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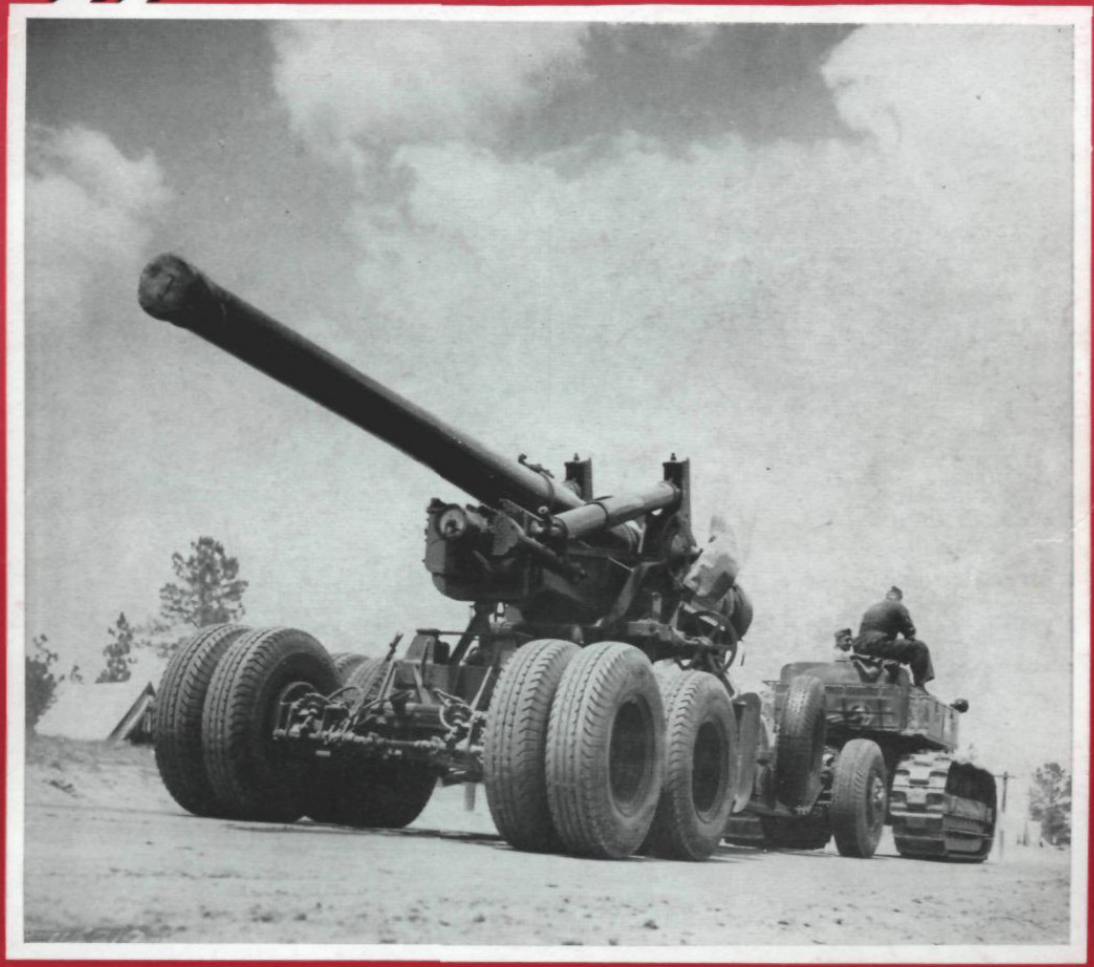

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Panzers Across the Meuse

APRIL, 1941

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BRITISH SERVICE JOURNALS indicate that their artillerymen are completely cynical concerning prospects of obtaining aerial observation (including adequate photography) from the R.A.F. Consequently they are much interested in the "flying OP"—a light plane manned by artillerymen. Major Ford discusses this problem from our viewpoint in *Wings for Santa Barbara*. Interest in this subject is enhanced by the presence at Sill of two light commercial planes, an Ercoupe and a Stinson, which are being tested in comparison with a new observation ship of more conventional military design.

A QUICKENING INTEREST is manifest in military circles over the recent definite news that the German Panzer units not only exploited the breakthrough on the Meuse, but also *created* it. And, as Soldan and others have said, "the influence of air power is simply overwhelming." We must not allow this to send us off on a tangent. Note how the organic infantry-engineer-artillery teams of the armored divisions forced the river crossing. Note also how the organic artillery of these divisions supported the continuation of the attack. It is true that huge masses of heavy artillery played no part in this operation as they did in the World War. But they were used elsewhere; for example, on the Aisne and at Colmar on the Rhine. We should also bear in mind the fact that at Sedan the Germans had complete air superiority. How would the absence of this have affected von Kleist's plans and actions? What would the effect have been if the stuka action, instead of demoralizing the defenders as it did on the Meuse, merely stiffened their spirit as it did the British in the retreat to Dunkerque and in London? No one denies the great influence of armored units and air force. But in the properly balanced force, *all* arms have an important role. Which is momentarily dominant will depend on the theater of operations, the relative composition and strength of the opposing forces, and upon many other elements.

ATTACKS ON, or defense of, a river line will occur often in modern war in all theaters except, perhaps, desert country. We should study such operations, and practice them *with troops* in our maneuvers.

IN AN EARLY issue we will present another account of Panzer action, which goes into considerable detail and gives a better idea of how important is the support of the organic artillery of an armored division.

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PANZERS ACROSS THE MEUSE

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A modern example of an attack against a river line

Von Kleist's forcing of the Meuse near Sedan in May, 1940, was of such far - reaching significance that it doubtless will long be studied as a classic example of a penetration followed by a complete breakthrough. It can be used to illustrate many other phases of warfare, such as air support of ground forces, employment of armored units, control of large motor columns, use of pioneers, supply, logistics, and so on. Since the strategic aspects of this great battle have already been discussed in this magazine, we shall not repeat them but shall use the operation more in detail to illustrate an attack against a river line.

It is not claimed that what is presented is, even yet, a complete or wholly accurate picture. The excuse for disclosing data piecemeal is the undesirability of waiting until the event has become merely an historical example. It is felt that the average reader desires more timely lessons.

GENERAL

The Command and General Staff School text, *Special Operations*, states that an attack against a river line consists of three phases:

a. The preparation for the crossing.

b. The operation of actually crossing.

c. The continuation of the attack, to obtain possession of the controlling terrain on the defender's side of the river.

We shall divide our discussion generally into those three phases.

THE PREPARATION

The preparation for the breakthrough on the Meuse began long ago—as early, at least, as the forging of the armored units which accomplished the task. Just when the German High Command made the decision to abandon the von Schlieffen Plan, and crack the French line at the hinge instead of turning its flank, may never be known. But on the day that this decision was turned over to the general staff for detailed study, the preparation commenced in earnest.

In tracing these preparatory steps, one should mention the design and production of German tanks, armored cars, cannon, and pioneer equipment; the tests afforded by the marches into Austria and Czechoslovakia; and finally the full-dress rehearsal of the Polish campaign. Subsequent to the latter, doctrines were re-examined, methods perfected, faulty equipment replaced, additional materiel built, and new units organized and trained. For the Germans, at least, there was no longer any lingering doubt that air forces could render effective close support to ground units, especially to armored columns. Plans for such cooperation were extended and applied specifically to the projected assault on France.

The six-months' training period which followed the capitulation of Poland must have been a strenuous one. There was much to be accomplished. Selected units which were to participate in the Meuse breakthrough had to be sent to the Pioneer School on the Elbe River for an intensive course in river crossings and reduction of fortifications. Thousands of motor-vehicle operators had to be trained to drive in column over winding, dusty roads, often two abreast on routes designed for single-lane traffic only. All men had to be so skillful and resourceful that minor breakdowns or ditched vehicles could be cared for promptly and thus not serve to delay the whole column. The commanders knew that once the advance commenced it must continue on almost split-second timing; readjustments then would be too late.

Several times during the winter of 1939-40 the German divisions were ordered forward toward the western frontier, ready for combat. Each time they were halted before they crossed the line. These were dry runs executed for training purposes; and also were designed to

confuse the Allies. According to Lieut. Col. Soldan,[1] "This six-months' preparatory training was a time of such psychological tension for the troops concerned, that the order for them actually to cross the border might almost be said to have given them a sense of relief."

RECONNAISSANCE

The C and GSS text (previously referred to) states:

> Prior to the advance to the river the commander announces a tentative plan based essentially on a map study assisted by such other information as has been secured. Before announcing his plan, the commander may make an air reconnaissance of the area under consideration. The purpose of announcing the plan at this time is to direct early reconnaissance toward a definite operation. The plan must be modified from time to time as results of reconnaissance are reported and recommendations are considered. This reconnaissance phase is the most important part of the operation.

The general plan of the German Army for the first phase of the Battle of France[2] was: "To break through the enemy fortifications south of Namur, thus preparing the annihilation of the English and French armies north of the Aisne and Somme Rivers. In addition, the simultaneous occupation of Holland was to eliminate it as a base for possible British land and air operations against the north flank of the German Army." At least this much of the plan must have been transmitted to that section of the general staff charged with the detailed planning of the operation, to permit them to direct their reconnaissance in the right channels.

To begin with, there was available a great quantity of terrain data, including large-scale maps. The historic Sedan area was well known to the Germans. What they needed now was a list of changes, if any, in the character of roads and bridges; and above all specific information concerning French and Belgian fortifications. Aerial reconnaissance, especially photography, doubtless was employed intensively during the winter of 1939-40. The only other source available was espionage, since Germany and France had no common frontier in this area. Espionage cannot be relied upon fully; consequently the Germans were not completely sure of the strength of the fortifications along the Meuse and in Belgium. Their plans were drawn up so as to provide elasticity in case of unforeseen contingencies, and allowed considerable latitude to field commanders. Nevertheless these commanders were provided with ample means to deal with such defenses as were known, with a comfortable margin of safety. There seems to be little doubt that the results of the reconnaissance enabled the Germans to build reasonably accurate facsimiles of the Belgian and French fortifications within their own country, or in occupied Poland, on which they tested methods of assault and rehearsed their troops.

SURPRISE

Surprise in this campaign was generally strategic rather than tactical. Press reports have indicated that the French were completely misled, by the German attacks in the Low Countries, into thinking that the main blow was coming on the north. This is unjust to the Intelligence Section of the French General Staff, who realized as early as nightfall on May 11 that the main effort was directed at the Sedan area. But the French High Command simply could do nothing then to remedy the situation. It was too late to regroup, too late to recall their First and Seventh Armies which were dashing gaily forward into Belgium. Neither could they withdraw any considerable force from the Maginot Line. There was pressure along the entire front.

All this does not mean to imply that there was *no* tactical surprise; for such existed in the speed with which von Kleist's armored column advanced, and in the fact (as will be elaborated upon later) that the Germans supported the river crossing with masses of dive bombers, thus obviating the necessity of waiting for heavy artillery to come up.

But the French were still thinking in terms of World War time schedules and methods; this despite the more recent lessons of the Polish campaign. To many, the whole French plan appears anomalous. After spending billions on a fortified line and training their army for static defense based on this line, as soon as they were attacked they sent their best troops out in the open plains of Flanders to fight under conditions for which they were neither trained nor equipped. But in fairness to the French military leaders it should be stated that we are insufficiently informed to be able to determine with certainty the degree of culpability which must attach to the French High Command. Political leadership must bear its share of the blame. Raymond Recouly, in *Gringoire*, says bitterly, "The authors of this crime (France's weakness) are, to be sure, rather numerous." He then goes on to name the principal "criminals": Pierre Cot, Blum, Daladier, and La Chambre.

Then, too, it must be remembered that the French did not propose to violate Belgian neutrality; for this reason they had been unable to make proper provisions for strengthening the Belgian defenses in the Ardennes. They had hoped to have from five to seven days in which to rush forward into that area with previously collected materials, and there construct defenses of a temporary character within the forests. With this assistance they hoped to fight a delaying acion back to their main position on the Meuse. As it turned out, the Germans gave them not seven days, but two.

Also, the advance of the French and British armies into Flanders was designed to permit the Allies to use

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[1] Prominent German military commentator, in "Der Durchbruch uber die Maas am 13 Mai," *Deutsche Wehr*. No. 5/52, 1940.

[2] As quoted in Memorandum of German General Staff, *Merkblatt zum Unterricht*, No. 7, July, 1940, which gives the general chronology of the campaign. Incidentally, it is believed that this general objective has not previously been published in the U. S. Press. Col. Soldan indicates that the Germans were influenced to make this decision in part, at least, by published writings of a certain French general which showed that the French considered the Ardennes area to be wholly unsuited for military operations. Thus the Germans knew that surprise

the strength of the Belgian line of the Albert Canal (based on Fort Eben Emael) and the reinforcement of the Belgian Army, to hold the Germans as far east as possible from the French frontier, until the enemy main effort had been located and reserves massed to meet it. Here again they were discomfited by the rapid reduction of Emen Emael and the forcing of the Albert Canal.

GERMAN ORGANIZATION

The armored column selected for the main effort on the west front was commanded by the cavalry general von Kleist, who already had distinguished himself in the first breakthrough of the southern wing in the Polish campaign. His army was part of von Rundstedt's group.

Von Kleist arranged his column in several successive waves, in accordance with German tank doctrines which call for attack in successive waves to give sustained power. The leading wave consisted of Guderian's and Reinhardt's armored corps, Guderian's on the left. Both these officers had served brilliantly in Poland at the head of armored units. Guderian, who sometimes is called the father of the German Panzer Corps, on account of his years of effort in its development, was selected to make the main effort—the breakthrough near Sedan. His corps, consisting of two armored divisions and one motorized division, advanced with the two armored divisions abreast, 1st Division on the left.

The whole force contained 45,000 vehicles. There are 3,000 vehicles in an armored division. Hence if we make allowance for corps, army, and supply units, it may be deduced that von Kleist had seven or more divisions. Although in May, 1940, the Germans had ten armored divisions, not all were assigned to this group; however, von Kleist is believed to have had at least five of them.

Designated to cooperate with and support von Kleist was General Sperrle's Third Air Fleet.

While official German tables of organization have never been made public, sufficient of the organization of an armored division has appeared in the foreign press (notably in a recent issue of *The Tank*, London) to permit us to say that this unit contains some 14,000 officers and men, and is organized into three echelons, as follows:

Reconnaissance echelon
- Motorized reconnaissance battalion (50 armored cars)
- Motorcycle company
- Supporting troops, possibly some pioneers

Shock echelon
- Tank brigade of some 450 tanks

Ground-holding echelon
- Motorized infantry regiment
- Regiment of 105-mm. howitzers (2 battalions)[3]
- Antitank battalion
- Motorized Engineer battalion
- Signal unit

The German motorized division contains:
- 3 infantry regiments
- 1 reconnaissance battalion
- 1 antitank battalion
- 1 divisional artillery
  - 1 regiment of 3 battalions of 105-mm. howitzers
  - 1 battalion of medium cannon, having:
    - 2 batteries 15-cm. howitzers
    - 1 battery 105-mm. guns
- 1 pioneer battalion
- 1 signal battalion

The order of march of an armored division might vary greatly with the situation. Illustrated in *Signal* (Berlin) is a division in single column. The tanks are in the lead. followed by an antitank unit, then the artillery, the motorized infantry, motorcyclists, signal unit, engineer unit with ponton train, finally the supply train. It is known, however, that motorcyclists and pioneers are frequently in the most advanced echelon, and that whether tanks or infantry leads depends on which is to open the hole in the opposing line. German methods and formations are very flexible. There is no "normal" way.

Of interest is General Guderian's method of exercising command in the field. His headquarters is divided into two echelons. The rear one (headed by the Chief of Staff) contains the larger part of the staff, and remains in fairly quiet places to study situation maps, work on orders, and to act as a clearing house for the flow of information to and from the front. The forward echelon of headquarters is led by the general himself (he is the "outside" man) in a small cross-country car. Apparently Guderian sits in the front seat of this vehicle, which he frequently drives himself. With him are two staff officers and an adjutant. Following are two aides in motorcycles with side cars; then two or three messengers on solo motorcycles; and finally the armored wireless truck or CP—an open armored vehicle equipped with radios, map tables, etc. Guderian used this car throughout the Polish campaign. With this small circus he spends his time up at the very front, circulating back and forth between his subordinate units.

THE FRENCH

The Swiss analyst, Colonel Daniker, who states that his data is obtained from a French article (*Candide*, December 25, 1940) based on official sources, sketches the French defense organization as follows:

The North Army Group, Gen. Billotte commanding, contained, among other armies, the Second Army of Gen. Huntziger and the Ninth Army of Gen. Corap. The boundary between these two armies was somewhere near Sedan, in other words about at the point of the main German attack. The Ninth Army was pivoted around Mezieres and was charged with conducting a defensive battle along the Meuse from Mezieres to Namur. To the right of that area there remained the Second Army on the Chiers and on the Meuse from

[3] Recent German articles hint that there are also some 105-mm. guns or 15-cm. howitzers in the Panzer division.

General Guderian in his armored CP

Longuyon as far as Sedan, inclusive. In the Ardennes, in front of the Meuse line, was a body of special Belgian chasseurs, trained to execute delaying action. The French planned to reinforce these with cavalry, as indicated below:

The 2d Cavalry Division, the Independent 1st Cavalry Brigade, and the 5th Cavalry Division were held in readiness in the area before the Second Army, whose location is shown on the map herewith. In front of the Ninth Army were the 3d Spahi Brigade and the 3d and 4th Cavalry Divisions. Thus, not counting the Belgians, there were the equivalent of five cavalry divisions in the Ardennes; under ordinary conditions quite a respectable delaying force. The trouble was, their opponents, the Germans, were completely armored and motorized, and had a powerful air fleet in instant attendance. The French and Belgians had only horse cavalry, with some light armored cars. The Allies had thought that this terrain was unsuitable for tanks. They were wrong.

The French defenses along the Meuse were much weaker than the Maginot Line, since they were relying on the natural defensive strength of the Ardennes and of the river obstacle. Nevertheless along this "Little Maginot Line" was a double line of pill boxes, wire, obstacles, and mine fields. In the vicinity of Sedan and Mezieres these works extended to the north side of the river, forming defended bridgeheads.

THE ADVANCE TO THE RIVER

May 10

Von Kleist's column lined up at the Luxemburg border ready to move out at 5:30 AM, May 10. Five minutes later special detachments of motorized pioneers crossed the border to dispose of road blocks. Aside from these obstacles built across the highways at defiles and at bridge approaches, Luxemburg offered no opposition to the German advance. Here again the careful German pre-visualization of the problem was manifest. The obstructions were of concrete and steel, and firmly anchored. Since even medium tanks could not push these blocks out of the way (as they often did with less firmly established obstacles), and since it would tear up the roads or bridges to use demolitions, the German pioneers had prepared ramps and platforms with which they bridged the obstacles. Nearly two hours were required to complete this work on the routes used to traverse the duchy, after which the armored divisions sped on through to the Belgian border.

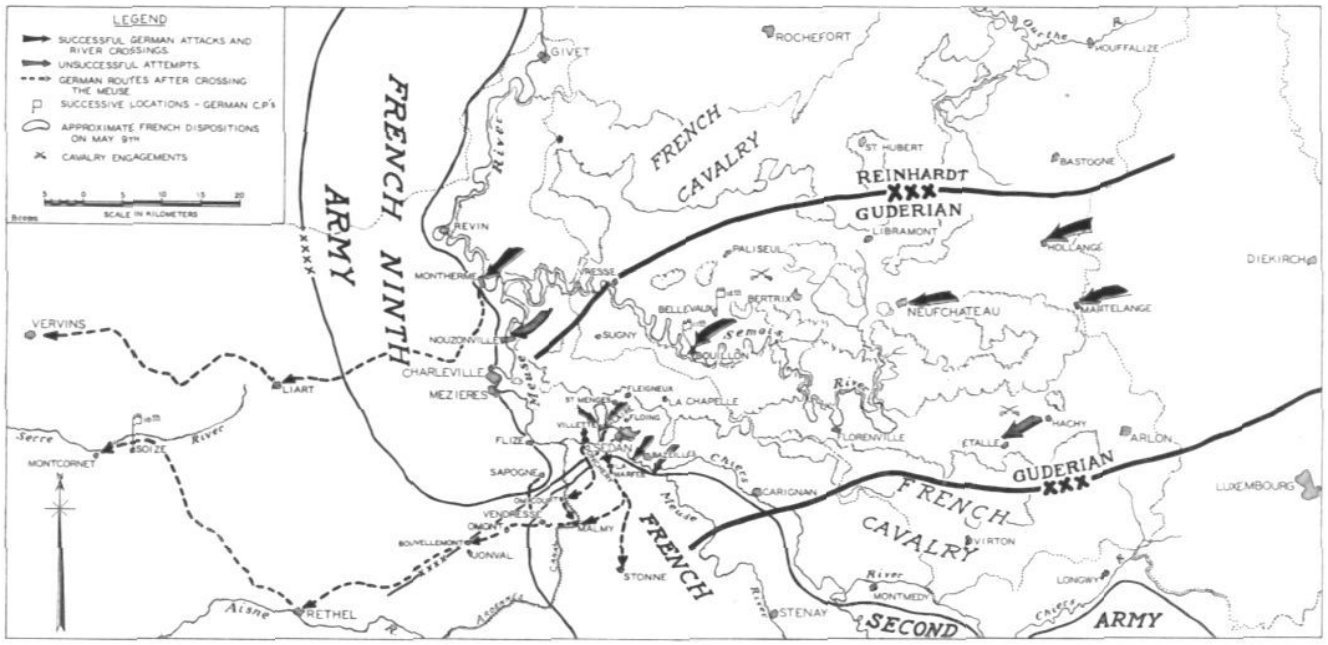
The initial rate of march of 20-25 miles per hour was not maintained after entering Belgium. The Belgian chasseurs offered some resistance; and various other things slowed down the advance. The wooded, hilly terrain was itself an obstacle. Roads were blocked by fallen trees or other improvised means which had to be removed even if undefended. Occasional mine fields had to be located and dug up. Bridges over minor streams had to be strengthened; or, where destroyed, they had to be rebuilt. The first day's objective was the line: Libramont-Neufchateau-Virton, where it was anticipated that strong resistance would be met. The French cavalry was moving east and north to make contact; that of the Second Army had an encounter with the Germans that afternoon. Evidently some of the Germans, perhaps motorcyclists, reached the Etalle-Neufchateau road. The French 2d Cavalry Division attacked them in the extensive forest clearing of Arlon-Florenville. In a battle which lasted from late afternoon until dark, in which the French suffered heavy losses, the Germans were thrown back to the vicinity of Hachy. Other German columns reached Martelange and Hollange that evening.

The 5th Cavalry Division, also part of the Second French Army, advanced its main body as far as Libramont.

The major part of the cavalry of the Ninth Army only reached the Meuse, with advance detachments as far as the Ourthe. Further movement was difficult because the Belgians had destroyed the bridges. This did not delay the Germans greatly, but it certainly hampered the Allies, who were not so well provided with pioneers and pioneer equipment.

Since the left flank of the 5th Cavalry Division had

A fen minutes before the big attack: General Guderian giving final orders to his divisional commanders.



been left in the air at Libramont by the failure of the cavalry of the Ninth Army to come up abreast, General Corap received orders that night to have his cavalry advance toward Marche-Rochefort as quickly as possible.

During the evening of May 10 a German air report was made to Guderian that French armored units were at Carignan, thus threatening his left flank. Others were approaching from Montmedy and Longwy. Guderian issued orders for part of his force to meet this threat in the morning, but at daylight it was learned that the reports were false. The French units observed were part of the cavalry of the Second Army.

May 11

On the morning of the 11th, the 3d Spahi Brigade (Ninth Army) had made contact on its right with the 5th Cavalry Division (Second Army). The 1st and 4th Cavalry Divisions had reached the region lying to the north and northwest of St. Hubert. These latter divisions were not in contact with the Germans of Reinhardt's corps on this day. However, the 5th Cavalry Division and the 3d Spahis were attacked near Libramont and Neufchateau at 11:30 AM.

Von Kleist, considering that Neufchateau was a defile, had issued orders to take it by envelopment. But the leading tanks dashed into the town and took it by surprise. There was a violent battle in the forest clearing of Bertrix-Paliseul; "again and again the dive bombers flung themselves upon the enemy and opened the road for the countless numbers of motor vehicles that were making their way with noisily laboring motors through this forested region of hills and mountains."

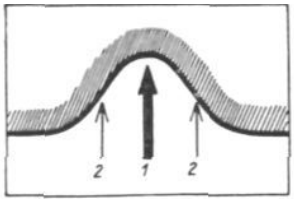
The cavalry of the French Second Army was thus forced back to the Semois River, which they crossed at 5:30 in the evening, blowing up the bridges. Advance units of Guderian's 1st Armored Division occupied Bouillon at once. The Germans were in high spirits; they had made up the time lost on the 10th.

The cavalry of the Ninth French Army now, in turn, felt exposed by the withdrawal on their right. Although they had not yet been in action, at 10 PM Gen. Corap ordered them to withdraw toward the Meuse. This movement commenced at 2:00 AM, the main bodies of the divisions leaving a covering shell of cavalry and light machine guns.

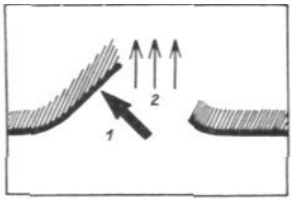
May 12

The Semois is a real tank obstacle. Its extremely irregular course winds through a deep gorge, heavily wooded on both sides, and intersected by numerous tributaries. At Bouillon the valley is wider; here the river runs through the town, where the bridge had been destroyed by the retreating Allies. After a fairly quiet night, Guderian's troops attacked Bouillon rather late, at 7:45 AM. The motorized infantry of the 1st Division made the assault, supported by the organic artillery, by dive bombers, and pioneers. The latter found a ford fifty yards downstream from the ruined bridge. After fire from defending pill boxes had been silenced with direct fire from antitank guns, antiaircraft guns and artillery firing at pointblank range, the advance infantry commenced crossing at the ford. Following them were some tanks, then more infantry in trucks. Meantime motorcyclists were being ferried across in rubber boats. Guderian and his staff watched the operation from the north bank. The engineer battalion of the division immediately commenced building a bridge. Soon a few French planes appeared and bombed the bridge ineffectively.

The infantry pushed straight south after the retreating Allies, followed by the corps commander who several times came under fire from pill boxes which had been passed up by the leading wave. The Germans, in their



Sketch 1



Sketch 2

Graphic comparison of the German attack of March 21, 1918 (Sketch 1) with that of May, 1940 (Sketch 2). In the former, the German Second Army was pushing at about a right angle into the straight-line front of the enemy. Both shoulders of the penetration had to be protected. In May, 1940, a new idea was inroduced (Sketch 2). The first thrust was made diagonally from a wing. What ordinarily is a secondary action for protection of a breakthrough here became the main effort. It is like opening a door, then propping it open while the main forces in rear sally forth to complete the annihilation. The principal condition for success is surprise and swift execution—made possible in this case by motorization.

headlong rush, never permitted themselves to be delayed by stopping to mop up islands of resistance; these were left to following units.

Reinhardt's northern corps also met resistance on this morning. General Rommel's 7th Panzer Division attacked an intermediate delaying position north of the Meuse. Covered by motorized field artillery the French cavalry withdrew behind the Meuse, destroying the bridges. By 2:00 PM all French units were south of the river.

Col. Soldan describes the fighting on this day as follows:

"By noontime General Guderian had taken all the defiles as far up as Vresse. On a broad front other detachments were pushing forward through the Ardennes, following behind him. A hunt was made upon the special Ardennes chasseurs, and upon the Spahis and white French troops, who were caught pell-mell as they were making isolated attempts at resistance, and were trying to escape from these mountains, which had come to seem uncanny to them with lurking dangers, amid the constant crackle and deafening detonations of backfire from the German motor vehicles.

"By evening a number of German motorcycle sharpshooters had advanced far enough to be the first to reach the southern edge of the mountain range and look down on the valley of the Meuse. Above them in the forest, especially through the countryside near Vresse, tired German soldiers stretched their weary limbs for a short rest."

The French were even more tired than the Germans, for they had been moving on foot and on horseback, whereas the Germans were completely motorized. As a result, the Germans had kept up with them continually after contact was made; the hoped-for delay had not been secured. On the left wing of the Ninth Army, only the advance elements were arriving on the Meuse. Since this army was pivoted about Mezieres, the northern divisions had a considerable march to make before they arrived on line.

In the Sedan-Mezieres area, the units of the Second and Ninth Armies were already in place, and had been there for nine months. However, they probably expected the Germans to halt and close up their columns for a coordinated attack.

Guderian realized that if he attempted to cross on the 13th he would be faced with the disadvantage that his full strength would not be up. Much more time would be needed to bring up heavy artillery, far behind on clogged roads. At least another day would be needed to assemble supporting infantry of following motorized divisions, also far to the rear. Even as late as the 13th the German column was so strung out that its tail was still on the Rhine near Coblenz when the head was crossing the Meuse.

