

THE FIELD ARTILLERY JOURNAL

MAY-JUNE, 1935

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THE UNITED STATES FIELD ARTILLERY
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DEAN HUDNUTT

MAJOR, FIELD ARTILLERY, UNITED STATES ARMY



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THE 155MM HOWITZER M 1918 MODIFIED FOR TOWING BY TRUCK. SEE PAGE 286.

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VOLUME XXV

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NUMBER 3

ORGANIZATION, ARMAMENT, AMMUNITION AND AMMUNITION EXPENDITURE OF THE GERMAN FIELD ARTILLERY DURING THE WORLD WAR

BY LIEUT. GEN. VAN ALFRED MUTHER, Retired During the war Chief of the Field Artillery section and director of the Department of troops of the Royal Prussian War Ministry

Translation by Captain Arnold W. Shutter, Field Artillery, National Guard Bureau

FOREWORD

There is on foot today a well-organized propaganda seeking to discredit the munitions manufacturers of the country. The argument is advanced that such people are largely responsible for the wars of the world in that they make readily available to belligerently minded people the means for their mutual annihilation. This fallacious opinion is finding a ready acceptance in the minds of an increasingly large number of American citizens.

The fact of the matter is that, if people are pushed to the verge of war, they will fight with whatever weapons come to hand. If the people of the United States should ever again find themselves in a like situation, they will have to fight with whatever means are at the moment available.

Now if, in the meantime, we have with the characteristic belligerence of the true pacifist, succeeded in hamstringing our own sources of guns and munitions, we will face that day from a most disadvantageous position. Few people realize the tremendous industrial problems involved in supplying the troops at the front with the necessary combat equipment.

For these reasons, it seems to me timely to review some of the problems involved in this question, to the end that we may proceed with caution in the present efforts to annihilate an industry on which, at some future date, our very lives may depend. With this end in view, the following translation is submitted.

A. W. S.

I

ORGANIZATION

THE peacetime organization of the German Field Artillery consisted of 101 Field Artillery Regiments of two light Battalions each, comprising each three light batteries manning six guns. In the case of eleven of the regiments there was an additional horse battalion of three batteries manning four guns each. In the case of the "Instructional" regiment of the Field Artillery School of Fire, there was still an additional light battalion of three batteries manning six guns each.

The strength of the German peacetime Field Artillery included also:

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50 Field Artillery Brigade Staffs
101 Field Artillery Regimental Staffs
214 Field Artillery Battalion Staffs
642 Batteries with 3,786 guns.

After the accomplishment of the mobilization, carried out in accordance with prearranged plans, there were present:

51 Field Artillery Brigade Staffs
131 Field Artillery Regimental Staffs
381 Field Artillery Battalion Staffs
1,069 batteries with 6,326 guns, including 5,096 field guns 96 n/A and 1,230 light howitzers 98/09.*
278 light ammunition columns
296 artillery ammunition columns, including 80 light howitzer ammunition columns, and 147 infantry ammunition columns that were likewise furnished by the Field Artillery

The mobile Field Artillery regiments of each active division were united into a Brigade organization; the eleven horse battalions became independent.

In order to augment the battle strength of the light artillery, there had to be undertaken during the course of the war a considerable increasing of the strength and reorganization of the Field Artillery units. At the same time, there had to take place a re-armament of the light artillery, a project to which I shall revert later. For the moment we will discuss, in its main features, the augmentation and reorganization of the Field Artillery during the war.

As early as October, 1914, five new Reserve Corps (XXII-XXVI) were set up for which 10 Reserve Field Artillery Regiments of 3 Battalions each (2 Battalions of field guns and one of light howitzers) together with light artillery and infantry ammunition trains had to be organized. Supplying these units with equipment was successfully carried out by drawing on the reserve equipment which the War Ministry had on hand, and which reserve was by these means absolutely depleted. We find here for

*German gun designations: numbers refer to year of model rather than to caliber. For example: F.K. 96 n/A—Feld Kanone 96, neuer Art—Field Gun model of 1896 new style (caliber 77mm). I.F.H. 98/09—leichter Feld Haubitzer 98/09—light field howitzer, model of 1898, remodeled 1909 (caliber 105mm).

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the first time, instead of the former Field Artillery organization (providing each division with a field artillery brigade) the assignment to each division of a regiment of nine batteries. This organization later came to be adopted by all Field Artillery units. At the same time the practice of assigning four guns per battery was adopted. Even the later newly formed units received batteries of four guns each. The transition from the six to the four gun battery was undertaken, not because the six gun battery had been found unsuitable but because there was not sufficient equipment on hand to provide the batteries with six guns apiece.

The question "six or four gun battery" had played an important role in times of peace. In war time it had to be decided in favor of the four gun battery due to shortage of matériel. If we had not had the six gun battery organization in the first place it would have been utterly impossible to have supplied the new establishments with equipment, as the manufacture of new field pieces had not at that time advanced to the point where it could simultaneously cover both the heavy casualties and equip newly formed units.

With the establishment in December, 1914, of four Prussian Reserve Corps (XXXVIII-XXXI) the High Command directed the re-adoption of the old organization (brigading). There were thus set up eight Brigade Staffs and 16 Field Artillery regiments, each regiment consisting of one field gun battalion and one light howitzer battalion, each battalion containing three batteries of four guns: and in addition the necessary ammunition trains. Formation of these new units took place at home station, the equipment coming from new manufactures. With this organization the preference for the light field howitzer came to the fore, which during the war had spectacularly proved its worth in view of the effectiveness of the individual round. We therefore find in the Brigade two instead of one battalion of light field howitzers.

In March, 1915, there were set up for five new Infantry Divisions (50th, 52nd, 54th, 56th and 11th Bavarian) five Brigade Staffs with ten Field Artillery regiments, each regiment with a gun and a howitzer Battalion. While the howitzer batteries were organized at home station, and there equipped with new matériel,

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the gun batteries were formed by drawing whole batteries out of the front lines, which were then replaced at the regiments through reorganization.

For further new formations for the year 1915 the principle was adopted of forming only Field Artillery regiments of nine batteries each. At the same time there was undertaken the completion of the Field Artillery of those divisions which did not have a Field Artillery Brigade available. These divisions were likewise to receive a Field Artillery regiment of two gun and one howitzer battalions. Thus upon the mobilization of the authorized twenty-nine Reserve regiments of Field Artillery, there were twenty-eight provided with a third Battalion of light howitzers. One regiment already had upon mobilization a third light howitzer Battalion.

The year 1916 brought further installations in its wake and the necessity of creating for the High Command a Field Artillery Reserve that had for its purpose the reenforcement of the defensive lines in the event of a hostile surprise attack, and during our own offensives, the mission of augmenting our own Artillery power. Fifty-seven Field Artillery regiments were earmarked for this Reserve, and were designated as Army Field Artillery Regiments. This project could only be put into effect by breaking up the Field Artillery Brigades. One regiment of the Brigade was strengthened by the addition of a third battalion and made up the Divisional Artillery, while the other regiment was transferred directly at existing strength to the Reserve of the High Command.

By the summer of 1917 the new organization of the Field Artillery (9 Batteries) had been accomplished for all regiments. This was made possible, in view of the lack of personnel and of horses, only through a material reduction in the light trains, in certain instances by inactivating them entirely. For reasons relating to the matter of production, the trains were next relieved from artillery connections and became Army troops. Later on, on the Western Front, the trains again reverted to Field Artillery command.

With the breaking up of the Field Artillery Brigades, the post of "Artillery Commander" was created under whose jurisdiction

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the whole of the Divisional Artillery was placed.

In order to be able to undertake a rapid shifting about of the light artillery, the practice was adopted, in the Spring of 1918, of mounting six Field Artillery regiments on trucks. The guns were placed in the trucks while the limbers were trailed.

For strengthening the offensive power of the artillery, early in the spring of 1918 the Field Artillery Batteries on the Western Front were furnished with 5 to 6 guns (without teams).

For strengthening the Eastern Front with captured matériel, 98 Batteries of 8 guns were organized.

The increase of Field Artillery may be seen from the following table, in which the 5 and 6 gun batteries (without teams) and the captured matériel has not been included.

Time	Number of Guns	Batteries Light Howitzers	Total Batteries	Total Pieces
Peace	489	153	642	3,786
August, 1914	864	205	1,069	6,326
August, 1915	1,261	342	1,603	7,708
August, 1916	1,364	565	1,929	8,616
August, 1917	1,838	871	2,709	10,836
November, 1918	1,691	1,109	2,800	11,204

According to the foregoing, the total number of batteries, at the close of the war, had, as compared with August, 1914, almost tripled, the number of gun batteries had practically doubled, the number of howitzer batteries had increased five-fold, the number of pieces not quite doubled. As compared with the peacetime setup, the number of batteries had very nearly increased five-fold, and the number of pieces tripled.

Aside from the equipment for new installations and for reorganization, it was also necessary to insure the replacement of weapons for the Field Army which, in part at least, was extraordinarily high. The Field Artillery Section of the War Ministry which had to work up the organization, the matériel and ammunition supply of the field artillery succeeded in approximating all demands of the High Command. At the close of the War there was an additional reserve of 3,500 guns and 2,500 light howitzers on hand, a total of 6,000 pieces.

II

ARMAMENT OF THE FIELD ARTILLERY

The German Field Artillery at the outbreak of the war was equipped with the Field Gun 96 n/A and with the light Field

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Howitzer 98/09 and in every Field Artillery Brigade there was a light field howitzer battalion of three batteries. Inasmuch as the reproach was raised in many quarters both during and after the war that the German field gun was inferior to the French field gun M. 97 in respect to range, it becomes necessary to go into this question in a little more detail. However, before discussing the details, it seems to be in order first to examine the reasons which were of influence in dictating the construction of the field gun 96 n/A. In this connection it is essential to make the point clear that this entire question is not purely an artillery one, but that the characteristics demanded of a given weapon are established not alone by the Army Administration and the artillery testing commission but that the General Staff has rather a deciding word to say in the premises.

During times of peace, searching tests and comparisons had been made by the Army Administration of the relative performances of the French field gun M. 97 and the German field gun 96 n/A. The result of this investigation was that, in view of the controlling factors, there was nothing to choose between the two weapons. This view corresponded to the opinion which was held at that time relative to the ballistic efficiency of a field piece, a point of view which was considered sound in almost all countries, and which was even shared, as we shall later see, by the French themselves. Even the German General Staff had never, in peacetimes, demanded a more ballistically efficient field piece.

If one considers the military situation prevailing in Germany prior to the war, it must be admitted that the construction of the Field Gun 96 n/A conformed to the specifications which were then in effect based on the opinions and comparisons in favor at that time.

The German Army had to embark on a warfare of movement of huge proportions, not only on the Western Front but in the East as well. On these considerations our whole system of military science was built up and our services adhered to the spirit of attack and exploiting success. For Germany, therefore, a light, mobile field piece was particularly indicated in conformity with the strategical and tactical views of her high command. Following out this trend of thought, no importance was attached to great

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range, but there was demanded of the field artillery progress toward a satisfactory effectiveness. In accordance with the experiences of the Russo-Japanese War, firing with field guns at the longer ranges was considered ineffective on account of the difficulty of observing small caliber projectiles. No value was attached to the use of shrapnel time fuzes at ranges in excess of 5,000 meters because the sharp angle of fall at these ranges and the small terminal velocity materially reduced the effect of the dispersion of the shrapnel balls. It was a question therefore of turning out a field piece that would have the effectiveness and the characteristics of the Field Gun 96 n/A, that is to say, a field gun which had the capability of following our infantry even over difficult terrain, and which could deliver effective fire at 5000 meters with a maximum range of 8000 meters. Mobility, having in mind the spirit of the attack and the exploiting of a success, was given the fullest consideration.

As a matter of fact, the beginning of the World War displayed distinctly the outlines of a warfare of movement, and all that had been anticipated of the field piece 96 n/A was realized in full measure. During this interval of time the field gun, so thoroughly tested in peacetimes, and so useful in war, whose chief advantages lay in its roadability, its mobility, and the speed with which it could be placed in its firing position, rendered distinguished service in 1914 during the advance in the West as well as in the operations and battles in the East in 1914-1915. It is indeed doubtful whether or not it would have been at all possible to have adequately accomplished infantry supporting missions along the bottomless roads and over the difficult, icy terrain in the East with a heavier field gun, such for example, as the French gun M. 97. In the winter battle in the Masurian Marshes at all events, the field gun 96 n/A on the left wing of the battlefield was the only gun that could directly follow the infantry. In like manner the great performances in marching that the German right wing Army had to accomplish in Belgium and France in the year 1914 really bespeak the serviceability of the construction of the field gun 96 n/A and from all this the conclusion is irresistible that the unparalleled success of the first few months of the war would not have been achieved if we had had a more

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effective but heavier weapon at the expense of mobility. But of what great significance the mobility of a field piece is for a warfare of movement may be further illustrated by the fact that the Chief of the General Staff caused a large number of batteries, that were already equipped with the more accurate but notably heavier field gun 16, to be rearmed again with the field gun 96 n/A for the offensive on the Western Front in March, 1918. Even the manufacture of the field gun 96 n/A which had been suspended, had to be put into operation again in order to have on hand a sufficient number of light weapons to accompany the infantry and to support the attack.

Let us now compare in detail the German field gun 96 n/A with the French field gun M. 97. Both weapons are practically identical in caliber. While the French weapon fires a shrapnel of 7.2 kg¹ with a V_o^2 of 529 meters per second the weight of the corresponding German projectile is 6.85 kg with a V_o of 465 meters per second. From the foregoing we can doubtless deduce that a greater effectiveness is indicated for the French field gun. The French shell has a different weight (5.5 kg) from that of the shrapnel (7.2 kg) and along with this a different V_o (584 m/sec) from that of the shrapnel (529 m/sec). As far as the firing is concerned this double trajectory is unfavorable, since at the various ranges different elevations have to be set off. According to the range tables the extreme range of the French gun, using shrapnel with the percussion fuze is 8,500 meters, but with shell³ only 5,500 meters, apparently for the reason that the dispersion of the lighter shell becomes increasingly large. The German field piece has a range of 7,800 meters. With respect to the maximum range of the two weapons therefore there is present a difference in range of 700 meters. This is, however, without significance, since no effect worth mentioning can be attributed to percussion shrapnel at the longer ranges. The time fuze range of the shrapnel in the case of the French gun is 6,800 meters, while the German weapon presents a corresponding

¹kg—kilogram: 1 kg—2,205 lbs., thus shrapnel weighs 15.876 lbs.

² V_o —muzzle velocity.

³Editor's note: Apparently the author has taken the limit of the range drum (5,500m) as the extreme range for shell. He has neglected the several hundred additional meters of range obtainable by "digging in" the trail.

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range of 5,000 meters. The large V_0 in which many effect to see the superiority of the French gun most certainly cannot be advanced as the only measure for reaching a decision with regard to a weapon, but it is a matter in this connection of proving how this relationship effects the behavior of the vital strength of the weapon at the various ranges. At this point, the fact must be established that, according to the range tables there is very little difference between the two weapons. At ranges in excess of 7,000 meters as a matter of fact, the terminal velocity of the German gun is greater than that of the French.

The question now arises, on what grounds did the French assume the great V_0 in the construction of their weapon? Certainly not for the purpose of increasing their range, but apparently only to improve the effective area of their "Obus Robin," a centrally chambered shrapnel. The results which are inseparable from a flat trajectory (limited selection of covered positions, and in some instances the utter impossibility of attacking certain targets from concealed positions because of the small angle of fall) had already been recognized by the French before the war, and they sought to make the trajectory more curved by the introduction of an independent angle of site mechanism, a measure which, as the war proved, did not remedy the evil. The inadequacy of this device had been recognized in peacetimes, for efforts had been made, in order to secure a higher angle of fall, to introduce for the French gun M. 97 a reduced charge and to lower the V_0 . The tube was to be materially shortened. The war put an end to these experiments.

In the midst of these observations, the point must again be raised that before the war in France, both of these principle results (in construction) had been recognized, which were necessitated by the high V_0 . and which found expression in the limited mobility and the necessity for "anchorage" which in turn delayed the preparation for action and shifting from one target to another, for as much as two years before the war the French Regulations Commission had ordered the introduction of a lighter and more mobile field gun.

Now the assertion has been made that the French weapon was constructed for greater range, that is, the French had recognized

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in peace times the importance of greater range and had already tried out the extreme range of their gun in mobile warfare. This assertion is not convincing, for the peace time range tables, as we have seen, envisages for shrapnel time fuze a maximum range of only 8,500 meters and for shell a comparable range of 5,500 meters. So the French were as a matter of fact by no means in possession of the material for firing at extreme ranges. Moreover the French field gun was not designed for firing at extreme ranges. The greatest elevation possible, without sinking the trail, was in the case of the field gun M. 97, 18° corresponding to a range of 6,800 meters; in the case of the German 96 n/A $15 \frac{2}{16}^\circ$ corresponding to a range of 5,325 meters. If greater ranges were required, it was necessary to "dig the trails in." From this it may be deduced that even in France, firing at ranges in excess of 7,000 meters was to be restricted to exceptional circumstances.

The correctness of this assumption is attested by General Herr, during the War the Inspector General of the French Artillery in his book, "The Artillery of the Past, Present and Future." He writes:

"The tremendous strides which were made in 1897 by the introduction of the 75-mm field piece, misled our leaders to the point of deceiving themselves concerning the efficiency of this weapon, whose annihilating effect they overevaluated. In conclusion, almost nobody believed in the value of long ranges because the Artillery in executing their principle assignment will never have occasion to fire farther in a limited field of activity than 3,000 to 4,000 meters. We have to figure on terrestrial observation. This is limited to a vision not exceeding 4-5 kilometers.

"With the tube of the 75mm field gun at a suitable elevation it is possible to attain a range of 8,000 meters, but the trail and the deflection mechanism are constructed only for an extreme range of 6,500 meters."

And the French General Staff is still of the opinion in January, 1914, that: "A light mobile Artillery which understands the proper use of the terrain, seldom needs a long range gun in order to reach the enemy at favorable ranges."

The foregoing outlines indicate sufficiently that both weapons

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were, in general, of about equal value. In a complete comparison, one dare not disregard the fact that the German Field Artillery quite aside from the Field gun 96 n/A was additionally armed with the light howitzer 98/09, an exceptionally effective weapon, while the French light artillery placed their sole reliance on the Field gun M. 97.

