Indian campaigns—the Cuban and Porto Rican expedition—"civilizing with a krag" in the islands—separation of the coast from the field—Pancho Villa—the punitive expedition—across the pond—the never-to-be-forgotten winter of '17—the "big push" of '18—the

watch on the Rhine, one and all stirring events of history pass in review as the pages are turned.

An officer and a non-commissioned officer have devoted several years to the assembling, correlating, checking, and compiling the data which has gone into this work. It is as authentic as the War Department and other official records and documents from which it was created.

The manuscript is now in typewritten form. Before it can go to press the publishers must know the number of copies to be run in order that the lowest possible price per copy may be fixed. The history will not go on the public market, but will be sold to interested individuals and organizations at absolute cost.

For benefit of those interested it is suggested that they communicate with—the Adjutant, Sixth Field Artillery, Fort Hoyle, Maryland.

National Convention of the Reserve Officers' Association

Plans are maturing rapidly for the National Convention of the Reserve Officers' Association of the United States, to be held in Chicago, June 3 to 7 inclusive. This Convention will be preceded by the Convention of the Illinois Department of the R. O. A. to be held June 1 and 2.

These Conventions coincide with the opening of the Chicago Century of Progress Exposition. Delegates and visitors will have an opportunity to witness the tremendous development and progress made in the Century which mark the growth of Chicago from a trading post to one of the world's dominant cities. They will see an exposition that is indeed modern in its architecture, as in the type of exhibits.

Attractive hotel and railroad rates will be available for those desiring to attend the Convention. Inquiries may be addressed to Headquarters of the Convention Staff, 53 West Jackson Blvd., Chicago.

BOOK REVIEW

Inevitable War

BY LIEUTENANT COLONEL RICHARD STOCKTON, 6TH

Lieutenant Colonel Stockton, in writing this book, has rendered a distinguished service to his country. The result of five years' research and consultation with competent authority; it makes available to all intelligent readers a clear account of the conflict between adverse legislation and sensible military policy which has continued in this country for 150 years. The real meaning of our military history has never reached either our political representatives, as a body, or our people, as a whole. School histories are but narratives of success. No attempt is made to point out failures of policies or the cause of disaster. Colonel Stockton, from established historical facts, has assembled evidence which, duly evaluated, makes clear the lessons which history contains. He shows the reader that the military policies of our thirty Presidents have been consistently sound and in accord. He further shows that these policies have been consistently rendered ineffectual by the legislative branches of the government, with the result that our national defense at the present time exists only in paper plans and theoretical training, insofar as the army is concerned, and has resulted in a navy which, for no good reason, now occupies third place among the navies of the world. With pitiless logic Colonel Stockton answers the arguments of the pacifists and by historical examples shows that the centuries prove them to be wrong. Also, in the last analysis, that the successful pacifist is more destructive of life and wasteful of money than any amount of prepared defense has ever been. With figures checked by professional accountants and economists, the author furnishes sound criticism on actual cost of purely military and naval preparedness, which are carried by legislative camouflage to the minds of the people as charges against the military establishment.

"Inevitable War" is published by Perth Company. It contains 873 pages, 111 chapters, 51 illustrations, and is fully indexed and annotated. The regular price is $7.50. A special discount of 35 per cent is made to members of all components of the services. The book may be obtained through the U. S. Field Artillery Association.

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