These disadvantages were outweighed by the presence of the supporting air fleet. And the Germans never hesitate to make a piecemeal attack if surprise can be gained thereby.

Guderian decided to force the crossing of the Meuse the following day—Monday, May 13th.

That night, while working at his CP at Bouillon on orders for the following day's operation, he was bombed out and forced to move his headquarters to Bellevaux.

THE CROSSING

Selection of the Crossing Fronts

Near Sedan the valley of the Meuse is over a mile wide, the unfordable stream being about 75 yards wide with a current of medium swiftness. The banks rise fairly sharply on the south to a height of some 500 feet above the river. Here the countryside is the ordinary French rural district, with extensive fields of grain, occasional small copses, a few farms, here and there a village. It is not unfavorable for tank action. The north bank is of similar character for a distance of 4,000 yards; then it becomes densely wooded, much rougher, and rises another hundred feet to the ridge between the Meuse and the Semois.

Farther downstream, in the vicinity of Mezieres and beyond, the river valley deepens until it becomes a gorge with vertical banks 300 feet high.

Col. Soldan states some of the considerations governing the selection of the crossing sites:

"It was a fairly well-known fact that the Meuse constituted a continuation of the Maginot Line proper, and that the French had created special obstacles there by constructing various types of defensive works. The region most worth considering for the purpose of a crossing was the stretch of river from Mezíeres to Bazeilles. Bridgeheads had been built by the French near Mezieres and Sedan; that is to say at these two points there were extensive defensive works pushed forward from the east bank of the river, while elsewhere the fortifications, inclusive of two strongly developed lines of pill boxes, were located on the western bank. The presence of a canal, the Ardennes Canal extending southward (from a point near Donchery) might have suggested crossing near Mezieres, so as to avoid the necessity of crossing a canal after crossing the river. In that event the canal would have caused the attack to swerve to the south, although the general direction of the movement was to the west. It must have seemed fairly obvious, on the other hand, that crossing the river would be relatively easy in the neighborhood of Donchery and Bazeilles,

The valley of the Meuse with Sedan in the background. This World War photo gives a good idea of the terrain where the Germans made their main crossing in May, 1940. In the foreground is hill 260, with 1918 wire and trenches visible. Across the river is Sedan; crossings were made to the right and left of the town, near Bazeilles and Glaire-Villette. This view, taken from the south bank, shows that the country is not unfavorable for tanks. The distant hills across the river, however, are more rugged and their summits are heavily wooded.

since the northward curve of the river between these points would offer a number of advantages (enfilade of the French positions)."

It was decided that Guderian would cross with his 1st Division at Bazeilles and Sedan, and his 2d Division at Glaire-Villette and at Donchery. Reinhardt was to cross at Monthermé and Nouzonville. Guderian was making the main effort. Evidently it was considered that the crossing sites on his front were more favorable than those further north.

The Crossing

On May 13 the Germans debouched from the woods north of the Meuse and worked their way toward the river. Roads had been mined, and movement off the roads was scarcely feasible in this area. Pioneers removed most of the mines, but now and then they missed some. Guderian narrowly escaped destruction, when his staff happened to notice that a small bridge which they were about to cross was mined.

Within 8,000 yards of the river the advance came under long-range but accurately adjusted artillery fire from the south. From this point on until the actual crossing, and even afterwards for another day, the backbone of the French defense seems to have been artillery fire. The French were still fighting a delaying action. Exception to this, of course, was in the machine-gun fire from pill boxes, especially along the river. But this was strictly static defense.

Some time before noon the 1st Armored Division CP moved to a point near Fleigneux, and the 2d Division CP to Sugny. This gives an idea of the progress of the action. Guderian hurried back and forth between his two divisions, not interfering with their actions, but keeping them informed of the situation. He also kept in constant touch, by radio, with his chief of staff at the rear echelon.

Soldan says:

"Beginning at noon, aircraft started a systematic bombardment of the enemy's defensive works, according to a plan carefully concerted in advance with General Sperrle. Attacking ceaselessly for a period of four hours, hundreds of planes threw a heavy cover over the enemy forces. Under the protection of this bombardment the German artillery worked its way to the front, while advancing detachments made their way close to the river, carrying with them whatever equipment they would need for the crossing."

During this approach the Germans employed the technique for reducing fortifications which by now has been fairly well publicized. In addition to the action of dive bombers, antitank guns, field pieces, and antiaircraft artillery were brought up at short range to pulverize pill boxes. Pioneers removed mine fields or detonated them. Medium tanks, which mounted cannon, were brought up to the river's edge to subdue fortified machine-gun positions on the opposite bank. Under cover of all this, two engineer battalions which had spent the night at Bouillon (so as to be near the front when the final dash was made) trucked their pontons and other bridge material to the vicinity of the crossing sites at Menges, Floing, and Bazeilles. Hundreds of light rubber rafts and boats for ferrying were carried forward to concealed places near the water.

An eyewitness account written by a member of Guderian's immediate staff[4] gives a colorful picture of the fighting during the afternoon:

"We set off again at 3:30 PM. It is impossible to pass the center of La Chapelle. The road is full of holes and has been rendered impassable for vehicles by artillery fire. The French have been shelling the town since morning. The General leaves the car and indicates a place to the right of the road for parking under cover his cross-country car, the radio armored car, and the motorcycle messengers. We now proceed

[4] *Signal*, No. 2, 1941.

on foot and are obliged to hurry. It has been decided to commence directing artillery fire against the enemy positions on the Meuse at 4 PM; and strong units of bombers and dive bombers have, moreover, been ordered to take part in the attack on the line of fortifications. Making our way across the debris and ruins, we arrive at a path which leads through the houses and meadows to the heights on the southwest fringe. It is there that the advanced artillery observer must be. We slowly make our way forward through the dense foliage on the heights. . . . . An interesting spectacle! The artillery forward observer occupies a position in a camouflaged shell hole a short distance ahead of us and is looking through his field telescope. The radio for communication with the guns is a few yards in rear of him. We have a wide view of the broad valley of the Meuse and as far as the heights rising towards the south. The shells whistle directly over us and to our right and left. Squadrons of bombers and stukas appear in the sky. Everything goes off to the minute. Formations of Messerschmitt fighters for the protection of the bombers are speeding in all directions, and columns of smoke grow like mushrooms in and behind the enemy positions into the grey of the afternoon."

At 4:00 PM the infantry and engineers ran down to the bank, threw their boats and rafts into the water and started across. The army group commander, Generaloberst von Rundsted, watched from the shore.

In spite of the heavy bombardment, the defenders' fire was not silenced. Machine guns and artillery opened up on the speckle of little boats that suddenly appeared on the river. Many were sunk, but others reached the shore. At once the specially trained pioneers and infantry in the leading waves rushed forward to the pill boxes, using machine guns, antitank guns, flame throwers, grenades, and demolitions to reduce these works. It is believed that the pioneer units suffered losses as high as from 30 to 60 per cent during the afternoon's operation. But a toehold was obtained. The crossings at Glaire-Villette and between Bazeilles and Sedan were successful. The two flank crossings—above Bazeilles, and at Donchery—were repulsed by heavy flanking fire on the river.

At five-thirty the engineers began to construct a 16-ton bridge at Glaire-Villette, and at six-thirty they were moving tanks and other heavy material[5] across the river on a 16-ton ferry powered with motor boats. By midnight they had completed the bridge; armored and motorized units continued to pour into the bridgehead, while lighter materiel such as 37-mm. antitank guns and motorcyclists, continued to cross individually in rubber boats.[6] Troops moving down the river bank from Villette took Donchery in reverse.

Orthodox instructions for a successful river crossing specify that the first troops across the river must at once secure a shallow bridgehead which will protect the crossing site from small-arms fire. The Germans knew this. They pushed south from the river immediately, even though darkness was falling. By 8:00 PM they had secured the high ground just south of the river valley at La Marfée. Here the woods terminate, and the terrain provides good observation to the south. Thus they obtained excellent ground from which to repulse French counterattacks. In every instance the Germans followed the accepted teachings for a successful attack on a river line.

A few French bombers appeared over Sedan, but it was too dark for them to bomb accurately, and they were greatly impeded by dense antiaircraft fire which the Germans had made ready near the crossing sites.

In the meantime Reinhardt, too, had made a successful crossing. An attempt to cross at Nouzonville failed owing to heavy French artillery fire. At Monthermé the crossing was made. The 57th Engineers ferried the assault waves of the infantry across, under cover of dive-bomber and artillery fire. As soon as a shallow bridgehead was established, the engineers tried unsuccessfully to throw a narrow foot-bridge across. That night a 16-ton bridge was built. They also used rafts to ferry artillery and tanks.

Two or three days later Reinhardt was able to build a bridge at Nouzonville.

THE FINAL PHASE

May 14

During the next few days it was necessary for the Germans to enlarge their bridgehead by gaining controlling ground south of the Meuse. In Guderian's sector this was the high ridge running through Stonne. He pushed straight south on the 14th, with his 1st Division on the east of the Ardennes Canal, and his 2d Division on the west side of it.

French counterattacks were expected; soon they were met.

Opposite Guderian the 55th French Division, the right wing of the Second Army, was disorganized—possibly as a result of the concentrated air attacks. Huntziger therefore called up his 5th Cavalry Division, which had reassembled in rear of the line. He also sent forward some tank units. On the left, Corap tried to close the gap between himself and Huntziger by throwing in the 53d Division and the 3d Spahi Brigade, the latter being still in bad shape from its rough experiences in the Ardennes.

Guderian's armored divisions, supported by some of his artillery which he had promptly got across the river, and by the air force, attacked these French divisions on both sides of the canal. The 5th Cavalry Division and the Spahis were annihilated. The 53d Division withdrew to Omont. The French armored units were quickly defeated in pitched battles with the German tanks, and their wreckage strewn all over the fields. The Germans attribute this to the superiority of their materiel, which does less than justice to their personnel. There was no better tank in Europe than the French Somua. They simply weren't handled correctly; there weren't enough of them; and many of those on hand were not used at all. The bridges over the Ardennes Canal were captured

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[5]The Germans put 100% overloads on a 16-ton bridge or ferry.

[6]According to Capt. P. W. Thompson in *The Military Engineer*. March-April, 1940, the German pneumatic boat is issued in two sizes. The small boat is about 10 feet long, 4 feet wide, weighs about 115 lbs., and has a capacity of four men. The large boat is about 18 feet long, 7 feet wide, weighs about 350 lbs., and has a buoyancy of about 2 tons.

intact. Guderian's divisions joined hands at Malmy and Omicourt.

In the meantime the area around Donchery was still subjected to heavy French artillery fire. Guderian's 2d Division turned west, thus relieving this situation, and permitting a bridge to be built at Donchery that night.

May 15

On this day heavy fighting continued below the river. Reinhardt now got more of his tanks and artillery across and began to move out into the open. Using the speed and power of his shock echelons he shattered the 61st French Division to the point of annihilation. The French Ninth Army, its flanks turned, and its units battered by tanks, bombers, and artillery, began to disintegrate. The Second Army held more strongly at Stonne.

Corap had started a retreat of his Ninth Army the previous night, but there was no chance of foot troops breaking contact and escaping from armored-motorized columns. The Ninth Army completely collapsed. Reinhardt marched 60 kilometers in one straight sweep west to Liart.

May 16

On the 16th Guderian fought another bitter tank battle with elements of Huntziger's Army, in which the French were again defeated and driven from the commanding terrain at Stonne. The Germans now were able to consolidate their enlarged bridgehead along the line: Vervins-Rethel-Stonne.

Guderian's staff officer describes the movements of their party during this final phase of the attack on the river line:

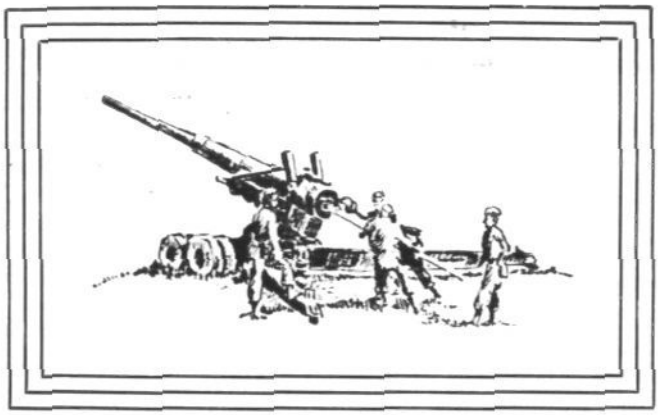
"On the 16th we go from the forest near Sapogne via Vendresse to Omont to the staff of the Tank Division and from there to the infantry regiment. Bouvellemont has just been captured. It is scarcely possible to breathe. There is a high wind and smoke and fumes, dirt and ashes fly in our faces. There are many fires in the village, for the possession of which a severe engagement was fought. . . . Enemy machine guns are firing along the road from Jonval. Our artillery is firing in that direction. We are compelled to lie flat in the ditches along the road. A number of soldiers belonging to an infantry unit are lying either wounded or dead in the fields of clover. More prisoners with wide-open eyes and trembling limbs come across the meadow. They are Spahis and Moroccans—a revolting sight. . . . The enemy has fought well in this district. Every house cost a severe struggle. This day is certainly of decisive importance in initiating this irresistible drive toward the west."

That night Guderian reached Montocornet, and established his CP at Soize.

The French front was disrupted over a width of 60 kilometers. The foundations for the battle of annihilation in Flanders, as well as the basic front for the second offensive into the interior of France, were created.

W. S. N.

German panzer troops crossing bridge built by pioneers near Nouzonville.



A Suggestion for Reinforcement

By Captain Richard C. Carpenter, FA.

In these stirring days, when we hear and read incessantly of parachute troops, of Panzer divisions, and motorized infantry advancing forty miles in a day, it is difficult to fix our attention upon more prosaic but nonetheless equally important ideas of tactics and armament. One of these problems, never solved satisfactorily in our army at least, is the question of artillery reinforcement.

One is inclined to pass by this subject with the casual remark that it is no longer a pertinent question because of the extreme mobility of the present-day division or corps. However, is such actually the case? Can we assume that organic artillery will always be sufficient for the mission at hand? Surely the German offensive launched across the Aisne on June 10, 1940, was aided by masses of reinforcing artillery fire.* Details, however, are lacking; only when the historian of later years sits down to the task of analyzing the events of 1940 will we know just how many battalions or regiments were necessary.

In our service schools this problem of reinforcing artillery is solved by assuming that there will always be additional reserves of army or GHQ artillery to throw into the breach at the proper time. Present practice contemplates attaching these additional battalions to the organic battalions; groupments are thus formed, and the commanders of the organic artillery assume command of the extra batteries either directly or indirectly through the battalion staff of an attached battalion. In either case the regimental staff of the attached unit is thrust ruthlessly aside; even the members of the battalion staffs are little more than so many figureheads. There is some faint possibility, we are told, that the staff of the attached unit may take over when displacement becomes necessary. All of which is very pretty on a Leavenworth map but is neither particularly efficient nor very practicable upon the ground when the inescapable personal element begins to function. Suppose, for example, that the colonel of the attached regiment happens to be the senior?

And, too, all of the above is based upon a false premise: We never have had nor is it to be expected that we ever shall have those reserve regiments that the instructor so glibly manufactures out of thin air. A regiment of artillery is an extremely expensive unit to equip and its personnel is not trained in a day. All of us know with what travail we have only recently managed to supply equipment to seven infantry divisions. Does it seem likely that anyone will bother his head about GHQ reserve units until those other divisions "to be" are similarly equipped?

But there remains the inescapable fact that we must have reinforcing artillery. There will come a time when it is absolutely necessary for the furtherance of the mission of the entire command. We can always detach artillery from the divisions temporarily out of the fray—as we have had to do before—but there remains a partial

*A recent Associated Press dispatch from Berlin also testifies to that effect. The news correspondent, who had seen the German documentary film dealing with the Battle of France, was greatly impressed by the large quantities of heavy artillery which the Germans used in France. Reports also indicated that the Germans pushed this motorized big-caliber artillery (mostly 21-cm.) so close to the front that its casualties were higher than any other component of the Army.—*Editor*.

solution that might obviate some of the disadvantages of the system outlined in the schools.

Let us take what materiel remains after we have made up our organic artillery and set it aside in the rear area; this may be French 75's and GPF's, it matters not. From this heterogeneous mass of cannon there is no necessity to attempt forming regiments or battalions. For, after all, where is the trained personnel and the additional materiel to come from—the experienced Bn S-3's, the details, the instruments, the radio sets and the operators therefor? Let us rather make up firing batteries only; firing batteries that, despite the denials of some of the old-timers, are the easiest component of artillery to train. In command of each of these units would be a lieutenant and he would be likewise the battery commander—for the firing battery would be the entire battery.

But a firing battery must eat; it cannot supply itself, and its training must be supervised. It therefore would be placed along with eight or nine others under the wing of a headquarters, complete with supply and mess battery, in much the same fashion that a flotilla of destroyers is placed under a mother ship for supply and administration. The entire group might be called a "Field Artillery Reinforcing Regiment" for want of a better name.

Now we are ready to supply reinforcing batteries to whoever shall need them. If the 1st Division attacks tomorrow, nine light and three medium firing batteries are detached from the training regiments in rear, the men are given lunches to eat until they join the messes of the batteries to which they are being attached; the organic staffs of the four battalions of the 1st Division meet the arrivals and guide them into positions previously surveyed, and the strength of each battery of the organic artillery has been increased twofold.

Everyone has heard the remark that an executive cannot control the fire of more than four guns (although he is in charge of six in the armored divisions) and perhaps this is true as regards the 105- and 155-mm. howitzers. But, by the same token, is there any reason why a battery commander cannot control two firing batteries each commanded by an executive? At the present time the services of the battery commander often go unwanted owing to the presence of a fire-direction center that takes control of his firing battery about the time he spots a target. *Certé*, the solution would seem to be to give him a firing battery all to himself while the fire-direction center uses the other. Or, as the situation requires, both firing batteries may be controlled simultaneously by either the BC or the fire-direction center.

There are additional advantages to such a system. Some are as follows:

Other branches have made the accusation with some degree of reason that the field artillery is overstaffed in proportion to the amount of fire power that can be delivered. The suggested system would balance that disproportion by furnishing twice as much fire power as heretofore without increasing the staff.

Antitank batteries may be needed in even greater proportion than at present contemplated in our Tables of Organization. If such becomes the case, the additional firing batteries may be utilized for this purpose.

Firing batteries in position may become exhausted in temporarily stabilized positions. If worse comes to worst, a new firing battery could replace the old one without the relief of the detail and remainder of the battery. (The analogy to the replenishment of a flashlight is here down to the word—battery.)

The field officers whose experience cannot at present be utilized in combat organizations because of physical defects, can be used in the training regiment in rear to insure that the reinforcing firing batteries are up to the mark.

No regimental or battalion staff will be discarded temporarily with resultant injured feelings. And no one will deny that a lieutenant coming up with a reinforcement unit will do little fussing with a battery commander under whose command he is going.

Finally, such a system would result in quite a money saving as compared to the organization of GHQ reserve regiments, no small point where John Q. Public is concerned.

It is frankly admitted that the details of such a system have not been worked out in their entirety by the author. Experience might indicate that it would become necessary to send along a little more than just the firing battery when a unit is being reinforced. For instance, an extra vehicle or two might be sent along as an addition to the combat train; possibly a man or two to act as a cook or KP for the additional men attached to the battery for rations; even a staff officer in the proportion of one to every three firing batteries might be attached to the battalion staff. But the essential thing to be striven for should dictate that no personnel other than those absolutely necessary should be sent, thus attaining the desired end, namely, that the reinforced unit should be twice as strong in fire power without the addition of much overhead.

It is our belief that the present-day battery contains enough wire, switchboards, and other materiel to care for the additional firing battery superimposed upon existing installations. But if there is not sufficient equipment—as determined by the Field Artillery Board or other experimenting agency—it should be easy enough to arrange for the reinforcing unit to bring with it the required items.

In conclusion, let me confess that this plan has never been attempted before: at least not to the author's knowledge. Since modern trends in organization are toward interchangeable units, the idea would seem to have sufficient merit to warrant experimentation. And that, at least, should be our watchword for the present.

British

The 10th of May found the battery halfway through a fortnight's training in the B.E.F. training area near Amiens. After nearly eight months of digging gun pits, this week's mobile training was soon to stand us in good stead. A subaltern remarked at breakfast that the German invasion of the Low Countries had been announced during the 7 AM news. A D.R.[1] was at once sent to Regimental H.Q. for orders. The colonel's answer was to "pack like hell." From their normal parades at 8 AM troops were marched to the village school, from the steps of which I told them the news and that two factors must govern all our actions—the utmost support of our infantry and the avoidance of casualties in the battery, and that neither would be achieved without the very highest standard of discipline.

The regiment had been selected to support the advanced guard in the move to the R. Dyle. We were somewhat uneasy that morning lest our unfortunate absence in the training area should deprive us of this advantage. However, orders were received that zero hour for Plan D was not until 7 PM and at 2 PM we were on the line of march through Arras and Douai back to our billets of the previous months near the Belgian frontier. Plan D, which after several previous scares was well known to all of us, was the B.E.F. scheme for the advance to the R. Dyle. We had practiced it twice with the Somme substituted for the Dyle. In the battery safe were detailed orders and maps for each officer. Battery areas and wagon lines for the Dyle position were already alloted and everyone was confident that he knew what to do.

Our old billets were reached without incident at 7 PM that night and an officer from each battery under the second-in-command was sent forward to reconnoitre the Dyle position. The battery was not now due to cross the frontier until 10 AM on the 11th May, which gave ample opportunity for maintenance and sleep. The route lay through Tournai, Renaix and Brussels. Brussels was crowded and the British Army was given quite a good reception. The march was uneventful — a few bombs had been dropped on the route and one or two casualties caused by machine-gun fire, but the battery had no adventures. A mile or two east of Brussels B Echelon[2] dropped out and occupied the wagon lines.

Editor's note: The following valuable account was published originally in the "Journal of the Royal Artillery," under the title: "Some Notes on the Recent Campaign in Belgium," 10th May to 3rd June 1940. by "B.C." We are indebted to the Editor of the "Journal of the Royal Artillery" for permission to present the article to our readers. Footnotes explaining British abbreviations have been added. American readers are also reminded that the British battery corresponds to our battalion. their troop to our battery, their section to our platoon, and their subsection to our section.

[1]Despatch rider; messenger.
[2]Administrative and supply echelon.

Artillery in Flanders

while the firing battery continued to its rendezvous, a large wood on some high ground a mile or two west of the Dyle. Being too dark for further reconnaissance that night, the battery was scattered about the wood and we got what sleep we could.

At 3 AM on the 12th, reconnaissance parties set out and were very ably shown round by "S," the troop commander who had gone ahead of the battery. Except that a certain amount of ground was overlooked by even higher ground on the east side of the Dyle, it was an ideal artillery country. By midday the battery was in action round the village of Huldenberg, with the guns in the best positions that we were ever to see. It was decided to keep the guns right back and to accept very long communications to OPs and to overcome this, maintenance dug-outs were established on the OP lines. This policy was always followed and worked admirably. It made full use of the range of the 25-pdr. and it obviated short moves. Troops where possible adopted the square formation—i.e., one section shooting over the heads of the other—and after that wherever possible this layout was used. It made a troop very difficult to bomb or machine gun effectively and it simplified the problem of covering very wide fronts which got wider as the retreat went on.

Digging then began in earnest at OPs and troops. The former were very exposed and the smallest slit trenches, carefully camouflaged and near existing paths, were used. This meant very limited accommodation, but in the short time available it was probably the best solution. Near both OPs were sunken roads which lent themselves to dugouts for wireless sets and signallers. In the OPs themselves there was just room for the officer and his assistant, a telephone, the remote control[3] and a few instruments. The right troop had a forward OP almost on the river bank which communicated by line and lamp to the rear OP. It was a rule in the battery that work did not cease on gun pits until protection had been provided for the detachments and the guns had been sunk to a depth which permitted them to shoot down to the minimum range ordered and no less. This entailed many hours' digging without rest, but the gunners fully appreciated that it was better to be tired than dead. Wherever possible guns were put into action in or very close to sunken lanes and into their banks tunnels were sunk and dugouts built.

By now a steady stream of refugees was passing through our lines. For the most part they were a heartrending sight, but among them were many Belgian soldiers. Throughout the retreat fifth-columnists, among the refugees, cut our OP lines and on several occasions made large arrows in corn fields to indicate troop positions to aircraft. The wire cutting was very difficult to contend with and only on one occasion did a maintenance signaller get a long distance shot at a saboteur. As arrows were detected they were obliterated and "W" the C.P.O.[4] became expert at cutting arrows and swastikas in other corn fields to confound the Bosche aircraft.

The 12th and 13th of May were passed peacefully though strenuously. The remainder of the division arrived and took up their positions, which considerably shortened our front. Hostile air reconnaissance became intensified and a few bombs were dropped. Louvain, about 9 miles to our left, had been bombed continuously now for several days. The town was heavily on fire in several places and the noise of bombs was almost incessant. One aeroplane, flying very low and apparently in difficulties, dropped its load of bombs just in front of the right OP but "M," the troop commander, and I put our heads down and then continued our business. His N.C.O. i/c signals[5] shortly afterwards cooked us some admirable eggs and bacon, our first meal for many hours. On the evening of the 13th orders were received to send a troop forward at dawn to support the divisional cavalry. A F.O.O.[6] in the armored OP[7] had been with them since our arrival but nothing had occurred. Accordingly "S" went out at first light and E troop came into action near the river bank. "S" sent back much information, including the news that an enemy tank had been destroyed, but he was never able to see a target for long enough to engage it. At about 1 PM the cavalry were ordered to withdraw and the troop moved back to its normal position.

At about 3 PM on the 14th May, the other battery of the regiment opened fire and "M" reported that Germans were appearing over the distant crest on bicycles. He also remarked that, when his 25-pdr. shells got really among the cyclists, bits of bicycle rose into the air above the telegraph posts. During the course of the retreat German cyclists were often our first target—they suffered many casualties, but it was never regarded as a successful shoot unless wheels and handlebars rose well into the air. Little more was seen that day, although a number

[3]A headset and transmitter connected to the radio by a wire 100 yds, or more long, thus permitting the OP officer to observe from an exposed locality, leaving the set in a car or dugout.

[4]Command post officer—handles survey and fire direction.

[5]Signal Sergeant.

[6]Forward observation officer.

[7]An armored vehicle (Bren gun carrier) used for moving OP details and their equipment through fire-swept localities.

Gun being drawn into position with prolonges

of targets were engaged off the map. From the left OP a few enemy gun teams were observed trotting away, but though guns were laid on them at once it was obvious that the Bosche coverers knew their job and each took a different route to the wagon lines. It may be remarked that no enemy horse-drawn units were seen after the Dyle.

The night was enlivened by a steady fusillade of L.G.M.[8] fire across the river, rising at times to a crescendo. Several S.O.S. calls were answered by D.F. fire[9] and a section was sent forward to do harassing fire. It was noticeable that the enemy always took advantage of the length zone of his guns to shoot up and down our roads at night. Our tasks were received late at night, and of course, it was too late to site the roving section to shoot up and down enemy roads. During the night a German battery commander had been rash enough to bring his guns into a position that was open to the right OP. Next morning I found that "M" had enjoyed this target enormously and had enlisted the help of a wandering medium troop commander, who had also done some good shooting. The Bosche O.M.E.[10] had apparently been sent for—he was seen to alight from his two-seater car and was afterwards joined by a working party. When "M" judged that the work was well under way he gave them another five rounds of gunfire and though these guns remained in position till we left the Dyle they did not fire a shell.

At about 10 AM on the 15th May the Germans attacked on our right. They had as yet little artillery but were supported by L.M.G.s and mortars. The situation on our own front was well in hand but on our right some ground was lost. A F.O.O. was sent to the right flank in the armored OP and he had some good shooting. Our own infantry withdrew about a mile that night to the line of the R. Lasne to conform with the troops on our right. This involved the loss of our forward OP, but as it brought the Bosche nearer to the rear OP, which had far better command, nothing was lost from a gunnery point of view. We bombarded the German positions heavily during the withdrawal and it was not for some hours that the Bosche realized that we were withdrawing, not attacking.

The 16th was marked by enemy pressure on our own front and considerably increased activity on the part of his artillery. The crest between the guns and the right OP had been perfectly ranged by a 5′9″ battery[11] and we crossed it at some considerable speed. During the day it became apparent that D troop had been spotted. They were shelled and bombed although the only casualties were one civilian killed and a fire in the troop cook house. It was decided, however, to move D and F troops to the alternative positions. Had the enemy gained the high ground on our right flank both troops would have been enfiladed at very short range. Communications were already laid to these positions and the troops moved a gun at a time. Thus very little fire power was lost during the move. During the retreat it was frequently necessary to move guns during the daylight but we found that as a rule the Bosche aircraft paid little attention to single guns. That afternoon orders were received to withdraw—the news came as a bitter surprise, for we knew nothing of what was taking place on our flanks. Reconnaissance parties were sent back to the rear positions and the tractors[12] were brought up close to the guns. On only one other occasion during the retreat were firing battery vehicles sent back more than a mile. On the second occasion very short notice to withdraw was received, the roads were hopelessly blocked with military and civilian traffic and some hours after the battery should have withdrawn we were still waiting for the tractors. They arrived very shortly before the leading Bosche troops.