There is added at this point the opinion of an English officer on the French field gun M. 97 which was published in the Royal Artillery Journal, 1922. The article directly advances the thought that the French Field Artillery, before the war, inaugurated a scheme to popularize the French 7.5 cm gun through the medium of a widely publicized propaganda. "Without doubt the French field gun may have been an exceptional weapon, possessing great range and rapidity of fire, as well as being light and handy. But without doubt it also embodied serious mistakes, as for example, the extreme flatness of the trajectory which limited the selection of positions, the frequent occurrence of 'shorts,' and the inadequate effective radius of the shells."

And finally, the opinion of the French General Herr in regard to the German field gun 96 n/A is not to be overlooked in this connection. He writes:

"The German light field gun is an extraordinary weapon, certainly inferior to our 75mm field gun, if not in mobility and practicable ranges, at least in rapidity of fire and effective radius of their projectiles."

The possibility of increasing the range of the field gun M. 97 worked out to the advantage of the French when position warfare was inaugurated, when maximum effective ranges for the Artillery and Chemical warfare assumed major importance and improved observation facilities and methods of orientation facilitated the use of greater distances. These results were also attained by the introduction of a melenite shell of greater efficiency, and supersensitive fuze.

On the German side, the proponents of the field gun 96 n/A and the light howitzer 98/09 no longer denied the demands for increased ranges after the position warfare had started. It was therefore a question of providing the German Field Artillery as rapidly as possible with a weapon suited to the new requirements.

THE ACCOMPANYING TABLE GIVES A COMPARISON OF THE WEAPONS WE HAVE HAD UNDER DISCUSSION:

	Field gun 96 n/A	French Field gun M. 97	Field gun 16	Light field howitzer 98/09	Light field howitzer 16	Light field howitzer Krupp
Caliber cm	7.7	7.5	7.7	10.5	10.5	10.5
Length of tube in calibers	27	36	35	16	22	20
Elevation limits	-12 15/16° to +15 2/16°	-12° to +18°	-10° to +40°	-10° to +40°	-10° to +40°	-4° to +43°
Deflection limits in degrees, each side of center	4°	2° 50'	2°	2°	2°	2°
Projectile	Field gun HE 11 shell, shrapnel	(1) Shell (2) Shrapnel	1. shell 2. shrapnel 3. "C" projectile	(1) KHG 05 (2) shell (3) shrapnel	(1) shell (2) shrapnel (3) "C" projectile	(1) shell (2) shrapnel (3) "C" projectile
Weight of projectile in kg	6.85	(1) (5.5) ¹ (2) 7.2	(1) 7.2 (2) 6.6 (3) 5.89	(1.) (2.) 15.7 (3.)	(1.) (2.) 15.7 (3.)	(1.) (2.) 15.7 (3.)
Fuze range	5,000 (7,000) ²	6,800	6,000	5,300 (7000) ²	7,000	7,000
Muzzle velo.	465	(1) 584 (2) 520	(1) charge 420 (2) charge 545 (3) "C" 602	302	400 "C" 427	430 "C" 453
Max range	7,800	(1) 5500 (2) 8500	10,700	6300 (7000) ²	9700	10,200
Weight in firing position	1020	1160	1325	1225	1380	1500
Weight limbered	1910	1970	2256	2260	2300	2535

¹During the war a shell (wt. 7.2 kg) was introduced that achieved a range of 11,000 meters

²Figures in parentheses indicate increase of range achieved during the war.

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The field gun 16, the light field howitzer 16, and the light field howitzer Krupp were created which exhibited a noteworthy increase in range in comparison with the previous weapons. The field gun 16 attained a range of 10,700 meters as compared with 7,800 meters for the field gun 96 n/A; the light field howitzer 16 and the light field howitzer Krupp a comparable range of 9,700 meters and 10,200 meters respectively as compared with the 7,000 meter range of the light field howitzer 98/09.

These guns presented no problems of new construction but were turned out by employing the mechanism already in use at the factories for the fabrication of the 96 n/A and the 98/09. A change in caliber that would have called for an alteration of factory equipment, could not be permitted to enter the picture in view of the terrific amount of preparation that would have been necessitated in making over the facilities of the manufactories.

The model 16 guns fulfilled in the highest degree the demands that were put upon them and the troops greeted with enthusiasm the long range guns through which the balance of power in opposition to the French field gun M. 97 was again restored for the period of position warfare. Along with a considerable extension of the range, additional effectiveness was secured by the introduction of new projectiles and improvement of construction of the fuzes.

In position warfare this gun gave a good account of itself. The troops adjusted themselves quickly to its small deficiencies, understanding perfectly that a wartime piece of construction could not achieve the perfection of a gun that had undergone a peace time experimentation. It was clear to them that the difficult situation in which industry found itself and the lack of time for searching tests would have to preclude the introduction of many a desirable feature. See Table, Page 208.

Major A. D. Drees expresses himself as follows concerning the new field guns in Schwarte's "Present Day Technique of Warfare":

"The new equipment, developed under such difficult circumstances, was a most noteworthy accomplishment in the field of gun construction and manufacture; that much may be said without any exaggeration. The new weapons were capable of fulfilling the most difficult tasks assigned to the troops, and the troops,

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on their part proved that they were in a situation to accomplish their tasks with the new armament."

And finally let us add the opinion of Dr. Schwinning, regent for the instruction in ordnance construction at the Technical Military Academy. He says:

"Technically the construction of the field gun 16 was a skilfull accomplishment, for it made it possible, in a very short space of time to embark on the mass production of a field gun fulfilling the ballistic requirements, without resorting to prolonged experiments. It goes without saying that we could not expect to produce, in so short a space of time, a finished product which would illustrate in every respect the highest measure of attainable technical progress, especially in view of the fact that we made use, as far as possible, of existing gun models and installations which were already present in the factories."

We have to thank the anticipatory efforts of the Artillery Testing Commission of our great German munition factories Krupp and Rheinmetal, that the German Field Artillery received in such a short space of time during the war, these efficient and highly useful weapons.

The rearmament project was undertaken in the winter of 1916.

At the close of the war, the following had been armed:

- 755 Batteries with field gun 16
- 751 Batteries with field howitzer 16
- 66 Batteries with field howitzer Krupp
- 936 Batteries with field gun 96 n/A
- 286 Batteries with field howitzer 98/09
- 6 Batteries with experimental models
- Totals, 2,800 Batteries with 11,204 guns

III

SPECIAL WEAPONS

Aside from the rearmament of the Field Artillery, construction and preparation of special weapons also became necessary, because the circumstances of war had given rise to exigencies which could not be handled by the Field Artillery. Therefore new weapons had to be brought into being which were likewise set up by the Field Artillery.

Mountain Artillery had not existed in times of peace. The desirability of mountain batteries was manifested as early as 1914

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in the campaign in the Vosges Mountains. During the course of the War, 21 mountain batteries, including 17 gun and 4 howitzer batteries, together with the necessary battalion staffs had to be organized. In all a total of about a hundred guns were produced.

Infantry Cannon. At the Front the views with respect to the value of Infantry cannon were for a long time divergent, and not until the favorable experiences that were had with experimental types, and the lack of a suitable weapon for use against machine gun nests in the Spring Offensive of 1918 had brought to fruition a general appreciation of the situation, was it acknowledged that in the future, Infantry cannon could not be dispensed with. The War Ministry had held the viewpoint consistently since the summer of 1916, that some such type of weapon was necessary for the close support of the Infantry and as a means of combatting tanks. The number of Infantry cannon which were prepared during the war was determined by the High Command. The necessity for field guns was of material influence in arriving at their decision, since Infantry cannon could only be produced at the expense of reducing the production of field guns. The first batteries were set up in 1916. A total of 50 Infantry Batteries were manufactured comprising some 200 guns. Plans were made for the further production of 60 Batteries.

Anti-Tank. Fifty "close combat Batteries" with 200 guns were set up in January, 1917. In addition:

- (a) 200, 2 cm. Anti-tank guns Erhardt & Becker.
- (b) 600, 3.7 cm. Anti-tank guns Erhardt & Krupp.
- (c) 150 Belgian 5.7 cm. casemate guns mounted on 4-ton trucks as Anti-tank guns.

The above weapons were actually employed at the Front. Additional orders were placed as follows:

In addition to (a) 1,000 guns.

In addition to (b) 1,020 guns.

Anti-aircraft guns. When war broke out there were 18 anti-aircraft guns on hand. Including substitute or make-shift guns, 3,000 anti-aircraft guns were produced during the course of the war. The amount of auxiliary equipment supplied to the Field Artillery and anti-aircraft Artillery such as rangefinders, searchlights, fire control implements, direction finders, accessories, harness and stable equipment cannot be given in detail.

(To be concluded)

THE FIELD ARTILLERY JOURNAL

To United States Field artillery association Press

In Appreciation,

I hereby wish to thank all officers and enlisted men in the U.S. artillery service, who so kindly donated towards buying this fine team of artillery horses and delivering them here at our farm.

I also wish to especially mention Maj. Gen. Upton Birnie Jr and Gen. Edmund of Washington and Capt. Max Carpenter of the Chicago Tribune and Maj. Gen. Frank R. McCoy, and also Carl Bobb and John Nelson who delivered by truck these old soldiers.

I surely appreciate this gift more than words can tell, when I realize what all the efforts it took to put over this deal. I really wish I could personally thank all enlisted men and officers, those mentioned and other officers who took part.

I wish to add that Judge & Reno are getting along fine, they sure feel frisky now having had a good long rest, the weather here has been unsteady, snowing and raining so not much field work. again thanking every body
from Leroy Johnson

"—BUT THE GREATEST OF THESE IS CHARITY"

SPRING was just around the corner—but in Washington it was cold and raining. Among the routine letters in the basket of Major General Upton Birnie, Jr., Chief of Field Artillery, was a boy's appeal for help from the Field Artillery—"an old team of artillery horses, that are too old to be of any use." This letter struck a chord of sympathy and understanding in the hearts of the Chief and his Executive, Lt. Colonel Robert M. Danford.

Could not something be done to help out this brave lad of thirteen summers? There are always horses that cannot stand the long summer marches. In what unit could they be found without too much letter writing? Major H. E. Maguire, commanding the 2nd Battalion, 3rd Field Artillery, Fort Sheridan, Illinois, was in Washington on leave. Yes, there were several horses in his battalion whose marching days were over.

Thus it was arranged—condemnation and sale of a field artillery pair. The FIELD ARTILLERY JOURNAL went into action and on the date that "condemnation and sale" was ordered at



THE AUCTION

THE FIELD ARTILLERY JOURNAL

Headquarters VI Corps Area, there was mailed to every Field Artillery commander in the Regular Army, exclusive of the Philippine Islands, a letter asking for a donation of three cents per officer and man. Realizing that the "red legs" and many others would contribute for this worthy cause, the Field Artillery Association drew out its check book and forwarded to Major Maguire sufficient funds to purchase and transport the animals from Fort Sheridan to Volin, South Dakota.

The days dragged as we waited for the auction—March 26. Newspapers and news reels were informed through the Public Relations Bureau that there was a "human interest" story breaking at Fort Sheridan—for details contact Captain C. B. Cole, F. A. Finally the wires flashed the message: "Judge Thirty-Five Dollars Reno Thirty-Six Dollars Left Here in Truck Twelve Noon Today—Cole."

We then knew we had succeeded. The animals were bid in at auction and purchased by Captain Max M. Corpening, Field Artillery Reserve, now assistant to an old Field Artilleryman, Colonel Robert R. McCormick, editor and publisher of the *Chicago Tribune*.

On the afternoon of the same day as the sale, an Army truck rolled out of the gates of Fort Sheridan, Illinois, and headed westward. Seated beside the driver was Private Nelson, while in the body of the truck contentedly munching hay, were his faithful



THE LAST REVIEW

BUT THE GREATEST OF THESE IS CHARITY

and beloved equine buddies, Reno and Judge, their Army service ended.

Doubtless these loyal animals were keenly aware of the fact that something unusual was happening. Never before in their lives had the miles passed so easily under their feet. The many trips of the Battalion to and from the summer maneuvers at Sparta had increasingly wearied their aging tendons and muscles. Could it be they were now riding to camp in the ease and grandeur to which their age and experience entitled them? Perhaps they had been especially favored because of their skill in breaking in recruit horses and teaching them their own letter perfect knowledge of every field artillery command and bugle call. And both horses thrilled at the thought of how that beloved bugle never failed to cause their ears instantly to prick up and their spirits proudly to conquer their aching muscles.

But the truck rumbled on and on until Reno said to Judge: "We must have passed Sparta long ago."

The next day this Army truck with its unique cargo rolled through the gate of Charley J. Johnson's farm at Volin, South Dakota, and was greeted by an astonished American family.

After Reno and Judge had trustingly and eagerly obeyed Private



ARTILLERYMEN SAYING FAREWELL TO JUDGE AND RENO

THE FIELD ARTILLERY JOURNAL

Nelson's instruction and had climbed from the truck to the ground, they were promptly introduced to 13 year old Leroy, and 11 year old Roger. Then, as these kind old animals nosed the chests and faces and hands of these excited boys, and, in turn, received from them an effusion of affection, pats and caresses, private Nelson was satisfied that his beloved battery horses had found new pals who could be trusted to remain faithful and true until these revered veterans of the Field Artillery passed to the green pastures of the shadowy beyond.

The Field Artillery responded—members of the Association, casual readers of the JOURNAL, and strangers sent in contributions. Even a Scotchman donated. We were more than successful. We bought a set of harness for Reno and Judge.



Associated Press Wirephoto

DELIVERED TO MASTER LEROY JOHNSON, VOLIN, S. D.

BUT THE GREATEST OF THESE IS CHARITY

Collected	\$526.78
Expenses.....	274.78
	<hr/>
Balance on hand	\$252.00

This balance will be held pending the decision of the Executive Council for its disposition.

The Field Artillery Association desires to express its appreciation of the prompt and generous contributions made by the officers and enlisted men of the Field Artillery, of the support rendered by many members of the Association and to thank those readers of the JOURNAL who so kindly assisted us in this worthy cause.

There are published herewith extracts from two letters which show how strong are the ties that bind us to the ambitions of youth.

"I believe this is one of the most remarkable things the Association could have ever done, and no doubt this magnanimous deed will, like battle field heroism, live forever in the annals of our Field Artillery."

"I hope there will be more Leroy Johnsons and more homes provided for our faithful but dumb (in speech only) fourfooted friends in the Service. The present wave of mechanization is heartening to the extent that IC'd equipment is inanimate and can be thrown on the junk pile without feeling."



LEROY JOHNSON AND HIS ARTILLERY PAIR

SPECIAL NOTICE

U. S. Field Artillery Association Prize Essay, 1936

An annual prize of \$300.00 is offered by the United States Field Artillery Association for the best essay submitted by any Field Artillery officer of the Regular Army, National Guard or Reserve Corps on any subject of current interest pertaining to the Field Artillery.

The following rules will govern this competition:

(1) The award of prize to be made by a committee of three members to be nominated by the President of the Field Artillery Association voting by ballot and without knowledge of the competitors or of each others vote.

(2) Each competitor shall send his essay to the Secretary-Treasurer of the Association in a sealed envelope marked "Prize Essay Contest." The name of the writer shall not appear on the essay, but instead thereof a motto. Accompanying the essay a separate sealed envelope will be sent to the Secretary-Treasurer, with the motto on the outside and the writer's name and motto inside. This envelope will not be opened until after the decision of the committee.

(3) Essays must be received on or before January 1, 1936. Announcement of award will be made as soon as practicable after that date.

(4) The essay awarded the "United States Field Artillery Association Prize" will be published in the FIELD ARTILLERY JOURNAL as soon as practicable. Essays not awarded the prize may be accepted for publication in the FIELD ARTILLERY JOURNAL at the discretion of the editor and the writers of such articles shall be compensated at the established rate for articles not submitted in competition.

(5) Essays should be limited to 8,000 words, but shorter articles will receive equal consideration.

(6) All essays must be typewritten, double spaced, and submitted in triplicate.

ROVING GUNS

BY LIEUTENANT COLONEL P. DE MAZENOD, FIELD ARTILLERY, FRENCH ARMY
Translated by 1st Lieutenant George A. Grayeb, 25th Field Artillery

WHAT is the role intended under existing regulations for the employment of sections and platoons of roving guns? Is there actually a doctrine on this important subject, and if so, what is this doctrine?

To the best of our knowledge, the subject of the employment of platoons of roving guns in defensive combat is given but brief mention and then only in Part Two of the Artillery Drill Regulations. Therein is expressed on this point certain ideas which appear to us to have interesting possibilities. Furthermore, the question, in our opinion, is rich in possibilities scarcely suggested by the brief treatment given by the regulation. We wish to glean, from the wealth of ideas which such a subject reveals, only those which appear to us to be most worthy of retention.

At the very beginning we must accept this proposition: The employment of platoons or sections of roving guns rests entirely upon the exploitation of two cardinal characteristics of the 75-mm cannon, namely its mobility and its rapidity of fire. Thanks to these two characteristics, this gun lends itself marvelously to the uses which we are about to discuss. To restrict its employment entirely to mass actions will be, in our opinion, to ignore all the advantages of this weapon as yet unequalled, after more than thirty years of use in foreign armies.

The use of certain pieces on isolated missions will not unduly weaken the artillery of a given sector, however meager it may be and, furthermore, will not sensibly violate the basic principle of centralization in the employment of this arm. On the contrary, they may render valuable service and, as we shall soon see, one of these will be to free the mass of artillery for the use, at the chosen moment, of its maximum fire power. Far from becoming weaker, this principle, on the contrary, becomes emphasized and is employed to its fullest extent.

For the sake of the continuity of this study, the principal advantages of the use of roving sections and platoons will be listed under four categories. In conclusion will be given, as illustrations,

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certain concrete cases of the employment of isolated guns towards the end of the last war.

MOVING SECTIONS AND PLATOONS. THEIR MISSIONS.

A. To harass the enemy lines at night with violent bursts of shell fire.

On most terrain it will be easy to bring up a 75mm gun to within 500 to 1,000 meters of the front lines. This operation, always possible at night, can be accomplished before daybreak by following covered avenues of approach leading to defiladed positions. In this situation, men and animals must be kept carefully concealed until the opening of fire.