Soon after reconnaissance parties had left, orders were received to retire straight through the new area, and to take up a position some miles further back to cover the infantry on the Charleroi canal. No further reconnaissance party was available, so an officer was ordered to collect the one already sent back and to make what arrangements he could for the arrival of the battery on the new rear line. The left OP line had been continually cut by saboteurs during the day and that evening interference on the wireless made communication impossible. However, as usual, "H" came to the rescue and brought "S" in. "H" was a territorial officer attached to the battery. He was due to return to England on the 12th May, but he had at once announced his intention of remaining with us. One or two telegrams recalling him had to be destroyed, and he became battery adjutant. He relieved me of administrative worries in the gun-lines, often went to see infantry commanders on my behalf

[8]Light machine gun—Bren or a Lewis.

[9]Defensive Fires.

[10]Ordnance mechanical engineer—an officer charged with repair of material in the field.

[11]That is, a 15-cm. battery.

[12]A prime mover, usually a 4 × 4 truck.

and in general did a thousand and one jobs, including the looting of the abandoned N.A.A.F.I.[13] at Lille, in a way that could not be bettered.

We had accumulated far more ammunition than we could carry in the vehicles. Orders were accordingly issued to troops to carry as much as possible and a program of frightfulness was worked out in the command post to dispose of the rest. Over a thousand rounds were fired in the last hour in action. Shortly before dark a parachutist alighted near the command post and, hotly pursued by guardsmen, disappeared into a row of houses. We never heard if he was caught or not, but as he was seen to be armed with a tommy gun it added zest to one's comings and goings.

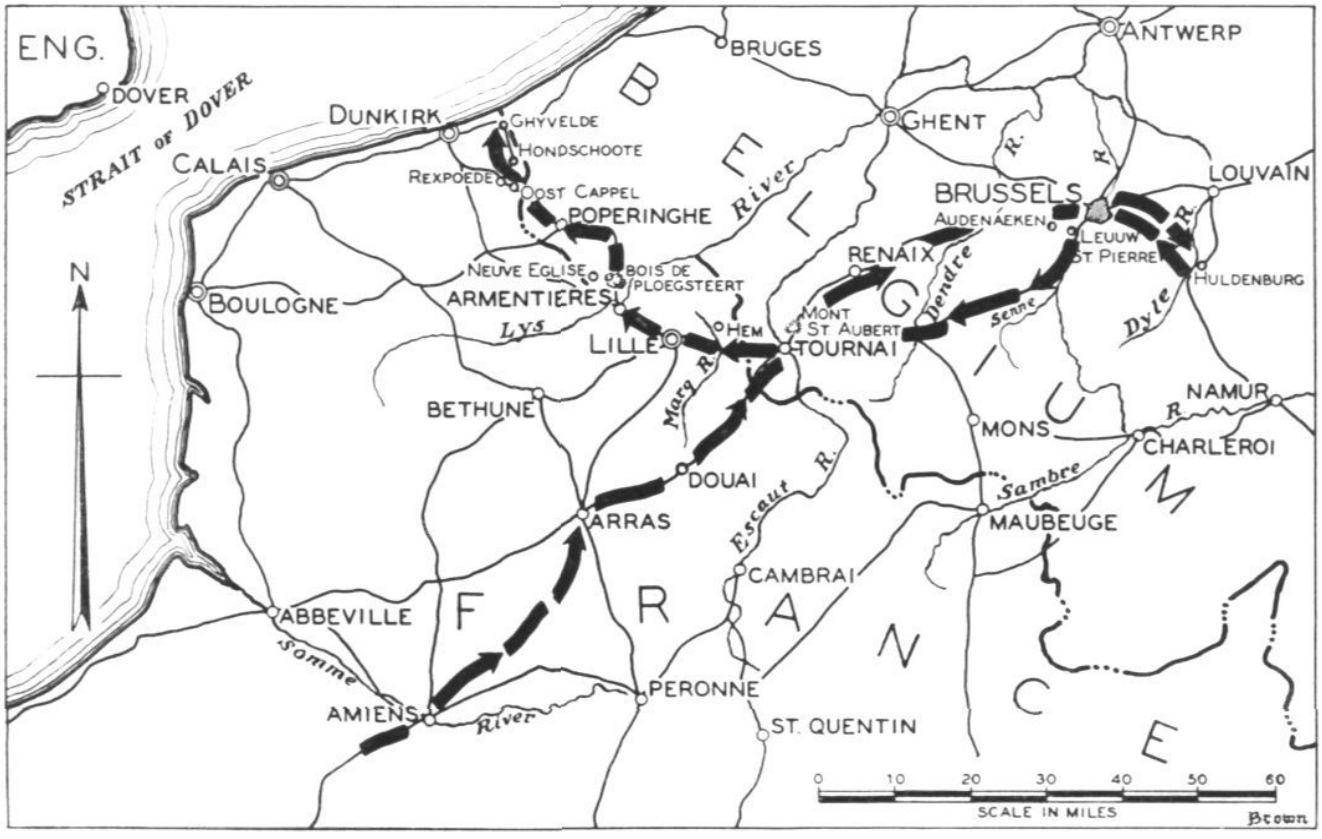
At 10 PM the guns ceased firing and the battery set out on the first of many long marches. Our route again lay through Brussels, but this time it was deserted. Sign posts had been obliterated or removed and we had no street maps. Coming along at the tail, I found a good part of the battery in one of the city's squares. We had not the remotest idea which way to turn, and there was not a star in the sky. I had a director set up on grid 270 deg.[14] and then ordered the battery leader to lead the guns down the boulevard that ran most nearly in that direction. My own orderly was invaluable—he and his motorcycle were here, there and everywhere and out of the back streets of Brussels he produced the rest of the battery. On every night march there were moments when it looked as though one would never see the battery again, but in some mysterious way vehicles always reached the rendezvous. Drivers and N.C.O.s were given cards with their destination and principal towns en route marked on them, but as they had no maps their task was not easy. Undoubtedly the battery employed many routes on each march, but the result was always excellent.

Shortly before dawn on the 17th the battery reached the rendezvous Leeuw-St.-Pierre, some 7 miles S.W. of Brussels. Orchards were allotted to each troop and the vehicles were got under cover as much as possible. The allotted area for the battery proved very bare, but three moderate troop positions were finally selected in a valley north of Audenaeken. Leaving the C.P.O.'s and G.P.O.'s[15] parties to do their work, I went back to Leeuw-St.Pierre to order the guns into action. The village had for some reason aroused the hatred of the German Air Force and we were forced to wait for nearly half an hour before moving the guns. His dive bombing and machine-gunning were extremely accurate that day, and any movement out of the village was severely punished. "H" wandered about calmly finding shelter for the men, and thanks to him no casualties were caused in the battery.

[13] A canteen or "post exchange."

[14] With the aid of an aiming circle he determined Y-azimuth 4800, or west.

[15] A Gun Position Officer.



Finally, the guns were sent forward at several hundred yards' interval and the battery came into action. One OP was found to be adequate to cover our front. D and E troops laid the cable jointly and a maintenance station was established in a chateau halfway down the line. The OP was in a brickyard and offered endless scope for protection and deception. During the day of the 17th there was continued bombing of villages and crossroads in our immediate rear but the battery was not detected. Gun pits were well under way when orders were received that evening to withdraw again to a defensive line on the Dendre canal. We were very reluctant to go, as we had not fired a shot and nobody had fired at us.[16] It was too late for a reconnaissance party to choose positions that night, so an officer was sent back with a small party to find cover for the battery near the rendezvous. This was essential during the inevitable halt next morning while positions were being reconnoitred.

That night's march was the worst that we did. Our rendezvous was Ophasselt on the main Brussels-Tournai road, and it appeared that the greater part of the B.E.F. was also using that road. It was light soon after 3 AM and many hours of broad daylight were spent in collecting the battery and getting it into action. Bosche aircraft missed a wonderful target in the early hours of the 18th when the congestion on the trunk road was at its height. For some extraordinary reason there was not a German aeroplane in the sky. The column was continually halting and it imposed a great strain on drivers not to go to sleep on these involuntary halts. Many did, but officers and orderlies on motorcycles were up and down the road waking them and trying to get some sort of order out of the chaos. The roads were still thronged with refugees and orders were received to evacuate compulsorily all civilians in battery areas. Right through the retreat we generally found some civilians in the battery area on our arrival, but after we had been there several hours the countryside became deserted. Many houses had obviously been left in great haste and in every case cattle were left in the fields, poultry in the yards, and dogs in their kennels totally unprovided for. Breaking the extraordinary silence that spread over the countryside, the predominant sound was the lowing of cattle waiting to be milked. We slaughtered such pigs, calves and poultry as we needed, but it was not until later that we slaughtered every living thing that we saw, rather than let the Bosche have them alive. When a few days afterwards the B.E.F. was put on half rations it really made very little difference to our welfare. The problem was not to find food, but to find the time to cook it and eat it.

It is difficult to remember exactly when we first heard in the battery that the Belgians had surrendered and that the French had allowed the Bosche to reach Boulogne. It was generally agreed that the former made little difference to the campaign and we considered that there were plenty of Military Police at Boulogne to deal with any disturbance there.[17] We had quite enough to do to fight the battery without worrying our heads over matters outside our control.

The guns were in action in fairly good positions by midday on the 18th, one OP again being established. "M" chose this very cunningly. A field covered with heaps of manure sloped down to the F.D.Ls.[18] He removed one heap and dug a slit trench. This he covered with a dome of wire netting and then replaced the manure. He had admirable observation, but from 5 yards away it was impossible to distinguish "M's" particular dung hill. At 5 PM the divisional cavalry withdrew through the infantry posts and registration was carried out. No enemy activity was seen, however, and digging continued furiously. Soon after dark there was intermittent rifle fire across the river and, at first, occasional lights were seen on the enemy side of the river. Later that night from a slight rise behind the command post a strong light was reported to be shining at us. From the OP it was screened by an intervening crest. We had no idea what it was, but another director was sent out to a flank in the hope of fixing its position and shelling it. Unfortunately, before the intersection was completed orders were received to retire—this time to the line of the R. Escaut. The other battery of the regiment was ordered to leave a troop behind to support our own infantry brigade which was acting as rear guard to the division. They had a great day's fighting and marching before rejoining the regiment the following evening.

Having believed that this position was to be held for some days, I had sent the tractors back to the regimental wagon line[19] at Monts des Rhodes some 10 miles in rear of the guns, and this was the occasion when we nearly lost the battery through doing so. The majority of the infantry had passed through us, before the tractors arrived, and it was with great relief that we set out at 2 AM for the rear position. As usual the colonel was waiting to see the last of the regiment through, and he was doubtless very relieved when we appeared. Despite the broad daylight, we had an uneventful march to the rendezvous—a wood a mile or two N.W. of Tournai. On arrival at the rendezvous the battery was ordered to deploy to support the outpost line in front of Mont St. Aubert. The outposts were ultimately to be occupied by the infantry brigade who at that moment were acting as rear guard. Mont St. Aubert, some 3 miles north of Tournai, is the outstanding feature of that part of Belgium. From the low level plain surrounding it, the Mount rises steeply to a height of nearly 500 feet above

[16]Changes of position as frequent and with as little apparent reason as on our maneuvers. Deepest sympathy.

[17]Evidently the British hold their MPs in higher esteem than our soldats have for ours.

[18]Forward defended locality. Similar to OPLR.

[19]Rear echelon; motor park.

sea level. The sides are thickly wooded and on top is a monastery, a church, a modern hotel and a small village. From the monastery tower the surrounding country is commanded with ease for many miles in every direction. It promised to be the perfect OP.

Admirable troop positions were found just behind the R. Escaut and all seemed set fair for perfect shooting. The infantry were not expected back in the outpost line until late in the day, and the afternoon was pleasantly spent doing a silent registration from the roof of the curé's house. He entertained us to an excellent bottle of claret and some biscuits, and presented us with a box of very good cigars. At about 5 PM the C.R.A[20] visited us. He had heard that the rear guard was heavily engaged and he was not too certain that they would be able to occupy the outpost line. They might have to go straight to the banks of the Escaut. He promised to let me know the final decision and warned me to be ready to move the guns. I left "S" at the OP and went off myself to see the rear positions which were then being reconnoitred by the captain. The country in rear was not nearly so favorable for troop positions, but two were selected before dark. As E troop were able to depress their guns sufficiently to shoot down to the line of the river they were left in action, when it was finally known that Mont St. Aubert was to be abandoned. D troop moved first and when it was in action F troop also retired. "S" returned from Mont St. Aubert and two more OPs were selected, one on each flank of the battalion we were supporting. The Escaut itself is a stream some 15 to 20 feet wide—in many places trees come almost to the water's edge and it is impossible to observe any long stretch of it. "H" was sent to reconnoitre the left OP and I ordered him to look first in the neighborhood of a certain bridge. As he approached the bridge he was stopped by a sentry, but he informed the sentry that he was going to his OP. The sentry, thinking "H" knew what he was about, let him proceed. When he was about 10 yards from the bridge it was blown up in his face. He was thrown flat on his back and covered with debris. However, he completed his reconnaissance and chose a good OP among the ruins of the bridge. I sent "G" the commander of F troop to choose the right OP. In his area was a fairly continuous row of houses some fifty yards from the river bank. He chose the best appointed of these and promptly had a hot bath,—there was always a good meal to be had at this OP and it became very popular.

There was still no sign of our infantry and a composite battalion of sappers[21] and others was hastily formed and put into the line. They were very thin on the ground, but they held the line gallantly until the evening of the 20th, when the infantry took over from them. By this time telephone wire and ammunition were becoming very hard to obtain. In our efforts to support the infantry to the last possible moment in each position, much cable had been inevitably left behind. However, the rear areas were a happy hunting ground for battery and troop N.C.O.s i/c signals. They were indefatigable in searching for abandoned telephone lines and they reeled in many miles of cable. It should be said that they were always most scrupulous not to reel in a line that was only temporarily disconnected.[22] Ammunition was an even more serious problem. Up till now there had been plenty, but on the 20th orders were received to restrict expenditure to 5 rounds per gun per day. Though we never doubted its necessity, I know of no more depressing order for a gunner officer to receive. The infantry demand his support and he is unable to give it. However, ammunition was procured in divers ways and although replies to S.O.S. calls had to be cut down in volume, they never went unanswered. At the same time only 5 rounds per gun per day were expended of the ammunition that we were known to possess.[23] I never knew where the extra ammunition came from and I never asked "R," a prince of wagon-line officers.

A Bosche observation balloon appeared at dawn on the 21st to the left of Mont St. Aubert. Bearings were at once taken to it and its position was anxiously plotted on the board, but it proved to be hopelessly out of range. Its occupants were apparently brought to earth for lunch, but apart from that daily interval it remained in the sky during our stay on the Escaut.

By 7 AM both OPs were busy and it is possible that the battery killed more Germans this day than on any other. On several occasions massed infantry presented themselves as targets among trees only a few hundred yards from OPs. Very few of them reached the river bank. About 10 AM a very startled D.R. arrived at the battery command post on his feet. He had lost his way, but explained that he had come from a battalion of the division on our right and was looking for his infantry brigade H.Q. I took his dispatch from him, which was too alarming to be true, telephoned it to our own regimental H.Q. and put him in arrest. To be on the safe side, I ordered D troop, which was on the right, to send an observer up a convenient tree near their No. 1 gun, which I knew gave a good view of the immediate country. Late that night, as I was going round the guns, a very tired T.S.M.[24] asked me if he might come down.

It soon became clear, however, that affairs were far from well on the right. "G" in the right OP reported that a few Germans had crossed the river and were advancing down the railway towards his OP. He gave them as many rounds of gunfire as we could afford, and they retired into the outskirts of Tournai. The town had been very heavily bombed for some days and was well

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[20]Commander, Royal Artillery. Divisional artillery commander.

[21]Combat engineers; pioneer battalion.

[22]Knowing communication personnel, we are sure of it.

[23]It is easy to see that this officer is a very practical and experienced "field soldier."

[24]Troop sergeant major—our battery "top kick."

on fire. The situation on the right being still uncertain, "S" was sent in that direction in a wireless truck—I gave him specific orders not to go beyond a certain pimple, which from what I knew was very nearly in Bosche hands. Meanwhile, "H" and I went off to the right OP to glean what we could. The last two hundred yards to this OP lay across very flat fields, but the houses on the river bank appeared to give one good cover. We started to walk across the fields, when one or two apparently stray bullets caused us to reconsider the situation. We decided to advance at 50 yards' interval, but to my annoyance all the fire was directed at me. The Bosche shooting was extremely bad but it was quite obvious that he was after my brass buttons and not "H's" battle dress. When I got back to the command post that evening I discarded my service dress and, incidentally, never saw it again. All seemed well at the right OP and we broke our journey back to the guns with tea at infantry H.Q. Their colonel told me that on the retreat from the last position he was directed through Renaix by a military policeman on point duty. When asked how long he proposed to stay there, the policeman replied that he was being relieved at 9 PM. The colonel took him and his relief on board and thereby saved them from capture half an hour later. This particular battalion H.Q. was in a house some 20 yards from where E troop had been in action. Though most grateful for anything we might have tried to do for them, the infantry strongly resented the retaliation that had been meted out to the now empty gun position. The roof of one wing of their H.Q. had been knocked off, and other shells had fallen nearby.

Back at the command post about 7 PM there was no sign of "S" and he could not be got by W.T.[25] He had last been heard about 4 PM, when he had called for concentrations on enemy forming up on the river bank well away to our right. He had then reported that he was going forward and had not been heard since. It was hopeless to look for him and it was therefore with great relief that we saw him walk in at midnight. He told us that he had worked his way down to the river bank, supported a counterattack by the brigade on our right and as he was the only gunner there, he had stayed with the infantry colonel in case he might be wanted. He had switched off his wireless and when at 11 PM the situation seemed stable, he had set out for home. His enterprise and initiative were rewarded by a M.C.

The 22nd was passed in similar fashion. A few shells dropped round the command post and D troop, but they were harmless. OPs had good targets and several mortars were spotted. It is doubtful if these were destroyed, but they were certainly kept on the move, which considerably reduced their efficiency. That afternoon orders were again received to withdraw, and reconnaissance parties went back to a line a few miles east of Lille. The infantry were to hold the line of the R. Marq. The battery retired that night, leaving D troop behind to cover the final withdrawal of the infantry, and by the morning of the 23rd we were again in action.

Lille is surrounded by a ring of forts built perhaps a hundred years ago. Each fort covers some three or four acres and is composed of very formidable earthworks and concrete tunnels. D troop came into action in one of these and the infantry battalion which we were supporting took another for its H.Q. One OP was again sufficient and a house was found some two hundred yards from the F.D.Ls. From here the telephone line was laid back through battalion H.Q. in their fort, which in itself made an excellent OP at night for observing S.O.S. rockets. We were in action[26] till the night of the 26th without firing a shell in anger. There was, of course, plenty of digging to be done, and we registered the D.F. tasks and adjusted them to the exact requirements of the infantry. Each night the infantry carried out extensive patrols on their front, but contact was never made. These patrols required a very carefully planned and timed artillery program should they get into trouble. As it happened, they never needed our support, but it was a great relief each early morning when they were reported safely home. There was considerable air activity and one evening "R" and I had the pleasure of seeing a Bofors battery get a "right and left." Having half an hour to spare, we drove as hard as we could to the nearest crashed aeroplane. It proved to be a Dornier painted with French colors. The surviving occupant had unfortunately been rounded up just before our arrival.

News was received early one morning that the N.A.A.F.I. depot in Lille had been abandoned. "H" took charge of the ensuing operations. He chose his party carefully and made several journeys in a 30-cwt. lorry before he was satisfied that our wants had been supplied.[27] It was with great reluctance that I finally left 2,000 of my favorite brand of cigarettes behind at Dunkirk, but many soldiers were still smoking free cigarettes a month later in England. Though there was still no sign of Bosche infantry, the village of Hem on our left flank was intermittently shelled and set on fire. Several air burst HE were fired at the front OP but they did no harm. Civilians continually asked one's advice as to where to go. We knew, of course, by now, that we were surrounded, but I cannot remember it worrying anyone. One could but advise them to stay where they were and await our advance. On the evening of the 26th, orders were again received to withdraw. One troop, E, was to remain for a further 24 hours, while the battery moved back by Armentieres to a new position near Neuve Eglise.

By dawn on the 27th the battery was in action near

[25]Wireless.

[26]This term evidently means "in position."

[27]Evidently "H" had a field day in looting this abandoned canteen. Our readers unquestionably will recognize a kindred spirit.

British 18-pounder in action

"Plugstreet Wood," where it remained till the evening. By now the B.E.F. was converging on Dunkirk, and Bosche air activity intensified. Armentieres and Poperinghe were bombed unceasingly. I had occasion to go from the Lille position to Neuve Eglise and back that day, and I saw far more destruction than I had seen up to date. In one place a refugee camp had been bombed—the bombing must have been deliberate—it was not a pretty sight.

"H" was with the infantry brigadier in the Lille position as liaison officer and "S" with our battalion H.Q. As only one troop was in action, regimental H.Q. was ordered back. I had to go too. The infantry were due to withdraw at 10 PM and I gave "S" orders to do likewise. Later that evening the Bosche appeared and E troop got a lot of shooting. It was not till after midnight that "S" felt justified in ordering "cease firing" and moving his troop back to join the battery. Late on the 27th the battery was again ordered to withdraw, this time to a position near Oost Cappel. That night's march through Poperinghe was most trying—the roads were congested with every kind and nationality of traffic. However, soon after dawn the battery was again in action, though by now the country was so flat that even flash cover was a luxury. No sooner were we established than reconnaissance parties were once again ordered back, this time to find positions in what became known as the Dunkirk perimeter. The area allotted to the battery was about the Farm St. Claire.

The reconnaissance and occupation of that position and the next was the most exasperating process. What we had considered up to date as traffic congestion became doubled or trebled. Whenever a German aeroplane appeared the drivers of allied vehicles forsook their charges and ran to the nearest cover—very often several hundred yards away. However, by that night the battery was once more in action, though it had moved only some three miles during the day. At 7 PM E troop came in. They had met the most hopeless traffic conditions and for several hours in the middle of the day they had been at a complete standstill. The Bosche air force had chosen this time to attack them. Their sergeant-major, a very fine warrant officer, had been killed by a machine-gun bullet, and one gun had received a direct hit from a bomb. The gun was destroyed and the tractor set on fire. "H" had at once made his way to it and found that a lance bombardier had calmly removed the ammunition from the burning tractor and trailer. He

was already wounded and in some pain, and for his very gallant conduct he received the M.M.

A few guardsmen were holding posts near us, but otherwise there was little to be seen of infantry. However, as our own infantry brigade was acting as rear guard, and as there was a British force out to the east, we had no worries. Battery H.Q. were in a most unsavory inn and what little sleep we had was on the billiard table. It was confirmed during the night of the 28th that we were in action well outside what was to be the line of F.D.Ls. Nothing could, however, be done in a hurry and it was the evening of the 29th before we were finally in action between Ghyvelde and Holy-Konke, where we were to remain until the final evacuation. An excellent OP was found in a windmill some 200 yards in rear of the canal held by the infantry. The mill was very strong and commanded the whole of our zone. By now the evacuation must have been well under way, for every road was lined with abandoned vehicles. The normal system of supply had broken down completely, and officers' patrols were sent out continuously to search for ammunition and rations. Over 2,000 rounds of 25-pdr. HE were brought into the battery in this way. We had anxious times in the next few days over ammunition, but thanks chiefly to "H" and "W" the situation was always restored.

Early on the morning of the 30th I had been to see our battalion H.Q. when I ran into the late major of the battery, who had recently been promoted and gone to command a field regiment in a neighboring division. He was wounded but in great spirits and had had a great time. The previous night he had lost touch with his own regiment, but had collected two or three antitank guns. Hearing that enemy tanks were in the neighborhood of Rexpoede, he brought his guns into action and did some very good shooting. When the action was over he made his way to Hondschoote, where he found other British wounded. He brought some home in a truck that he found and arranged transport for the rest. His old battery were very pleased when he later received the D.S.O.

About midday I was in the windmill OP with "S" when we again saw the German cyclists. "L" from the other battery was also in the OP and between us we had some excellent shooting. The cyclists had to cover some 200 or 300 yards of exposed road, and both batteries had it ranged to a nicety. The inter-battery competition was most fairly conducted. "S" and "L" took it in turn to fire a single round of gunfire from their troops and as far as possible I refereed. The laying, sight testing and calibration of both troops must have been excellent, for hardly a shell missed the road. Alas! two days later "L" was killed near this OP and "S" was wounded and is still missing. On the way across the fields from the windmill to my truck I was pursued by purely chance rounds of gunfire. I regret to say that in our haste the troop N.C.O. i/c signals and myself walked straight into a 6-foot deep blind ditch. After this we steadied the pace. By now most of the forward area was an inch or two deep in water and ditches were hard to see. That evening orders were received to send spare personnel to the beach for embarkation. As there was no question of moving the guns again, most of the drivers were sent, as well as B echelon personnel.

Throughout the 31st the enemy pressed on our front. Enemy infantry guns and mortars were frequently spotted and shelled. Our infantry battalions sometimes rang the battery up to thank them for a particular shoot. Their thanks were at once passed to the detachments and were much appreciated. During the morning the adjutant rang the battery up to say that a despatch rider that he was expecting from us had not arrived. Enquiries were made and the route that he had to travel was searched, but no trace was ever found of him or his motorcycle. He was a great loss to the battery. Late that afternoon I visited battalion H.Q. and found that a successful counterattack had been put in on the left. "S" was now with the infantry and "M" had taken over his OP. I had by now discarded my 8-cwt. Morris truck (the wireless set was in use at the command post) and was using a very fine Humber Snipe left behind by some staff officer. Finding that the infantry colonel was without a car, we presented the Humber to him. It was destroyed next day by a direct hit from a shell, though fortunately it was empty at the time.

Whilst I was at battalion H.Q. a "state" of the battalion by companies was presented to the colonel. They were holding over 4,000 yards of front, and one company was shown as "Nil." The colonel did not turn a hair but asked me if we could support a counterattack he was putting in on the right. I accordingly went to the OP to see what we could do. The line of the F.D.Ls. had been withdrawn that day and "M" had retired to another convenient windmill. At its foot were the completely ruined and burnt-out remains of what that morning had been a Guards Officers' Mess. "M" and I engaged all the enemy that we could see from his new OP and the attack was successful. A counterattack on a small scale by highly trained infantry is, of course, extremely difficult to watch. "M" and I had excellent command, but even so it was not for some time that we knew the result. The night had its share of alarms and excursions and the battery fired on several D.F. tasks. Supporting our own battalion, we knew that an S.O.S. call would not be made unless it was essential, but it was a relief to find in the morning that the infantry had somehow maintained the "status quo."

The morning of the 1st of June passed fairly uneventfully, but by midday the Bosche were attacking strongly on our left. Near battalion H.Q. the line turned back at a right angle and was very thinly held. The Bosche worked his way into our line and "S" set out from battalion H.Q. to help to restore order. The guns were warned to be ready to shoot 100 deg. to the left of their

original zones, and shoot they did. "S" was not in a position to give detailed fire orders, but the map references that he sent to the gun were so accurate that he had little difficulty in correcting their fire.[28] How the infantry, who were already holding 4,000 yards of front with 250 men, were able to extend their line another 500 yards and to counterattack is beyond the comprehension of a gunner—but they did it. By 6 PM the situation was restored and "S" returned to battalion H.Q. To shorten the line slightly, the F.D.Ls. in that area had been brought in until the H.Q. itself was one of them. Soon after 7 PM I wanted to talk to "S" on the wireless, but his signaller told me that he was busy manning a Bren gun. An hour later we heard that he was badly wounded and that the infantry had taken him to the beaches. Though the beaches were searched in the early hours of the next morning, we never found this very gallant and able officer.

The infantry were due to leave their positions at 9:30 PM and the batteries were ordered to cover their withdrawal until 10 PM. Plenty of ammunition, including all the smoke shell that we had carried about for the last three weeks, was available. For the last hour the guns engaged every recorded target and any likely place for a Bosche to be in that we could think of. At 10 PM every smoke shell in the battery was fired into Hondschoote, a village of particularly unhappy memory to us. What the Bosche made of our apparently extraordinary behavior, we shall never know, but it certainly kept him quiet.

Soon after 10 PM breech blocks and sights were removed from guns, wireless sets, telephones and anything else destructible were destroyed, and the battery set out in six lorries for Dunkirk. The town had been fairly knocked about by now, but apart from a few shells landing on the foreshore we had little trouble. The battery embarked in divers little boats, and assembled at Leeds nearly a week later. I had one or two things to see to and somehow missed the last boat. There were still odd officers and soldiers of nearly every unit in the B.E.F. about the town and beaches. About 8 AM it was learnt that our own divisional commander was in command of the remnants, and officers of the division visited as many cellars and holes in the sand as possible to assure British personnel that there was no longer anything to worry about. The intelligence officer of our own infantry brigade and myself divided most of the day between a cellar and a hole that we dug on the beach, under an 8-cwt. truck. We learnt that day a great deal about the anatomy of an 8-cwt. that was previously unknown to us. About 5 PM we were invited to share a brew of tea with some other officers in one of the few reasonably intact houses on the promenade. The tea would have been most welcome, but as I was pouring mine out a bomb arrived in the next house. There was a glimmer of light, through a cloud of masonry and dust, to show where the front door had been. We made for it and four out of five of us emerged intact.

There were several sunk destroyers off the beach, and the Bosche spent most of the day bombing these and the moles. It was the first holiday we had had for some weeks, and despite everything most of us got a good sleep. That night the Navy came to our rescue with destroyers—and at 4 AM on the 3rd June we landed at Dover.

Looking back on the retreat, two things stand out in one's mind. Our admiration for the infantry was unbounded. Their fighting and marching were magnificent—they were never ruffled and took everything as it came. And secondly, the splendid work done by the soldiers of the battery. Whether he was a gunner, a driver or a signaller one and all worked unceasingly. The gunners went on digging long after they were exhausted, not once, but in every position—the drivers drove safely and well when it was almost intolerable to remain awake—and the signallers treated the whole operation as though it had been a drill order at Aldershot.

[28]This battery was fortunate to possess a fire-control map. Other participants say that they had no maps after they left the Escaut R.

Germans attacking British positions along the Lys. British machine guns are firing in bursts from hedge in background. Note German division commander (General von Briesen) with map under his arm.

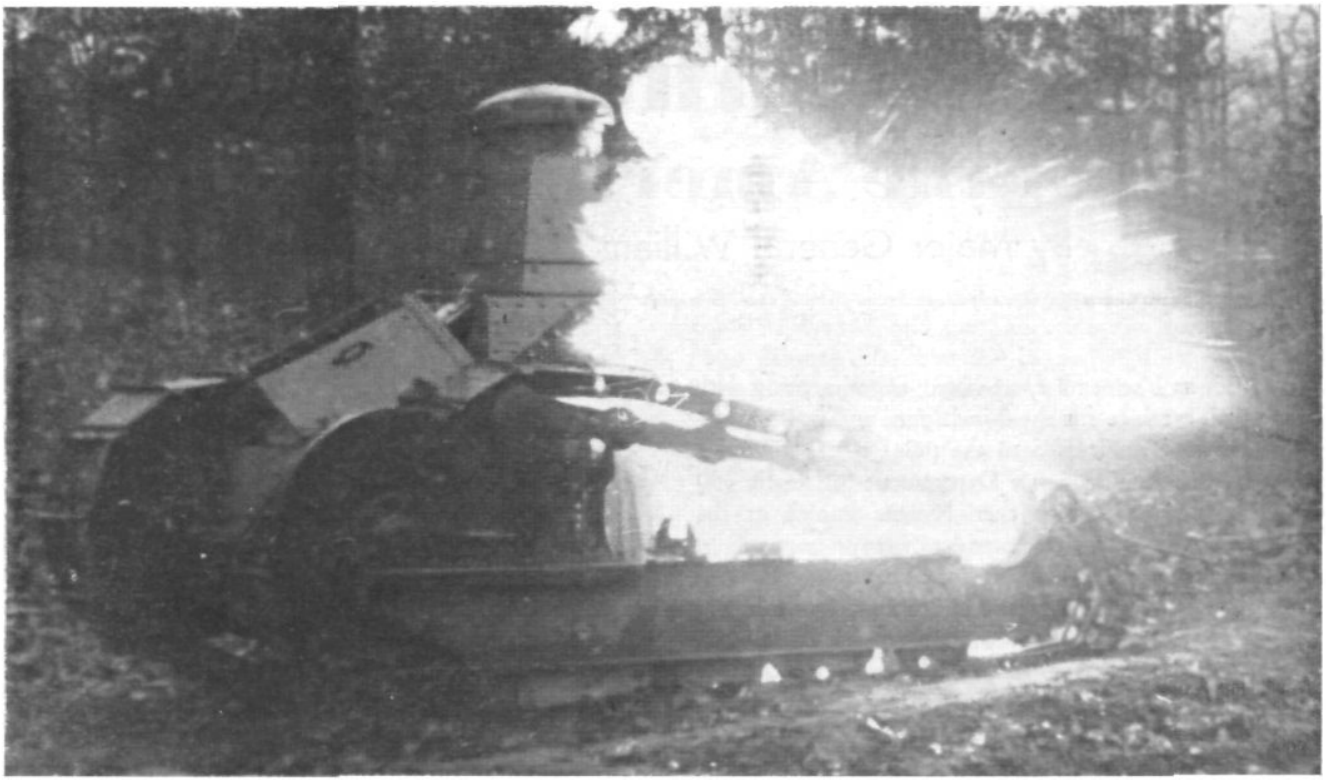
MOLOTOV COCKTAIL

By Captain John C. Hooker, FA

A quart bottle is filled with a mixture of gasoline and motor oil in the proportion of two parts gas to one part oil; this permits slower ignition and carries the flame into the slits and interstices of the tank. The bombs cover the tank with flame, and really penetrate the interior where, of course, the fire would ignite munitions, gas tanks, gas lines, etc., in addition to having a salutary effect on the crew.

We featured this is a regular part of our AT training, and find that the principal effect is that it is a morale builder; the men now feel that if they should somehow fail to stop a tank by gunfire,

Left, Sergeant E. H. Miller holds quart bottle used as gasoline bomb and lower, Sergeant H. O. Brown igniting the bomb.



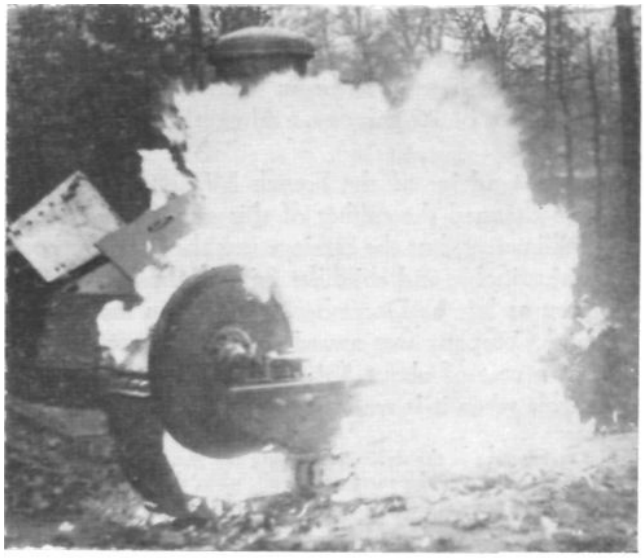
The bomb strikes rear of tank

they can effectively conduct a close defense of the position. The men are enthusiastic about it—refer to giving the tankers the "hotfoot."

The method used in drill is, when close attack is expected, the chief of section gives the command PREPARE FOR CLOSE DEFENSE; Nos. 3 and 5 prepare the fire bombs, one for each member of the squad, placing them handy, the waste saturated with gas. and lights a torch or "flambeau"; at the last instant, when all must throw their bombs, all cease firing and throw at the chief of section command BINGO. This word was chosen because of its non-similarity to any military command, because of its apppropriate nature, i.e., game is finished; and because of its phonetic simplicity.

The bomb has waste taped to the bottom, and this soaked in gas, is ignited at the last moment by a helper or from a torch.

The flames spread



Tank is enveloped in flames

RISE and FALL
of the American "75"

By Major General William J. Snow, USA-Ret.

In 1913, as I remember, we began experimenting with a split-trail carriage for the 3-inch gun, and by 1916 development had progressed to the point where an order was placed by the Ordnance Department for nearly 300 of these carriages, which then became known as the "Model 1916." Ninety-six carriages were to be made by the Bethlehem Steel Company, and the balance by the Rock Island Arsenal. I was on foreign service from 1914 to 1917, so do not know what the Field Artillery thought of this carriage. But I do know that, as an abstract proposition, the Field Artillery had for some years desired a carriage with wide traverse and high elevation, and this means a split-trail such as we knew the Italians had. Just how these requirements were to be incorporated mechanically in a carriage, if at all, was the task of the Ordnance Department. That Department evidently thought that in the "Model 1916" they had solved the problem, for Bethlehem was given an additional order in May, 1917, after we had entered the war, for 340 more of them, at a price of nearly $10,000 each. In June, 1917, the New York Air Brake Company signed a contract for 400 of them, without recuperator,* and the government furnished the funds for building the plant for the express purpose of constructing these gun carriages.

As late as December 1, 1917, the Willys-Overland people got a contract for 2,927 of them, also without recuperators, deliveries to begin April 1, 1918, at the maximum rate of 25 per day. Altogether, about 4,000 were ordered.

Upon the advice of the French Mission, on June 5, 1917, we changed the caliber of this gun from 3 inches to 75 millimeters; but the carriage was the same for both. This unjustifiable and childlike faith in the Model 1916 gun, even as late as December, 1917, when the Willys-Overland Company was awarded the large contract for 2,927 at a cost of about $21,000,000, was all the more remarkable when it is realized that not one had yet been delivered on the contracts made in 1916—this for the reason that the contractors had been unable to make the carriage. This fact was well known to the Ordnance Department, which was continually making changes in the drawings and specifications to correct defects that developed in the course of manufacture. In other words, the gun carriage was not a practicable manufacturing proposition. It must also be added that not one of these carriages had ever received a field test (since none existed to be tested). But, notwithstanding that, the largest order yet given was placed as late as December, 1917. Why was this? With the idealism (and I suppose egotism) characteristic of the American people, we hoped and expected to make a real contribution to the war of something better in arms than was then in use by the Allies. Certain officers in the Ordnance Department settled on the "Model 1916" to fill this role. Both France and England were using a single-trail carriage; if we could develop a split-trail, it would mark a real advance; hence the tremendous effort put on this gun and carriage, an amount out of all proportion to the results attained.

Up to the time I became Chief of Field Artillery, in February, 1918, not one of these gun carriages had been finished. During the first month of my incumbency, one came through. This was followed in March by eight, in April by none, in May by four, in June by six; or a total up to June 30th of nineteen carriages. Of course this was not a drop in the bucket compared to our needs. And please bear in mind that we entered the war in April, 1917; hence when this first carriage came through in February, 1918, we had been at war ten months. Looking at this length of time from a war point of view, it was bad; but, looking at it from a manufacturing point of view it was better. We had made some of the contracts in 1916; so, instead of ten months, approximately a year and a half had elapsed between letting contracts and date of first delivery. This was bad, looked at from any point of view. But, even so, it could have been condoned if the carriages thereafter had come through in a flood; or, in other words, if this year and a half had been used in building factories, tooling up, installing machinery, and in making all the other necessary preparations for quantity production. When, four months after the first carriage was completed, the hoped-for flood proved

*The recuperator is the device connecting the gun with the carriage. Its purpose is to absorb the energy of recoil, when the gun is fired, and to return the gun to the exact position it had previous to being fired. This saves re-laying after each shot. Some idea of the efficiency of the recuperator may be obtained when I state that the energy to be absorbed at each shot is equal to that of a heavy automobile, going at the rate of 100 miles an hour, stopped in a fractional part of a second and within three feet; and this work is done fifteen or more times a minute, with no shock or jar.

to be nothing but a dribble of nineteen carriages, it should have been perfectly evident to any common-sense man that the whole program was a fizzle. True it is, there were certain officers in the Ordnance Department who recognized this clearly; these men, in 1917, were recommending that the "Model 1916" be abandoned and a switch made to the French 75-mm. gun and carriage; but in the confusion then existing in the Ordnance Department their voices were as one crying in the wilderness. They, however, persisted.

One of the most persistent of these was Captain C. B. Goodspeed, an Ordnance Reserve Officer, Captain Goodspeed was, in civil life, a large manufacturer, familiar with steel and conversant with all the problems of production. All during the autumn of 1917 he strove to clear up this carriage muddle. Finally, on January 8, 1918, he wrote a Memorandum to his Chief, boldly recommending the cancellation of the 2,927 carriage contract with Willys-Overland for the "Model 1916" and the substitution of a contract for an equal number of French 75-mm. carriages without recuperators. His Memorandum went on to state that in any carriage we might make, the recuperator would be the bottleneck; that the French recuperator was a finished and tested device; that we had one in this country at that time; and that it could, consequently, be produced in quantity quicker than we could perfect and manufacture our still experimental spring recuperator for the "Model 1916." He added that the French recuperator could actually be produced cheaper than the one we had on the "Model 1916."

Another officer who realized the hopelessness of the Model 1916 was Lieutenant Colonel Everett S. Hughes, a regular officer of the Ordnance Department, and a thoroughly capable man. For months and months he had endeavored to impress his seniors with the view that the Model 1916 was at best an experimental gun and carriage that would possibly be unsuccessful and certainly was untested. It had not reached the production stage. Repeatedly, during the latter half of 1917 he called attention to this fact. So, on January 16, 1918, he wrote a Memorandum to his Chief recommending the same cancellation and the same substitution that Captain Goodspeed had recommended. This Memorandum of January 16th stated among other things that all spring recoil mechanisms tested to that date had failed; that as an alternative device the St. Chamond hydropneumatic had been designed and was to be used with the "Model 1916" but had not been tested; and that the Machine Tool Committee of the Council of National Defense stated that: "After a careful study of the spring recoil mechanism as designed for the 'Model 1916,' it will be impossible to secure machine tool equipment for manufacturing this mechanism inside of six months," and that "the carriage, exclusive of recoil, has developed certain defects that must be overcome before it can be considered a perfected carriage."

Let us study these statements for a few minutes to see just what they imply. The Willys-Overland Company would presumably begin deliveries of carriages under their contract on April 1st. The carriage could not be used until equipped with the recuperator. Therefore, the time-limiting factor was the recuperator. This device would have to be of either the spring return or the St. Chamond type. But no spring return had yet been devised that would work for the Model 1916. Now let us assume that by some stroke of genius (which had not manifested itself since manufacture started in 1916) one could be devised, and that, miraculously, it could be devised at once. In that case, according to the National Defense Committee, machine tool equipment to make the recoil device could be gotten together in six months. Therefore, the 2,927 carriages from Willys-Overland would be equipped with this device not earlier than July, 1918. Adding time for testing, assembling, etc., late summer was the earliest any Model 1916 carriages could be expected. But suppose we drop the spring recuperator, and consider the St. Chamond. Only one of these had been made; it was untested; it was still in France, IF it were promptly tested in France and IF it successfully tested out, and IF it were then promptly sent to the United States, and IF the drawings for the recuperator were also sent to this country promptly, and IF the drawings for the jigs, tools, and fixtures also came promptly, why, then, as soon as the machine tools could be collected, manufacture could begin! So here again it would seem that summer was the earliest date that any of these Willys-Overland carriages could be equipped. However, we have not yet finished with delays. Rock Island Arsenal, the only manufacturing concern that had yet been able to make a single carriage (the one which was presumably on its way to France for the St. Chamond test), stated that besides the recoil mechanism there were other defects in the carriage which would have to be corrected. One officer who had been working on the carriage for months, in the Office of the Chief of Ordnance, called it "an abomination and in fact a practical impossibility as a manufacturing proposition."

In view of all this, it would seem that the only sensible thing to have done would have been to approve Colonel Hughes' recommendation to give up the Model 1916 and adopt the French 75-mm. Instead, however, a conference was held in the Office of the Acting Chief of Ordnance, on January 31st, at the conclusion of which no decision was announced. However, the contract with Willys-Overland was shortly afterward cancelled. The Company had done nothing except to tool up in preparation for work. So finally after *months* of agitation by the men who had seen the futility of trying to make a gun carriage that was still in the highly experimental and development stage only, an impossible project was abandoned.

One of my early acts after my appointment as Chief of Field Artillery was to visit the Ordnance Department and inquire about gun production. The information I received differed with each section visited; no two sections

gave the same figures. Thus in one place it was stated that when the original orders were given for carriages and other vehicles it was assumed that by October 1, 1918, completions would be as follows:

1,632 Batteries of 75 millimeter
257 Batteries of 4.7 inch
768 Batteries of 155 millimeter howitzer
386 Batteries of 155 millimeter gun.

Each battery comprised four guns, so guns were represented here by the thousands. If such large quantities were to be completed by October 1st, it meant that some of them would begin to come through long before that date, and that deliveries would increase week by week. This was indeed encouraging, but other sections of the office regarded these figures as fantastic.

For days I could make no headway, as I received so much conflicting information. The only thing I was sure of was that guns were not being produced and that nobody seemed to speak with authority. It was only gradually that I found out about the failure of the "Model 1916" program and the lack of accord among the officers of the Ordnance Department. One day I was in my office studying some Ordnance charts showing anticipated production, when Major Bacon, who was my liaison officer with that Department, informed me that the charts were worthless. He told me that two separate divisions of the Ordnance Department were issuing these charts at regular intervals; that they never agreed; and that the set which I was examining came from the wholly unreliable source. He then brought me the reliable charts. This disturbing situation was food for thought, so I asked him if he thought he could really find out for me the actual conditions in the Ordnance Department and what the true prospects were for geting guns and carriages; and whether he could find out with whom I could cooperate in that Department so as to get results. He said he thought he could, so I told him to go ahead and not to come back to the office until he had gotten to the bottom of the matter. At the end of three days, he came back saturated. He had worked day and night. The information he gave me was so important that I felt compelled to communicate the substance of it to the Chief of Staff, who thereupon wrote a letter (March 18th) to the Acting Chief of Ordnance and followed it, on April 3d, with a cablegram to General Pershing to send Major General C. C. Williams to the United States by the first available transport with a view to his appointment as Chief of Ordnance. That was a very wise selection. General Williams continued as Chief for ten years and proved to be the ablest Chief of Ordnance that the Army had during the forty years I was connected with it.

As an immediate result of the relief of The Acting Chief in the Ordnance Department, an agreement was reached, or so I thought, that most of the completed parts of the Model 1916 which the contractors had on hand would be shipped to Rock Island. This was the suggestion that Colonel Hughes had repeatedly made. My understanding was that this Arsenal would make as many of these "Model 1916" carriages as it could by assembling these parts, but that no new manufacturing would take place there except of such missing parts as were necessary to utilize the completed parts turned in by the contractors. Subsequent events, however, showed that I was wrong, for either the faction that was behind this gun and carriage lived up to this agreement none too loyally, or I had misunderstood the agreement. The contracts that I had understood to be cancelled were merely softened down. They were only subordinated, and every time from then to the end of the War that new manufacturing facilities arose, up came the "Model 1916" to seize them.

Early in the spring of 1918 I learned that a Model 1916 gun and carriage had been sent to France some time before. Still later, suddenly remembering this fact, I called for a report of its test, and was informed that the gun and carriage had been lost. Later it was learned that the ship carrying the weapon had turned back in mid-ocean, gone to Halifax, and unloaded the gun and carriage. Both were still there when finally located. Later still I found that this gun and carriage had originally left the United States on December 13, 1917. Now let me state why this carriage had been sent abroad. The Model 1916 carriage, as originally designed, had a spring recuperator. However, up to December, 1917, it had been impossible to make a spring recuperator that would work at high elevation, so the carriage was sent abroad to be fitted with a St. Chamond (hydro-pneumatic) recuperator to see whether that would work. We had called on the French to design a recuperator for us and this recuperator was now ready for test.*

Here it was early in 1918 and we were still experimenting on a gun and carriage with which to fight the war. And the war was going on all the time while we were trying to design a gun and carriage with which to fight; we were even calling on a foreign country to help us in our designing. It is a great temptation to make some caustic remarks on such a procedure. And the temptation is especially great when it is realized that there were 42 brigades of field artillery (comprising almost a quarter of a million men) actually in existence and waiting for guns with which to train. I may further add that in June, 1918, a report was received from the Chief Ordnance Officer in France, stating that the St. Chamond recuperator had withstood the firing test on the Model 1916 carriage, but that "the road test had

*After we entered the war, and while we were, of course, having trouble in designing a spring recuperator for our "Model 1916" gun carriage, we made a contract with the French officer who had designed the hydro-pneumatic recuperator in use on the famous "Soisante quinz" to design for us a similar recuperator. He was to utilize the knowledge he had of the French one and its ten years' service, to design the best one in the world. We paid him, as I remember, $60,000. The recuperator he designed for us, we called the St. Chamond so as not to confuse it with the French one which was called the Puteaux, from the arsenal where it was made. And, of course, we got into trouble with the French for "stealing their military secret."

torn the carriage all to pieces." The report then asked for 60, or preferably 100, Model 1916 guns and carriages to be fitted in France with the St. Chamond recuperator and there given a field test! Again, I resist the temptation to comment on the whole incredible procedure beyond stating that we did not send the "preferably 100" or even the 60 asked for, an effective reason being that the total production at that time had been but 19 carriages.

Although General Pershing had, in the previous February, approved the manufacture, here in the United States, of the French 75-mm. gun and carriage as it stood, yet on July 21, 1918, five months later, the Ordnance Department received a real shock in the form of a long cablegram in which he recommended changes in the light gun program. These changes centered around the proposed adoption of the St. Chamond recuperator. In effect, they amounted to a substitution of this recuperator for that of the Puteaux, the one with which the French 75-mm. carriage had been equipped ever since the first one had been made in 1897 (which will be discussed later), and to injecting new life into the "Model 1916." As to the latter, either someone must have used General Pershing's name in the cable, or he must have been furnished only incomplete and misleading information as to the results of the road test of the Model 1916 with the St. Chamond recuperator, or the Ordnance Department in France was completely out of touch with that Department in the United States (asking for 100 carriages when only 19 existed). Some of the contracts for this carriage had been running two years; we had been in the war 15 months; and we had produced only 19 guns where thousands were needed. As far as production is concerned, I thought the whole thing had been given up as a bad job. Yet here was the A.E.F. reviving this carriage by means of a new recuperator of which only a single one had yet been tried. Under the conditions cited it was, of course, idle to expect that the field artillery could be equipped with this weapon during the War. As the adoption of suggestions for change would have slowed down production, the War Department replied to General Pershing by cable as follows:

"With reference to your 1472 paragram 1. If quantity production of 75 millimeter materiel is to be secured at an early date, it is absolutely necessary that no changes in design be made or even discussed at the present time. If present program remains unchanged and manufacturers are encouraged in continuous production of the models with which they are becoming familiar a large and steady flow of materiel should be secured during the next few months. When that has been accomplished the gradual introduction of improved types of guns and carriages may be made without demoralizing output but not before. * * *"

Yet, like Banquo's ghost, the matter would not down. The Ordnance Department group that was determined to manufacture a gun which might be stamped "made in America" seized upon every occasion when new manufacturing facilities became available again to push the "Model 1916." In the late summer of 1918 we had one turned over to the field artillery for a field test at Fort Sill. The test showed that, because of the complicated carriage, it took the gun-crew hours and hours to clean the carriage after a mud test, and that owing to lost motion an unbelievable variation could be produced in the range. Firing over our own troops was absolutely out of the question, on account of the gun's inaccuracy. There were other defects also. The carriage was wholly, utterly, and absolutely unsatisfactory to me.

As late as September, 1918, an attempt was made to let a contract for 1,500 of these carriages. A more accurate statement would be that an order was given the Bethlehem Steel Company to make 1,500. I tried unsuccessfully to head off this order by verbal representations to the Ordnance Department. Having failed in this, I wrote a letter to the Chief of Ordnance on the subject, and in addition took up the matter with the Chief of Staff. This resulted in instructions being given about the middle of October to the Chief of Ordnance in the name of the Secretary of War, that the order for these additional carriages would be cancelled. These instructions were given 18 months after we entered the

Photo by Morris Swett

The 75-mm. gun M1916. This weapon was provided with an ingenious variable recoil, which has been obviated in more modern guns by the use of equilibrators and trunnioning near the breech.

war, and although we did not then know it, within a month of the end of the war. Up to December 31, 1918, six weeks *after* the end of the war, only 249 Model 1916 carriages had been completed, even though three contracts were at that time still outstanding and even though the Rock Island Arsenal had thrown into the work all the energy and experience of which it was capable. This was not one-twentieth the number we had needed. And this persistent pushing of the Model 1916 was in the face of the fact that by that time we had given the gun and carriage a field test and found them to be unsatisfactory. So here was the absurd spectacle presented of trying to make in war a gun that could not be made in sufficient quantity, and that, even if it could be so made, would be unsatisfactory. Some people no longer referred to it as the "Model 1916" but as the "Crime of 1916." The whole trouble with this carriage was that it had been put into production without sufficient development work first. The result was that development work took place concurrently with production, if I may so describe such an anomalous procedure. One defect after another would develop; and the correction of one defect would necessitate changes in parts that had already been passed as satisfactory. To the backers of the carriage, success seemed always just around the corner.

As I have stated, the spring-return feature of the recuperator gave trouble right from the start. But this was only one of the many defects. The pintle was to be an elaborate forging, but no forging company considered this practicable and many flatly refused even to try to make it; so the first 500 were castings instead of forgings. The axle arms attached to this would not hold. The sight mechanism had considerable lost motion. The breech of the gun, the trails of the carriage, and many other features were unsatisfactory.*

In fairness to the Ordnance Department as a whole, I want to repeat my statement that not all the officers of that Department were back of the Model 1916 gun and carriage. There were some who realized the absurdity and even danger of the course that was being pursued in still trying to produce this weapon and they were frankly outspoken to me about it all during the war. What was really needed in the Ordnance Department was a realization of the fact that the Model 1916 was still in the experimental and development stage and that it had not yet reached the production stage. No blame can be attached to those who seek to develop a new and better weapon either in peace or war; but until it is developed, it must be regarded as purely an experiment, and quantity production should not be attempted. A clearer understanding of this fact would have led to the subordination of the development of this gun and carriage to the production of the French 75-mm. and the better use of the manufacturing facilities of this country in making the French 75-mm., which was a fully developed product that had stood the tests of time and the battlefield.

Years after the war I was privileged to read the diary of an emergency Ordnance officer who had been on duty in the Ordnance Department in Washington during the war. The following are some extracts from that diary:

"December 10 to 14, 1917: Some impractical theorist insists on making this gun, because of the belief that the elevation possible with the French 75 is insufficient for all contingencies. * * * The first recoil cylinder and counter recoil buffer failed; a new one was made to a new design and it failed. A third and satisfactory one has not yet been built. * * * In other words, the design of our 1916 model is not yet completed, to say nothing of not having been built and tested. It is utterly incredible to me and to all others in the office who have had any manufacturing experience how they can even consider adopting what is so conspicuously an abortion, and an untested and untried one at that. * * * I estimate that our gun and carriage will take twice as long and cost three times as much as the French. This additional cost in money and time would be too great for even a greatly superior gun, but it is understood that it will be spent for an inferior one. * * * I am firmly convinced that this gun is a colossal mistake and will develop the worst scandal of the whole Ordnance failure. Someone should get worse than h—l for it, because it is a stupid mistake in judgment."

This is strong language, stronger than I used but not stronger than I was tempted to use all during 1918 in my heartbreaking efforts to get enough guns to train the then actually existing field artillery brigades. On December 15, 1917, this same officer wrote in his diary:

"Went to Colonel ———; he told me that * * * we should immediately proceed with the manufacture of 3,000 spring mechanisms. * * * I remonstrated calling his attention to the fact that the spring mechanisms would require three times the machines and more than three times the men that would be required for a French mechanism. * * * When I told other officers of the Colonel's orders, they were incredulous, because they appreciated the almost impossible conditions created. We are confronted with the necessity of equipping a plant or plants with three times the machinery that would be required for the production of the French mechanism, and, at the same time, to equip the same or additional plants with jigs, dies, gauges, machines, etc., for the manufacture of French mechanisms. The program, therefore, calls for 3,000 spring mechanisms and 3,000 French with which the spring mechanism will be replaced. In other words, we are spending four times the time and money on recoil mechanisms for the 75 millimeter gun as is necessary."

One day the Inspector General of the Army came into my office to discuss matters, and finally said that if I desired he would inspect the Ordnance Department "and give them h—l." I replied that I was after guns and not h—l. Perhaps I made a mistake and his inspection might have resulted in killing off the "Model 1916" and the utilization of the facilities thus released could have been diverted to speeding up the French 75-mm. program.

Although the failure of the Model 1916 program seriously interfered with training in this country and jeopardized the equipment of the A.E.F., yet I am glad to state that this failure was the only big error of the Ordnance Department during the war. There were many

*Many field artillery officers who took the Basic Course in 1919-1921 recall this gun. Every time they fired it, some parts would fall out on the ground. It seemed to be "basted" together.—EDITOR.

harassing delays and many shortages of Ordnance materiel, of course, and the problem of the Field Artillery was much complicated thereby; but in all of these other cases part of the trouble was due to causes beyond the control of the Ordnance Department.