Reconnaissance should always be made during daylight and the direction of fire carefully marked by means of stakes so as to reduce to a minimum the time necessary for the gun crew to open fire. As soon as this is completed the piece is withdrawn. The time necessary for unlimbering the piece can be easily estimated beforehand and this time will almost always be shorter than that required by the enemy to determine the origin of the fire and to deliver artillery fire on this point. Machine gun fire will prove ineffective if care is taken to mask the piece by terrain features, emplacing it in positions protected from enfilading fire and offering no definite points of aim for the machine gunner. Consequently, in a short lapse of time, a harrassing hail of shells will have been hurled at the enemy at an hour when his precautions for security are relaxed and without revealing any of our artillery dispositions. Targets chosen should be of a size sufficiently large to insure successful attack, at least in part, by a vigorous preparation with data obtained from a map. They should be, furthermore, quite vulnerable and with no overhead cover. Supply points, bivouacs, cantonments and, in general, all troop assembly areas can be considered as suitable targets.

Fire should be conducted with the greatest possible vigor, and at the greatest rates the gun crews are capable of delivering. Its duration should not exceed two minutes; beyond this point it will cease to be effective. It will burst upon the enemy like a thundercloud, leaving him in confusion for some time. By the time that the enemy will have recovered, it is quite probable that his fire will fall in empty space because the piece will have vanished. In

ROVING GUNS

case the target is of particular importance or considerable size it should be attacked with a platoon. In this way and by proper handling twice the area, both in width and depth, will be covered. Although unlimbering and preparing for action will be executed just as rapidly, it will prove to be a sensibly more vulnerable operation. In any case, however, the work accomplished by a single piece will be of importance enough. It must not be forgotten that a 75-mm gun, when energetically manned, can hurl in two minutes on a given target more than 100 kg (220 lbs.) of H. E. shell.

B. For the accurate determination of firing data.

A piece may be put in position daily at a point previously selected and if this position is accurately located with a good OP nearby, the corrections of the moment can be easily obtained with a few rounds and this data transmitted to each battery. This method becomes particularly useful when artillery massing for an attack is forbidden to open fire until H hour.

It is sufficient then, in a given sector, for one gun to go forward to a position previously located and a few hours in advance for the purpose of obtaining all necessary information and passing it on to all units going into action. Besides weather effects this piece can be called upon to furnish for certain targets data as to range and direction, information which will be put to good use by the batteries upon their arrival in position. Ordinarily one gun of each caliber in a groupment will suffice for this task.

C. By occupying false positions to keep the location of the real positions undisclosed.

For this purpose, the execution of routine fire missions is entrusted to sections or platoons of roving guns for whom a number of interchangeable positions should be selected and prepared in advance. This procedure is especially useful in sectors where an enemy attack is expected.

The aim in view is to oppose the enemy, at the critical moment, with the fire of fresh batteries hitherto silent. Positions for these sections or platoons must be distinctly separate from alternate positions assigned to the batteries in the sector. It is obviously important that the alternate positions not be "shot up" in advance.

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In no case should they be used for roving gun positions, for to do so would be to destroy their value. The study of alternate or reserve positions does not fall within the scope of this article. It is sufficient to note simply that each of these positions, of which the Germans made such great use towards the end of the last war, possessed three characteristics:

1. Was sufficiently close to the main position to permit of rapid occupation without the risk of being reached by fire directed on the latter.
2. Was sufficiently organized and accurately located.
3. Remained silent until its occupation.

This latter condition precludes its use as a position for roving guns. Where then shall we place them?

First of all they should be emplaced distinctly outside the area assigned to the supporting artillery units so as to shield these both from enemy fires and observation. These positions need not be thoroughly organized but they should, nevertheless, provide in the immediate vicinity reasonable shelter for personnel at least against the small calibers. As a matter of principle, the teams of the sections or the platoon should not remain in the vicinity of the position.

An easy avenue of escape should be provided by felling trees if necessary so that, upon displacing, men and animals will be exposed for the least possible time during the operation. To sum up, the principal security of these roving guns is best provided by their own mobility. How long should they remain in any one position?

That will depend upon the enemy's reaction. The frequency of the displacements from one position to another will depend upon the rapidity with which they are located by the enemy. But their total abandonment is avoided because one of the principal reasons for their use is precisely that they might become known to the enemy. Finally on the day on which one side or the other passes to the attack, the enemy's fire will spend itself on these fly-by-night positions, thus sparing the true artillery dispositions whose powers will have been guarded intact. Should the enemy assume the offensive some of these platoons or sections employed on this mission will be surprised by the attack. Their conduct

ROVING GUNS

in such cases is prescribed by the regulations as follows:

"When surprised in the midst of a maneuver by a suddenly launched attack, they should endeavor to rejoin their batteries. Should, however, the violence of the enemy fire make all displacement impractical, they will expend on the spot their available ammunition supply on certain counter-preparation missions previously designated; once the ammunition is exhausted the personnel joins the infantry fighting in the vicinity. Guns are spiked before capture by the enemy."

In such an eventuality detached sections and platoons are far from lost for the defense of the sector. They cooperate as best they can, each from its particular position from which targets will not be lacking. Finally, their employment away from the larger units will tend to shield from enemy fire, in part at least, personnel at observation posts. In thus sacrificing themselves, they enable the observers the better to accomplish their primary mission of breaking up the enemy attack. This disproves the accusation sometimes made against these roving guns of disrupting the plan of fire in time of need. It should be added that these small detachments, few in number and at the most one for each artillery group, will have little or no effect, by their absence, upon their units. On the contrary, their effectiveness will more than compensate for the slight inconvenience caused by their temporary detachment.

D. To deceive the enemy as to artillery density in a sector.

While the disposition and activity of roving guns depends upon the needs of the situation, they result in placing before the enemy lines a curtain of fire essentially artificial. His observers are deceived by an arbitrary artillery deployment which, at will, can be made to appear weak or powerful, timid or aggressive. Interpreting this activity as evidence of artillery more or less numerous, the enemy is thus deceived as to our intentions.

In the event of an offensive elsewhere, have we any interest in forcing the enemy to keep, temporarily, opposite us forces which he could employ to better advantage in some other area? In such a case, single roving pieces are better suited than platoons and, because of their increased mobility and ability to put the enemy on the wrong scent, their activity should be redoubled.

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Each of these guns, by sweeping fire, simulates battery salvos and no unit of the Artillery Information Service will be able to detect the ruse. It will be quite possible to deliver with a single piece really effective fire; there again the speed with which the 75-mm gun can be fired is such as to deceive the most informed as to the number of pieces in action. With the same purpose in mind, several dummy emplacements, insufficiently camouflaged, can be prepared in the vicinity of roving gun positions. Particular care should be taken to prepare positions for four guns and to provide well-defined roads leading thereto.

It will be useful if certain ones of these are relatively close to real positions. Even if the location of the latter must be revealed, for example, when laying down defensive fires at night, confusion is bound to arise in the minds of enemy observers as to the true and false positions. Finally, if the employment of roving guns is accentuated, unbeknown to the enemy, part or all of the artillery in a given sector may be temporarily withdrawn.

In the course of the French offensive of 1918, thanks to this ruse, numerous artillery units over a long period of time were shifted with impunity from one sector to another with profitable results. Furthermore, certain definite artillery retirements were executed without any change being made apparent in the sector or with any decrease in its accustomed activity. In the offensive sectors the importance of concealment of roving guns for routine fires is self-evident. To these roving guns now falls the double duty of executing the normal fire missions right up to the very last moment and to transmit before H hour to those batteries in support of the attack all the information necessary to open effective fire with surprise. Thus, even in the offense, the use of roving guns offers nothing but advantages. On the one hand, they insure the offensive action of those units assigned to the attack and on the other, they do not reduce the security of the sector by a single piece.

It should be understood, however, that during the night preceding the attack, these detached pieces rejoin their batteries unless special missions, taking advantage of their mobility, commit them elsewhere. Although it might, perhaps, be profitable to study the employment of these guns offensively in liaison with the attack, to do so is beyond the scope of this article.

ROVING GUNS

ISOLATED PIECES

We have enumerated some of the essential services which roving guns are called upon to render. Their usefulness has still other possibilities, offensively as well as defensively, and one solution does not fit all.

Besides these pieces, conveniently called "roving" guns because they appear like wanderers on the field of battle, are others which can be detached for a precisely definite mission and one which is essentially temporary. These are the so-called "isolated" guns, who once their blow is delivered, return to the fold. Responding as they do to varied and almost limitless calls, no general rule can be given on the subject of their employment. Each case must be treated separately. Quite often the effort will succeed or fail without any apparent reason. The great unknown quantity is the reaction of the enemy which depends on a factor itself very fickle, that is, the enemy's morale. Also success is an affair of the moment and many efforts fail which would have succeeded an hour before.

The experience gained in the last war sometimes justifies us in evolving certain probabilities if not principles on the subject of the success of this sort of operation. We shall try to clarify them, with the aid of several examples taken at random from the war, acts which we either have heard cited by their authors or which we ourselves witnessed.

The exploit of the gun at MONDEMENT is well known. The enemy had just seized the chateau and some outbuildings from which he was machine gunning our infantry. A seventy-five was brought into the area, its mission being to approach the buildings as closely as possible under cover of the woods and to drive the enemy out. Despite all the risks in the operation (the piece being initially brought up with its team and subsequently pulled by man power) the effort was successful. The fire of the gun by direct laying at a range of only a few hundred meters rendered the chateau untenable for its occupants. The enemy thus lost an important strong point and after a lively infantry engagement, the position was recaptured by our troops.

A few days afterward, the Germans were in retreat in another sector of the front. At first only the signs of this retreat were perceived and no one was aware of its amplitude.

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The situation was still uncertain and the troops were wearied by five days of fighting. A group commander took the initiative by sending forward a platoon of artillery with the mission of taking under fire, to the limit of range, the routes on which enemy movements could be observed. This platoon displaced forward preceded by a few scouts without encountering any hostile troops. It travelled a distance of several kilometres, passed our advance infantry elements and occupied a position on high ground dominating the region. There the platoon leader saw through his field glasses long columns of vehicles moving toward the north. He opened fire on these columns and continued firing up to the limit of his range. He saw the confusion which his fire created in the columns, emptied his caissons and rejoined his group. The platoon was not struck by either bullet or shell.

This incident took place early in October, 1914. The Germans were at SAINT MIHIEL and had occupied the CHAUVONCOURT barracks. A plan was prepared for recapturing these barracks as well as the outskirts of CHAUVONCOURT west of the MEUSE. In furtherance of this plan, a 75-mm gun was placed at the edge of the woods north of the village of PAROCHES, with the mission of opening a breach, at a range of 400 meters, in the wall surrounding the most advanced barrack and to prepare a way for the passage of the infantry. It was brought up the day before the attack and emplaced in the ruins of a house. At the designated hour it opened fire and made the required breach. During this fire the enemy made no reply, but when the infantry made the assault, enemy machine guns came into action and the operation failed.

It was decided to recapture the place two days later and the gun was therefore left in place in order to give the infantry close support. But it had been located by the enemy and, on the same day, it was destroyed by the fire of heavy caliber guns.

This incident took place on the LINGE in 1915. After heavy fighting the position had been taken but fighting continued on the summit of the LINGE-KOPF. In order to destroy some machine guns on the opposite slope which were decimating our "chasseurs," the commander decided to put a mountain gun in the front line. After a painful trip, with the gun carried on the

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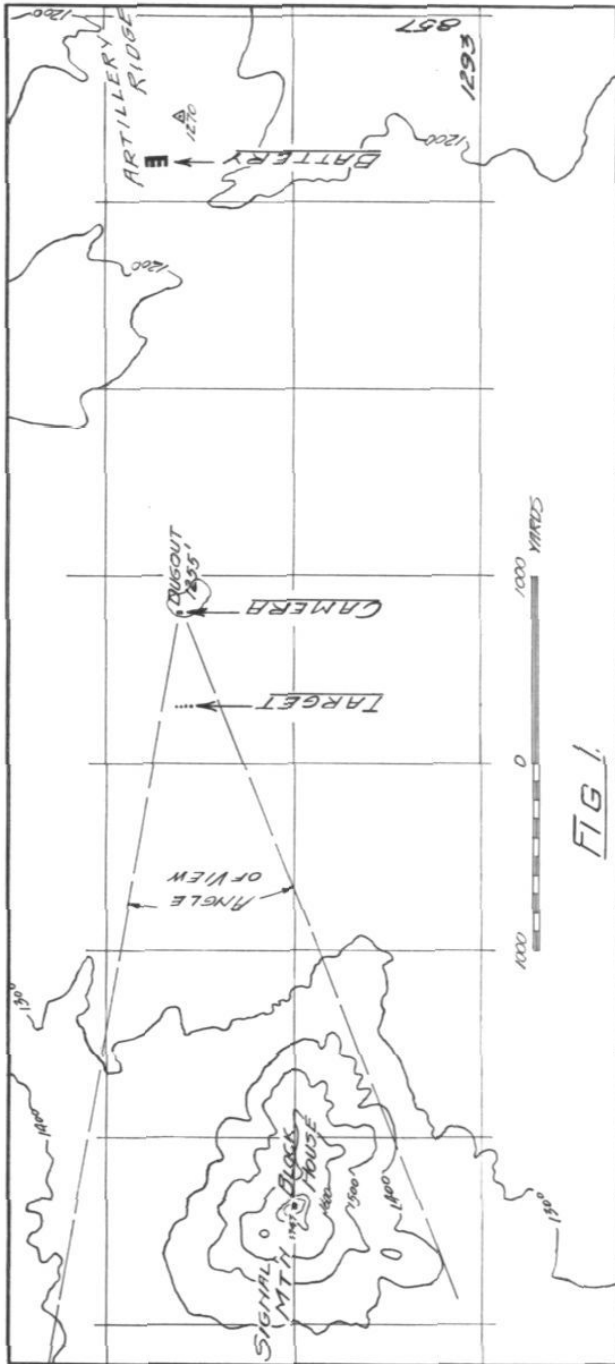
backs of the men, across trenches zigzagging up the slopes and enfiladed by machine gun fire, it was finally placed on the summit of the LINGE-KOPF. It was quickly destroyed and the officer with his men fell, heroically performing their duty.

What is the conclusion to be drawn from these four examples?

The section at MONDEMENT and the platoon at the MARNE accomplished their missions perfectly for the following two reasons: First their action was strictly limited as to time; the former fought rapidly and with brutal effect at a critical moment, the latter took advantage of the demoralization of a defeated enemy in retreat. Finally and above all else, both operated in a situation essentially moving and on a battlefield where the artillery of neither side had as yet achieved superiority.

The question of the two other guns appears in another light. In the first case the enemy had been for several days firmly established in front of PAROCHES. His observers had leisurely studied the terrain before them. This gun, which was firing from a village about 500 meters from the lines, quickly attracted their attention. They notified their batteries and as soon as these had finished with our infantry they had great sport demolishing the gun left in place. In the second case, we find a situation already partially stabilized. For several weeks both sides had contended for the possession of the LINGE-KOPF. In order to break up our attacks, the enemy had made a powerful concentration of artillery. His observers watched the narrow sector for the attack so attentively that no movement in it escaped their attention. Scarcely had the piece opened fire before it was being heavily shelled. Since protective shelter was necessarily precarious on such chaotic ground, men and materiel were soon put out of action. In view of these facts the following conclusion is believed appropriate:

Against an enemy not yet established or who has momentarily lost moral superiority, all boldness is proper and, in general, will succeed. On the contrary, against an adversary in control of ground permitting maneuver and observation, all isolated guns engaging in fights of advanced elements are doomed to destruction before the accomplishment of their missions.



ARTILLERY SMOKE SCREEN

BY CAPTAIN L. M. McBRIDE, Chemical Warfare Service

TO PRESENT a concrete example of the possibilities of laying a smoke screen with the 75mm gun, the accompanying photographs and explanatory data are submitted as being of interest, due to the favorable conditions for obtaining definite information at the time of firing, supplemented by photographs of the progress of the formation of the smoke screen.

This firing was conducted at the Field Artillery School, Fort Sill, Oklahoma, and the locations of the battery, target, camera and terrain features in the background of the photographs are shown on the sketch map, Figure 1.

One battery of 75mm guns was used, firing shell, Mk. II, Smoke (WP—White Phosphorus), Fuze, Short. The target to be screened was a "four-section battery in the open," the range of which was 2,950 yards: the mean range of the smoke screen was 2,800 yards.

The photographs were taken by Air Corps personnel located in a dugout which was nearly on the line of fire (axial), and about 500 yards short of the target. A special camera with telephoto lens was used.

The weather was clear and warm, with a wind of from 8 to 10 miles per hour from the south (left flank).

Figure 2 shows the development of the smoke from Round 1, fired for adjustment, the front of the smoke cloud having obscured two sections of the target.

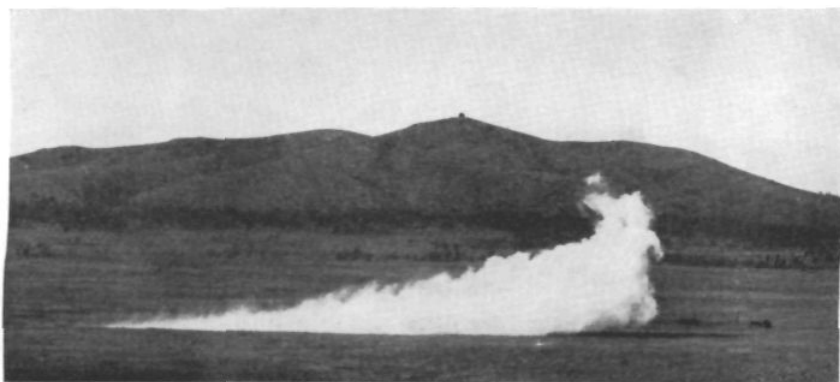


FIGURE 2

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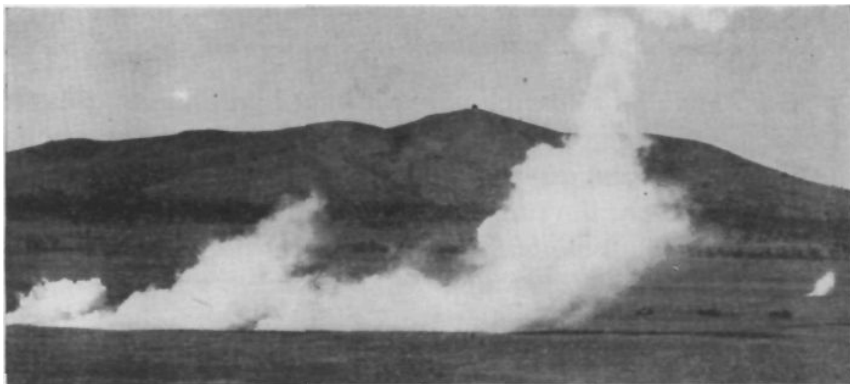


FIGURE 3

Figure 3 shows Rounds 2, 3 and 4, which gives a very good idea of the width of the sheaf. This photograph is also of interest in that, by comparison with Figure 2, it will be noted that the front of the cloud has raised abruptly, uncovering an additional section of the target, due to vertical air currents produced by the heat of the burning phosphorus. In this photograph the small patch of smoke "over" and "right" of the target is attributed to the ricochet of the base-cup of one of the above rounds, carrying with it an appreciable amount of phosphorus trapped in the base.