Perhaps I should modify this statement to a slight degree. I have seen various letters and memoranda originating with those officers in the Ordnance Department who in 1917 were struggling to get this carriage into production and who were writing to heads of Sections in that Department telling of their troubles; and in some of these papers the authors use the words: "if the Field Artillery insist on this carriage," or some similar expression implying that the carriage was being built at the behest of the Field Artillery. I do not know who was considered the mouthpiece of the Field Artillery at that time, for there was no chief of the arm. The nearest approach to one was a quasi-committee of three field artillery officers* who for about two months in the fall of 1917 were stationed in Washington and on occasions were consulted on field artillery matters. But that short-lived committee never held a meeting, being otherwise fully occupied; not all of them had their offices in the same building. And certainly, when I came to Washington as the first Chief of Field Artillery in February, 1918, I was wholly unable to find any person or committee acting as a mouthpiece for the arm, although, as I have stated earlier in this book, I made diligent search for anyone who knew anything about the field artillery. In fact, all I could find was unsettled questions due to the lack of a mouthpiece. Even granting that the field artillery favored this gun and carriage in 1917, certainly there was no doubt whatever where I stood on the question after I became Chief early in February, 1918. So far from lending any encouragement to it, I made myself a nuisance in efforts to kill it off and bury it. There never was a day after I had learned of the wholly undeveloped stage of the carriage when I would not have rejoiced upon hearing that it had been abandoned and the facilities thus released devoted to some proven gun and carriage. Although I have, all through the discussion of the Model 1916, talked about the carriage only, yet, in fact, even the gun itself passed through six different models. So everything connected with the "Model 1916" (gun, recuperator, and carriage) was in purely an experimental stage at the time we were trying to produce it in quantity.

I may close this unfortunate gun-and-carriage discussion by stating that finally so many changes had been made that there were at least half a dozen "Models" of the "Model 1916," and consideration was even being given to the question of changing the designation of the latest one from Model 1916 to "Model 1918."

This "Model 1918" consisted of a redesigned "Model 1916" carriage, with the St. Chamond recuperator and a French 75-mm. gun on it. The reader will therefore see that this was at least a direct descendant of the original "Model 1916," with preponderant infusions of French blood it is true, but still having the "Model 1916" family characteristics.

The moral of this story of the "Model 1916" is clear. The development of a new weapon is a long process, necessitating exhaustive proving ground and field tests which cannot be hurried, and must be participated in by the using arm. The highly efficient Ordnance Department that Major General Williams developed during the period of his incumbency as Chief would never have made such a tragic mistake as has been described herein.

*This committee consisted of Majors J. E. Stephens. W. S. Browning, and D. H. Curry.

DURATION OF ARTILLERY PREPARATIONS

Generally the length of an artillery preparation is limited by the desire of the commander to secure surprise, although occasionally there may be other and more technical reasons such as shortage of ammunition. Closely related to this is the question as to how soon, after the preparation has commenced, can the enemy bring up his reserves. Today's motorization undoubtedly imposes on us a revision of logistical concepts. But if the enemy can move up his motorized reserves in, say, half the time required for the movement of foot troops, does that mean that we should shorten the duration of our artillery preparation a corresponding amount?

Not necessarily. There are other considerations. The necessity for properly "softening" the defensive installations may outweigh the desirability of local surprise. We must take into account, too, the magnitude of the action, the extent of the front, the probable depth of the defense, and the size of the forces engaged. If the hostile general reserves or other forces capable of limiting our attack consist of as much as a corps, it makes little difference (so far as surprise is concerned) whether the artillery preparation be 15 minutes or an hour in length. The additional forty-five minutes' fire, however, may win the battle. Note that the German air and artillery preparation for the surprise on the Meuse lasted four hours!

MILITARY

Mexican field artillery (*above and in the center*). *The standard field piece of the Mexican field artillery is 75-mm. St. Chaumond-Mondragon, which has a range of about 5,000 yards. The guns and caissons are drawn by mules. Mexican artillerists practice indirect fire and fire direction in accordance with standard methods, but are inclined to rely on axial methods and direct fire.*

The current trend toward augmenting the cordiality of relations with our neighbors "south of the border" leads to increased interest in our military comrades in the Republic of Mexico.

Mexican cavalry. The nature of the terrain in Mexico, in which one may encounter tropical jungles, high central plateaus, rugged mountains, or deserts—and where dirt roads may be impassable during the rainy season—points to the use of cavalry for many operations of the Mexican Army. The cavalry is armed with the Mosqueton carbine, the bayonet, saber, and Mendoza light machine gun. The Mexican regiment is about the size of an ordinary U. S. squadron.

According to *Taschenbuch der Heere,* 1939, the peacetime strength of the Mexican Army is 47,500 officers and men, and the war strength is 120,000. The peacetime army is divided as follows:

Infantry: 50 battalions, having 150 rifle companies, 50 machine-gun companies, and 2 depot companies.

Cavalry: 40 regiments of 120 dragoon squadrons and 40 machine-gun squadrons.

Artillery: 1 regiment of field artillery of 4 batteries; 1 regiment of mountain artillery of 4 batteries; 1 battery of antiaircraft artillery.

Technical troops: 1 battalion of 4 pioneer companies and 1 reconnaissance company.

The infantry battalions are constituted with: staff, reconnaissance detachment, 3 rifle companies, 1 machine-gun company, 1 accompanying weapon and train. The cavalry regiments each consist of: staff, reconnaissance detachment, 3 squadrons, 1 machine-gun squadron. The artillery regiments each have a staff and 4 batteries.

The Mexican Tank Corps passes in review. The vehicles are Marmon-Herrington light tanks powered with Ford engines and carrying two light machine guns.

The Mexican Army is provided with modern automotive transport, as may be seen from this group of Dodge trucks being loaded for rail movement.

MEXICO

Illustrations Furnished
By Lieut. Raleigh
Hansl, FA

Mexican infantry at rifle practice. The standard rifle of the Mexican army is the Mosqueton, *a 7-mm. Mauser-type combination rifle and carbine. The magazine holds five cartridges. Effective range. 1,850 yards. Other arms include the .45 automatic pistol, a Mendoza light machine gun, Hotchkiss and Browning heavy machine guns, and Brandt 81-mm. and 120-mm. mortars.*

Mexican troop train about to depart on an expedition against the Escobar rebels, 1929. The soldiers usually ride on top of the cars, while equipage is carried inside.

Cadets of the Collegio Militar—the Mexican "West Point."

Part of the Mexican Air Corps. On the ground are new Bellanca monoplanes. In the air are three of the older planes built by Consolidated.

In the Vosges—aftermath of the blitzkrieg

Artillery Support of Motorized Divisions

Editor's note: The employment of a motorized division offers a number of variations on the tactics of an ordinary infantry division, be it triangular or square. This has been the subject of considerable discussion and experimentation abroad; and there has also been some recent groping in this country. Although the Italians have not, as yet, enjoyed marked success in the employment of these units, the *ideas* of their best military minds appear to be sound, and in accordance with the methods which the Germans used so spectacularly in France and the British in Libya. The following article, condensed from a translation of an article by Col. Caracciolo, in *Rivista di Artiglieria e Genio*, is well reasoned and worth careful study.

General

A motorized division (that is, one organically constituted as such), by virtue of its rapidity of movement, soon becomes detached from army corps or other large units. This occurs whether it is rapidly preceding a major unit in order to seize points of great strategic or logistic value, or moving on a wide sweep to strike at the enemy's flank or rear.

From the tactical point of view, then, the division will quickly find itself almost isolated. Though its style or its intentions at least must be "Attack and Overcome!" it will still be necessary for it to be able to free itself quickly if the success of the attack appears doubtful, so as to avoid becoming bogged down by the weight and the vulnerability of its machinery and by the necessity of keeping to the roads. Thus the structure of a motorized division presents contrasting characteristics: strength and abundance of equipment, and lightness of columns. To achieve both ends it is necessary to condense to the utmost the power of the equipment and to drill the personnel in a specific manner. The newest armies must have a minimum of motor equipment and personnel. The effectives of a motorized division should be made up in great part of selected troops having a long-service status.[1]

Composition of Division

A motorized division can be considered as composed of 3 echelons:

(1) An echelon for scouting duty and for establishing contact with the enemy (motorcyclists and armored cars or light tanks);

(2) A mechanized echelon for security (light tanks, motorized machine guns, and eventually artillery);

(3) A combat echelon (infantry, motorized artillery, engineers, etc.).

The service units, of course, are not included here.

Whatever the make-up of the first echelon, there can be no doubt that the conditions under which a motorized division will generally operate (specifically, beyond the limits of safety) render scouting and contact a very delicate and difficult mission. The scout motorcyclists will not be able to move far away from the roads, and will always be inseparable from their means of transportation. The functions of light armored vehicles consist in lending compactness to the scouting echelon; in searching areas inaccessible to the motorcyclists; in isolating and annihilating the leading enemy groups, and at the same time protecting the motorcyclists.

The second echelon has not only a protective function, but also that of meeting the first resistance and overcoming it while the main body of the division, to the rear, continues its movement. It seems logical that it cannot be composed solely of motorized infantry; but it must be endowed with adequate strength and compactness. In other words, the duties of the first echelon are the usual ones for the scouting groups, whereas the second echelon is in reality an advance guard combining strong aggressiveness with its security mission.

Availing itself of its mechanized equipment, this second echelon must repulse and neutralize the first resistance, to enable the infantry of the main body to proceed by motor vehicles and take up, as far forward as possible, a suitable dismounted formation.

As for the third echelon, to weigh down a motorized division with too great a number of battalions is now—so far as the writer has been able to observe—utterly discredited, the greatest of its many disadvantages being the enormous length of columns.

To be sure, some foreign scholars would entrust the infantry to motor vehicles with a capacity of 50 men each. It is doubtful whether these gigantic vehicles are suited to the purposes of a motorized division, which must exploit to the utmost the advantages offered by the roads.

The Artillery Component

The artillery of a motorized division has its own characteristics of spirit and service. It is not only the materiel but also each tactical action that must be different from those of the artillery of a normal infantry division.

The necessity for a rapid intervention in combat, and the methods of transportation, prescribe that positions be taken that are easily occupied and not too distant from the roads. Such positions must be taken as can be quickly cleared for successive advances in the direction of the division attack. These factors naturally restrict the zones in which the groups can be deployed and occasionally—in spite of any urgency—they render such deployment very arduous, if the aim is to obtain a minimum of defilade and masking. It is the writer's opinion, therefore, that in the artillery of a motorized division preference should be given to the howitzer. Its easy adaptation to terrain, and the fire potentialities inherent in its trajectory, compensate to a great extent for the sacrifice of extreme range.

Furthermore, the problem of ammunition replenishment which is especially difficult in the case of motorized divisions, makes standardization of bore in the regiment advisable.

Despite this, a certain number of long-range pieces are manifestly useful for distant interdiction and counterbattery fire. It would be advisable to assign pieces capable of an initial high rate of fire and of a range superior to that of the weapons allotted to the artillery of an ordinary infantry division.

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[1] As in the U. S. Army, where the motorized divisions are Regular Army units.—Editor.

It would be superfluous to list here all the ideal prerequisites for artillery of this sort, and then babble on about them. For years we have been reading in the foreign reviews of every country a mass of requirements as easy to write about as they are difficult to obtain: Maximum lightness, great range, wide traverse, great precision, etc., etc.—"Maxima" is used in every field, even if some such uses are technically contradictory. But actually no substantial innovations have been effected in any army.

ORGANIZATION OF ARTILLERY

A motorized division in a two-column formation ought to have at least three artillery battalions, to be able to supply direct support battalions to the first echelon of each column, and, in the majority of cases, leave a battalion directly responsible to the division artillery commander. Furthermore, in order to provide for counterbattery and distant interdiction fire, it would be advisable for the divisional artillery to have an organic fourth group equipped with the relatively long-range materiel previously mentioned.[2] Groups of army or corps artillery might arrive later, since they are capable of rapid transportation, but this cannot be relied upon.

American motorized division during maneuvers.

In substance, in a motorized division with a double formation the artillery might consist of:

3 battalions (9 batteries) of howitzers
1 battalion (3 batteries) of long-range guns
Total: 12 batteries.

There would still be doubt, however, as to the advisability of the 3-battery battalion. Although being a battalion's normal allotment in the attack, it is nevertheless not entirely free of a certain clumsiness in movement and a certain awkwardness in the selection and prompt occupation of a given position.

On the other hand, the 3-battery formation would be useful for the long-range gun, since it might on occasion be necessary to assign to a rear echelon at least one long-range battery, without excessively reducing the group itself.

Thus an alternate solution presents itself to make the battalion lighter and more compact, without notably decreasing the number of batteries, as follows:

4 battalions (8 batteries) of howitzers
1 battalion (3 batteries) of long-range guns
Total: 11 batteries.

This solution renders the bulk of the artillery more rapid, elastic, and adapted to the requirements for employment in the motorized division.

There is, finally, a more economical solution (and in our opinion, an *exceedingly* economical one):

3 battalions (6 batteries) of howitzers
1 battalion (2 or 3 batteries) of long-range guns
Total: 8 or 9 batteries.

However, the volume of fire that can be developed by 32 or 36 pieces—often not coordinated with army or corps artillery—is not, in this observer's opinion, sufficient for the missions of a motorized division nor for the usual circumstances in which it might be called upon to perform such missions.

It is at any rate evident that in all the above cases, and particularly in the last one, the cooperation of the army corps artillery in support of the relatively small divisional body is necessary and often urgent.

MARCH FORMATIONS

The complexity of the column or columns of a motorized division and the delicacy of the operations of detrucking a division require that the development of the artillery (into sub-columns) during the march towards the enemy be governed by the military situation. Above all, the probable successive formations of approach and deployment should be taken into consideration. It is sufficient in this connection to mention the difficulty of passing through long motorized columns, and of the masses of vehicles and other equipment which obstruct the road for the motorized artillery while the infantry are dismounting at the beginning of an engagement. While the infantry battalions, after dismounting from the trucks, may immediately proceed afoot, passing on both sides of the column of empty trucks, the artillery

[2]Thus the author, by processes of logical reasoning, arrives at a solution remarkably like the organization of the artillery of U. S. motorized divisions.

cannot resume its forward march until the road has been cleared of these vehicles.

We had this experience during the great maneuvers held in the Upper Adige. In fact, the division artillery (which was necessarily marching in column on a single road, behind the main body) was blocked by a long column of empty trucks. After the dismounting of the infantry battalions, the artillery, because of darkness, rain, numerous crossings and other circumstances, proceeded along the highway very slowly on its way to preestablished locations. To those who remark that the motorized artillery may rapidly make up time as soon as the road is clear, one may say that under certain circumstances, the detaching of artillery from its infantry, while the infantry is proceeding afoot, may be an involved and difficult task, especially in the closing-in phase.[3]

Therefore it is advisable to divide the artillery units into proper column formations initially and avoid placing too many detachments in the rear of the infantry echelons.

Part of German motorized division on the advance through Holland. Note AA machine gun mounted in vehicle.

General Pichon's Theory

It may be of some interest to briefly sum up the ideas expressed by the logical French thinker, General Pichon.

After stating the premise that the artillery must frequently "sacrifice itself for rapidity of intervention," the author cites the importance of the organization of movement because "if we speed to success we may likewise speed to failure" by a slight error of calculation. It is therefore necessary that the motorized division, because of the great risk incurred by even slightly delaying so delicate an operation, be ready to shift from a formation of strategical transport to one of tactical transport.

Therefore he deems an extremely elastic march formation necessary, with echelons well subdivided and with considerable intervals between them. His aim is to avoid allowing any echelon to be brought too close to the one preceding, especially when the situation at the front is not clear or when the first echelon is already in difficulty. This is to facilitate the rapidity of movement which, even from a considerable distance, permits rear echelons always to close up on advance echelons in good time. It can be accomplished if the intervals between echelons of foot troops are modified as to *time* in order to fill in the intervals themselves; and they must likewise be modified as to *distance* for the motorized echelons. The "kilometric echelonment" is an uncertain basis of estimate, for it must be measured in terms of time. This extensively subdivided echelonment, an extremely elastic formation, applies even to the battalions, whose 40 or 50 motorcars should advance in groups of 4 to 5, distributed over a 10- or 11-kilometer section of the road. This is to make it possible for the last groups to overtake the first ones in about a half-hour, one half hour being considered "due time" by the author.

The intervals among the echelons of an infantry division are reckoned in marching times. This term, applied to the motorized unit, works in such a way that the motorized division, preceded at a distance of 20 to 30 km. by motorcycle elements, spreads over an extraordinarily deep area, depending on the number of columns into which it has been subdivided.

We shall not here discuss the advantages that Pichon expects to obtain from such a subdivision and echelonment within the division, nor the evident risks. It is natural that a movement so arranged constitutes — with reference to the roads — a formidable logistical undertaking; that security, especially on the flanks, becomes more dubious and the handling of the division a matter of serious concern. It may be asked whether a bold enemy who succeeded in infiltering himself between echelons so widely separated, could not hinder the march of the following echelons and break the unity of the division as it is about to deploy for attack. And it might be asked whether the division can have full logistic mastery of such wide zones of territory, without clashing with other march dispositions, and whether its manipulation will not be sometimes excessively complicated and problematic.[4]

Security While Detrucking

If the approach march begins and develops gradually,

[3]American artillery, too, has experienced similar difficulties during recent maneuvers.—Editor.

[4]The author's fears have been borne out by the recent operations in Greece, which indicate that motorized divisions must not be employed too boldly in mountainous (or jungle) terrain. If the Italians failed to heed the warnings of their own thinkers, we should take the lesson to heart.—Editor.

as we enter the radius of hostile artillery action, it is ordinarily the latter which gives us our first warning. For foot troops, the shift to thinner formations is an operation which offers no difficulty. For a motorized division, on the other hand, the shelling of the columns of motorized equipment by the enemy even from great distances can have serious consequences. It necessitates arresting the advance of the columns, detrucking under fire while the motorized unit remains immobile, reconstituting the groups, taking up the appropriate formation, and making a hurried evacuation of the empty trucks even if they are far from the roads, thus offering a target of exceptional vulnerability.

Groups constituting the divisional reserve might form the motorized nucleus destined for exploitation and pursuit. They remain in the motor trucks as long as possible, even during the attack phase, giving the main body of the division opportunity to reassume its motorized formation.

In any case it is appropriate for the security echelon to advance rapidly and take position adapted to the protection of the main body during the detrucking. The armored and mechanized equipment of the security echelon would do some valuable work by swarming into the forward zone and along the flanks, so as to give prompt protection against any hostile obstruction to the shift from truck-column formation to dismounted formation at that critical moment.

Whether the artillery is in the security echelon or subdivided in the main body, its forward movement, due to the fact that the infantry battalions are now dismounted, will take place in successive quick displacements from one position to the other, being governed by the movements of the main body and by the successive lines occupied by the latter.

The absence of pack-animal groups[5] will necessitate the assignment of one of the motorized artillery groups to the security echelon, when it is deemed necessary. Also, in this case, the necessity of keeping to the road, and the visibility of the materiel (tractor and piece) will cause the march to consist of alternate rapid movements and halts. It also seems logical that whenever the division has its own long-range artillery group, the said group (or at least one of its batteries) marches with the main body of the advance guard.

In fact it is of greatest importance for the artillery to be in a position to act in depth from a great distance as soon as possible in order to interdict the roads and to counteract and neutralize the enemy's batteries, should they fire on the roads over which our division operates.

The concept of long-range artillery assigned to the advance guard is not new, and more than ever answers the urgent needs of the motorized division, which is particularly sensitive to interdiction firing.

[5]The ordinary Italian infantry division frequently contains pack artillery.

German gasoline tanker. Note refill cans on ground.

THE ATTACK

It is evident that as the attack develops, the differentiation from a normal infantry division gradually diminishes. If the motorized division possesses as part of its normal equipment a large number of armored vehicles, it is expected to launch the first attack. This must be very rapid and violent in order to open a gap in the enemy's lines as quickly as possible. The unit immediately following must maneuver into this gap and battle for the decision.[6]

The task which the artillery must perform in the mechanized echelon in this case consists of supporting the tanks in the attack—a traditional task of this arm, but one difficult in practice. If the situation is favorable and well defined, even groups with the main body must be brought up in suitable formation, with ample firing space. The batteries should have a distant and wide view of the tank action, since other means of liaison between the artillery and the tanks remain to this day uncertain. It is true that the equipping of tanks with radio is now well generalized; but liaison with the tanks by radio is a complicated and at present uncertain task for the artillery, which must support the tanks from a short distance, neutralize the antitank guns coming into action at the last moment, and above all act quickly against unforeseen objectives. Therefore, an unobstructed view is necessary, together with a high degree of initiative on the part of battalions and single batteries. A well-planned defensive assignment of sectors of attack among the various units and the batteries is also necessary.

The artillery, to carry out such an assignment, must multiply its activities. The tendency to dispose of the great quantities of artillery (absurd in the case of the motorized division) which some writers on the basis of hypothetical calculations deem necessary for sufficient aid to a tank attack borders on the realm of pure theory.

It goes without saying that unless the motorized division has no strong mechanized echelon at its disposal, it would be imprudent for it to venture into a preliminary attack with light-armored vehicles. After a portion of such vehicles has carried out the assignment of protecting the reconnaissance and obtaining contact with the enemy, they will probably be reunited with the divisional reserve, for use at the proper moment.

The function of this artillery, then, is limited to the attack *as in the case of any other artillery with an infantry division*. It takes care of protecting ample lateral sectors and prepares for the possibility of rapid shifts of front and for eventual offensive on the flanks of the motorized division.

EXPLOITATION

Though nothing of particular value is to be noted in the action of the artillery of the motorized division during the exploitation of a success, certain features appear again during the pursuit phase and during the renewal of movement of infantry in motorized vehicles as soon as the divisional reserve enters into action.

The motorized column of the divisional reserve proceeds decisively with the mission of overcoming and destroying or advancing through the last sporadic defenses, quickly aiming at the centers of the movement and at the harassment of the retreating enemy. It is preceded and protected by a leapfrog advance of the motorized echelon of the detrucked infantry units. These, by this time, must have carried out their assignment and be ready to be picked up by their motorized vehicles in order to resume the advance in motorized formation. At this point it becomes necessary to reapportion the artillery. It is important that the complicated movement of the reserve, which must be executed hastily, have artillery support; this artillery should be preceded by a group of motorcycles and light tanks or armored cars to maintain contact and for scouting purposes. This group should have both an aggressive mission and proper equipment with which to execute it.

In this phase, any particular method may be suggested only by the decision and intuition of the commander of the division and by the artillery commander.

BREAKING CONTACT

It must be foreseen that the motorized division, either because it may be incapable of bringing the attack to a conclusion or for other reasons, must retain its freedom of maneuver and be able to break contact.

In this rather delicate phase, in which all the members of the motorized or foot units have the advantage, the movement takes place under the protection of strong rear-guard groups fully equipped with mechanized means so as to give the main body time to execute a withdrawal. The artillery should be partly assigned to the rear guard and partly assigned to the main body, ready to deploy in support of either.

If the division has a battalion of long-range artillery, it is preferable that this group, or at least one of its batteries, be assigned to the rear guard to carry on interdiction fire and slow up the enemy's movement.

The artillery battalions will advance leap-frog fashion, by echelon.

SUMMARY

The characteristics of the use of artillery may then be summed up as follows:

—fractional disposition in the column formation of the division;

—a tendency toward decentralization.

—bold deployment, overlooking any threats from the flanks;

—economy of fire; a short and violent fire;

—strong probability of acting in support of its own armored vehicles, or in defense against hostile tanks.

[6]The author evidently visualizes the action of an armored corps, the spearhead of which is an armored division, followed by one or more motorized divisions. This was the formation used by the Germans in the Sedan breakthrough.—Editor.

Wings For Santa Barbara

By Major William W. Ford, Field Artillery.

It is perhaps unfortunate that most of our field artillery officers have learned their gunnery at Fort Sill!

Before the author of that statement is shot as a heretic, he wishes to explain.

He doesn't mean the School, he means the terrain.

He means that the terrain at Fort Sill, though admirably adapted to the *teaching* of gunnery, unfortunately creates in almost everybody's mind false conceptions as to the relative frequency of employment of the methods taught. In vain may the School caution its young graduate not to expect such favorable terrain at his next maneuver, or in the next war! In vain may it admonish him that observed fire or good maps will be the exception, not the rule! Not until he gets out and tries to maneuver over those vast reaches of land where there is no observation and where there are no maps does he realize just what he's up against. And then he finds that while he has a remedy in theory he has none in fact. There he is, brimful of learning, but as helpless as a statue of Napoleon.

HISTORICAL

During the Third Army maneuvers in the early part of 1940 this writer was a battery commander in the light artillery of a "streamlined" division. During successive division, corps, and army exercises he participated in a number of field problems. *Not once*, during this period of four months, did he find a decent OP! *Not once* did he have a map or map substitute from which fire could have been computed! *Not once* was an actual air observer available to adjust the fire of his battalion!

Major Ford is particularly well qualified to write this article, as flying has been his hobby for seven years. During this time he has owned two planes and has accumulated over 500 hours of pilot time.

It goes without saying that this battery was rarely capable of delivering the fire support expected of it. To be sure, forward observers with "walkie-talkies" were always on the job. Occasionally they performed a helpful service; more often *not*. The simple fact is that along the coastal plain of South Carolina, Georgia and Louisiana terrestrial observation is an exceedingly difficult business, even at short distances.

The experience of this battery was not unique. Ask anyone who was there!

THE PROBLEM

What, then, are we going to do about it?

One suggestion is to forget it, on the ground that we shall probably not fight in such abominable (artillery) country, anyway. This suggestion comes from those who still can't forget the Fort Sill terrain.

But where *will* we fight? If we should have to defend this broad land from an invader, just where would the fracas be likely to begin? In Oklahoma? Kansas? Indiana?

The coastal plain of the Atlantic and Gulf states, from New York all the way down and around to east Texas, is much the same as the country of the Third Army Maneuvers. It is low, flat, sandy, and for the most part densely wooded. It is a very depressing country from the standpoint of one having a fondness for good OP's. If *this* is where we shall meet our invader we had better do something to enable our artillery to see.

Again, if the strategy of defense should require an overseas offensive effort on our part, on what kind of terrain should we expect to find our enemy?

This question is not rhetorical. We might of course expect to find the enemy in any sort of country whatsoever. But of this we may be sure: whatever (ground) observation there is, the enemy will have it. We would have an uphill fight on our hands. We would be blind once more.

Now all this is in no way new. It is a problem which has engaged the serious attention of our best minds at the Field Artillery School and throughout the arm. The obvious need for air observation has spurred the development of an excellent procedure for firing with this aid. The trouble is that we do not have an adequate number of planes or observers for this purpose; nor are they on order; nor are the types of planes we contemplate best suited to the job. More of this later.

Much effort has likewise been spent on improving our methods of firing without the actual air observer, using air photographs instead. This development has now reached the stage where its enthusiasts believe that effective fire can be delivered using wide-angle photos and map data corrected. If their enthusiasm proves justified, a highly important addition has been made to our field artillery technique.

But surely no one will expect this or any similar method to possess the merits of observed fire. There are at least three reasons why such an expectation would prove false:

1. Even the splendid wide-angle photo presents a tough problem in the matter of vertical control. This problem can perhaps be solved fairly well if we are able to determine a number of angles of site to points in enemy territory. *But much of the time, in that type of terrain where we are most likely to fight, we cannot do this*. Ground observation will be nil.

2. Even if we could fire accurately at any point on the photograph, *someone must select the targets*. Now some targets, some important targets, are determinable from geography alone. But in most cases it takes geography *and the enemy* to make targets. Who can doubt that many targets of a critical nature will develop at the decisive stage of battle, targets that were not there the day before and hence do not show on the photograph, targets which only a pair of eyes can discover in time to be of any use?

3. Observed fire ranks first in the matter of ammunition economy, transfers of fire next, map fires last. Ammunition is of the essence!

If, then, there is as yet no satisfactory substitute for observation, and if this observation is frequently unobtainable from the ground, the *what* of our decision is automatic: we must give wings to our eyes!

Requirement: the *where, when, how* and *why*.

A SOLUTION

a. Where: a trained *field artillery* observer, a light airplane of the "flivver" type, and a pilot, *in each battalion of light and medium field artillery*.

b. When: at all times. The above arrangement should be organic.

c. How: training the observers is a cinch; there are thousands of commercial light planes in this country, available upon requisition; if there is any shortage of military pilots, we can draw upon the tens of thousands of civil pilots holding CAA certificates of competency—they can fly these little planes quite well enough. The British hope to use artillery officers to pilot their artillery planes.

d. Why: because we do not have an adequate number of observers or planes now available for artillery missions, nor may we reasonably expect to get them, except through some such program as the above.

DISCUSSION

a. The battalion is becoming more and more the fire unit. It should have constantly at its disposal all the means necessary to perform its tasks. Adequate means include air observation. Furthermore, this air observation must be available to the battalion from the moment the first gun is fired. One or more airplanes "on call" at a division airdrome miles away is too few airplanes, the planes are too far away, and the observers who will man them are too unacquainted with the battalion personnel for close teamwork.

The plane for our field artillery battalion should go with that battalion at all times. The "flivver" plane, with its light wing loading and its 75 HP engine, cruises at about 80 MPH and lands at about 45 MPH. It does not require a prepared landing field, but can land in almost any cow pasture or similar place.* Hundreds of landings and take-offs have been made on highways. Even plowed fields are practicable provided the furrows are not deep.

Aloft, this little ship is merely an elevated OP for its field artillery observer. Communication is by two-way radio having a range of five or six miles. Excellent sets of this type are already in service on civil aircraft as aids to navigation. They can be adapted to military use simply by changing their frequency to the desired military channels.

Objection will be heard that such a craft will be quite vulnerable to hostile aviation. Well, what aircraft isn't? Only the best of the fighters themselves. Does anyone think, for example, that our present service type observation ship, the O-47, would bear a charmed life in an atmosphere infested with enemy pursuit? Of what use are one or two flexible machine guns, firing to the rear, against the eight fixed forward guns of the modern fighter?

Our little flivver plane will have no armament at all; its protection will consist in:

1. General superiority of the air secured by our pursuit aviation. Let no one say we may not have this. We *may* not win the war, but we should try. We should try, likewise, to gain air superiority. No modern war has been won without it. Of course not even a definite air superiority on our part will render us immune from enemy air attack. But such superiority, or merely an equality, should make it possible for us to employ observation

*Recent tests indicate that the landing gear of these commercial planes breaks down after repeated landings in "cow pastures."—Editor.

aviation without prohibitive losses, especially if other protective measures are adopted.

2. Observing from low altitudes *over own territory*. Low-flying airplanes, particularly if painted camouflage, are hard to see from above. If enemy fighters *cruise* at low altitudes our ground weapons should be able to make it hot for them.

3. Maneuverability. Upon the approach of hostile aircraft our pilot will put the little ship into a series of tight turns, barely off the ground; high-speed enemy fighters, much less maneuverable, will have difficulty in bringing their guns to bear.

Military pilots will at once exclaim that the average commercial light plane lacks that visibility upward and to the rear which is necessary to enable the crew to detect the approach of hostile pursuit. The answer is: (a) a few commercial designs do not have this defect; (b) a fairly simple modification will remedy this defect where it exists; (c) the ground radio station working with the plane can often furnish timely warning of the approach of hostile aircraft.

4. Short flights. Our plane will take off, make an adjustment, and land again in very short time; enemy craft will have to be Johnny-on-the-spot to get it.

b. Having the plane, pilot and observer constantly assigned to the battalion they serve has great and obvious advantages. Close teamwork is achieved through this permanent relationship. The plane accompanies the battalion by short hops. It is ready at the moment it is needed. Moreover, *each battalion* has this invaluable aid; no longer does the battalion commander hope in vain for the brief use of a plane said to be on some distant airdrome "on call."

c. The training of observers presents no great difficulty, but they must be trained. They cannot be produced from a hat on the field of battle. Field artillery officers, well grounded in gunnery, should be selected for this duty, especially so in view of the fact that for its protection our flying OP will probably remain for the most part over our own territory. It will not always be possible for the observer to *estimate deviations in yards;* often he will have to *conduct the fire,* using axial methods.

d. The program herein presented contains little that is new, but much that remains unexploited. It has two essential features which urge its immediate adoption:

1. It provides a more nearly adequate quantity of air observation for field artillery;

2. It does this with the maximum economy of planes and men.

Few artillerymen will dispute the desirability of having one plane per field artillery battalion. To achieve this goal, we must train observers and procure planes and pilots in large numbers. Why not train, as observers, officers whose basic military education has included the technique of artillery fire? Why not use a light commercial airplane costing $1,500 in preference to a service-type observation plane costing twenty to thirty times as much? The little plane will do the job better, it can be maintained by one mechanic instead of requiring a crew of several, and it doesn't require an accomplished military combat pilot to fly it. Since these planes and the pilots to fly them are available in far greater than the required numbers, their use would release a corresponding amount of "military" plane production for pursuit and bomber types, and a corresponding number of "military" pilots to fly these heavier types. Our present observation aviation would then be freed to perform command, reconnaissance and photographic missions, for which purposes alone we do not have sufficient planes of this kind.

Why not use the resources we have?

We need not abandon any other measures now contemplated; the cost and the difficulties are small; in so simple a way we can insure the ability of our artillery to *shoot!*

The Forward Observer*

A Tactical Problem Illustrating the Actions of a Forward Observer, and How Artillery-Infantry Liaison Operates in the German Army

By Major von Ondarza

Early on October 6, following its crossing of the Danube at Leibi, the reinforced 8th Infantry, with the 1st Battalion, 3d Artillery, attached, continued its advance against an enemy reported from the northwest. The 8th Infantry formed the right column of the 3d Division, with axis of advance: Leibi—Ob Elchingen—Göttingen — Albeck — Hörvelsingen — Bernstadt — Holzkirch [Map 1].

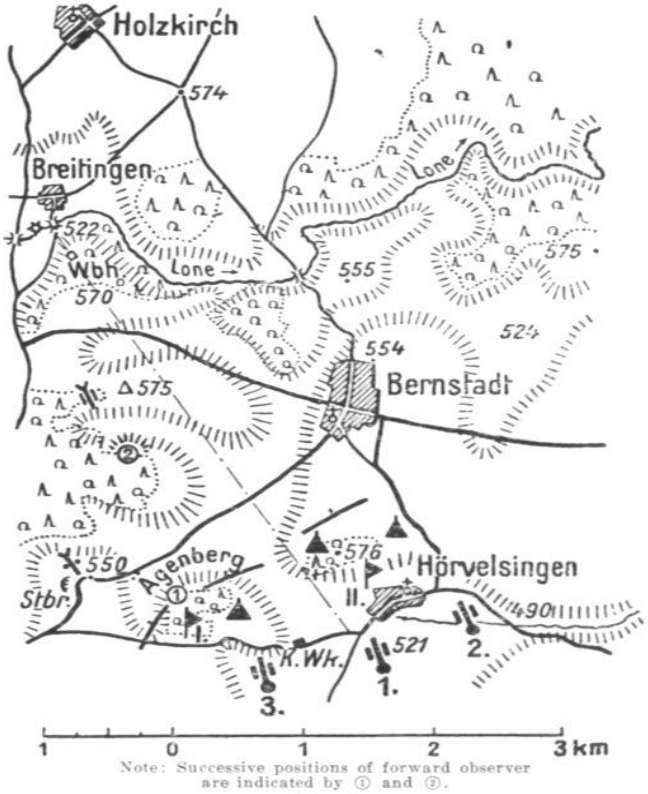
*From *Artilleristische Rundschau*, December, 1940. Translated by T. N.

The advance-guard battalion (2d Battalion 8th Infantry) attacked a weaker hostile force at 10:30 AM just north of Hörvelsingen, capturing hill 576 (400 meters northwest of Hörvelsingen). On account of increasing enemy resistance, the battalion is halted temporarily.

NOTES

1. The troops have had battle experience, but are fatigued after a protracted march.
2. The troops have normal loads.
3. The enemy has up-to-date leaders and equipment.
4. Air situation: Isolated reconnaissance planes at high altitude.
5. Maps available: Only the 1/100,000 map.
6. Weather: Clear, sunny, warm.

Map 1



Map 2

The enemy is holding the ridge west from Bernstadt to hill 575. The commander of the 8th Infantry has decided to attack with two battalions in the assault. Main effort on the left; the attack to follow a brief pause for development and preparation of fire. The attack will be pushed to the edge of the woods south of Breitingen (1st objective). Boundary between the 2d Battalion on the right and 1st Battalion on the left: West edge of woods on hill 576—*Wbh* south of Breitingen [Map 2].

Orders to CO 1st Battalion 3d Artillery: "1st Battalion 3d Artillery will support the attack of this regiment from positions south of Hörvelsingen, paying particular attention to the attack of the 1st Battalion 8th Infantry by neutralizing the enemy on hill 575 (1500 meters west of Bernstadt), and preventing any flanking attack from the direction of Bernstadt and the wooded heights northwest of that village."

At 11:15 AM, on hill 576, the CO 1st Battalion 3d Artillery gives his orders to his battery commanders (see Map 2).

His order to the 3d Battery is: "3d Battery on the left. OP at the northeast edge of Agenberg. Battery position near K.Wk. (Southeast of Agenberg). Zone of observation: From *Wbh* (south of Breitingen) left as far as *Stbr*. near hill 550. Contingent zone: remainder of regimental zone. The forward observer will accompany the attack of the left infantry battalion."

At 11:45 AM the 3d Battery reports by radio that it is ready to fire. At that moment a battalion messenger arrives at the 3d Battery OP with the following order:

"FROM: CO 1st Battalion 3d Artillery, at Bn OP on hill 576.

"TO: CO 3d Battery.

"1. H-hour, 12:30 PM.

"2. Firing chart herewith.

"3. Battalion concentrations on targets 204 and 207 as soon as firing data have been computed as per attached overlay. Report when ready to fire them.

"4. Arbitrary grids [of the coordinate squares] will be oriented with the spire of the church in Bernstadt at the center.

"5. Aiming points for 6 October:

A. Hörvelsingen church.

B. Mill at southwest edge Breitingen.

C. Church in Bernstadt.

"5. No restrictions on fires on remunerative targets.

(Signed) FRANZ,
Major, Battalion Commander."

While the battery commander reads this order, his lieutenant, who has been designated as forward observer, reports: "I am now going to the 1st Battalion 8th Infantry and thence to the forward left company."

Question: Was it proper for the forward observer to prepare to start forward before more detailed instructions had been received from the battalion, for example, the firing charts?

Answer: Yes, it was proper. The forward observer never waits; he acts. His time is precious. He must reach the company with which he will operate before it begins its advance. Why? The forward observer must learn from the infantry company commander on the ground exactly where the company will advance. The company commander shows him the targets which already have been identified and which may be particularly dangerous to the company, or points on the ground where strong enemy resistance is expected. This detailed cooperation can only be effected in the forward company; as a rule the precise details are not available at the battalion CP or OP.

Artillery forward observer in shell hole.

Question: What must the forward observer always carry with him, even though time is limited?

Answer:

1. Map.
2. Exact location of his firing battery. (If possible also same data for the other btrys. of bn.)
3. Base line of his battery.
4. Protractor.
5. Coordinate square. [A transparent platen with arbitrary grid, used for target designation.—Editor.]
6. Firing tables.
7. Field glasses.
8. Two radio operators with radio equipment.

"Wait," says the battery commander. "Take the firing schedule of the battalion with you." The lieutenant receives this schedule and moves out at once, followed by his two radio operators with their "knapsack" radio set.

Question: Why does the lieutenant go to the left infantry company?

Answer: Thirty minutes ago when the lieutenant saw the commander of the 1st Battalion 8th Infantry near the OP of his battery, he went over and reported to him as forward observer; whereupon the infantry battalion commander showed him the points from which the two forward companies were to advance to the attack. It was immediately apparent to the artillery lieutenant that the terrain in the zone of action of the left company would afford better opportunities for observation. He therefore said to the infantry battalion commander, "I am going to the forward left company and will advance with it since I shall be able to observe better there." The infantry battalion commander indicated his approval.

At 12:30 PM the lieutenant, running forward along a covered draw, meets the leader of the left company. It is easy to find him. Without need of any questions the infantrymen, who know the artillery observer already, call out to him, "Lieutenant, the captain is forward down the draw." When he arrives there, the infantry company commander orients him with a few words: "I am going forward with my company towards the corner of those woods. Glad you are here. There on the left of the company is a machine gun which fires as soon as one of my men puts his head up. I have laid a heavy machine gun on it to neutralize it as soon as we advance. I would be glad, however, if you could drop a few shells on it."

The artillery forward observer had been waiting for just that. After a brief study of his map he figures the range and deflection. At that moment his radio operator reports, "Radio communication with the battery is complete." The lieutenant replies. "Charge 3; fuze quick; No. 4 only, base deflection left 480, site 300. 2800."

Question: Should the forward observer open fire without first obtaining permission from the battery commander?

Answer: Yes. The battery commander has allotted to him the left piece. In case of remunerative targets the forward observer fires the entire battery. Should the battery commander be firing the whole battery, this will be reported to the forward observer by the executive when the observer's command is received at the battery position. Such conversation as "Shall I fire? I am here . . . or there. I see this . . . or that, etc., etc.," causes valuable time to be lost.

Question: By what procedure has the forward observer prepared his data for a target close in front of his own infantry?

Answer: The forward observer has determined, by means of the firing tables, how many yards short of the target the shortest shot probably will fall for the particular range. From the firing tables: Dispersion with charge 3 at 2800 yards = 43 × 3, i.e., 129 yards; or, in round figures, 130 yards. If the whole battery fires, 43 × 6 = 258; or, in round figures, 260 yards should be used.

Question: Do we use a 400-yard bracket?

Answer: No; on account of danger to the forward troops, we should creep back to the target from the far side.

* * * *

It is 12:30 PM. The attack has begun. To the right and left is some machine-gun fire. The enemy is replying vigorously. Shells from several batteries are falling on hill 575. Firing by the artillery forward observer, however, has been successful in silencing the machine gun, and the infantry company goes forward by bounds. The company commander calls to the artillery forward observer, "I am going ahead. Are you coming with me?" The artillery lieutenant answers, "No, I shall stay here as long as I can get good observation."

Question: Is the action of the artillery officer proper? Should he not stay with the infantry company commander?

Answer: The artilleryman's conduct is proper. The prime mission of the forward observer is to shoot. This he can do only if he can see something. He remains at his OP as long as he can support the infantry company effectively with observed fire. It would be faulty if he insisted upon pushing forward solely to show his spirit. His activity then would consist merely in changing station, setting up his radio, taking it down again, and running forward once more. He would have no time to shoot. While recognizing the importance of remaining in personal contact with the infantry company commander, the prime mission of the forward observer is always to shoot.

* * * *

The forward observer has taken under fire machine guns which he has spotted on the edge of the woods in front of the company; and thus he has facilitated the advance of the infantry. The company is now approaching the woods. Thus the time has arrived for the forward observer to displace and reestablish contact with the foremost infantry elements so that when the company leaves the woods in the direction of hill 575 he can support the continuance of the attack from the far edge. He goes forward to the company. One of his radio operators is having difficulty in keeping up, so the officer helps the man to carry the radio by means of the carrying strap. That makes the going easier. In a short time the edge of the woods is reached. The view toward hill 575 is good. The forward observer tells his operators to set up their equipment. A small ditch at the edge of the woods affords cover. Enemy machine-gun fire is falling a short distance beyond. The company commander cannot be seen.

But something has gone wrong with the radio; it cannot

establish communication. This is the moment to be patient and not get rattled. A corporal from the third company slips in from the right and reports, "In front, hidden in the sand pit, about 400 yards away is an enemy infantry gun which is causing us trouble. We have already suffered several casualties. The captain asks you to put that gun out of business. We have no communication with the battalion. The lieutenant can see the gun if he gets to the sand pit."

Question: What does the forward observer do, since he has no communication with his battery and therefore cannot shoot? Should he do nothing until he regains communication?

Answer: Of course he goes forward at once, taking advantage of a momentary slackening of the enemy machine-gun fire which is beating the grass in front of him.

The company commander is glad to see him, and shows him the target. Now what can he do? Everyone is counting on the artillerymen. The forward observer goes back to his radio detail and asks, "Have we communication?" The reply is, "No, we cannot get the battery." So the lieutenant tries by using another frequency to get communication with the 1st Battery instead. This time he is successful. By reason of past experience, the forward observer has recorded the positions and base deflections of the neighboring batteries prior to the attack. He asks for a gun, stating that the support of the left company is very urgently needed. The gun is given him; after a few minutes the forward observer can open fire, and by neutralizing the enemy piece he helps his infantry company forward.

Eventually he is able to reestablish communication with his own battery. The forward observer sends back to his battalion a report that the western part of hill 575 is still occupied by the enemy. Machine gun emplacements can be recognized. The observer, Lieut. Zimmerman, adjusts his battery on them.

In the meantime, a request has come from the 1st Battalion 8th Infantry to the 1st Battalion 3d Artillery to place fire on hill 575, especially on the western end of it, since strong enemy occupation of that area makes the further advance of the infantry impossible. From reports which have been received, the artillery battalion commander finds that unfortunatley the western part of hill 575 cannot be seen from any of the battery or battalion OPs. There is no communication with the forward observer of the 1st Battery, and the forward observer of the 2d Battery is too far to the right to be able to help.

What is the decision of the battalion commander under these circumstances?

He issues the following order: "The forward observer of the 3d Battery will make a brief adjustment of his battery on the machine guns on the western part of hill 575. The firing data for the 1st and 2d Batteries will then be determined from the battalion firing chart and the fire of the entire battalion placed on the western part of hill 575. The forward observer of the 3d Battery will observe for the entire battalion."

In this case the batteries might be laid as follows:

2d Battery on the church in Bernstadt.

1st Battery generally northwest.

3d Battery generally northwest.

The forward observer of the 3d Battery will have adjusted with the following data: deflection, left 320; range, 2600. From these data the following ranges and deflections are determined:

1st Battery, 50 right, 3,000.

2d Battery, 450 right, 3,400.

This procedure is often successful. As the attack proceeds, the battalion commander finds that his batteries very often cannot continually observe their fire on the most desirable targets at the moment that the infantry requires it, and he must therefore resort to massing the fire of several batteries on such targets. As stated in *Artillery Bulletin No. 5* page 13, this type of fire is based upon the presumption that the battalion commander can rely upon the professional artillery skill of the forward observer principally concerned.

The importance of the forward observer has most certainly increased. *Upon him there often rests the complete responsibility for the support of the infantry*. If, as often happens, the battery commander himself is not the forward observer, the best qualified artilleryman junior to him would appear to be the man for this job.

The foregoing picture of the actions of the forward observer demonstrates what smooth cooperation is possible between the forward observer and the infantry when the artilleryman who is sent forward is known to the supported infantry battalion or company. It is necessary, therefore, that the same officer always be sent to work with the same infantry unit. Only upon such a basis of personal acquaintance can be founded that mutual confidence which guarantees that the artilleryman will help his sister arm forward in the most difficult situations.

To conclude this brief discussion, which merely samples the wide field of the activity of the forward observer, two thoughts from paragraph 66 of Volume 5 of *Artillery Regulations* [Tactical Employment of Field Artillery] may be quoted:

"The activity of the forward observer demands, for this particularly difficult type of firing, a sure professional artillery knowledge and experience, as well as a knowledge of infantry tactics and a lively sense of initiative.

"In order to accomplish his primary mission, the forward observer should not be tied to the infantry commander. Instead, his place should be where he can best see, and thus effectively assist the infantry by means of his fire."

Training Artillery Intelligence Personnel

A schedule for the instruction of artillery intelligence sections is contained in Mobilization Training Program 6-1. The following instructional notes may be found useful to supplement official training literature used in conducting the course outlined in MTP 6-1.

General

Artillery intelligence sections exist primarily for the purpose of locating *targets*. In a sense, their activity is more technical than tactical; their work and their training differ little, if any, from that of any other well-trained artillerymen. And, in that connection, all field artillerymen are intelligence personnel. In all artillery headquarters, however, from the battery detail to the staff of the corps artillery officer, are found specialists whose primary duty is that of collecting, evaluating, and disseminating artillery intelligence. For this work they need special training additional to that which they receive ordinarily in their combat units.

In addition to securing intelligence of a purely artillery nature, the artillery intelligence sections are able, because of their training, equipment, and advantageous position at observation posts, to secure much information of a general character — data which is of value to the supported troops and to the commander of the major unit involved. It is, therefore, the secondary purpose of training to prepare intelligence sections to recognize, secure, and transmit intelligence that may be of interest to other arms of the service.

It is the resonsibility of all troops in contact with the enemy to be constantly on the alert to obtain and report all information of the enemy and the terrain. Intelligence sections can perform much valuable "missionary work" by constantly reminding other members of the unit of their duty in this connection. All troops, and especially members of the intelligence section, should cultivate an inquiring attitude toward all matters affecting the enemy. No scrap of information is unimportant. It should be emphasized that bits of information, seemingly inconsequential if considered separately, when fitted together at the headquarters of the higher unit frequently provide a complete picture of the enemy organization, his movements, and his capabilities.

Personnel should be reminded that the obvious thing often escapes notice because no one thinks that it is worthwhile to report it. It may not be obvious to others, even though perfectly patent to the observer. Receipt of data sent in by troops may not be acknowledged by higher headquarters; troops should be taught that the absence of such acknowledgment does not indicate that the information was useless or valueless. They should never adopt the "who cares?" attitude. The value of negative information should constantly be brought to their attention.

Troops should be taught that it is routine to report the location of their own units, especially front lines, flanks, and movements. Artillery observers occasionally are able to determine these things from their OP's better than the infantry themselves, and have at their disposal means of transmitting the information more promptly to the higher command. It is important also to report the location of neighboring units.

AN UNEXPLAINED EPISODE OF THE SPANISH WAR

The document reproduced here was drawn up in an observation post of Franco's Madrid Corps. Its contents dramatically reflect life in the Red Army by describing an episode concerning which it has never been possible to obtain further information:

CERTIFICATE RELATING TO AN ACT WITNESSED BY THE INTELLIGENCE SERVICE OF THE CENTRAL SECTOR

"At 10 AM yesterday (May 17, 1937) a rapidly driven automobile and a small truck entered La Poveda, leaving at 4 PM. At 11:30 AM today there arrived a light automobile, a small truck, and another vehicle, apparently an ambulance. They stopped about 10 meters in rear of the enemy's trenches and there was seen running behind some trees a man enveloped in flames and surrounded by several other men; as soon as he died they carried him to the ambulance; this act was repeated 10 or 15 times, and the vehicles then left at high speed."

—From "El Ejercito" (Madrid)

Duties of S-2

The general duties of an S-2 include the following:

1. To take positive measures to secure information, to organize the system of intelligence within the unit, and to participate in training of the intelligence sections.
2. To observe and report enemy movements and dispositions.
3. To study the progress of the battle on the front and flanks of his unit, and to be prepared to give information on the dispositions of his own and of neighboring troops.
4. To study the topography of the unit's area and of

the surrounding country, including lines of approach to and from the enemy position.

5. To collect, sift, and collate intelligence reports emanating from within the unit, and to distribute information so obtained.

6. To study information received from higher authority or neighboring units, and to draw attention of the unit commander to any items calling for attention.

7. To insure that the unit is kept supplied with up-to-date maps and air photos.

8. To see that orders are carried out with respect to prisoners of war, captured materiel and documents, and local measures of counterintelligence.

9. To keep intelligence records up to date.

10. To prepare and forward periodic or special intelligence reports as required by the situation.

Liaison with Other Agencies

Certain information valuable to the artillery can not always be obtained through its own agencies. S-2's on the various artillery staffs should maintain close liaison with division or corps G-2 sections and with the intelligence sections of the neighboring and supported units. They should operate on the principle that this information will not necessarily come to them in a routine manner, but that they must constantly seek it out. A few items which must be obtained in this way include data on hostile tactical doctrine; a general and detailed description of enemy uniforms, materiel, airplanes, tanks, and ships (when we are defending a shore); enemy organization; and location and movement of units, especially artillery and reserves. Air observers will inform the commander, but not necessarily the artillery, concerning important targets; movements of the enemy toward the front which will, at an estimated future time, come within artillery range; or of impending attacks by air or mechanized forces. The Air Corps may also be able to furnish meteorological data which will supplement that obtained from our own metro service; weather predictions may influence the artillery commander's plan.

Whenever prisoners of war are interrogated concerning hostile artillery or other matters of interest to the artillery, a member of the artillery intelligence section should be present.

Artillery intelligence sections should maintain a list of questions for which they wish other agencies to secure the answers, and should keep higher units informed of their requirements concerning intelligence.

There are also many items which the artillery intelligence sections can and should obtain for the commander, or for supported troops, which do not pertain directly to their own work. Data of this type include reports of unusual air activity, movements of mechanized units, activities of enemy patrols, observation groups, working parties, and road traffic. Reports of hostile artillery activity are, of course, always important. The artillery should report locations of flashes; areas shelled, together with the rate of fire, effect, number, and caliber of the hostile weapons firing; type of fire, such as harassing, interdiction, registration, counterbattery; and so on.

Forms, Records and Reports

An intelligence officer should be guided by the following principles: (1) Obtain all information which might conceivably be of value; (2) analyze and evaluate this data carefully; (3) disseminate everything of value promptly. In performing these functions, records and forms are useful because they of necessity produce a careful, methodical procedure. The intelligence officer is not an author of information; he is a collector and collator. His value increases as he learns to introduce system into his work. To obtain system the prescribed forms and records are of great assistance, if properly understood and used. They are not introduced for their own sake; when it is seen that their painstaking maintenance has become an end in itself and has introduced a bottleneck in the flow of information, they should be unhesitatingly abridged or discarded. It is well to emphasize at the outset, however, that for the inexperienced intelligence officer these forms and records are practically a necessity. For example, the intelligence officer is much more apt to properly fulfill the first principle noted above if he constructs a plan for collecting information. Such a plan should list the items to be obtained, the time by which they should be obtained, and the agencies which should be assigned to collect them. After more experience has been secured, the S-2 need not write down such a plan, but, at the outset, it prevents him from omitting essential data.

Stress should be laid on the necessity for producing clear and concise reports. The commander has no time to read a lengthy study. S-2's must be given practice in writing a report that can be grasped almost at a glance, with the gist of it in the first paragraph. Supplementary data and supporting annexes then may be appended for the superior to study at his leisure.

In making reports, S-2's should be taught to differentiate clearly between facts, probabilities, possibilities, and guesses. If personal opinions are expressed, reasons therefor should be given. The intelligence section should be taught that negative reports are often of great value and that it is unwise to draw conclusions of any sort in a report, unless grounds for such conclusions exist in the evidence submitted. For example, where an S-2 report states that "five hostile batteries have been located in the sector of the 1st Division," unless evidence exists it is well to add "No conclusions can be drawn at this time as to the caliber or organization of this artillery" or some similar statement.

In many cases the graphical form of report is the most concise and most quickly understood by the person for whom it was intended. Intelligence officers should form the habit of rendering reports in the form of marked maps or sketches, or as overlays, supplemented by the

minimum of written explanation.

The work of the enlisted members of the section in keeping records and forms and in rendering reports is mostly clerical in nature. They should not be entrusted with evaluation or dissemination of intelligence, and the S-2 himself should be the author of all reports. Nevertheless, the enlisted men can be used in filling out routine records, in making entries in the work sheet (if one is kept), and even in making entries in the file of enemy-battery cards. If they have been properly familiarized with this type of work, they can relieve the S-2 of much routine labor.

AERIAL PHOTOS

One or two periods should be devoted to the study of the aerial photograph as a source of combat intelligence. The technical and mechanical questions involved in the taking, developing, and printing of aerial photographs should not be considered.

Emphasis should be placed on interpretation; i.e., the determination of just what the features shown on the photographs really are.

The class should be able readily to recognize the critical topographic features, military works, and suitable targets for field artillery; such as, batteries, command posts, observation posts, and troop concentrations.

A 50-minute period should be devoted to a study of the terrain. The stream lines and ridge lines should be marked on the photograph in two colors. The communications, including railways, navigable waterways and roads, localities and woods, should be noted and shown in colors.

Another period should be devoted to a study of military works and activities, trenches, wire, emplacements for infantry automatic weapons, observation posts, command posts, and telegraph and telephone wire lines.

Special emphasis should be given to a study of artillery activities and battery positions, both camouflaged and in the open.

The student should then be given an inaccurate or incomplete map and an air photo. He should be required to correct or complete the map by the addition of the tactical features shown on the photograph.

Great stress should be laid on the accurate location and plotting of a map or grid sheet by restitution of control points and targets taken from the air photo.

The construction of graphic scales for use with air photos should be covered.

RECONNAISSANCE

Reconnaissance consists of the examination of territory for the purpose of obtaining information. Reconnaissance as affecting field artillery comprises reconnaissance for positions, routes, and information concerning the enemy.

Most field artillery officers are familiar with reconnaissance for positions and routes, but reconnaissance for information of the enemy is not always included in routine training.

The period devoted to this subject should be subdivided into an orientation period and a tactical ride. The instructor should present a tactical situation and have the class make a terrain study from maps and air photographs. This study should include favorable and unfavorable effects of the terrain on all enemy capabilities and on enemy artillery locations. At the conclusion of this study, each S-2 should prepare a plan for securing essential information. The tactical ride (horse or motor) should afford a personal reconnaissance of the area under consideration. From their combined map study and reconnaissance, the students should have a clear understanding of the effect of the salient features of the terrain on the enemy capabilities. These features include railroads, navigable waterways, roads, localities, large wooded or open spaces, etc.

The instructor well might present to the class a resume of information normally studied by higher headquarters, such as the importance of the area to the economic life of the country, etc. He should require from the officers an estimate of the terrain from the enemy point of view, including the favorable and unfavorable effects of the terrain on all possible lines of action open to the enemy.

OBSERVATION POSTS

In selecting an observation post, the primary consideration is that observation must be reliable and continuous. Locations selected should command an extensive view of the field of fire, should facilitate prompt establishment and maintenance of signal communication, and should be as inconspicuous as practicable. Tree tops, shell holes, ruins, steel towers, windmills, chimneys, church steeples, and front-line trenches may be used on occasion as observation posts. Construction may vary from hastily prepared cover and concealment to a well-equipped concrete dugout.