FIGURE 4

Figure 4 shows the screen established due to the wind carrying the smoke from the first four rounds across the target.

Figure 5 shows the screen being maintained by firing Rounds 5, 6, 7 and 8, after which the firing was stopped.

ARTILLERY SMOKE SCREEN



FIGURE 5

Figure 6 shows the cloud drifting downwind, and Figure 7 shows the target uncovered.

The entire front, or width, of the screen within the limits of the camera is about 300 yards. Taking the average wind velocity as 9 miles per hour, the travel of the cloud was 264 yards per minute, requiring about one minute and 8 seconds to pass across the front of the camera. In Figure 2, the screen is effective in obscuring power for about 100 yards and with a 9 mile wind the time to travel 100 yards is about 23 seconds, hence 3 rounds of smoke shell per minute would produce a continuous screen of the density shown.

Actually, a total of 8 rounds was fired and the target was completely obscured for about 8 minutes, requiring an average of one round per minute. However, as the front of the actual target in this case was 60 yards, and the present Artillery tables (TR 430-85), for smoke ammunition requirements call for 12 rounds

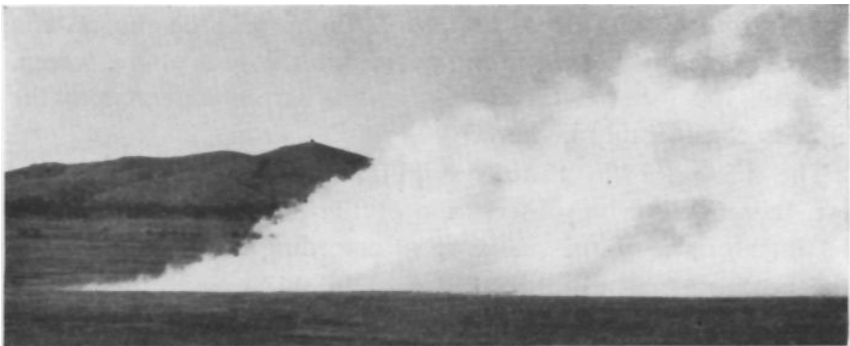


FIGURE 6

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FIGURE 7

per minute to screen a front of 400 yards, it would require $12 \times 60/400$, or 1.8 rounds per minute. Therefore this screen was established and maintained with about 55% of the tabular requirements. This is not taken to indicate that the table value is excessive, but to show that an effective screen can be produced well within the limits established.

Although this screen was fired to obscure the enemy battery, it is interesting to note the extent to which the terrain in the background was also obscured.

The "Block House" on Signal Mountain, in the left-center background, has an altitude of 1,747 feet; the altitude of the camera was 1,255 feet and that of the target 1,230 feet, hence, the Block House was above camera by 492 feet, the camera above target by 25 feet.

The distance of Block House from camera was 3,300 yards and from target 2,800 yards, therefore, the profile height on the vertical plane of the target, and approximately that of the screen, is about 100 feet. The thin top of the screen observed to the right is considerably higher.

The firing was by "battery right," the wind being from the left, thereby allowing observation of the individual bursts without interference of the smoke from preceding rounds.

The short fuze was properly used in this case as the range, being less than 3,000 yards and the terrain flat and open, would have caused a possibility of duds with the long fuze.

ARTILLERY SMOKE SCREEN

The point of impact was properly placed well upwind from the target and also a sufficient distance in front, which is the accepted procedure in order to screen the flank of the target and at the same time take full advantage of the wind. The screen being placed to the front of the target prevents the liability of "overs" being ineffective and also prevents the possibility of a sudden shift or eddy in the wind producing gaps or carrying the smoke behind the target.

The screen, after being established, would have been maintained by a slow rate of fire or by individual guns, had it been desired to continue the fire.

Had the fire been for neutralization of the enemy battery, or other small target occupied by personnel, it could properly be placed directly on, or immediately in front, as the concentrated fire would accomplish the double purpose of screening as well as obtaining casualty and demoralizing effect from the white phosphorus.

This screen was placed on a target of small front; however, had it been desired to establish the screen on a wider front, the battery would have been "opened" initially to cover the front desired and subsequently closed on No. 4 (to windward) to maintain the screen.

It is considered that this firing, although limited in extent and number of rounds used, shows the possibility of placing a highly effective smoke screen with the light gun with properly conducted and observed fire, and requiring only a reasonable amount of ammunition.

STUDENTS RECEIVE JOHN J. PERSHING MEDAL

A GROUP of eighteen C.M.T.C. and R.O.T.C. students visited Washington over the Easter week-end to receive from the hands of Secretary of War Dern the John J. Pershing gold medal for "Distinguished Attainment in Military Education."

This award and guest trip to Washington is sponsored annually by the Civilian Military Education Fund. Competition is opened to all C.M.T.C. trainees and R.O.T.C. students. Selections are made by the Corps Area Commanders. The principal factors governing selection include military bearing, cooperation, leadership and general record of camp and campus achievement.

Four of the group have been trained in the Field Artillery and will be commissioned in the Reserve Corps this year. These are:

Addison D. Merry, Cadet Colonel of the Cornell Field Artillery Unit. Mr. Merry entered college from the Peekskill Military Academy. He has stood high in his scholastic studies and has been outstandingly prominent in college affairs at Cornell. He was voted the most popular cadet in the R.O.T.C. camp at Madison Barracks in 1934.

Clyde P. Patrick, a senior in the University of Oklahoma. Mr. Patrick completed the Blue C.M.T.C. course at Fort Sill in 1934 and was recommended for a commission upon completion of the prescribed extension correspondence course of study. He entered college from the Georgia Military Academy and took the Basic R.O.T.C. course at the University. He was selected as the best Red trainee at Fort Sill in 1932; the best White trainee in 1933, and as trainee regimental commander in 1934.

James D. Van Doren, a freshman in the University of Illinois. He is a graduate of the Oak Park, Ill., High School. Attended four C.M.T.C. camps, graduating from the Blue Field Artillery course at Camp McCoy, Wis., in 1934, and recommended for a commission. Mr. Van Doren has had an outstanding C.M.T.C. record having received a rating of "excellent" in all military qualifications.

Joe C. McHaney, Cadet Colonel and Corps Commander, Agricultural and Mechanical College of Texas. Mr. McHaney was

STUDENTS RECEIVE MEDAL

selected as the outstanding student at Camp Bullis R.O.T.C. camp in 1934. Scholastically, he had accumulated by the end of his junior year a total of 225 grade points, which was a surplus of 89 grade points over the 136 necessary for graduation.

During the four-day visit of the group, an extensive program of entertainment was arranged. On Friday, April 19th, a luncheon was given at which Admiral Hugh Rodman and Major General Upton Birnie, Jr., Chief of Field Artillery, were the honor guests. Later in the day the group was received by Chairman McSwain of the House Military Affairs Committee and by Congressman Parks, Chairman of the Sub-Committee on Appropriations of the House.



Tenschert Photo

The outstanding student soldiers of the country came to the Capital last month for a four-day stay. Selected as the best college military corps officers and C.M.T.C. students in their respective corps areas, the men were decorated by Secretary of War Dern with the John J. Pershing Medal for achievement in military education. Following the presentation ceremonies the student soldiers were photographed on the steps of the War Department with Secretary Dern. Bottom row, left to right, William H. Glenn, Jr., Georgia Institute of Technology; Joe C. McHaney, Texas A and M College; Secretary Dern; Alexander Lawson, University of Illinois; Walter Haberer, Jr., Dayton University; Addison D. Merry, Cornell University. Second row, left to right, Clyde B. Patrick, University of Oklahoma; Ralph Norling, Youngstown College; Robert F. Scott, Clemson College; Dean Swift, Kansas State College; Herman Nickerson, Jr., Boston University. Top row, left to right: Gilbert Carpenter, Virginia Military Institute; John Franklin, Shenandoah Valley Military Academy; Thomas S. Pierce, Lewes High School, Lewes, Delaware; August Anneberg, University of Kansas; M. L. Marchant, Citadel, S. C.; George Dewey, Salt Lake City High School; Donal F. O'Brien, Rhode Island State College. Upper right: James Van Doren, University of Illinois.

REQUIREMENTS OF AN ADVANCE GUARD FOR SUPPORT BY ITS ARTILLERY

BY COLONEL ROQUES, French Army

GENERAL CONSIDERATIONS

WHEN one studies advance guard engagements at the beginning of the World War, and more particularly their conduct on the French side, one is struck by the lack of support given to the infantry by the artillery which was charged therewith.

The causes of this were many: from a knowledge of the events which developed, it has been possible to determine these causes, and consequently to fix the general conditions which permit the infantry of an advance guard to be efficiently supported by its artillery.

We shall study the question: first, in terrain only slightly broken, and secondly, in mountainous terrain.

* * *

I. THE ARTILLERY IN SUPPORT OF AN ADVANCE GUARD IN SLIGHTLY BROKEN TERRAIN

In order better to fix our ideas, let us consider a division composed of three regiments of infantry (1st, 2d, and 3d), one regiment of light artillery of three groups of three batteries each, one regiment of heavy artillery of two groups, two companies of engineers, and the services.

Let us suppose this division marching in three columns:

Left column	{ 1st and 3d Infantries 1 company of Engineers.
Center column	{ The heavy artillery regiment and the services.
Right column	{ 2d Infantry 1 company of Engineers.

This division is moving forward in slightly broken terrain, and is protected by two advance guards; the left advance guard consists of two battalions of the 1st Regiment of Infantry and one company of engineers, under the orders of the Colonel commanding the 1st Infantry.

REQUIREMENTS OF AN ADVANCE GUARD

The right advance guard consists of one battalion of the 2d Infantry and one company of engineers under command of the Battalion Commander.

The advance guards move forward by bounds from crest to crest, in a formation echeloned in width and depth, permitting the retention of freedom of movement, while covering the main body against effective fire of the hostile light artillery.

They progress by predetermined bounds and halt as soon as they have gained the successive crests which were fixed as their objectives.

Their forward movement is protected by the three groups of the artillery regiment forming the artillery of direct support:

One group to the right advance guard (one battalion of the 2d Infantry).

Two groups to the left advance guard (two battalions of the 1st Infantry).

The artillery of direct support places its fires at the disposition of the advance guards, but itself remains completely under the orders of the Division Commander.

It is absolutely necessary that the Division Commander remain master of the whole of his artillery and always know where it is. It consequently would be dangerous to turn over to the commanders of the advance guard covering forces the power to command a part of the divisional artillery.

MOVEMENTS OF THE ARTILLERY OF DIRECT SUPPORT

Movements are made as follows: each support group or groupment divides itself into two parts:

On the left—two echelons of a group each.

On the right—one echelon of one battery and one echelon of two batteries.

The first echelon is stationed near a crest ready to support the movement of its infantry to the following crest.

The second echelon moves, as soon as free from supporting the preceding bound, at increased gaits, passes its first echelon, closes up on the main body of the advance guard and establishes itself near the following crest as soon as the infantry attains it, so as to be ready to intervene without delay in the course of a new bound.

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ESTABLISHMENT OF LIAISON BETWEEN ARTILLERY AND INFANTRY OF THE ADVANCE GUARDS

In order to be ready to efficiently support the advance guards, the artillery charged with their support, must have liaison with them.

The simplest and most generally employed process consists in the sending to each of the advance guards by the artillery groupment charged with its support, of a liaison detachment.

It is of the utmost importance that whenever possible the groupment commander himself march with the commander of the advance guard.

In the case envisioned, therefore, we see the left advance guard (two battalions) commanded by the Colonel commanding the 1st Infantry, supported by two groups of light artillery. These two groups will move forward by echelon a group at a time, in accordance with the orders of the Colonel commanding the light artillery regiment, and will make certain of intimate liaison with the Colonel commanding the 1st Infantry regiment.

The right advance guard commanded by the commander of the battalion of the 3d Infantry is supported by one group of light artillery under the orders of the group commander. This group will move forward by bounds by battery and will assure liaison with the battalion commander commanding the advance guard.

The halts to go into position and the departures therefrom in order to gain the next position ought not to be made on schedule fixed by the commander of the divisional artillery or on a special order from the latter, but by liaison by means of simple and direct signals from the artillery detachment with the group or groupment commander who is marching at the side of the commander of each of the two advance guards.

* * *

ENCOUNTER WITH THE ENEMY

As soon as the infantry of the advance guards has gained contact with the enemy and its forward motion has been stopped, the artillery which supports it must exert itself to reduce the hostile resistance as quickly as possible. Each fraction of the artillery in position normally takes as its mission all the objectives in the zone of action of the advance guard it is supporting, from the line

REQUIREMENTS OF AN ADVANCE GUARD

of departure of the moment out to 1,000 meters beyond the limit of the bound being made, for example; the terrain beyond that belonging in principle to units of corps artillery placed in position in accordance with the same principles.

When the infantry demands the aid of the artillery, the latter will intervene; sometimes automatically, by neutralizing the hostile batteries, sometimes by firing on infantry objectives thus revealing the line of combat. The demands for fire coming from section chiefs or company commanders will reach the infantry commander who will pass them on to the artillery group or groupment commander. This request ought to contain at least the following information:

- (a) Enemy (coordinates): Probable front, depth, nature.
- (b) Friendly troops (coordinates): This is the indication of the base of departure from which the infantry will launch its attack, at the termination of the artillery fire.
- (c) H = The hour at which the infantry desires the fire to cease.

In condensed language, this could be announced:

E.N.I.	5292	T.A.M.	5190	H.E.U.	(.....)
(enemy)		(friendly troops)		(hour)	

The infantry might even adopt, after consultation with the artillery, a simple notation of points on the terrain from which it could derive more easily the designation of the point to be fired upon. The duration of the fire (three or four minutes) could be fixed (unless otherwise noted).

ACCOMPANYING ARTILLERY

The accompanying artillery is not attached to the advance guard except in certain particular cases; difficulties of liaison, close cut up compartmentized terrain, such are the circumstances which justify the idea of pushing as closely as possible to the infantry some pieces of artillery, completely, but temporarily, at the disposition of that infantry. The field piece in use in the majority of armies can in general by reason of its weight and the flatness of its trajectory be used for close accompaniment only in certain types of terrain and under favorable circumstances.

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II. THE SUPPORTING ARTILLERY OF AN ADVANCE GUARD IN MOUNTAINOUS TERRAIN

In the mountains, the advance guard of a groupment of forces (infantry division, brigade, regiment), operating in a compartment advances along the axis of penetration, and progresses by successive bounds limited by the characteristic breaks in the terrain (ridges, narrow passages and deep valleys).

To the advance guard, in accordance with its importance (size?) and the ease of forward motion, is attached a weak or strong unit of artillery charged with supporting the movement of the infantry. This artillery is entirely or in large part pack in order that it may be able to follow the infantry on pack trails and along the crest lines. If available, use is made of howitzers as these permit the choice of battery emplacements with the greatest facility and especially allow the placing of the batteries (thanks to the curved trajectories) closer to the infantry, which facilitates liaison and rapidity of support.

This unit of artillery, charged with supporting the advance guard, is placed under the orders of the advance guard commander.

And here are the reasons: the reasons for the concentration of means in the hands of the commander of the divisional artillery in ordinary terrain no longer exist in *the mountains* to the same extent.

In reality, artillery charged with the support of an infantry unit working in compartmentized terrain, generally would not be able to fire in a neighboring compartment and consequently would not be called upon to fulfill other missions than those initially fixed for it. The great difficulties of liaison and of communication moreover prevent the intervention of a distant commander and preclude the possibility for him to take back an artillery supporting the infantry in a compartment. The choice of battery positions is dependent upon the terrain, the location of the hostile resistances and the maneuver contemplated by the commander of the advance guard to reduce these resistances—all of which are things which can be determined only at the particular place, in view of the particular circumstances.

REQUIREMENTS OF AN ADVANCE GUARD

Decentralization of command is therefore possible; it is useful, and in many cases indispensable.

ADVANCE GUARD INFANTRY-ARTILLERY LIAISON

Decentralization of command of the artillery necessitates the immediate juxtaposition of the infantry and artillery command posts. The establishment and the maintenance of liaison find themselves assured by this fact.

Always, in spite of the existence of facilities for observation, the necessity remains for liaison detachments sent by the artillery to remain close to the supported infantry, as soon as that infantry, advancing, moves away from its supporting artillery.

The composition and the assignment to duties of the liaison detachments are functions of the terrain. Thus a battery supporting a battalion engaged alone in a compartment of the terrain, can detach a non-commissioned officer and a very much reduced personnel to a company whose zone of action is not observable from the observation posts.

THE ACCOMPLISHMENT OF THE SUPPORT MISSION

As in ordinary terrain the artillery ought to be able to place fires at the request of the infantry on resistances discovered, located and indicated by the latter, and, likewise, these fires ought to be lifted on demand of the infantry when the latter estimates that it will find itself within assault distance.

The difficulty is to bring about the concordance of efforts in time and space. That is to say: to place the fire at the precise point where the hostile resistance is found and to place it there as soon as possible after the friendly infantry is immobilized by the hostile fire: to maintain it there until, neutralization having been obtained, the infantry, again moving forward, is at assaulting distance, and at this moment to lift the fire.