The desirable characteristics of observation posts are:

a. Clear view of the sector.
b. Reliable communications.
c. Cover and concealment.
d. A location as near the front as is feasible.

If possible, the observation post should be near a defiladed road, thereby providing easy access to the post and reducing its probability of discovery. The edges of woods and villages and constructions of various kinds are advantageous in this respect; in addition, the latter afford elevation above the ground. Observation posts are revealed in air photographs by loose dirt, wire lines, paths, and approaches which end at the post. An approach independent of an existing route (path or trench) must be prolonged past the post, or be camouflaged. If the observers are to do their work without interference from enemy fire, they, their wire lines, and the approaches to the observation post must be concealed.

RADIO INTERCEPT AND GONIOMETRY

The subject of Radio Intercept and Goniometry (direction finding) does not appear to be covered in any official text. Experiments conducted on maneuvers by the 1st Radio Intelligence Company have demonstrated the need for units of this nature. Detachments from this company functioned during the First Army maneuvers, August, 1939, at Plattsburg, N. Y. This detachment was used for:

a. Intercepting, recording, and forwarding hostile radio messages.

b. Monitoring the transmission of friendly radio stations.

c. Locating the positions of hostile radio stations.

During these maneuvers, many hostile radio stations were located with a fair degree of accuracy, numerous hostile messages were intercepted, and, in monitoring the transmissions of friendly radio stations, conversations were intercepted and reported. The detachment of the 1st Radio Intelligence Company was also able to plot roughly the location of radio-equipped vehicles of the mechanized cavalry brigade and to follow the bulk of the vehicles from one flank of the army to the other. The reports rendered on this maneuver supported the conclusions that:

(1) Much of the information obtained through radio intercept and direction finding is of value to the artillery intelligence sections. Direction-finding locations present area targets with sufficient accuracy to warrant artillery fire. If enemy technique locates radio stations near important command posts, an excellent target for harassing and interdiction fires of medium and heavy artillery is presented.

(2) Any active enemy would be aware of the type of radio equipment we use and of our practice of placing sets near command posts, and would undoubtedly have intercept and direction-finding equipment to intercept our transmissions and locate our stations. We therefore should remove our radio stations as far as practicable from command posts or other installations.

(3) Directed or beamed radio equipment will limit the effectiveness of hostile radio intercept and direction finding.

(4) All artillery radio nets are vulnerable to radio interference; entire dependence on radio as a sole means of communication will subject the artillery to confusion, delay, and loss of control.

The instructor should impress on the class the extreme urgency of the proper use of radio in our own forces and of the great advantage which will accrue to our own troops, especially the larger units and the artillery, through the proper evaluation and use of information obtained through radio interception.

THE ENEMY

A period should be devoted to a general study of the enemy.

A study of the enemy's governmental organization, armed forces, political doctrine, language, race, religion, and customs should be made. The enemy represents the most uncertain factor in war. A continuous study is necessary to determine his capabilities. There must be no surprise, regardless of the action taken by the enemy.

This study must begin on or before mobilization and continue throughout the war. During peace, the War Department makes a study of the enemy, his country, and possible theaters of operations. These studies include the composition, distribution, organization, armament, equipment, and tactical methods of his military forces. The economic and political aspirations, history, national psychology, military geography, and climatic conditions of the hostile country undoubtedly will be issued in War Department Bulletins to units down to include divisions. The instructor should carefully study and cover their salient points during this period.

CONCLUSION

The power of the artillery largely lies in its ability to maneuver its fire over a wide and deep zone. The artilleryman thinks in terms of targets. Experience has shown that it takes the coordinated effort of all possible information-gathering agencies to locate artillery objectives in such a way as to insure effective artillery support. The artilleryman must see that all information of possible value to any unit is reported promptly, accurately, and completely. In addition to information of artillery objectives, the artillery S-2 and intelligence personnel must seek all other information which will assist in clarifying the enemy situation. Only with such information can the artillery commander estimate the situation and intelligently advise the force commander as to the employment of the artillery. Technical information may be gained through the study of the organization, habits, methods, and materiel of the hostile artillery. Information of vital importance may be obtained through identifications of hostile mechanized vehicles and aircraft. Such information may not be of immediate use but, when studied over a period of time, it leads to a better understanding of the hostile doctrine and capabilities.

A map maneuver should be drawn to illustrate the use of the S-2 work sheet in evaluating, interpreting, and dissemination of military information.

A simple, logical situation should be assumed in the general and special situations; followed by a series of messages and events which could logically occur and which may be expected in the situation assumed.

Emphasis should be placed on proper procedure and logical interpretation of the messages and events, rather than on speed in handling or volume. The class must be impressed with the necessity of unemotional and clear thinking and the need of extreme accuracy. Deductions made or conclusions reached as a result of wishful thinking are dangerous, and unverified information should be so marked. The source of the information must always be considered and in many cases, sources should be given.

MAKING LATERAL FIRING EASY FOR BEGINNERS

by Major Karl F. Hausauer, 106th FA

Whether lateral firing for beginners becomes complex and hard to understand, is largely a question of proper basic elementary instruction. As I look back over my own experience, I blame instructors for the confused, bewildered impression of lateral fire that characterized my first efforts to understand and correctly apply the proper principles of conducting this type of fire.

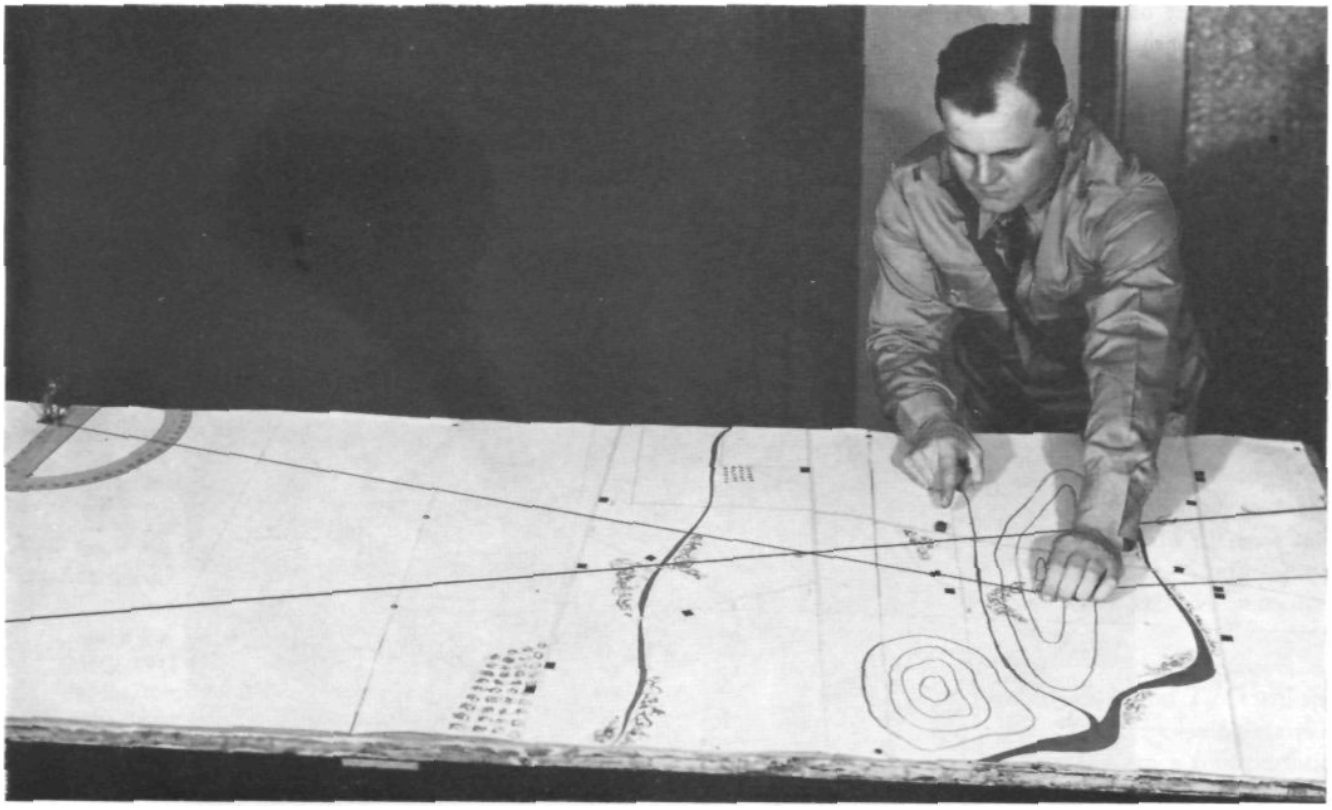
Either my instructors did not thoroughly know their subject—or they knew it too well. In either event, they failed to present it in a sufficiently elementary manner to bring about a clear understanding of the underlying principles.

Usually lateral instruction begins with blackboard firing aided by a diagram illustrating the relative position of the guns and the observer. The beginner endeavors to apply the proper factors to "get on the line" and to "stay on the line." He tries to remember his gunnery text 161, then attempts to visualize his position with relation to the guns, and finally senses the chalk mark on the blackboard for deflection or range, depending upon whether the procedure is small or large angle T. With training this of course is not difficult, but, for the inexperienced officer who has just struggled through axial procedure, it is by no means a simple mental process. The sensing of the shot is not nearly as difficult as the attempt to secure a mental picture of exactly what is happening.

Blackboard lateral firing is much harder to comprehend than actual lateral firing during service practice where the position of the guns is apparent and where the line of fire is soon marked upon the ground.

These field conditions can be really realistically indicated for classroom instruction by constructing an "indoor range" combined with a rather simple idea that graphically portrays the line of fire and the observing line. This method has been used for instruction of officers' firing schools for several years past and has definitely proved its worth in helping beginners to more quickly grasp lateral procedure.

To build an "indoor range" as shown by the illustration



requires only a few hours' time and a capital investment of 25 cents. The materials needed consist of:

(1) An ordinary mess table or piece of wallboard of about 4 × 6 feet.
(2) A small toy cannon
(3) A toy soldier to indicate the observer
(4) A spoon of black thread
(5) A small colored bead
(6) A few yards of string elastic and a yardstick.

All of these are procurable in any five and ten cent store.

The mess table is covered with cardboard or paper, and on this surface an enlargement of any military map is reproduced. The scale of one inch to 50 yards is recommended so that c will represent 2 inches. This affords ample space for range and deflection manipulation.

It is advisable to include roads, crossroads, road junctions, houses, churches, and other terrain features in scale on the map to add interest and to provide suitable targets. The indication of a line of hills by contours and a stream running perpendicular to the line of fire will afford opportunities to graphically illustrate when forced deflections can properly be made in large T problems.

To avoid compelling a student to form a mental picture of the comparative gun and OP positions, the toy cannon is placed in the gun position and the tin or plastic soldier at the OP. While not absolutely necessary, these toys add realism and interest.

The line of fire or trajectory is actually indicated by black thread strung from the gun position to and extending beyond the target. A small colored bead is placed on this string and moved back and forth to indicate the point of burst. Thus, it becomes easy for the student to continually see the line of fire on the ground. Bracketing for range in small T procedure and deflection in large angle T is easily illustrated by moving the string and bead from the near side of the target to depict shorts and from the far side to designate overs.

Deviation at the OP and shifts at the gun position are measured by means of placing a large protractor or a deflection fan at these points. The string, marking the line of fire, is attached to a glass headed pin at the far end away from the gun, and moved from left to right corresponding to deflection commands.

To measure the deviation at the OP the elastic string is strung taut through the OP to and beyond the target. A large-scale protractor is placed at the OP with zero on the elastic band line. Thus, deviation can be measured on the protractor from the OP by stretching the elastic along the line OP burst depending upon where the bead falls on the gun or trajectory line. After reading the deviation the elastic string is released, snapping back to mark the observing line.

Positions of observers and guns are not necessarily fixed and can be reversed from problem to problem and also changed to secure any desired value of r or R.

Factors will work out arithmetically correct and can be computed by formula or read from the s or d tables in the Range Table. When firing, the position of the bead on the trajectory line is placed according to the scale of one inch to 50 yards to indicate the point of burst at the ordered range or elevation. If the adjustment is percussion precision, then the value of the fork in yards is computed from the Range Table and applied in the same manner.

The best results are obtained in connection with large T problems. The method of bringing shorts "on the line" by range changes and "staying on the line" by ½s, s, 2s, or 4s shifts can be clearly demonstrated.

Obviously, the purpose of this type of instruction is for basic training only. It is not intended for use as a terrain board to teach officers how to sense. Its sole use is to illustrate the principles of lateral conduct of fire as they pertain to getting on the line and staying on the line. Once thoroughly understood basically by any officer, much of the complexity of lateral fire will disappear—at least that has been our experience.

Field problem at Fort Sill

FROM THE CHIEF'S OFFICE

TEST OF MOTOR VEHICLES

In September, 1940, the Chief of Field Artillery, in collaboration with the Quartermaster General, began planning tests of a small fleet of representative motor vehicles of types in extensive use by the Army. Among these were vehicles under current procurement and, in addition, a few which some considered superior for field artillery purposes to those then being procured—some designed primarily for prime movers for light artillery. In recommending such a test, the Chief of Field Artillery stated, among other things: "Only by extensive comparative tests can the answers be found to a number of controversial questions regarding types and quality of vehicles now being procured. * * * The number of vehicles proposed for test is sufficiently varied and representative to provide much valuable data on motor transportation."

For the past few months, the Holabird Quartermaster Depot has been doing considerable test work in connection with the current development and procurement of motor vehicles. This and pressure of other work delayed the departure of the test convoy for Fort Bragg until the early part of March. Undergoing test now by the Field Artillery Board are the following vehicles in the test fleet:

½-ton, 4 × 4 trucks:

Dodge, 1941 production model, 218 cu. in. engine, 170 ft.-lbs. torque.

Ford, experimental type, 239 cu. in. engine, 178 ft.-lbs. torque.

International, experimental type, 213 cu. in. engine, 156 ft.-lbs. torque.

1½-ton, 4 × 4 trucks:

Chevrolet, 1941 production model, 235 cu. in. engine, 192 ft.-lbs. torque.

Ford, experimental type, 239 cu. in. engine, 178 ft.-lbs. torque.

International, experimental type, 259 cu. in. engine, 192 ft.-lbs. torque.

2½-ton, 4 × 4 truck:

Autocar, 358 cu. in. engine, 270 ft.-lbs. torque. [Not yet received for test.]

2½-ton, 6 × 6 trucks:

GMC, 1941 production model, 270 cu. in. engine, 215 ft.-lbs. torque; Timken bogie.

International, experimental type, 318 cu. in. engine, 242 ft.-lbs. torque; Thornton bogie.

International, experimental type, 361 cu. in. engine, 268 ft.-lbs. torque; Hendrickson bogie.

4-ton, 4 × 4 truck:

GMC, experimental type, 451 cu. in. engine, 370 ft.-lbs. torque.

4-ton, 6 × 6 trucks:

Diamond T, 1941 first production model, *Hercules* RxB 501 cu. in. engine, 365 ft.-lbs. torque.

Diamond T, 1941 second production model, *Hercules* RxC 529 cu. in. engine, 397 ft.-lbs. torque.

Among accessories and special features being exhibited and tested on these trucks are: Closed cab modified to the open cab type; Dayton steel wheels; unison action seats; Salvetti and Darrell constant velocity joints; differential wheels; Thornton locking differentials; 7.50, 8.25, and 9.00 tires on 1½ and 2½-ton trucks; 9.00 and 11.00 tires on 4-ton trucks; and various types of cabs and lengths of wheelbase.

About April 10, 1941, the fleet will move to Fort Benning, Georgia, for demonstrations and tests by the Infantry Board.

¼-Ton Liaison Truck:

The Field Artillery Board is concluding its test of ten ¼-ton liaison trucks, manufactured by the Bantam Car Company. So successful has been their performance that recommendations have been submitted for issue to field artillery units on the following basis:

a. In lieu of all motor tricycles listed in T/BA's.

b. Substitution of two ¼-ton trucks for one ½-ton command truck in each liaison section of light and medium artillery and in each firing battery of motorized artillery.

c. The addition of one ¼-ton truck per battalion headquarters battery of horse and horse-drawn artillery.

Extension of the use of this vehicle beyond that given above is anticipated as experience in gained with it.

COMMUNICATION EQUIPMENT

The adequacy of wire-laying equipment, transportation, and personnel set up in the T/BA and T/O for the Division Artillery Headquarters Battery has been questioned by several field artillerymen. There appears to be a belief that four 2½-ton, 6 × 6, wire trucks, with equipment and crew, should be provided. Here again we are confronted with the old struggle between what is essential and what is the most economical. Unquestionably, four large wire-laying trucks are desirable; however, tables of organization and tables of allowances are framed under constant pressure to reduce the overhead of men and materiel. Until the need has been definitely established by extensive maneuvers, no change will be made.

An analysis of the personnel, transportation, and equipment now set up in the T/BA and T/O will show that, with proper distribution, four wire-laying crews are available. The following extract from a transportation-and-loading chart is one suggested solution:

WIRE SECTION

Equipment	*Transportation*	*Personnel*
1-belt LC-23 1-Climber LC-6 1-Reel Unit RL-31 1-Telephone EE-8 w/test cord and clips ½-mile wire W-110 on Reel Dr-4 4-mile wire W-110 on Reel DR-5 1-Wire Pike MC-23	Lineman Truck 1 ½-ton, 4 × 4, Weapons Carrier	Signal Sergeant Linemen, 5 and 6 Chauffeur
1-Belt LC-23 1-Climber LC-6 1-Reel Unit RL-31 1-Telephone EE-8 w/test cord and clips ½-mile wire W-110 on Reel DR-4 4-mile wire W-110 on Reel DR-5 1-Wire Pike MC-23	Lineman Truck 2 ½-ton, 4 × 4, Weapons Carrier	Signal Corporal, 3 Linemen, 7 and 8 Chauffeur
1-Axle RL-27-A 1-Linemen's equipment TE-21 1-Reel Unit RL-26-A 1-Switchboard BD-72 4-Telephones EE-8 (1 with test cord and clips) 1-Mile Wire W-110 on Reel DR-4 8-Miles Wire W-110 on Reel DR-5 1-Wire Pike MC-23	Wire Truck 1 2½-ton 6 × 6, w/winch	Signal Corporal, 1 Telephone Operator, 1, 3 and 5 Linemen, 1 and 3 Switchboard Operators, 1 and 3 1—basic Chauffeur
1-Axle RL-27-A 1-Linemen's Equipment TE-21 1-Reel Unit RL-26-A 1-Switchboard BD-72 4-Telephones EE-8 (1 with test cord and clips) 1-Mile Wire W-110 on Reel DR-4 8-Miles Wire W-110 on Reel DR-5 1-Wire Pike MC-23	Wire Truck 2 2½-ton 6 × 6, w/winch	Signal Corporal, 2 Telephone Operators, 2, 4 and 6 Linemen, 2 and 4 2—Basics Chauffeur

From the above table, it will be noted that four wire-laying vehicles are actually available. Only two of these are equipped with motor-driven reels (RL-26-A) for recovery of wire; however, wire may be recovered by hand, using the RL-31 reel unit. It is the opinion of officers who have had some experience in wire communication that the two light and two heavy vehicles will provide a more flexible and satisfactory transportation arrangement than four heavy vehicles.

It is contemplated that the division artillery commander will consider the vehicles and personnel of his own headquarters battery and subordinate headquarters batteries as a pool upon which to draw to meet any wire-communication requirements. In many situations, the batteries and battalions will have relatively short wire circuits. In each case they can, and should, assist the division artillery headquarters battery. In other situations one wire truck should be adequate to handle communication to two subordinate battalions.

One important factor, often overlooked, which may mean excellent or poor wire communication, is the location of the division artillery command post. A division artillery commander who establishes an arbitrary rule, such as that his command post must be always with that of the division, may impose upon his wire communication group an impossible problem in installation and maintenance of wire. When the division command post is a considerable distance to the rear, the division artillery commander should not hesitate to move or establish his command post well forward and close to the battalion areas. One long wire circuit to the division command post and four short circuits to battalion command posts are easier to install and maintain, and insure far more satisfactory and certain communication than a short circuit to the division command post and four long wire circuits to the battalions.

ANTITANK STUDIES

The Chief's office is receiving a number of very fine letters from commanders of Division 75-mm. antitank batteries. It is expected that the organization and equipment of this unit will be carefully restudied after the spring and summer maneuvers. The letters referred to are expected to prove of constructive value in this study.

The Military Wochenblatt gives the following characteristics of the new Japanese 105-mm. gun, M30:

Weight in firing position, less than 8,800 pounds.

Range, 19,800 yards.

Prime mover, a caterpillar-type tractor made in Japan.

The art of war is subjected to many modifications by industrial and scientific progress. But one thing does not change—the heart of man.—DU PICQ.

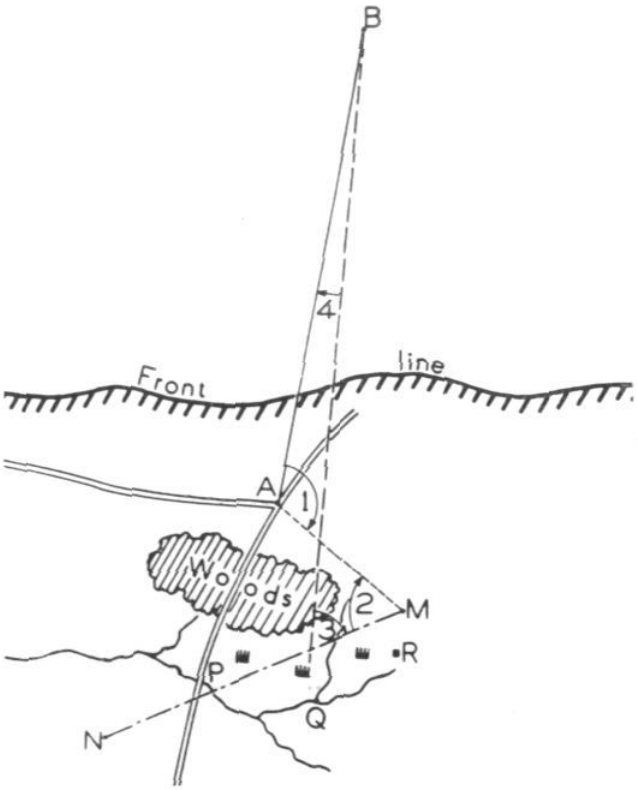
NOTES FROM THE FIELD ARTILLERY SCHOOL

EXAMPLES OF BATTALION AND DIVISION ARTILLERY SURVEY

(Extracted from Chapter 8 of the manuscript for the proposed Technical Manual TM 6-200, Field Artillery Survey.)

BATTALION SURVEY FIRING CHART: BATTLE MAP

EXAMPLE 1



a. Mission.—To be prepared for unobserved fires without registration. Speed is required.

b. Situation.—The terrain is gently rolling with scattered woods. B, in the target area, can be seen from A; both can be identified on the map. B has been selected as the base point. The position area cannot be seen from A, but it can be seen from M, which is visible from A; M does not appear on the map. The control for the survey is taken from the terrain details that show on the map.

c. Survey operations.— (1) *Location of batteries*. — Map locations are determined by traverse from nearby points identified on the map and on the ground; for example, P, Q, and R.

(2) *Direction*.—The line AB is used to establish direction. Direction is then transmitted to the orienting line MN by measuring angles 1 and 2; the batteries take their direction from the orienting line

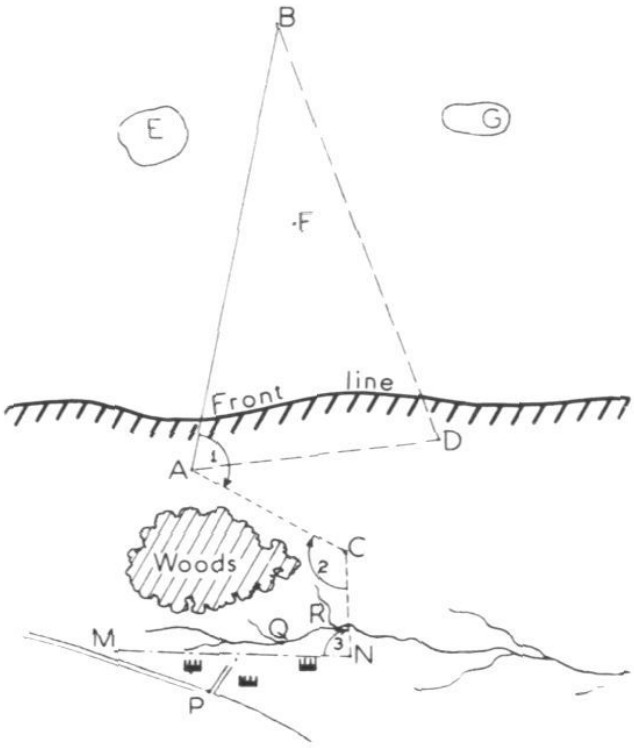
(3) *Scale*.—Taken from the map.

(4) *Vertical control*.—Taken from the contours of the map.

d. Remarks.—It is not necessary to plot the orienting line MN on the map. Base angle 3, for example, can be computed, using angles 1, 2, and 4.

FIRING CHART: WIDE-ANGLE PHOTO

EXAMPLE 2



a. Mission.—To be prepared for unobserved fires without registration. Speed is required.

b. Situation.—The terrain is rolling with scattered woods. B in the target area can be seen from A; both can be accurately identified on the photo. A, B, and the position area can be seen from D (located approximately on the photo).

c. Survey operations.— (1) *Location of batteries*.— Photo locations are determined by traverse from nearby points identified on photo and ground; for example, P, Q, and R.

(2) *Direction*.—AB established direction, which is transmitted to the batteries by a directional traverse (angles 1, 2, and 3) and by the orienting line MN.

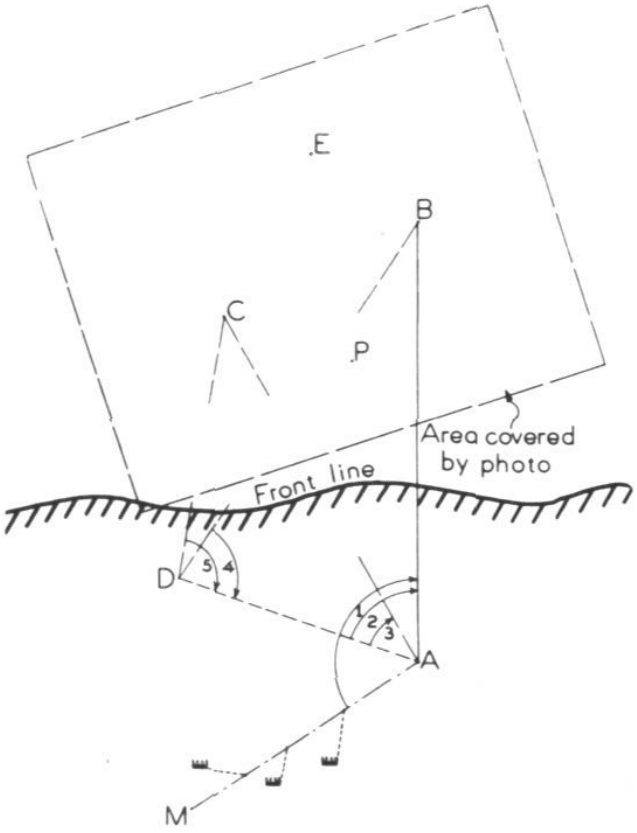
(3) *Scale of photo*.—Taken as 1/20,000 until the distance AB is determined by computation, using the base AD. (When

the length of AD has been determined, the location of D can be accurately plotted with reference to AB.)

(4) *Vertical control*.—An arbitrary altitude is assigned to D. From this point, angles of site are measured to the batteries and to various points or localities in the target area, such as E, F, and G (identified on the photo). Distances are measured on the photo. Altitudes may now be computed.

FIRING CHART: GRID SHEET

EXAMPLE 3



a. Mission.—To be prepared for unobserved fires without registration; fires are not immediately required but time is limited.

b. Situation. — The terrain is rolling with low hills; the countryside is well dotted with farm houses and other buildings. An air photo covering most of the target area is available. On it are two points, B and C, which can be identified from both A and D. A and D are visible from each other. The position area can be seen from A. No ground control has been furnished by the division artillery survey section, and none is expected in time to carry out the mission.

c. Survey operations. — (1) *Direction*. — Arbitrarily established by AB, whose direction is determined approximately with a declinated instrument. Direction is transmitted to the batteries by angle 1, then along and from the orienting line AM.

(2) *Location of batteries*.—By traverse, from A, carrying both distance and direction. An arbitrary grid is established.

(3) *Scale*.—Established by plotting to a 1/20,000 scale on a grid sheet.