To locate the resistance and to indicate it to the artillery is effected as on level ground, but the difficulty is much greater because of the absence in the panorama of characteristic reference points—or on the contrary because of the existence of many such reference points all presenting the same aspect. Besides, the lack of terrain detail on the maps and the existence of naturally camouflaged

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or covered shelter, render still more uncertain the designation of objectives.

The designation of the objective by means of coordinates having been transmitted to the artilleryman, the latter must be able to find on the terrain the point indicated, *a problem still more difficult, but one which he has to solve*; for in order to place the fire on this point, it is necessary that he see it and be able to adjust rapidly on it. It can not here be a question of fire prepared and executed with map data.

In order to make the solution of this problem easier, the juxtaposition of command posts even down to the lowest echelons (battalions and batteries) is thus to be sought after and to be maintained as long as possible.

For this reason, the artillerist will choose an observation post permitting him to see all or the greater part of the terrain over which the infantry will advance.

Usually command posts of the infantry and observation posts of the supporting artillery will be different throughout the advance, because the infantry commander must always follow closely his combat line. Thus it is a question of exercising one's wits and of finding simple and sure methods for sending to the artillery these three essential points of information with respect to requests for fire:

T.A.M. (friendly troops)..... (such locality)

E.N.I. (hostile objective to be taken under fire) (such locality)

H.E.U.=(hour at which the friendly infantry desires the termination of the fire).

In spite of all the efforts of the infantry commander and of his artillerists, it is certain that in many cases it will be very difficult to make these conventional signals work even in their most simple form. This is why emphasis is here placed, first on the necessity for the artillery to remain as long as possible in intimate liaison with the infantry: then, on the indispensable precaution which the infantry commander ought to take, on leaving his artillerist, to impress on the latter his scheme of maneuver, pointing out to him on the terrain, the successive objectives, the points to be reached

REQUIREMENTS OF AN ADVANCE GUARD

by the infantry, and the terrain lines marking the point at which the arrival of the friendly infantry will be the signal for the artillery to lift its fire.

Let us recall here one of the particular difficulties of warfare in mountainous country: the infantry will not reach these lines as a coordinated whole. The better climbers will arrive first, and the remainder will follow with difficulty. If the fire is lifted too soon, the enemy comes to life and can unloose grenade fire or a counterattack from above on those below, disastrous for winded troops.

Thus it is necessary that the infantry arrive, get itself in hand, and reorganize. This is the essential prerequisite for a victorious charge into the hostile position. In spite of its long service in maneuvering with the particular troops it is supporting, the artillery will need good observation in order that it may seize the proper moment to ensure for its infantry, by precise and sustained fire, an enemy incapable of reaction.

**IF YOU CHANGE STATIONS, PLEASE SEND
THE JOURNAL YOUR NEW ADDRESS**

TAKING THE KINKS OUT OF S AND D

BY CAPTAIN HERBERT M. HINCKLEY, F. A. RESERVE

"What one fool can do, another can" is an ancient Simian proverb

YOU know our educators have a distressing habit of making things complicated. And this is especially true of things mathematical. They seldom take the trouble to show you how easy the easy calculations are.

So with that thought in mind, I dedicate this manuscript to all exponents of the old Army adage "Keep your mouth shut, your bowels open, and volunteer for nothing."

I shall divide this subject into three general headings.

1st—A review of the necessary mathematics. (You'll be surprised.)

2nd—The solution.

3rd—The application.

Strange as it seems, all you need is a clear understanding of the mil rule and the principles of proportion. Arithmetically proportion is expressed thus:

$$3 : 6 :: 4 : 8$$

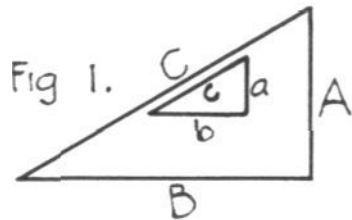
THREE is to SIX as FOUR is to EIGHT

This means that 6 and 8 are respectively twice as much as 3 and 4.

Geometrically proportion is illustrated by similar triangles. They seem to grow larger or smaller as the case may be without changing their relative shapes. (See Fig 1.)

Now remember that it does not matter what unit of measure is used for corresponding sides, thus:

a and A may be expressed in meters, while b and B may be expressed in yards.



Likewise corresponding sides may be divided into as many units as the angle it subtends is divided into mils. (See Fig 2.)

The growth of similar triangles or the proportion of the corresponding sides can be expressed thus:

$$a : b :: A : B$$

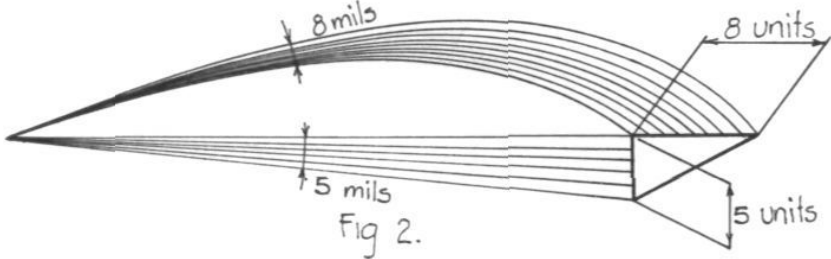
TAKING THE KINKS OUT OF S AND D

Now multiply the means and extremes

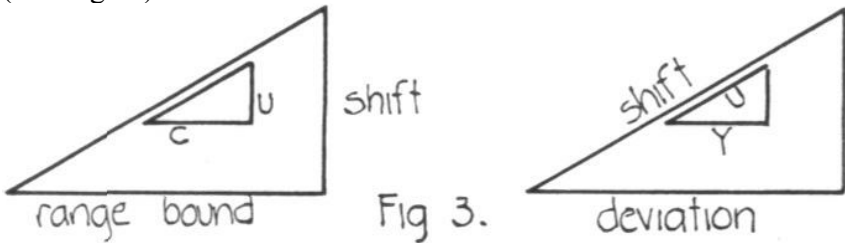
$$A \times b = a \times B$$

Then transpose b

$$A = \frac{a}{b} \times B$$



While we are discussing proportion and similar triangles, let me acquaint you with two situations that we will encounter later on. (See Fig. 3.)



Proceeding as before we get the following relationship:

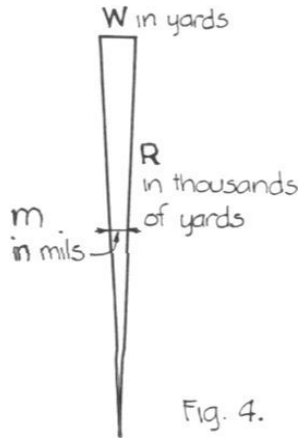
$$\text{Shift} = \frac{U}{C} \times \text{range bound}$$

$$\text{Shift} = \frac{U}{Y} \times \text{deviation}$$

The mil rule will engage our attention next. The rule is: "At a range of 1000 yards, one yard subtends an angle of one mil. (See Fig. 4.)

$$\text{Hence } m = \frac{W}{R}$$

Thus ends the first part of my subject.



With this knowledge of mathematics, we will proceed with the solution.

Figure 5 represents a fixed relationship based on C equal to 100 yards.

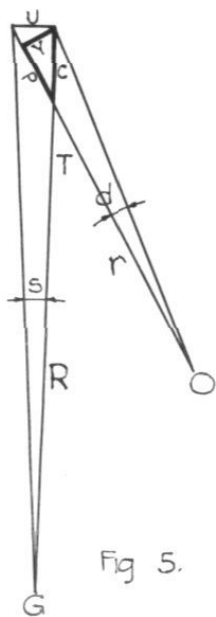


Fig 5.

NOTATION

- C=change in range of 100 yards from point T.
 s=shift in mils required at the guns to bring the burst on the OT line when a range change of 100 yards is made from point T.
 d=deviation of a burst from the OT line in mils when a range change of 100 yards is made from Point T.
 T=angle OTG measured in mils also the point of intersection of lines.
 R=gun range divided by 1000.
 r=observer range divided by 1000.
 U, Y and P=distances in yards.

In the calculation of s and d first use the mil rule.

$$s = \frac{U}{R + \frac{C}{1000}} \qquad d = \frac{Y}{r + \frac{P}{1000}}$$

Here is the first time we disregard a quantity of minor importance. We drop from our calculations the minor quantities

$$\frac{C}{1000} \text{ and } \frac{P}{1000}.$$

The following table shows why:

Range	Error
2000	4.75%
3000	3.2%
4000	2.44%
5000	1.96%

TAKING THE KINKS OUT OF S AND D

Our formulae now become:

$$s = \frac{U}{R} \qquad d = \frac{Y}{r}$$

Let us leave s and d temporarily to construct a table of U and Y.
(See Table 1.)

TABLE 1

Angle T in mils	U in yards	Y in yards
200	19.89	19.51
300	30.32	29.02
400	41.42	38.27
500	53.51	47.18
600	66.82	55.56
700	82.14	63.41
800	100.00	70.71
900	121.74	77.27
1000	149.94	83.20
1100	188.07	88.29
1200	241.42	92.39

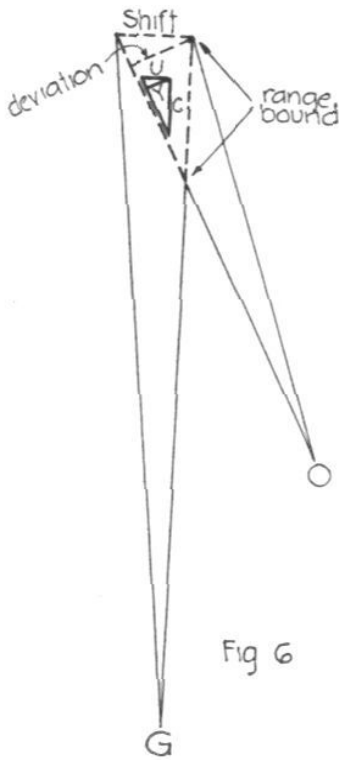
A very casual study of the above table will reveal clearly why the factor 1/10 T is used for small angles T. Up to 500 and 600 mils U and Y are about 1/10 of the angle T. In fact the error is only 8% in the worst case.

Reproduced below is the same table, except that U and Y are tabulated to the nearest ten yards.

TABLE 2

Angle T in mils	U in yards	Y in yards	
200	} 1/10 T	} 1/10 T	$s = \frac{U}{R}$
300			
400			
500			
600			
700	80	} 70	
800	100		
900	120	} 80	$d = \frac{Y}{r}$
1000	150		
1100	190		
1200	240	} 90	

The task now at hand is to find a way to use these factors s and d.



Referring to the accompanying figure, the dotted lines represent a situation of any reasonable size in the vicinity of the target.

The little superimposed figure represents the theoretical proportions from which s and d were calculated.

You may assume the target to be on either one of the two lines of sight from the OP. (See Fig. 6.)

Now as previously shown, the following relationship may be stated:

$$\text{Shift} = \frac{U}{Y} \times \text{deviation}$$

$$\text{Shift} = \frac{U}{C} \times \text{range bound}$$

However, since the shift and deviation will be expressed in mils it follows that s and d should be substituted in the place of U and Y, hence:

$$\text{Shift} = \frac{s}{d} \times \text{deviation}$$

$$\text{Shift} = \frac{s}{c} \times \text{range bound}$$

The first factor is used to get on the OT line and the second factor is used to stay on the OT line.

Furthermore since for small angles T,

$$\frac{s}{d} = \frac{1/10T}{R} \div \frac{1/10T}{r}$$

1/10 T will cancel out and leave,

$$\frac{s}{d} = \frac{r}{R} \text{ (for small angles T)}$$

Need I say more?

VERY LONG RANGE FIRE (OVER 20,000 METERS) IN THE MEUSE-ARGONNE CAMPAIGN

BY COLONEL CONRAD H. LANZA, Field Artillery

THE ALLIES

ON October 11, 1918, the American First Army, then engaged in the Meuse-Argonne campaign, issued instructions directing that, as soon as possible, there be emplaced long range guns to fire on Montmedy, Longuyon, Spincourt, Dommery-Barroncourt and Conflans. These places were important railroad centers and railheads for the German Armies. It was desired to interrupt the railroad lines through these towns, and thereby interfere with supply and replacement services.

There were available for this mission:

	<i>Batteries</i>
3 14" guns, U. S. Navy.....	1
2 340mm guns, Batteries B and D, 53rd Coast Artillery ..	2
2 305mm guns, French Army	1
	—
Total.....	4

All guns were mounted on railroad carriages. Ammunition was limited to the small stock in France. It was known that the useful life of the guns was short. Consequently it was desired to avoid waste of ammunition by making every round count. It was intended that no firing would be done except when air observation made accurate adjustments possible.

The French 219th Air Squadron was assigned to duty for observing purposes. It had present 15 pilots and 8 observers. Because of frequent fog, rain and mist at this season of the year, it was foreseen that visibility would probably be limited to only a part of each day. Arrangements were therefore directed to be made to provide for adjusting all four batteries simultaneously, utilizing two observers for each target. This was the most that the 219th Air Squadron could do, and would leave no observer in reserve for possible contingencies or casualties. For this reason application was made for another Air Squadron. To protect the observing planes from air attack, pursuit aviation was requested:

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it was estimated that about two flights would be needed. The Air Service was unable to increase the observing force, but it agreed to protect observing planes, provided arrangements were made sufficiently in advance of dates of firing to enable the necessary number of pursuit planes to be assembled.

General Pershing was specially interested in interdicting the railroad passing through Montmedy, as this was a very important line to the enemy. The railroad passed under part of Montmedy in a two track tunnel and, just west of the tunnel, crossed a valley on a high masonry viaduct. It would have been difficult to construct a detour if either the tunnel or the viaduct could have been blocked. It was believed that if this could be done, it would materially interfere with the enemy's ability to transfer divisions from the west front to east of the Meuse and vice versa and in addition would seriously affect his supply system. Incidentally, Montmedy was also the railhead of a narrow gauge railroad which ran south to the forces on the east bank of the Meuse. Blocking or interdicting traffic on this line would cut off supplies to the enemy opposing the right of the American First Army unless he opened a new line of communication. It was possible to open such a line of communication through Deutsch Eck, but this place also could be reached by long range interdiction fire. Another method, but a more difficult one, would be to interdict the railroad junction near Spincourt, in addition to cutting the line through Montmedy. On October 12th, this latter solution was decided upon and the necessary orders issued; the other targets which had been considered were classed as secondary ones.

The 14" Navy guns were emplaced north of Verdun; the other batteries were near that city. The Navy guns were detailed to conduct the interdiction fire on Montmedy. Before any fire was undertaken, using the Navy range tables, the probable number of hits to be expected were calculated. The railroad through that point ran at almost right angles to the direction of fire, giving a target of indefinite width, and a depth of 25 meters. Assuming that a perfect adjustment was made and maintained, the Navy tables indicated that, in round figures, about 1 hit in 600 rounds was to be expected. There were only 1,300 rounds of ammunition in France for these guns. To extend the life of the guns as much

VERY LONG RANGE FIRE

as possible, the Navy did not desire to fire faster than 4 rounds per hour—roughly 100 rounds per gun per day, or 300 rounds for the battery. This would give a probability of one hit every other day, provided that a perfect adjustment was constantly maintained. After slightly over four days all ammunition in France would, at this rate, have been expended, with a probability of securing a little more than 2 hits. Similar calculations for the other targets disclosed that the probable number of hits to be expected was low. General Pershing was informed that, in the opinion of the Artillery, the railroad through Montmedy could not be blocked by long range interdiction fire. The General ordered the fire to start as soon as practicable.

Several days passed without firing, as the weather prevented air observation during the hours in which pursuit aviation had been informed the adjustment would take place. On October 23rd, visibility was fair and, air observation being available, the 14" Navy guns fired for adjustment. The target was Longuyon, selected instead of Montmedy because the Air Service reported the better visibility in this direction. Each gun fired one round; and all three rounds were lost by the Air observers. Firing was thereupon suspended for a more favorable opportunity. This opportunity having arrived on October 24th, the 14" Navy battery and the 340mm Army batteries fired for adjustment; again all rounds were lost by the air observers. On October 28th, the 305mm French battery fired ten rounds, and once more all rounds were lost by the air observers.

On October 29th, the Air Service reported that weather conditions were so bad that it was useless to even attempt to observe artillery fire. As the Army commander desired to have fire for effect commence without any further delay, the 14" Navy guns were directed to open fire, not on Montmedy, but on Mangiennes, which was at closer range. This change was made because it was believed that, without observation of any kind, fire on a target as far distant as Montmedy would not be effective. Thirty rounds, for which the firing data was calculated from the map, were fired against Mangiennes. In the same manner the Army 340mm guns fired four rounds against Conflans on this date. Naturally nothing was known as to the result of this fire.

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On October 30th, the Air Service having again reported that the meteorological conditions were too poor to admit of observation, map data was utilized, and all batteries did some firing. For the first time the 14" Navy guns opened fire on Montmedy. As it was known that this city was occupied by friendly inhabitants, it was particularly desired to avoid causing them any injury, especially the women and children. For this reason the battery was assigned three targets, near Montmedy, but slightly outside the city. These were:

- a. the narrow gauge railroad yard, south of the city
- b. the main line railroad yard and railhead near northeast exit of the city
- c. the railroad viaduct at west exit of tunnel, on main railroad line northwest of Montmedy.

The railroad tunnel, which had been originally selected as the main target, was eliminated from consideration, as it ran in part under the city and was close to it. The battery fired twelve rounds, distributed among the targets. At about the same time, the Army 340mm guns fired nine rounds against Conflans, while the French 305mm guns fired twelve rounds against Longuyon.

After completion of this fire, visibility improved, and planes flew out to all of the targets, to photograph the areas about them, and to thus obtain much needed data as to the results of the fire. The planes photographed the wrong area around Conflans. They failed to photograph any areas in the vicinity of Longuyon and Montmedy, explaining on their return that this had been due to a superior force of hostile planes which had prevented them from accomplishing their missions. The batteries knew nothing, consequently, up to this time, as to the effect of any of their several shoots.

On October 31st, twelve rounds were fired without observation, against Longuyon and Conflans, and six other rounds against Spincourt. No available information was received as to the results of this fire.