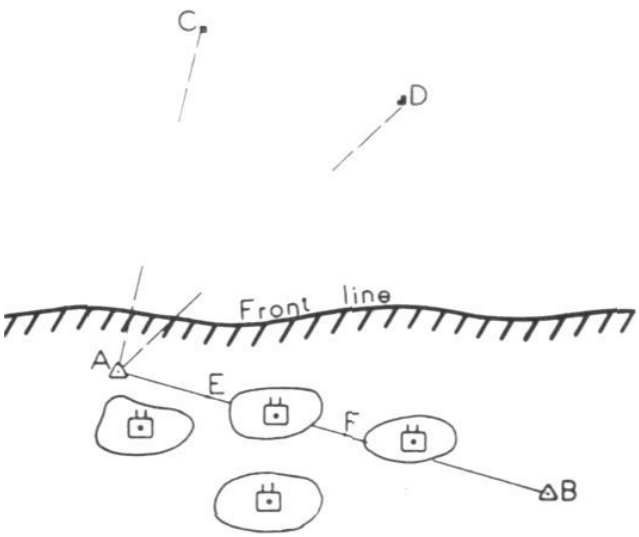
(4) *Control of air photo of target area*.—The length of the short base AD is taped; its direction is determined by angle 2. Using this base and angles 2, 3, 4, and 5, the grid sheet locations of B and C are determined. These points then control restitution from the photo.

(5) *Vertical control*.—A is assigned an arbitrary altitude. Angles of site are included in the position-area traverse. From A, the site is measured to all points in the target area, such as E and P, that can be identified on the photo.

d. Remarks.—In this situation, the survey operations require considerable time. Every effort should be made to get the survey section in the area as quickly as possible. Early information of the position area is essential. All survey possible should be done before the batteries arrive.

FIRING CHART: BATTLE MAP

EXAMPLE 4



a. Mission.—To be prepared to deliver massed unobserved fires without registration. Sufficient time is available for a precise survey.

b. Situation.—The terrain is rolling, with scattered woods and farm buildings. A and B, identifiable within our lines, are control points used by the army engineers for constructing the battle map; their coordinates are known; an instrument set up at either point can be seen from the other. A few buildings in the target area, such as C and D, can be seen from A and identified on the map.

c. Survey operations.—(1) *Direction*.—Established by the line AB, whose *Y*-azimuth is computed from coordinates.

(2) *Location of batteries*.—By battalion traverses carrying both distance and direction. The division locates convenient points, such as E and F, on the line AB for use by the battalions in starting their traverses.

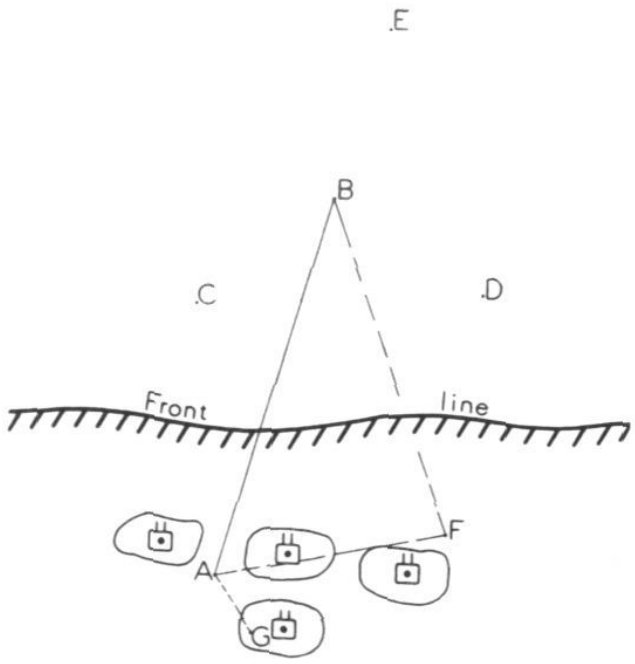
(3) *Scale*.—The scale of the battle map is 1:20,000.

(4) *Vertical control*.—Taken from the contours of the map.

d. Remarks.—In this example, direction was not established by a line running from the target area to the position area because there were no visible points in this area whose accuracy of location could compare with those of A and B. However, as a check against errors of survey and against the accuracy of the map, ground angles such as CAB and DAB should be compared to the corresponding map angles.

FIRING CHART: WIDE-ANGLE PHOTO

EXAMPLE 5



a. Mission.—To be prepared to deliver massed unobserved fires without registration. Speed is required.

b. Situation.—The terrain is rolling with scattered vegetation. B is visible from A and F. A and B are identifiable in the photo; F is not. The division artillery survey section arrived in the area with the first reconnaissance echelons.

c. Survey operations. — (1) *Location of batteries*. — Each battalion locates its batteries by inspection or by short traverse with respect to nearby terrain features.

(2) *Direction*.—Established for the division by the line AB; transmitted to all battalions by a directional traverse from A to their position areas.

(3) *Scale*.—Determined by computing the length AB, using the base AF.

(4) *Vertical control*.—The altitude of A is arbitrarily established. Altitudes of other points for vertical control are then determined: G and F in the position area; B, C, D, and E in the target area.

d. Remarks.—(1) In case the division artillery survey section is unable to perform its part of the operations enumerated above, specific battalions are assigned to assist.

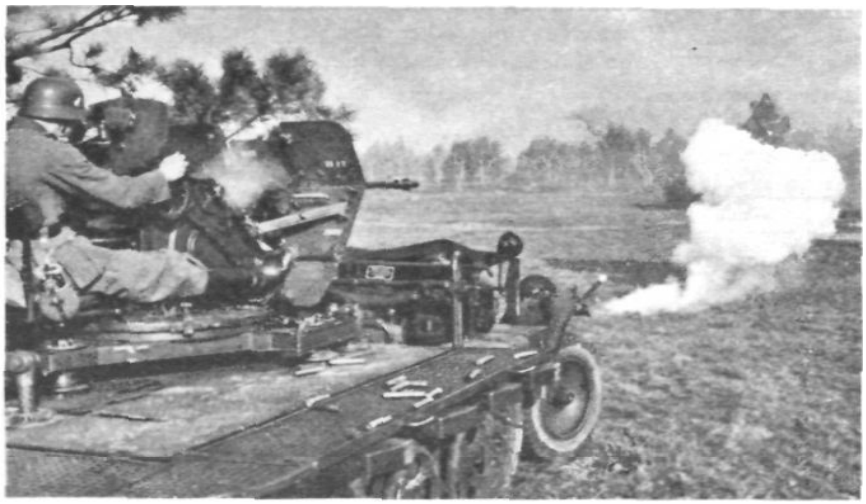
(2) When the survey is completed, the fires of the division artillery may be massed, without previous registration, on any target located on the photo. Since all battalions have the same basic direction, any correction determined by one battalion may be applied to the others. Therefore, when registration becomes practicable, or if there is surveillance by an air observer, corrections for both direction and range may be made.

(3) In some situations, time and effort may be saved if the division section, with an instrument at A, measures the directions to points conveniently near the position areas. This will assist each battalion with the initial portion of its directional traverse.

TWO NEW GERMAN WEAPONS (From "Signal," February, 1941)

Four-barrel light AA gun

This 20-mm. automatic weapon is not a part of the regular antiaircraft organization, which, in the German Army, pertains to the Air Force. It is assigned to infantry, artillery, or such other ground forces as may have need of protection against low-flying aircraft.



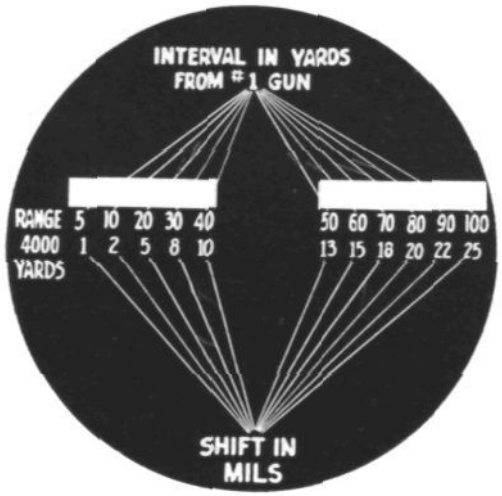
Self-propelled AA-AT gun

Smaller than the multiple-barreled mount, this weapon is used against either planes or tanks. It employs an automatic 20-mm. cannon mounted on a tracklaying vehicle having a very low silhouette. The Germans claim that units employing these two weapons have brought down 250 enemy planes since the beginning of the war.

Circular Convergence Table and Firing Data Card

Aids for the Battery Executive

By Lieut George F. A. Pearsall, 102nd FA



This home-made circular convergence table has as its ranges 1,500 yards to 50,000 yards. Interval between guns from 5 yards to 100 yards. This data was taken from FM 6-40.

It consists of two discs, two and one-half inches in diameter, secured by an eyelet in the center allowing them to be revolved. On the top disc at the left is an opening marked RANGE YARDS. To the right are eleven smaller openings and above each opening is the interval in yards from No. 1 gun. These are 5, 10, 20 and up to 100 in ten-yard intervals. Directly over these figures is a white space where the gun number can be placed in pencil to facilitate the announcement of the necessary shifts. The bottom disc contains all the ranges and the corresponding shifts in mils which appear in their proper openings. By interpolation any combination can be quickly figured.

In the field as the guns are placed in position the gun recorder paces off the interval from No. 1 gun, perpendicular to the line of fire, and places the yardage in large numbers on the right-hand side of the shield so it is visible to the executive. When the command to converge comes, the executive turns to the announced range, looks at the proper interval, and commands the individual shifts.

Another method is to provide each chief of section and the gun recorder with the table and allow them to make their own changes. Many officers frown on this because of the increased chance of error.

By increasing the size of the scale to three inches the entire table to include the 10,000-yard range can be printed on the bottom disc. A good grade of cardboard and waterproof ink should be used in the construction of these scales.

The author wishes to acknowledge the assistance of Captain Peter O'Neil, 102nd Field Artillery, in the construction of this scale.

FIRING DATA CARD

This firing data card has all the elements of fire commands plus the correct readings for all guns, in the least possible space. Attention is called to the deflection difference columns which provide for the convergence shifts and the opening and closing of the sheaf with the fewest possible entries.

A space is provided at the top for the initial commands from which the problem is made up.

These cards made up without the gun readings are very convenient for use in training telephone operators in the transmission of fire commands.

On the reverse side of each card is a diagram showing a battery in a staggered position, with the intervals from No. 1 gun indicated. Each card to show a different setup. The commands for convergence to be figured from the diagram. The date on which the cards have been used should be entered on the back to prevent the frequent use of any one card.

These cards also should be printed on the best grade of cardboard, using waterproof ink. It is a good plan to have the last line of each problem printed in red ink to facilitate checking. The data should be checked at different times other than when the last line is used, as an added check on the gun crews.

FIRING DATA CARD **BATTERY B 102 F. A.**

INITIAL COMMANDS **PROBLEM NO**

PL.	DRUM	DEFLEC-TION	DEFLECTION DIFFERENCE 1	2	3	4	ON	OPEN	CLO-SE	SITE	SHELL MK.	CHAR-GE	FUZE	CORRECTOR UP.	DO.	TOT.	METHOD OF FIRE	RANGE OR ELEVA-TION	4		3		2		1	

WITH THE ARMIES OF FOREIGN NATIONS

THE ARTILLERY IN LARGE ARMORED UNITS. Colonel M. Mori, in *Rivista di Artiglieria e Genio*, Rome, November, 1940. Translated by O. L. S.

Our colleague Colonel Blatto has stated, with his usual clarity, the problem of "Artillery in large armored units."* His statements of fact are in full accord with the possibilities of today and of the near future, and may be accepted as such; his conclusions may perhaps be questionable.

In taking up a study of the organization of the division, and hence of its artillery, the author selects as a basis of his discussion the operations connected with exploitation of a success; hence, for an armored unit of normal type, as used by the various armies, a breakthrough operation should be disregarded. If such a task is to be assigned to an armored unit, it should have a special organization, materially different from the normal. But since in a breakthrough all types of divisions should cooperate, I do not agree that special divisions should be formed for the purpose; I would propose rather that armored vehicles suitable for the purpose should work together, and that for training and administration these should be grouped in independent regiments, of the general type of those now used for cooperation with infantry.

Before taking up an analysis of the resistance which the armored unit will meet in its advance, we should emphasize one point—in an armored division, the principal arm is the tank; any other arm or specialty, including infantry, is an auxiliary only. From this point of view alone is it possible to study and solve the organizational and operative problems of such a unit.

The author thus states the forms of resistance which may be met by an armored division which reaches out into the enemy's rear areas:

"1. The reaction of similar units, acting alone or in cooperation with units of a different type;

"2. Defensive organization of inhabited places, of accidents of the ground, of lines of obstacles, etc.;

"3. A new position, systematically planned and strongly held."

The author very properly disregards resistance of the third type, and limits his study to the qualities which the artillery should possess in order to work with the tanks in breaking down the resistance of types 1 and 2. In this connection, it seems necessary to go somewhat into particulars.

In the first place, we must state and solve the problem, fundamental in determining the characteristics of artillery—within what limits should artillery cooperate with the tanks? In other words, what types of action are called for from the artillery of an armored unit?

This calls for an analysis; and, for easy comprehension, we shall use the language familiar to all artillerymen.

Accompaniment.—Yes; on the assumption that this means destruction or neutralization of the enemy's antitank weapons. This is of prime importance; for normally the preparation will be greatly abbreviated or omitted entirely, and the antitank weapons will be discovered only at very short range, and they can not be neutralized beforehand.

Immobilization.—Yes; on the assumption that this means destruction of the enemy's tanks possessing the same characteristics as those of our own primary armament.

Support.—In the usual sense, of cooperation with the infantry, this is impracticable. Colonel Blatto proposes to secure it by echeloning groups within the division and increasing the number of groups; but even by this procedure, the only one that promises results in any particular case, I do not hesitate to call it impossible. A brief consideration will show this.

Assuming that the artillery is deployed on the front of the attack, and that it has a useful range of 11 kilometers; then assuming the rate of advance of the tanks as 12 km. per hour, it can give continuous support, without change of position, for at least three-quarters of an hour, during which time the advance by echelons must be made. But we must now inquire, what are the targets upon which concentrations may be placed? Evidently, only the antitank guns, for the tanks themselves are expected to deal with any other resistance. Here is the essential difference between supporting fire for the benefit of an armored unit, and for the benefit of the infantry. The antitank gun will expose itself only at a range of 500 m. from the tank which forms the target; and then the question is—is it possible, during the time while an armored vehicle covers 500 m. at the rate of 12 km. per hour, to discover and locate a target, transmit the firing data, open fire, and neutralize the target? Certainly it is not. Infantry, under fire from a center of resistance, can lie down and wait for neutralization; but

**Rivista di Artiglieria e Genio*. September, 1940; translation in FIELD ARTILLERY JOURNAL, March, 1941. Other articles on this general subject, in the *Rivista*, have been by Colonel Caracciolo (February, 1940) and by Gen. de Stefani (May, 1940).

there are only two things that the tanks can do—advance in formation and maneuver against the antitank gun, or, if this is impracticable and time permits, seek another route for advance. They can not wait for neutralization.

If it becomes necessary to destroy or neutralize antitank guns which can not be reached by the tanks themselves, and which unduly hinder the advance, then it is evident that the ground for the tank attack was badly selected; and there is nothing to be done but wait for the action of the infantry accompanying the tanks. And then the problem of the artillery is not the support of tanks, but the support of infantry.

Short-range interdiction. — Yes, assuming that this means direct action against attacks threatening the flanks of the advancing formation, or in the front to impede the movement of similar units, or against reserves or supports. This is possible, for the reason that there is greater freedom of action than in the case of support.

Long-range interdiction.—For reasons which will be evident, this should be left to the air force.

Barrage.—This is no part of the functions of artillery in the armored division. It is, however, a function of that artillery to protect the tanks when at a halt or in assembly formation—a defensive task which requires preparation; we might say that it is intermediate between barrage and short-range interdiction. To avoid the use of new technical terms, which often confuse rather than clarify the situation, we may class this task as a form of short-range interdiction.

Counterbattery.—Yes. This is a form of emergency neutralization, in which the lack of complete dispositions is made up for by energy on the part of the observers, and by skill in conduct of fire.

To sum up, then, the types of fire for which calls may be made upon the artillery of an armored division are (1) accompaniment, (2) immobilization, (3) short-range interdiction, (4) emergency counterbattery.

The first two types call for short range and great rapidity, and hence for guns mounted in tanks—the tactical equivalent of the infantry accompanying gun. These, to execute their task, must move and fight with the other tanks (but not split up), attached to the tank formations, and mixed with them. To accomplish their mission they should act in platoons of not less than three guns, and should be free to maneuver as the situation may require, in cooperation with the tanks' formations.

The principal requirements which they must satisfy are—

Good protection.—This may be secured, not only by armor, but by design such as to reduce the angle of impact of the enemy's projectiles.

Armament.—Limited to a single machine gun for defense, and one gun, of caliber 75 at most; possibly 65 might be found sufficient, and if so preferable. The 65 has power enough to deal with the armor of any medium tank which now seems possible for the armament of an armored division. The question also arises, whether the gun should be mounted in a casemate or in a turret. For an ordinary gun-tank, the turret is necessary; but for this special tank the casemate seems preferable, for its action will usually be by advancing directly upon the target, to attack it by fire and movement. Naturally, the casemate must permit a reasonable traverse, say 15 degrees on each side, to provide for fire upon a target moving obliquely. The casemate simplifies the problems of mechanical construction, reduces the size of the tank, and also facilitates designs in seeking to reduce the angle of impact—for the tank, habitually advancing directly upon the target, is exposed to frontal fire only.

Good field of view. It is of prime importance to see the target. If the enemy's tanks are perfectly visible at short range, it does not at all follow that his view is equally good, for our own tank can easily conceal itself.

Maneuverability equal to that of the tanks of the division.

Minimum visibility; relation between height and length.

Minimum crew; chief, driver and radio-man only.

Normal action in platoons of three tanks each; assignment of a battalion of two companies of three platoons each, to each regiment of the armored division. Each such division should have two tank regiments.

The other two types of fire call for artillery possessing the following characteristics—

Rapidity of fire, to secure maximum effect in minimum time.

High power, to reduce the number of shots required to secure a specified effect.

Range, 10-12 km.

Ease of handling.

Maneuverability.

Ability to use positions anywhere that tanks can go; this reduces the time necessary for finding a position with minimum elevation, thus expediting occupation of position.

Lightness, to give speed on roads.

Ammunition supply by a limited number of vehicles, so as not to overload the regiment.

All this suggests a piece not over 100-mm. in caliber, preferably a howitzer rather than a gun. A greater caliber would not answer the requirements above outlined, and would overload the ammunition supply system.

For the regiment, three battalions of two batteries each should be sufficient. The battalion must be light; three batteries would make it too heavy, in maneuver or in action. In concentrations, rapidity of fire would compensate for the reduction in number of guns. If this number of guns should be found too small—which I do not believe—I should prefer to add a two-battery battalion, rather than add a battery to each battalion.

We have yet to consider the antiaircraft artillery that should be organically assigned to the division.

I agree with Colonel Blatto that antiaircraft defense

should be controlled by the corps. But since the corps plan must always be combined with a divisional plan, it is necessary that the divisional artillery regiment should have at least a battalion of three batteries, of automatic cannon with a range of 5,000 or 6,000 meters. Guns of shorter range would answer their purpose only to a limited extent, even against low-flying planes, on account of the brief period of time during which they could fire.

(Signed) MARIO MORI,
Colonel of Artillery.

NOTE BY EDITOR OF *Rivista:*

We add here a commentary by Colonel Blatto, whose article in the September number suggested Colonel Mori's article.

The first result that I had hoped for, in opening this discussion, has been attained. Argument has begun; and we may well hope to reap a rich harvest of ideas and experiences.

In writing this comment on Colonel Mori's article, I have no intention of defending a personal theory. We can accept only one point of view—that which may lead us, in one way or another, with reasonably close approximation, to concrete fact and to practical utility. I limit myself, therefore, to the controversial questions so clearly formulated by Colonel Mori, taking them up in turn.

1. *Formation of independent armored regiments*.—Here we should inquire first, whether, for a breakthrough, there is need of armored vehicles materially different, technically, from those required for exploitation of success. If so, there is nothing further to be said. But I can not believe that this is the case: for whenever and wherever the armored division undertakes a breakthrough the obstacles to be overcome (that is, such as have not been eliminated during the preparation of the attack) are substantially the same as those which the same division must meet in the course of exploitation.

Hence I consider the proposed organization as uneconomical.

2. *Supporting action by artillery*. — "In the usual sense, of cooperation with the infantry, this is impracticable." And no one, in so far as I know, ever thought it was; and we are in perfect agreement. But the author further suggests that it is impossible to accomplish a special form of support, which he attributes to me; to this conclusion he is led by my proposition that the divisional artillery should be organized in four groups, so that there may always be two groups ready to act in support of the tanks.

I am caught, it will be seen, in the trap of a terminology which the author calls *classic;* I should prefer to call it merely *current*, for it is hardly justifiable to consider expressions as classic, which have been changed, at least in part, five times in twenty years.

To prove the impossibility of this support, the author takes it that I would deploy the artillery *on the front of the attack* of the tanks. But since the operation which we are considering is the exploitation of a success, this *front of attack* has very little meaning to me. My mental picture of the action of the division is materially different from that which the author seems to have.

Ahead of the division columns, there will be operating a reconnaissance force of considerable strength — to judge by the experience of the recent campaigns and by the tactics now under study by ourselves. This force will, in all probability, be able to send in all the information that will be necessary to determine the action of the combat aviation and of the artillery. It is hard to imagine that the enemy, facing the advance of such a force, will remain silent and concealed until the first wave of tanks of the main body has come to within 500 meters.

Since this reconnaissance force will normally march at least fifty kilometers ahead of the leading elements of the main body, and since it will be accompanied by the instrument carts of the artillery battalions, it seems to me that there will be plenty of time to decide how, when and where the artillery should go into action to insure adequate effect. Whether this action be called support, or by some other name, is of little importance. The essential thing is that wherever the tanks are to go the enemy must be attacked with energy, and the action of the artillery should utilize its full range.

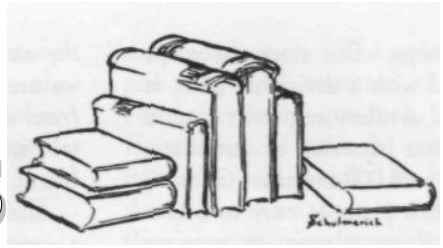
3. *Counterbattery*. — The author uses the expression "emergency counterbattery." But in the typical action of the division, emergency is normal. I hardly see how there can be any other situation, in the employment of ground forces. In any case, this action will be facilitated by the procedure of changing position by successive echelons of battalions, combined, of course, with effective air observation.

4. *Accompanying artillery*.—Colonel Mori proposes the adoption of the 65-mm. gun in a casemate, in preference to the 75-mm. in a turret. Undoubtedly, there are excellent reasons for this preference. We may note, however, that the Germans have adopted the 75 in a turret, and appear to be satisfied with it.

5. *Caliber of the divisional artillery*.—I have suggested the 105-mm. howitzer, because this seems to be the prevailing tendency, not only for armored divisions, but for divisions of the ordinary type. Ordnance designers claim that the problems of construction may be solved, within the specifications laid down by Colonel Mori, as to rapidity of fire, power of the single shot, range, ease of handling, etc. As to the logistic weight—ammunition supply—I can hardly agree to the preference given to the 100-mm. caliber over the 105. From this point of view, it seems to be immaterial whether we fire 40 projectiles of the 105, or 50 of the 100. In fact, considering the effects called for by the defensive organization of the rear areas, the 40 rounds of 105 may be preferable.

OETE BLATTO,
Lt. Col., Gen. Staff.

BOOK REVIEWS



"Permit me before I finish to recommend—and I do in the strongest manner I can to you and your officers — to devote some part of your leisure hours to study of your profession, a knowledge in which can not be obtained without application, nor any merit or applause to be achieved without a certain knowledge thereof." — GENERAL GEORGE WASHINGTON.

INVASION IN THE SNOW — A STUDY OF MECHANIZED War. By John Langdon-Davies. Houghton Mifflin Co., 1941. 206 pages. $2.50.

Few recent books by war correspondents contain anything of direct professional value, no matter how great their general interest. *Invasion in the Snow* is an exception. The author has taken the trouble to analyze the methods which enabled the Finns to do so well against the overwhelming odds of Russian numerical and material superiority. He points out many things which will be of value to our troops who are now practicing warfare in northern regions. For example, he shows in detail the faults contained in the Russian manual for ski troops, and indicates the correct principles as employed by the more experienced Finns. We learn also what types of clothing, shelter, and heating arrangements the Finns had, which kept them operating while their opponents froze to death by the hundreds.

There is much for the artilleryman, too. The book points out the value of small, light weapons—howitzers—carried or dragged on sledges, for use in the snow-filled forests.

Of more general interest is a clear discussion of why and how the Finns were clearly superior in the fighting, especially in the northern part of the country, but succumbed to the Russians on the Carelian peninsula. The final defeat was brought about almost entirely by a very heavy and prolonged artillery fire. The Finns had endured, unflinchingly, months of aerial bombardment. Their morale was still high. But they broke down psychologically under this artillery fire. In this phase the Russians shelled the Summa sector so intensively that 300,000 projectiles were dropped on the Finnish positions in 24 hours. This was equal to the maximum output of the whole British munitions industry for five days in 1940. According to the author, "all calculations as to tactics had been borne out by events; tanks had proved useless in forest terrain; antitank measures had proved once and for all that automatic fire is as deadly to tanks as to infantry. Once more heavy artillery had become the final arbiter."

One striking thing brought out is that modern methods of censorship and propaganda can keep a whole nation in ignorance as to the true state of affairs. The morale of the people in Russia was not weakened by the dreadful losses their troops sustained during the first part of the war, for they knew nothing of these disasters. Similarly the final outcome of the war came as a crushing blow to the Finns, who supposed that they were winning.

Mr. Langdon-Davies' book is the best work on the Russo-Finnish war that has yet appeared or is likely to appear for some time. It provides something which you can "get your teeth into."

—W. S. N.

WHAT THE CITIZEN SHOULD KNOW ABOUT THE ARMY. By Lieut. Harvey S. Ford, FA. W. W. Norton Co., 1941. 223 pages; index. $2.00.

Many times has this reviewer, interrogated by relatives or other civilians, wished that he were able to recommend to them some one volume which would give them the concise, authoritative, up-to-date data about the Army which they wished. Lieut. Ford's new book fills the bill admirably. The army man can now present to

his civilian friends a copy of this book, and tell them that it contains the desired information, briefly and accurately expressed, and understandable to the average layman.

Lieut. Ford, who has specialized in military research for a number of years, is now assistant editor of THE FIELD ARTILLERY JOURNAL. Being stationed in Washington, having full access to information available in the War Department and being able to have his work reviewed by official sources, he was able to produce a volume which can be considered reliable in every way. The army officer and the enlisted man, as well as the civilian, will welcome this book, since it provides a compilation of many facts concerning which the average military man is imperfectly informed, or cannot easily obtain. Persons who have recently entered the military service will discover that it provides them with an excellent general orientation.

The author is to be congratulated, also, on the clear method of exposition. —W. S. N.

WEST POINT IN THE CONFEDERACY. By Ellsworth Eliot, Jr. G. A. Baker & Co., Inc., New York, 1941. $3.50.

Students of the Civil War have always found it difficult to obtain adequate information regarding the officers of the Confederate Armies, largely because a great amount of the Confederate records was destroyed in the period immediately following Appomattox. Cullum's "Biographical Register" is notoriously vague about the post-'61 careers of the Confederate graduates, and Wright's slender volume, "General Officers of the Confederate Army" (1911), has many obvious limitations. Here, then, we have a thick book, packed with countless interesting facts and anecdotes which fills a long empty gap.

The Civil War still retains its great popularity, and deservedly so. Those who continue to be fascinated by the struggle of 1861-65 and its many colorful personalities will certainly wish to add this book to their library.

—H. S. F.

THE CADENCE SYSTEM OF TEACHING CLOSE ORDER DRILL. By Colonel Bernard Lentz. The Military Service Publishing Co., Harrisburg. 1940. 75c.

The first edition of this book was issued in 1919, with an introduction by General King; the second in 1925, with an introduction by General Summerall; and the third and present edition contains an introduction by General Herron. In the author's words, "Cadence and rhythm are the life of close order drill," and evidence is offered to the effect that the Lentz System of Cadence Drill can improve even the worst of the "undrillables." No comment is necessary to point out the timeliness of this manual. —H. S. F.

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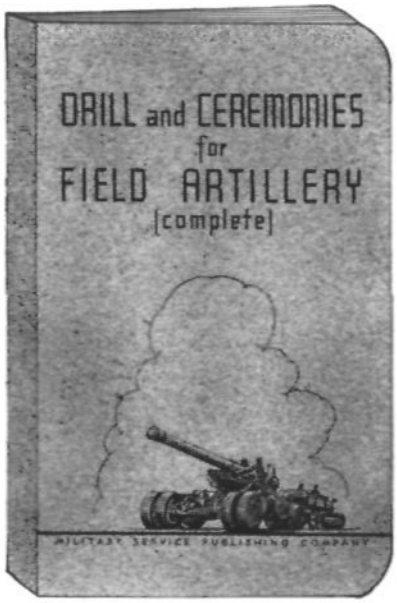

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