As a part of the artillery preparation for the battle of Buzancy, fought on November 1st, the long range interdiction fire was ordered increased, and directed to be fired regardless of whether

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observation could or could not be made. Fire was scheduled to start at 5.45 A. M., which was fifteen minutes after H hour. It commenced promptly on time. Map data was used throughout, as no air observation was available at any hour during the firing. The following number of rounds was fired:

	<i>Rounds</i>	<i>Targets</i>
14" Navy battery	50	Montmedy (3 targets)
	95	Longuyon
305mm French battery	30	Spincourt,
	35	Dommary-Baroncourt,
340mm Army batteries	52	Conflans
	<hr style="width: 10%; margin: 0 auto;"/>	
Total	262	

Due to the uncertainty caused by the lack of observation, zone fire was used to increase the probability of securing at least some effective rounds. The firing program was completed by 9.00 A. M. and fire then ceased. During the afternoon, visibility became good to excellent. The planes attached to the batteries flew out and photographed the areas supposed to have been the targets around Spincourt, Dommary-Baroncourt and Conflans. The planes were unable to reach the other targets. After the photographs were developed, they were carefully examined, but failed to show any hits.

No firing occurred on November 2nd, but at 3.05 P. M., November 3rd, a friendly aviator, having dropped a message stating that the Germans were in full retreat east of the Meuse, that Remoiville and roads therefrom were jammed with traffic, with a train in the station loading troops, the 30th Artillery Brigade (Railroad), to which the long range batteries were assigned or attached, was ordered by the Army to open fire on Remoiville. A quarter of an hour later the Brigade inquired as to whether it was preferred that they fire on Remoiville itself, or on the railroad track. They were instructed to fire on the whole place and do it at once. The 305mm battery was thereupon detailed to comply with this order and shortly afterwards fired twenty-five rounds for which data was calculated from the map. As Remoiville was invisible to the OPs, and as no more planes flew over the area, no information was obtained as to the results of this fire.

On November 4th, a few rounds were fired against Dommary-Baroncourt.

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On this occasion the planes were out and did see some rounds. This was the only case where this happened. The fire was slow and unsatisfactory and was discontinued. On each succeeding day, to include November 9th, a few rounds were fired. This date marked the end of the attempts of the American First Army to cut the enemy's rail communications by long range interdiction fire. When, two days later, on November 11th, the Armistice put an end to the war, the American Army knew from reports of air observers, and from a few observation posts equipped with powerful telescopes, that the number of trains moving over German railroads through Spincourt, Longuoyon and Conflans was substantially the usual number. Concerning Montmedy, which was not so easy to observe, occasional observation and photographs showed that the railroad through that city was certainly in use and, so far as could be determined, was not injured. With this exception there was practically no information in the First Army as to the results of the long range interdiction fire extending over a period of eighteen days; nor did the battery commanders know whether their methods of calculating firing data was or was not producing satisfactory results.

THE RESULTS

14" Guns, U. S. Navy: The three rounds fired on October 23rd against Longuoyon, at a range of about 33,000 meters, failed to strike the target, which was the railroad yards near that town. All rounds were correct for deflection, but the range was around 500 meters short. The shells fell within the limits of the town, three friendly civilians being severely wounded. There was no military damage. The rounds fired on the 24th against the same target missed both the target and the town. Where these shells struck is unknown; no craters were found within 1,000 meters of Longuoyon and no one in Longuoyon reported this firing.

Of the thirty rounds fired on October 29th against Mangiennes, at a range around 24,000 meters, the local German commander reported having observed fifteen rounds as way over, all shells falling in open country and doing no damage. The remaining fifteen rounds were lost, presumably either too far over to have been seen, or possibly failed to explode. The rounds observed were about 1 mil east of the proper deflection.

The twelve rounds fired on the 31st against Montmedy could not

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be plotted. The only record found was a German report which stated that all rounds were misses. No rounds fell near Montmedy and no damage was incurred.

The firing on November 1st against Montmedy had better results. Three targets were fired at, of which target (a) was at a range of about 36,000 meters and targets (b) and (c) each at a range of about 37,500 meters. The results were as follows.

(a). This target was the narrow gauge railroad yard south of Montmedy. Twenty rounds were fired—one hit was secured. This destroyed a hand car and a tool shed. The remaining nineteen rounds did not fall within 1,000 meters of the target and were lost. In view of this fact, it seems possible that the one hit may have been a short of one of the series fired at targets (b) or (c).

(b). This target was the main, standard gauge, railroad yards and railhead northeast of Montmedy. Nine rounds were fired, of which none hit the target. Two rounds were about 500 meters short; one of these destroyed a small grocery store. It was impossible to determine whether this shell caused any casualties. Five rounds were 50 to 500 meters over. The foregoing seven rounds appear to have been practically correct for deflection. The two remaining rounds were nearly correct for range, but not for deflection, for they fell about 500 meters (1½ mils) west of the target and within the city. One of these shells struck the Fifth Army command post, causing casualties to officers and men. As the result of losing the battle of Buzancy on this day, the command post continued to function until after it had issued the necessary orders for the withdrawal of the Army. At 3.00 P. M. the command post closed and moved to Virton, Belgium, about five kilometers away. The dispersion on this target was approximately 1,000 meters in range and 700 meters (2 mils) in deflection.

(c). This target was the viaduct, carrying the double track railroad of the main line, and was located a short distance northwest of Montmedy. This viaduct was a high, solid stone structure, around 600 meters in length, with its long axis nearly perpendicular to the line of fire. It was just west of a tunnel.

In plotting the fire on this target, it has been found impracticable to separate entirely the rounds fired on November 1st from some of those fired on later dates. In all 50 rounds were fired.

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The center of impact was close to the mouth of the tunnel, which had originally been intended to be the target. This point was 300 meters east of the center of the viaduct, equivalent to a deflection east of less than one mil. Seven rounds were within 100 meters of the center of the impact; of these seven, two struck on top of the tunnel about 30 meters east of the west exit. These did not injure the tunnel. Fourteen rounds fell within 40 meters of the tracks, there being one just over and another just short. The railroad was nowhere damaged. The explanation is that the 14" Navy shells were armor piercing projectiles with thick walls and correspondingly reduced bursting charges. These shells caused tremendous destruction when burst in a confined space but in the open they gave craters about the same as the Army 155mm shells

Three shots which were the furthest off for deflection fell to the east in Montmedy; one struck a wood barracks, killing, according to one report, eight German soldiers, and according to another report, nineteen soldiers. The second of the three shells destroyed a barn and killed a child and a cow; the third shell destroyed a house without causing any casualties. Some of the rounds fired but not identified wounded three friendly inhabitants.

The dispersion on target (c) was 1,700 meters in range, of which 800 meters were due to zone fire, making the net range dispersion about 900 meters; the deflection dispersion was about 1,400 meters, or not quite 4 mils.

Of the 95 rounds fired against Longuyon on November 1st, three shells struck within the town limits, destroying houses and killing and wounding several friendly citizens. Two rounds struck in the railroad yard, which was the target, and cut three tracks. The last shot of the series was just over the railroad yard and struck a shack, severely wounding two German soldiers. The remaining 89 rounds were reported as being over, falling in the country and doing no damage.

Twenty rounds were fired during November against Mangiennes. All missed the town, being reported as over. Including the thirty rounds fired in October, fifty rounds in all were fired against this target, which was not hit. Thirty-seven rounds have been located. Of these, three rounds were about 300 meters beyond the far edge of the town and 34 rounds were at various distances

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between 300 and 1,000 meters over. The remaining 13 rounds were lost and were probably more than 1,000 meters over.

305mm French Battery: The ten rounds fired on October 29th against Longuyon are not mentioned in German reports. They evidently missed the target and must be classified as lost. The twelve rounds fired on October 30th, also against Longuyon, at a range of about 32,000 meters, were observed by the local German commander, who reports them all as misses. His report does not indicate in what sense the shots missed. Air photographs failed to show any craters within 1,000 meters of the target, in any direction.

The twelve rounds fired against Longuyon on October 30th are reported by the Germans as noted, but no damage done. The 65 rounds fired on November 1st against Spincourt, at a range of about 28,000 meters, and against Dommery-Barroncourt, at a range of about 27,000 meters, are unreported, and apparently did not fall near these targets.

340mm Coast Artillery Batteries: On October 24th, these guns fired against Longuyon, at a range of around 32,000 meters, for adjustment, with plane observation. These rounds were lost by the planes, and also by the Germans, who failed to notice that they were being fired at. Four rounds fired against Conflans, at a range of about 33,000 meters, on October 29th, did not fall near this target and were lost; the same happened the next day, when nine more rounds were fired.

On November 1st, 52 rounds were fired against Conflans. No accurate record of this fire can be found. Ten hits were reported in the railroad yards, which was the target, which cut several side tracks, without interrupting traffic on the main line. From the one report available, it seems possible that these hits may have occurred on different days, and possibly include those already mentioned. On November 9th, five more shells were fired at Conflans and all of these missed the target.

The twenty-five rounds fired against Remoiville, on November 3rd, at a range of around 30,000 meters, occurred while Austro-Hungarian troops were passing through and entraining at that point. These troops had been withdrawn from the front and were en route to their homes to be mustered out by reason of the armistice signed by their country in Italy. At the moment that the rounds

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were fired, about 4.00 P. M., traffic was dense, both by road and by railroad. No records of any hits can be found nor of any interruption to traffic. Apparently all rounds were lost.

COMMENTS

In long range fire, meteorological conditions frequently form a large unknown factor in the firing data. These conditions may vary along the range and may change, without the knowledge of the battery commander. The longer the trajectory and the higher its maximum ordinate, the greater the possibility of such variations. The center of impact will move according to atmospheric changes not observed or imperfectly observed at the battery.

A heavy gun fires relatively slowly. Fire by a single piece, especially at a slow rate of fire, such as every fifteen minutes, as used by the 14" Navy guns, is generally useless, even where air observation is available. In such cases the meteorological changes may offset or considerably alter corrections by the battery commander, making it impracticable to secure a proper adjustment of fire. To reduce the time required for adjustment, it is best to fire by battery.

Guns of long range batteries should be carefully calibrated before any fire on the battlefield commences, making it unnecessary to adjust the pieces individually and making it possible to start adjusting by battery. As the dispersion at long ranges may cover an area equivalent to a square kilometer or more, air observers should be provided in numbers sufficient to watch an area of this size. Bursts in woods or in or between buildings are easily lost by observers in planes flying at altitudes common when over territory in possession of the enemy. Consequently adjustments should be made on terrain having as few obstacles as possible. If the target is included in such terrain, so much the better, but if it is not, fire should be conducted at the nearest open terrain of proper size and a transport of fire made after the adjustment has been obtained.

In fairness to the Air Corps, their observers should not be asked to remain for a long time in dangerous positions over hostile country to permit the artillery to make a slow and lengthy adjustment. Firing data should be thoroughly prepared in advance and, as soon as the planes report that they are ready to observe, fire by battery should follow rapidly.

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The center of impact can only be kept on the target by constant good observation. When this can be done only at intervals, after completing an adjustment, the battery, or battalion, should be brought in at once and the the desired number of rounds fired for effect as quickly as possible. After this no further fire can be counted on, until a new adjustment is made.

The targets, consisting of stretches of railroad, immediately adjacent to Montmedy, Longuyon, Conflans, etc., with numerous woods in the vicinity, were not a suitable target for adjustment, as the chance that bursts might occur in concealed terrain and fail to be seen by the air observers was too great.

Slow fire of interdiction against roads or railroads is hopeless, both on account of dispersion and changes in weather conditions. The proper targets for long range fire are those of a reasonable size, such as groups of batteries close to one another, towns, cities, woods occupied as billets or dumps, air fields, etc.

Very heavy guns wear out rather rapidly if the rate of fire is high. Either this defect must be overcome by improvements of design or else these guns must be reserved for important battles, where their great radius of action or their power may enable important or distant objectives to be brought under destructive fire. For example, if on the defensive, bringing enemy railheads under fire may prevent orderly deployment of a hostile attack. On account of the present short life of these guns, it is generally necessary to reserve them for special foreseen missions.

Very heavy guns are sometimes needed to fire against protected objectives of such strength that smaller calibers cannot advantageously be employed. This is an important mission. It seems probable that the number of targets of this nature will increase in future wars. For example, in order to counteract air observation and air bombing a considerable number of underground airports and motor vehicle parks now exist or are being constructed in Europe. In such cases, terrestrial observation, if possible, should be used, but if the target is too distant for this, fire will have to be conducted by utilizing air observation.

Destruction of personnel is the main mission. If destruction of matériel is secured at the same time, this is an extra gain. To destroy matériel in war, without destroying the personnel, seldom gives decisive results. This is specially true in counter-battery.

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To kill off the cannoneers by a sudden burst of fire is more effective than a slow fire of precision with a view to actual destruction of the matériel.

The best method of fire is to bring in all the guns as soon as an adjustment is obtained. This method produces a strong, terrifying effect from numerous enormous bursts in rapid succession accompanied by some visible destruction. This requires a considerable number of pieces. At least a battery and preferably a battalion, excellently trained, is necessary in order to maintain a rapid and effective fire.

The types of projectiles required for long range fire are:

- (a) high explosive, with
 1. delay fuzes, for use against personnel protected by cover
 2. instantaneous fuzes for use against personnel above ground.
- (b) toxic, for uses against personnel, with fuzes as for (a)
- (c) smoke, with instantaneous fuzes, for adjustment.

Smoke projectiles which will give a widely visible smoke ball are needed. White phosphorus is not suitable in winter, when snow is on the ground, nor when there is haze. Orange colored smoke would be better.

Heavy long range guns are usually mounted on railroad cars, but may be tractor drawn. They have thus high tactical mobility and they can be placed in battery at the last moment, to avoid detection. Orientation and preliminary calculation of firing data can be prepared in advance. The batteries can be emplaced well forward to fire deep into enemy rear areas. Care must be taken to assure proper supply of ammunition; this may prevent a very forward position. Batteries should be available for any mission needed, under direction of the proper chief of artillery; assignment of batteries exclusively to counter-battery, neutralization or other mission, when there are several missions to be carried out, is not advisable, as it calls for too many batteries.

Very long range heavy guns are an important weapon in war,

- a. to bring fire against personnel at long ranges;
- b. to bring fire against protected personnel, at short or medium ranges.

A special tactics and technique are required for their employment to a maximum degree of efficiency.

A NOVEL SMOKE BOMB RANGE

BY 1st LIEUTENANT GEORGE F. A. PEARSALL, 102nd F. A.

DURING the winter months, our conduct of fire instructions are confined to a miniature indoor range which we have scaled accurately and laid out on our drill shed floor. This we find most helpful in the training for proper sequence of fire commands and correct procedure in the conduct of fire.

When the officers are thoroughly acquainted with these two elements, we find that instruction in correct sensing is necessary. For obtaining the latter, we have found that the best results were derived through the use of an outdoor smoke bomb range. Actual firing conditions are simulated as nearly as possible. The observer, equipped with field glasses, is located at the O. P. which is more than fourteen hundred yards distant from the bursts.

With this method, we have been experimenting week-ends for the past six months and have succeeded in developing the following simple, safe and inexpensive smoke bomb range.

The range is situated on the gradual slope of a hill, this set-up gives us a greater variety of bursts. There are two rows of stakes perpendicular to the line of fire and about sixty yards apart. The front covered is eighty mils. There are eighty stakes in each row numbered from 0-80. The targets are distributed between the two rows.

The distance from the O. P. to the targets is fourteen hundred yards. For transmission of fire commands, we have used short wave radio, both voice and key, and semaphore signalling, the latter being the most dependable.

The operator at the target keeps the deflection changes by means of the range control board, which has eighty holes in the stationary top row. The sliding center has four more rows, plainly numbered one for each gun. The directions for making this board and method for staking out the range were taken from Special Text No. 99. Field Artillery Training.

The operator has the proper deflections for all targets for various aiming points and compass laying, figured for several different gun positions. When the initial data are received, he

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- A—Control board.
B—Control box with five switches for smoke pots (S); ground switch (X); battery switch (Y); key (Z).
C—Powder cans; C' measuring teaspoon for powder.
D—Galvanized hoods on steel stakes.
E—Smoke pot assembled.
F—Cans for base.
G—Cast iron cups.
H—Spark plugs.
I—Smoke bomb set up for graze burst, hood three inches over pot. Note wire coming in through left side of can.
J—Ground rod.
K—Single wire.
Note: Binding posts for wires on back of board not shown in picture.

can give the exact location of the burst, provided the error does not exceed the limits of the range by more than twenty mils.

The control box, 18" × 12" × 9", contains six dry cells, a one inch wireless spark coil in the lower section, and on the upper hinged shelf four single pole double throw switches, two single throw switches and a telegraph key. This shelf is set down enough to allow the cover of the box to be closed.

One of the single throw switches cuts the battery from the primary of the coil, the other is between the secondary connection and the ground rod binding post. These two switches are not absolutely necessary but we put them in as an added safety precaution.

The telegraph key closes the primary circuit and makes the plug fire.

Each double throw switch represents a piece. Number four is at the left end, one at the right. The knives of these switches are all connected to the other secondary connection at the top of

A NOVEL SMOKE BOMB RANGE



GRAZE BURST ON A VERY WINDY DAY

the coil. Thrown in the forward position it connects the coil, through a binding post in the back of the box, to its respective smoke pot in the over row beyond the targets. In the near position, it connects the short limit smoke pots. On the back of the box are the nine binding posts, four shorts, four overs and one ground rod connection.

The smoke pot is a cast iron cup about a quarter inch thick and approximately four inches in diameter, three inches deep. The bottom is drilled and tapped to receive a spark plug. A tin tube, six inches long and three inches in diameter made from a tin can by removing both ends, serves as a base on which to place the smoke pot. A hole in the side admits the wire to the spark plug from the control box. The open end at the bottom of the can allows it to be pressed into the ground, and in addition to making the smoke pot secure, it also insures a good ground connection.

Wire from box to pots should have suitable insulation and slack should be left at the pot to allow for shifts.

Four men, known as loaders, attend each smoke pot for the cleaning, testing and loading. They carry their powder in a covered can, with a spoon, a small wire brush and file. Repeated firing causes carbon and burnt powder to form around the

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sparkling points of the plugs. To avoid the delay of a misfire, each plug is cleaned and tested for a spark before loading. All switches are pulled out during the cleaning. After the pots are tested and loaded, the switches are again pulled to the open position until the command to fire. Switches are thrown in "when ready to fire" comes from all loaders. At the command "Fire," the key is pressed giving the bursts to correspond to the method of fire.

During our experiments, we tried many methods to produce a graze burst with our black powder. We tried a score of mixtures but could not produce the kind of smoke peculiar to graze burst. Finally we built a galvanized iron hood on a stake. This hood or conical shaped cap is about a foot in diameter and six inches high. To it an iron rod is riveted. The rod is sunk in the ground to a height of three inches above the smoke pot. The charge of powder is reduced. When the pot is fired, the smoke is deflected down along the ground. The air bursts are given without the hood and the smoke shoots up. On windy days, sensings must be quickly made and this is one of the features that has developed the sensing of all officers using the range.

A six foot rod to which the smoke pots can be attached gives us a variation in height of burst.



GRAZE BURST WITH NO WIND



AIR BURST

Graze and air bursts can easily be distinguished as can be seen from the accompanying photographs.

In conclusion, I wish to state that the results obtained with the range described above have been highly satisfactory. Among

A NOVEL SMOKE BOMB RANGE

those who had the opportunity of working on it were many officers who, hitherto had been timid when at the firing point. All expressed great admiration for our little scheme and furthermore gave actual evidence of its practical value by the confidence and accuracy with which they conducted their respective problems during our recent tour of duty. They stood up, sensed the burst quickly and barked their commands like veterans. The improvement was evident to themselves and others.

The range was made possible by the following officers of Battery "B" 102nd Field Artillery, Massachusetts National Guard:

Capt. H. M. Long, Lieut. B. F. Brady, Lieut. George F. A. Pearsall, Lieut. Scott V. Curry, Lieut. Melvin F. Hooper.

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THE JOURNAL YOUR NEW ADDRESS

A RIOT FORMATION

BY LIEUTENANT COLONEL STEWART G. COLLINS.

151st F.A., Minnesota National Guard

ON the morning of July 17, 1934, Minneapolis was confronted for the second time in two months with a complete paralysis of its commercial automotive transportation. But of greater moment to its citizens than this temporary dislocation of industry were the still fresh memories of the disorders and bloodshed that had attended the May strike. Local authorities were determined that a repetition of this bloody business should not occur. They recalled how promptly order had been brought out of this May chaos by the intervention of 3,000 state troops in the affected area. Accordingly, early in the morning of the 17th, a formal request was made on the Governor for military aid. The Executive at once directed the Adjutant General to order into state service such troops as he considered necessary to maintain law and order. The Adjutant General acted immediately.

Thus on July 17, 1934, a large proportion of the 151st Field Artillery (Minn.) was suddenly and unexpectedly assembled at the Minneapolis armory. There, in the very heart of the affected areas, it constituted a threat to the lawless and a guarantee and comfort to the law-abiding. But what of this force itself? A Field Artillery unit is certainly not looked upon as the ideal instrument for action against a mob.

The May strike had shown the characteristics of the opponents with whom these troops would have to deal if the situation went beyond control of the local authorities. They were not disgruntled school boys out for a frolic but determined men who felt they were suffering a grave injustice. In May two special officers had been killed; many others were seriously injured. Armed with revolvers, shot guns, pieces of iron pipe, and sections of metal-filled rubber hose, these strikers had constituted and would again constitute a formidable opposition.

What means should this provisional battalion of field artillerymen adopt to contend with such an opponent so armed? All of the officers of this battalion were familiar with Colonel Bellows' "Treatise on Riot Duty." Many had seen active work on such duty before. The men had been trained in the formations and tactics

A RIOT FORMATION

set forth in the Bellows study. But now, actually confronted by a real situation, it suddenly dawned on the battalion that formations intended for infantrymen armed with the rifle and the bayonet were unsuitable for artillerymen armed with the pistol and the machine gun.

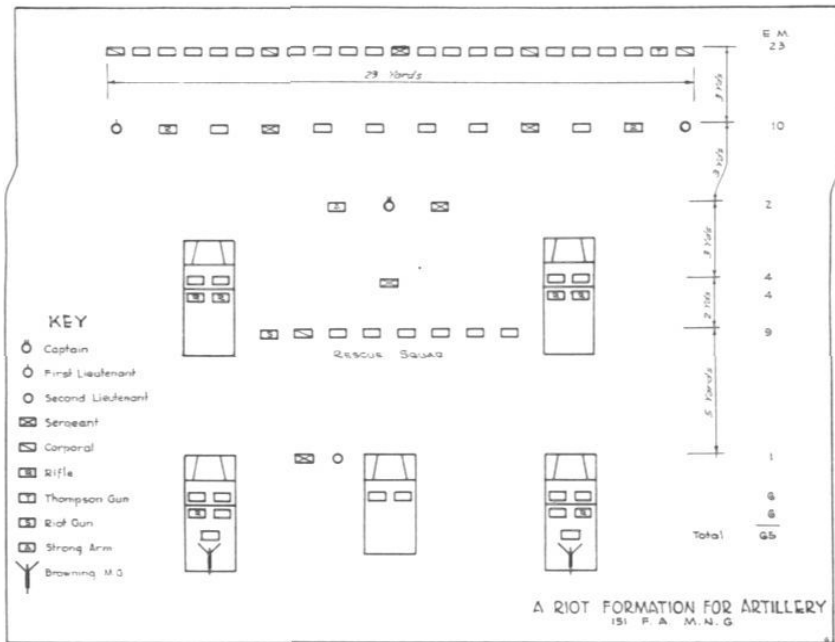
The first thought turned to nightsticks, which were available in ample quantity, but in view of the fact that the antagonists (truck drivers) were more powerful individually and had at least equally effective clubs, this thought was immediately discarded. Firearms would have to be used.

Since our individual arm was the pistol, we were now forced to devise some means whereby a sufficient distance to insure freedom of action for this weapon could be easily maintained. With this as a basis of departure we eventually arrived at the formation which is shown in the accompanying diagram. Fortunately, a few days intervened between mobilization and actual riot duty. During this period the battalion was drilled intensively in the new formation. Thus by the time we were actually called out everyone was thoroughly familiar with the improvised scheme.

Meanwhile this saving interim had been used to augment our normal equipment. Each battery was allotted one Thompson submachine gun, one riot gun, and about eight service rifles. These weapons were distributed to picked men who were then assigned the key positions in the formation. Originally this distribution, and indeed the formation itself, did not agree with the diagram shown here. For instance, under our first plan all trucks marched behind the Rescue Squad. Later, someone discovered that the truck cab afforded an excellent rifle rest. When this was determined the formation was modified by placing two trucks close behind the front lines (as shown). From this position the riflemen in the trucks not only commanded the front but were beautifully situated to observe all activity behind the opponents' forward ranks. It was in this manner, by a suggestion here and a suggestion there, that the final formation was eventually evolved.

A word or two will suffice to explain the diagram which is virtually self-explanatory. The purpose of the Rescue Squad is, in general, indicated by its name. Under the direction of the battery commander it makes all necessary arrests. The "Strong Arm" in this squad, a powerful individual who is carefully selected, is used

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for special purposes. The psychological value of the "Strong Arm" is at once apparent. The rifles in each battery are assigned to the best shots. The primary mission of the riflemen should be to pick off the individuals who are using or attempting to use firearms or other dangerous weapons. This device was adopted with the hope that it would avert general and promiscuous firing in which many innocent bystanders are invariably injured.

The reader has probably noted that the diagram makes no mention of gas or a "gas detachment." As a matter of fact our original formation included a "gas squad" of three men armed with a shoulder cannon and some gas shells. However, in our present set-up this has been omitted in view of our conviction that a "gas unit," to be efficacious, should be larger than three men, should be better equipped, and should, if possible, be under the command of some one thoroughly schooled in the tactics and technique of the non-toxic gases.

If three Thompson guns had been available for each battery, two of them might well have replaced the rifles on the two leading trucks and the employment of the third left to the discretion of the battery commander. Our experience with these guns showed that

A RIOT FORMATION



they exerted a tremendous moral effect not only on the opposition who confronted them but also on the troops who possessed them.

Referring again to the formation set forth in the diagram one can see at a glance its great flexibility, which is the sine qua non of any riot formation. For instance, the formation can be split vertically into two units, each supported by a rifle and a machine gun truck while the battery commander retains the Rescue Squad. In fact the "riot team" combinations that can be evolved are limited only by the ingenuity of the battery commander.

On the occasion when this formation was first used it was deemed advisable to keep each battery intact in order to present a concerted front which would be more impressive. However, it is likely that in any future operations in which this scheme is used battery commanders will be allowed greater freedom of action. In the situation under discussion battery commanders were directed to maintain their units as a whole but were not directed what line of action to follow in the event the crowd failed to move under the threat of force. It was felt that the main problem confronting the battery commander would be the matter of maintaining sufficient distance to insure freedom of action for the pistol. He had the means to solve that problem. The method of application was up to him.

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Thus while waiting for the call, that daily became more imminent, the battalion had worked out and been schooled in an entirely novel riot formation. On the afternoon of the 20th, three days after mobilization, the hour for intervention struck!

At 2:00 P. M. on this date a commercial truck convoyed by a police escort was rammed by a truck load of strikers. Immediately the strikers swarmed over the disabled vehicle. Demands made by the police that they disperse were ignored. Shots fired over the heads of these men had no other effect than to attract several hundred other strikers and sympathizers. This new group rushed forward to support their comrades. Heedless of orders to halt, scornful of volleys fired over their heads, the mob charged headlong for the police. No longer could the forces of law and order temporize. Sights were lowered and the riot guns spoke in deadly earnest. After ten minutes the mob retreated. Behind them they left two dead and sixty-seven wounded.

The Chief of Police now called on the battalion commander for help. He stated that the strikers were equipping themselves with firearms preparatory to a counter-attack. The battalion intelligence section confirmed this report.

Within fifteen minutes the first battery reached the scene of the battle. Immediately it went into its new formation and moved against the mob. (Estimated at 1,500—probably half of this number were spectators.) Confronted by this martial threat the crowd wavered and then began to withdraw. The second battery now put in its appearance and took its place about 100 yards in rear of the first. Each battery covered its own flanks and rear with the machine gun trucks. The police remained at the scene of the original fight. Together the batteries moved forward. The crowd, now definitely under way, continued its retrograde movement. Slowly it thinned out and eventually it disappeared.

Within two hours the battalion of the 151st Field Artillery had accomplished its mission and was back in the armory. Not a shot had been fired. Not a blow had been struck. Three men who had refused to move on had been arrested and turned over to the police. Beyond that, nothing!

The threat of state force, the determined attitude of the troops, and the formidable appearance of the business-like formation had been sufficient to restore tranquillity to a sorely tried city.

CHANGING THE PICTURE OF COMMAND AND STAFF FUNCTIONS

ORGANIZATION FOR COMMAND AND STAFF FUNCTIONS

BY COLONEL RALPH H. WHITNEY, 356th Field Artillery

MILITARY men have become so accustomed to seeing the words "Command" and "Staff" grouped together that it may be possible that an incorrect impression is formed of the relationship between these two agencies. We sometimes hear officers discuss this phrase "Command and Staff" and paraphrase it into "Leadership and Assistants." We also hear the statement made that the staff of any commander is a part of that commander's "official" mind added to grasp the multitude of details that it would be physically impossible for one brain to master. Experience and mature judgment lead to the conclusion that we must change the outlines of this picture of "Command and Staff."

"Command" implies two things—Jurisdiction and Authority. Jurisdiction carries with it the responsibility for making the major decisions and the responsibility for all the acts of subordinates. Authority provides the power to enforce the decisions by control of the units available for use at any given time. If we regard "Staff" as meaning "Assistants or a part of the official mind" then it can be logically argued that the staff of a commander shares the responsibility for the decision and the authority for enforcement. This, we know, is an erroneous assumption.

There are but two major Functions of Command:

1. Making an Estimate of the Situation
2. Making a Decision

and these two functions are of equal importance and may not be delegated. Once the decision has been made and transmitted to the subordinate commanders the final results rest with them.

At this point the thought may occur that, in accordance with our present teachings, the staff is charged with the supervision of the execution of the commander's decision. The general acceptance of this point of view has been the cause of some of the greatest failures in military history and has resulted, in past conflicts, in inexcusable friction between the staff and subordinate

ordinate commanders. Supervision implies authority over those supervised and the staff is not in the chain of command, therefore has no authority.

The presence of the staff sections on the battle front or elsewhere should not be for the purpose of supervising the execution of decisions already made but to observe the situations developed by the execution of current decisions in order that they may be prepared to execute their proper functions in connection with subsequent decisions made necessary by the ever changing situations of modern warfare.

ORGANIZATION FOR COMMAND AND STAFF FUNCTIONS



We are all agreed that the sole responsibility for decision rests with the commander and him alone. If the command fails to accomplish the mission assigned then the commander and he alone must shoulder the blame. The failure of the command is the failure of the commander. That is the law.

Repeated failure of missions possible of accomplishment can mean but one or two things—either lack of ability to make a proper Estimate of the Situation or lack of ability to control and coordinate the agencies available for the accomplishment of the Decision or both. The result—involuntary relief of command with its accompanying disgrace.

To regard the officers of the staff sections as personal assistants of the commander is as erroneous as to regard the commanders of subordinate units as personal assistants of their superior officer.

PICTURE OF COMMAND AND STAFF FUNCTIONS

Each separate section of the staff is just as much a separate unit as are the subdivisions of the subordinate units of the whole command and their efforts must be coordinated in exactly the same manner as those of these subordinate units. They must function properly with regard to time and the amount of energy expended as any other unit of the command, and the failure of a section of the staff to carry out its mission when and where needed may have just as much effect upon the successful accomplishment of the mission as a like failure on the part of any other subordinate unit.

The argument may be advanced that the staff is not in the chain of command, has no command function and therefore cannot be regarded as a separate unit and must be carried as a "mental appendage" of the commander. To answer this we must refer back to the Functions of Command. Here we see that the second function of command, "Decision" is translated into action by the various subordinate units. Their tasks *follow* the decision. On the part of the staff the sequence is reversed. The action of the staff *precedes* the first function of command "Making the Estimate of the Situation." Just as the subordinate commanders make possible the accomplishment of the mission by carrying out the "Decision" of the commander, so does the staff make possible the accomplishment of the mission by supplying the necessary information and recommended plans for the correct and complete "Estimate of the Situation." They have, therefore, a responsibility equally as great and equally as important and equally as independent as that of subordinate commanders. They are charged with enabling the commander to perform, effectively, one of his two major functions: that of making a correct and complete Estimate of the Situation.

We must conclude, therefore, that the staff must not be regarded as a part of the commander's official being, not as personal assistants but as a separate unit of the command with a definite and well defined mission and with positive and well outlined responsibilities.

Our Staff set-up for Divisions and higher units divides the group into a "General Staff" with four major sections and a "Special Staff." The members of the latter have dual functions

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of command and staff duties. In order that the various staff operations may be supervised and coordinated in a manner similar to that of the subordinate units of the command there is created in our "Tables of Organizations" an office called Chief of Staff. The duties of the Chief of Staff as far as the various staff sections are concerned is no different than that of the brigade commanders; he must control and coordinate the forces under his command with one purpose in mind and that is to enable his immediate commanding officer to carry out one of the Functions of Command and thereby accomplish the mission assigned. The Chief of Staff, then, may be regarded as the commanding officer of a group of units having for their mission the making effective of one of the two major functions of the supreme commander.

Attention should be called to the fact that the discussion in the preceding paragraph refers only to those duties of the Chief of Staff that are closely related to the functioning of the various sections of the General Staff and the Special Staff. A discussion of his duties as second-in-command and as intimate friend and advisor to the commanding officer has no direct bearing upon the subject under consideration.

We might paint the old picture of Command and Staff Functions by showing a burning building with the commander and his staff rushing along towards the fire carrying a great barrel of water with which to drench the flame. The building represents the plans of the War Department for the protection and defense of our nation and the flames depict the enemy destruction of our defensive measures. The barrel of water represents the plans of the commander of the field forces to overcome the enemy destruction. Now it must be apparent to everyone who sees this picture that it will be necessary that all the men in the picture will be needed to get the barrel of water up to the fire and upset it upon the blaze.

This is the picture that is painted when we think of Command and Staff as "Leadership and Assistants" or of the staff as a part of the commander's official mind or being."

Let us erase, for our purpose, a part of this picture and paint in a different conception. Let us place the water barrel on the ground within easy reach of the threatened building and let us

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show the commander with bucket in hand dipping out the water from the barrel and throwing it on the fire at points where it will be most effective and then show the staff, headed by the Chief of Staff, struggling up from the nearby creek, each with his bucket of water to keep the commander's supply adequate for the quenching of the blaze.

In this last picture we have the commander and the staff sections in their proper relations: the commander standing alone and in sole control of the elements at his command with the staff sections each furnishing their own individual efforts and placing them in a common pool, out of the collective volume of which comes the commander's Estimate of the Situation and his Decision.

BOOK REVIEW

NAVAL CUSTOMS, TRADITIONS AND USAGE. By LIEUTENANT COMMANDER LELAND P. LOVETTE.—Lieutenant Commander Lovette has contributed to the literature of the service, in this unusual and entertaining book, a work of permanent value. The information it contains will be indispensable to every student of naval subjects. The author is to be congratulated on his masterly exploration of a field which hitherto has escaped the attention of naval writers. A study of Commander Lovette's book will go far toward correcting imperfect technique and will be a fair wind to a knowledge of the traditions of the service and the history and meaning of its customs. Price, \$3.75.

TYPE PROBLEMS

These type problems are fired with the 75mm gun, M1897, shell Mk. I, normal charge, fuze short, range 4,600 yards. The fork to the nearest mil is 4.

a. ESTIMATED DATA

<i>Method of fire</i>	<i>Elevation</i>	<i>Sensing</i>	<i>Remarks</i>
1 Rd,	160	+	
	144	-	
	152	-	
	156	+	Trial elevation is the center of the bracket 152-156.
3 Rds,	154	++-	Fire for effect.
	154	+ - +	4 overs, 2 shorts. Fork is 4. Adjusted elevation is
			$154 - \left(\frac{2}{12} \times 4 \right) = 153.3$
6 Rds,	153.3	++-	4 shorts, 2 overs. Adjusted elevations is

	153.6		$153.3 + \frac{1}{2} \left(\quad \times 4 \right) = 153.6.$

b. ESTIMATED DATA

<i>Method of fire</i>	<i>Elevation</i>	<i>Sensing</i>	<i>Remarks</i>
1 Rd,	160	+	
	144	-	
	152	-	
	156	+	
3 Rds,	154	++?	Fire for effect, 1 more round must be fired to complete the half-group, as procedure depends upon the next sensing.
1 Rd,	154	+	3 sensings over, elevation reduced $\frac{1}{2}$ fork, 1 round has been fired at 152; 2 more are needed.
2 Rds,	152	--	Rounds fired at 154 and 152 considered as having been fired at 153, giving 3 overs and 3 shorts.
6 Rds,	153	+--	5 shorts, 1 over. Fork is 4,
		---	Adjusted elevation is
			$153 + \frac{1}{2} \left(\quad \times 4 \right) = 153.7$
	153.7		

c. STRIP MOSAIC

<i>Method of fire</i>	<i>Elevation</i>	<i>Sensing</i>	<i>Remarks</i>
1 Rd,	160	+	
	152	Target	This is the trial elevation, and remainder of first group of fire for effect is fired.
5 Rds,	152	+ - + - +	3 overs, 2 shorts. Fork is 4. Adjusted elevation is
			$152 - \left(\quad \times 4 \right) = 151.7.$

TYPE PROBLEMS

6 Rds, 151.7 --+ 3 shorts, 3 overs. Adjusted elevations is 151.7.
 --++
 151.7

d. CORRECTED MAP DATA

<i>Method of fire</i>	<i>Elevation</i>	<i>Sensing</i>	<i>Remarks</i>
1 Rd,	161	+	
	157	-	
	161	+	First round at 161 is disregarded, as it would determine the trial elevation.
3 Rds,	159	-+?	Second half-group will be fired at 159, so enough rounds are fired to complete the group. 4 shorts, 2 overs. Fork is 4. Adjusted elevation is
4 Rds,	159	-+--	159+ $\left(\frac{2}{12} \times 4\right) = 159.7.$
6 Rds,	159.7		

Lateral Precision, Small t

(Paragraph 86-b, Page 131. T. R. 430-85)

Target Description: A disabled tank. *Mission:* Destruction. *Materiel:* French 75mm gun, Model 1897. *Visibility:* Excellent. *Wind Direction:* Right to left. *Initial data obtained:* Range-deflection fan and range finder. R=3.6, r=3.6, T=220, c=5, s=6, F=3, s/c=1.2, r/R=1. B. C. on left.

Initial commands: No. 1 Adjust, Base Deflection Right 100, Shell Mark I, Fuze long, No. 1 One Round, Quadrant 110.

<i>Commands</i>	<i>Elevation</i>	<i>Deviation</i>	<i>Range</i>	<i>Deflection</i>	<i>Remarks</i>
	110	30 L	?		
R 30	110	Line	+		2F × s/c=6 × 1.2=7.2.
L 7	104	3 L	-		3 L × 1=3 L
					3 L + 7 L=10 L
					10/2=5.
R 5	107	Line	-		L 7 + R 5=L 2
					2/2=1.
R 1, 3 rds.	108	Line	-	-	
		3 L	-	-	(forced)
		Line	-	-	R 2 incorrect.
R 2, 2 rds.	110	4 L	+	?	Defl. bracket of 1 mils already obtained. 3 overs 3 shorts, all assumed to have been fired at
		Line	+	+	109.
L 1, 6 rds.	109	Cease firing			

SUMMARY: Error in initial data: Deflection 27 mils; range 20 yds. or 0.6 per cent. Time not taken. Ammunition expended 9 rds. Classification satisfactory. General comments: An excellent problem.

ARMY WINS INTERCOLLEGIATE POLO CHAMPIONSHIP



CECIL COMBS NO. 1, HOWELL ESTES NO. 2, HARRY WILSON, BACK. INDOOR INTERCOLLEGIATE POLO CHAMPIONS, 1935.

SUCCESSFULLY completing an undefeated season, the Army polo team with Cecil Combs at No. 1, Howell Estes, No. 2, and Harry Wilson, back, won the indoor Intercollegiate title on March 30th by a close victory over Yale. For the first time the tall Intercollegiate cup is at West Point, where this same team intends it to stay another year. The Army team, coached by Lt. Don Galloway, developed a strong attack early in the season, beating Cornell, Squadron A and the 112th Field Artillery teams by large scores. Against stiffer competition from Yale, Harvard, Ft. Hamilton, Penn Military College and Princeton, it developed a remarkable staying power and a powerful defense based on Harry Wilson's strength at back. Rarely did Army lead at half time, but at the end they were always 3 goals or more in front.

As a result of these impressive victories Army entered the tournament in the unusual role of favorite. The first game, with

ARMY WINS INTERCOLLEGIATE POLO CHAMPIONSHIP

Princeton, brought out the fact that the team could play the same coordinated, balanced polo in a small arena as it had played all year in the large Riding Hall at home. Princeton never threatened after the first period—and the final score, 10½ to 2, was a good measure of the relative strength of the two teams. In the semi-finals the team met P.M.C., whose No. 2, Clarence Combs, is one of the best of the indoor players. In a fiercely contested struggle, Wilson's outstanding play kept P.M.C. behind, and in the last period the Penn team went to pieces before Army's superior team play. Several goals by Cecil Combs and Estes definitely decided the issue at 9½ to 4.

It was expected that the Yale game would be tough, but no one anticipated the battle it turned out to be. Army's mounts, thanks to the work of Major Jack Thompson, proved equal to Yale's best, and the game soon developed into a riding and bumping contest. Yale's first goal came when a back shot by Combs, Army's No. 1, bounced off a horse into Army's goal. Yale pressed this advantage and at the half the score was 2½ to ½. Neither team had been able to break loose, however—the hard riding-off of every player made any sort of open play impossible. In the third period Army broke through to score twice and tie the game—and for the rest of the game the tide rose and fell as first one team and then the other gained the lead. Both teams were playing fine polo at a terrific pace. Army seemed to have a slight advantage, but 20 seconds before the end of the game Yale scored to take the lead, 6 to 5½. A few seconds later a back shot fell short in front of Yale's goal, and Howell Estes, the Army captain, drove it through—the last play of the game and Army's first championship.

IF YOU CHANGE STATIONS, PLEASE SEND
THE JOURNAL YOUR NEW ADDRESS

FIELD ARTILLERY NOTES

Visit By Chief of Field Artillery

The Chief of Field Artillery visited Fort Bragg during the recent Corps Area tactical inspection and maneuvers thereat. He left Washington on April 21st and returned on April 26th.

During the early part of May, General Birnie visited Fort Benjamin Harrison to look over the facilities of the First Battalion, 19th Field Artillery. Thence he proceeded to Chicago and visited the Headquarters of the Sixth Corps Area. From there he motored to Fort Sheridan and saw the Second Battalion, Third Field Artillery.

From Chicago the Chief of Field Artillery entrained for Fort Knox, arriving in time for the Fifth Corps Area maneuvers. At that station he had the opportunity of seeing the activities of the new First Battalion, 68th Field Artillery (Mechanized), and the First Battalion, 19th Field Artillery, the latter having marched from Fort Benjamin Harrison for the maneuvers.

Purdue University R.O.T.C. Presents Military Carnival

Moving with all the characteristic dash and precision of a veteran military organization, the Purdue University R.O.T.C. presented its 1935 Military Carnival before a capacity crowd in the university armory on the campus at West Lafayette, on Friday evening, March 22nd. More than 3,000 friends and relatives of the members of the Corps, including President E. C. Elliott, the Hon. David Ross, president of the Board of Trustees, and many other distinguished faculty members and visitors were enthusiastic witnesses of the two-hour program which demonstrated various phases of the R.O.T.C. training as well as including several spectacular special events.

To many spectators the most striking of the twelve events which followed each other with professional precision, were a demonstration of direct artillery fire by a 75mm gun against an attacking tank, and the illuminated tractor drill which was a breath-taking finale. Following a demonstration of the "command system" drill by an entire Purdue regiment which made the girders vibrate and filled the varsity cheer leaders with envy, the armory was completely darkened until sudden spot-lights picked out a steel-helmeted gun crew crouching behind the shield of

FIELD ARTILLERY NOTES



Photo by J. C. Allen & Son, W. Lafayette, Indiana

their piece at one end of the floor and an ominous looking tank in miniature advancing from the other. Sharp commands from the chief of section brought the flash and bark of the first round from the gun and a deafening explosion near the moving tank showed where the shell might have landed. Another burst from the gun and this shell crashed nearer. Round after round was fired as the tank obliqued across the arena, each burst coming closer to the target until a final detonation on the tank sent the turret flying an instant before the armory was again plunged into darkness. When the lights came on again all sign of the artillery duel had miraculously disappeared from the floor and another of the Purdue regiments was marching in with massed colors and guidons to go through its colorful marching maneuvers and parade. The comments of the spectators on the artillery firing, many expressing their apprehension that one of the shells fired might miss the tank and land in the crowd beyond, were amusing to the cadet stage hands who had laid the wires to the bombs and detonated them from behind the scenes.

The Purdue R.O.T.C. is organized as a motorized brigade of three regiments and is the largest Field Artillery unit. All the 1,500 students enrolled participated in the carnival and the 300 cadet officers in the advanced course took an active part in organizing, training and staging the show.

Changes in Personnel in Office, Chief of Field Artillery

Lieut. Colonel Robert M. Danford, who has been the Executive in the Office, Chief of Field Artillery since November, 1931, has completed his duties in that office. He has proceeded to Fort Sill to take a Refresher Course of a few weeks' duration. Afterwards, he will go on leave before sailing for Hawaii on the July transport to join the 11th Field Artillery Brigade.

The new Executive in the Office, Chief of Field Artillery, is Lieut. Colonel Lesley J. McNair, who reported for duty in Washington on April 22nd. Colonel McNair came to the office from Camp Beauregard, La., where for some months he has had command of a C.C.C. District in the Fourth Corps Area. He was detailed to the latter place while in command of the 2nd Battalion, 83rd Field Artillery stationed at Fort Bragg. Previously, he was Assistant Commandant at the Field Artillery School.

Lieut. Colonel Frank K. Ross, the Personnel Officer, will leave the office about July 1st, after four years of duty in Washington. After a short leave he will sail for the Philippines and join the 24th Field Artillery at Fort Stotsenburg.

Lieut. Colonel R. E. D. Hoyle, for the past four years head of the Department of Tactics and Communication at the Field Artillery School, will succeed Colonel Ross as Personnel Officer. Colonel Hoyle is expected to arrive in Washington about June 15th.

Major Edwin P. Parker, Jr., in charge of the Training Section, will leave the office about July 25th upon completion of four years of duty therein. At that time he will proceed to Fort Bragg, being assigned to the 83rd Field Artillery for duty.

Lieut. Colonel Allen C. McBride, for the past five years an instructor at Fort Leavenworth, will replace Major Parker as head of the Training Section. He should arrive in Washington about August 1st.

Major Basil H. Perry of the Training Section, due to his detail as a student at the Army War College, will leave the office this summer. He will probably relinquish his duties about July 15th.

Major Louis E. Hibbs, now on duty with the 6th Field Artillery at Fort Hoyle, will relieve Major Perry in the Training Section. He is due to report in the office before July 1st.

FIELD ARTILLERY NOTES



Field Artillery Dinner

The sixth annual Field Artillery dinner for officers and their families in and near Washington was held on Friday evening, April 26, at the Army and Navy Country Club. The club was appropriately decorated for the occasion. Before a background of the coat of arms of each regular regiment of Field Artillery, Major General and Mrs. Birnie, assisted by Colonel and Mrs. Walter D. Smith, Lieutenant Colonel and Mrs. L. J. McNair received the one hundred and sixty-four guests of the evening.

The design on the place cards shown above, drawn by Major S. LeRoy Irwin, depicts the Field Artilleryman with a new means of moving Artillery into position.

Reconstitution of Inactive Unit

The 77th Field Artillery, less 1st and 3rd Battalions, will be reconstituted at Fort D. A. Russell, Marfa, Texas, on or about September 1, 1935. This regiment will be armed with the 155mm howitzer. Its strength at Marfa will consist of 19 officers and 515 enlisted men. The 2nd Battalion, 77th Field Artillery, was made active on December 1, 1934, at Fort Sill, Oklahoma. The reconstitution of this unit completes the active units of the 4th Field Artillery Brigade to a strength of six active battalions which is comparable to that of the 2nd Field Artillery Brigade.

Autogyros

For various reasons the purchase of autogyros anticipated in the FIELD ARTILLERY JOURNAL of July-August 1934 has not yet been made. It is hoped that these will be procured in the near future.

An interesting demonstration of the autogyro was held recently at Bolling Field. The Chief of Field Artillery, members of his staff, and other field artillery officers stationed in the vicinity of Washington were particularly interested. General Birnie and numerous other officers were taken up and looked into possibilities of the autogyro for observation of fire, and for reconnaissance. Due to its slow speed, it appears practicable to fly at very low altitude, 20 to 30 feet above the ground, and make a reconnaissance for battery positions and routes, such as might be made by the commander of a truck-drawn battalion with much more facility than by reconnaissance by car or motorcycle.

EXTRACTS FROM REVUE D'ARTILLERIE, FEBRUARY 1935

"The soundness of the autogyro principle is no longer questioned. Certainly, the present types have given satisfaction. New types are under study. Though those developed to date have not the power and speed of airplanes, they have important advantages over them in that they can take off and land almost vertically, can fly low and at a much lower speed than airplanes.

"At the present time the use of autogyros can be forecast without further development in the principal government services: police, postal, public health, etc., as well as for national defense.

"The autogyro is particularly adapted for naval use in that it requires only a very restricted space for landing or taking off and catapults or take-off bridges are unnecessary."

* * *

"As to aerial photography————— Thanks to its possibility of very slow flight, it permits taking pictures of clearer definition. —————Time of exposure can be increased ten times. ————— This is of particular value for night photography."

"Autogyros have been tested in maneuvers in several armies. Following the British maneuvers, La France Militaire of May 2, 1934 summed up some interesting results as follows: A division

FIELD ARTILLERY NOTES

commander, thanks to the autogyro was able to observe personally ahead of his different columns and to give orders direct to column commanders: it was also found possible to fly along the column, to transmit orders and information and to receive reports while in flight. In this regard it is noted that autogyros are in no way hindered by road congestion as are automobiles and motorcycles which are tied to the road. On the ground the rotor blades can be folded back. The machine occupies little space and is difficult for hostile aviators to distinguish."

* * *

"In France, rights of manufacture have been acquired after tests by Liore and Olivier Company. Tests by the Navy gave equal satisfaction. In Germany the firm of Focke-Wulf has acquired the rights and started manufacture of La Cierva autogyro.

"Sweden has ordered six autogyros in England and has applied for manufacturing rights.

"Spain is taking steps to purchase several machines.

"Russia has started active manufacture."

EXTRACTS FROM REVUE D'ARTILLERIE, MARCH 1935

"ENGLAND—*Reconnaissance by autogyro.*

"Some very interesting tests are foreseen in the British Army in 1935.

"In the latter part of 1934, six machines were delivered to the Old Aviation School as part delivery of a lot of one hundred.

"Objects of these tests—1. Use for location of objectives, and for observation and later for conduct of fire. It is not expected that it will replace the airplane for observation beyond the lines.

2. Use for transport of staff officers, and as a means of communication.

"Two of the machines delivered were painted with a view to camouflage.

"Others were equipped with radio sets and are to be used at the artillery school for experimentation in observation and conduct of fire.

"Two machines were placed at the disposal of the chief umpire in the last grand maneuvers and were found quite satisfactory.

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"These machines are two-seaters, powered with 140 horsepower engines. Larger ones are under manufacture; one accomodating four or five passengers is to be tested early in 1935.

"RUSSIA—A new autogyro. The new Russian machine is a two-seater. Has a capacity for 2½ hours flight, a maximum speed of 95 miles an hour, a minimum speed of 25 miles per hour, a ceiling of 10,000 feet; requires 55 yards to take off and 6 to 8 yards to land."

The Spirit of Yesteryear

"The artillery, however, presented a more noble aspect. These men, trained in the ways of honor, and with the pride of their school in their hearts, kept the stragglers and common soldiers away from the guns. Here, when a horse fell it was replaced by one taken from one of the officers' private carriages or from a wagon. At any cost the guns would not be left behind. When horses failed, the men harnessed themselves to the lighter pieces, bound the ropes about their arms and chests and dragged on.

"The cossacks following the rear noticed this and feared to make an open attack upon so courageous and desperate a crew."

From description of Napoleon's retreat from Moscow in "Coronet" by Manuel Komroff.

155mm Howitzer Modified for Towing by Truck

The 155mm howitzer batteries of the Regular Army have all been equipped with trucks as prime movers. To enable the howitzer to be towed at speed, the carriages are being modified by providing pneumatic tired wheels equipped with air brakes connected to the truck brake system, and by the attachment of a lunette to the end of the trail, thereby eliminating the limber. Issue of these modified carriages will probably start in July and be completed for active units during the next fiscal year.

BOOK REVIEWS

ROBERT E. LEE. By Douglas Southall Freeman—Time undoubtedly will show that these four volumes form the greatest biography ever written about General Robert E. Lee. For twenty years the author has been making research into ever possible source for new information and for substantiation of old. The first two volumes deal with the history of Lee and the Civil War to include the death of "Stonewall" Jackson at Chancellorsville. The remaining two volumes carry forward the tide of the Confederacy from "the high water mark" at Gettysburg's Cemetery Ridge to the ebb at Appomattox. Five years remain to Lee after the surrender before he gives his last command "Strike the tent." Through these four volumes is shown the life work of him who was General and "Ol' Marse Robert." Published by Charles Scribner's Sons. Price \$3.75 volume, four volumes, boxed, \$15.00 (less 10 per cent if ordered through the Field Artillery Association).

ORDEAL BY FIRE. By Fletcher Pratt—A breezy history of the Civil War by a master of battle field description. Strategy and tactics are mixed in understandable portions capable of being swallowed with a laugh. Like Mr. Pratt's first book "Heroic Years," this history is written in a style certainly different. A history you will enjoy and remember. Published by Harrison Smith and Robert Haas. Price \$3.00 (less 10 per cent if ordered through the Field Artillery Association).

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