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IN THIS ISSUE:

Air-Borne Invasions

JULY, 1941

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WITHOUT DOUBT the successful invasion of Crete has brought again to the front the question "Can England be invaded?" Even after the fall of Holland there were those who were inclined to minimize the importance of air-borne invasions, saying that such attacks were only suitable for small-scale operations. Because of the timeliness and importance of this subject, and because too few of our people have given it much weighty thought, we are publishing herein two articles which discuss the pattern which airborne invasions have taken in the past, and the scheme which they might conceivably take in the future. There follows naturally an analysis of what methods are best suited to meet this kind of attack. And in this it is interesting to see that both historically and by logical deduction artillery plays a vital role. In the leading article, there is no desire to furnish prophecies as to what will happen, or to frighten folks into pulling the bedclothes over their heads. It is merely an effort to analyze what methods might be used in the attack were feasible at all. Perhaps the invasion of England will never occur. Be that as it may, the power of a well-prepared air-borne invasion has been proved. Its use is adapted to assault on islands in the Western Hemisphere as well as in the Mediterranean—or to operations in the far Pacific for that matter. If our readers' interest is aroused to the extent that more study will be given to this important subject, our efforts will have been repaid.

AS WE READ each succeeding installment of Gen. Snow's serial we are impressed anew with the great timeliness of the advice which his memoirs contain. The situation in 1918 was not identical with what we are going through today, but so far as industrial preparedness is concerned there are many similarities. Gen. Snow's work assuredly provides *Signposts of Experience* which, if heeded adequately, would enable us to avoid many of the pitfalls which hampered us in our previous great war effort. We hope that all those who are concerned in procurement of weapons and munitions will read carefully Gen. Snow's next two installments. The final chapter (in September) will deal with personnel, promotion, and miscellaneous matters.

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INVASION OF ENG

Editorial note: For obvious reasons, the following article is speculative only in character. It does not represent official views. It visualizes only possible lines of action open to Germany. It omits any discussion of possible British defense plans or resources.

Dover, above, photographed from a German airplane at a distance of 12½ miles, showing Dover Castle on the right to the entrance to the harbor on the left. This photograph was made with an infra-red filter through fog and mist. Below is a section of the cliffs on the coast between Dover and Deal, northeast of Dover.

LAND –
A PREVIEW

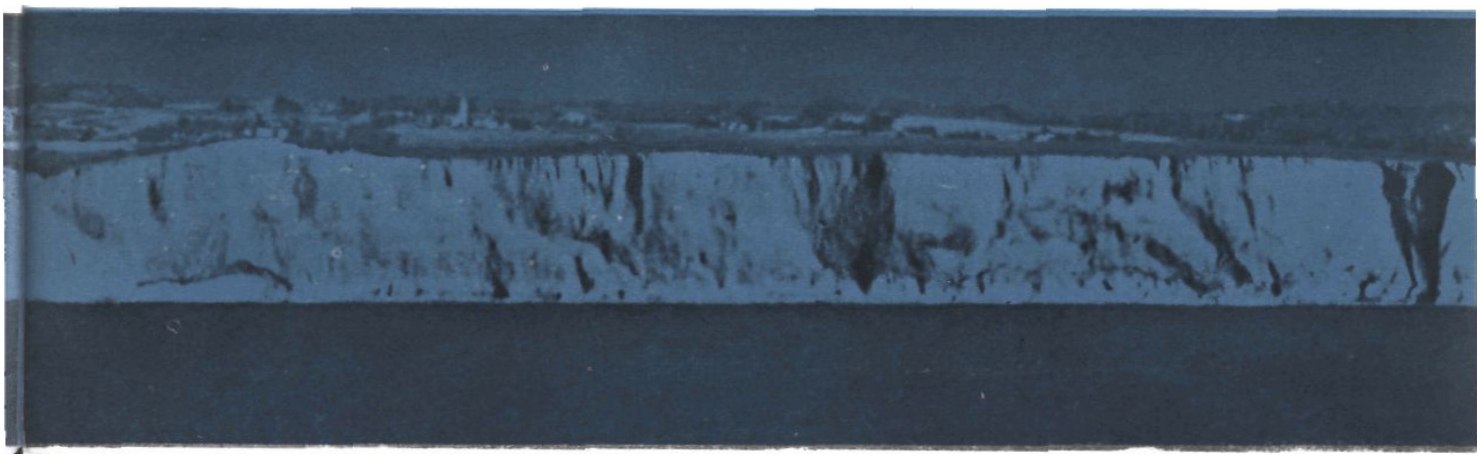
THE QUESTION

Invasion of England? When? What will the pattern be?

Only Hitler, we believe, can answer the first two questions; and perhaps even he has not reached a decision. The third query is still open to debate, so there is no good reason why we should not join the host of other pseudo-experts—both here and abroad—who have been speculating about it.

The conquest of Crete again focuses attention on this critical military problem; and the too-quick denial of the "experts" that there is any great similarity between the Cretan affair and an assault on the British Isles shows the trend of their thoughts. No good can come from concealing the horrific possibilities. An overly optimistic cajolery of the public has a tendency later to weaken confidence in leadership. French misplaced confidence in the Maginot Line and in Gamelin and his Army is a good example of this. Hence in examining the possible elements of an invasion of England we will not pull our punches. It should be safer that way.

Tomas de Martin Barbadillo, in *Ejercito* (Madrid, April, 1941), has discussed the problem of the invasion of England in what he claims is a purely dispassionate and objective manner. In view of the known



German amphibious operation taking place in northern waters

leanings of official Spain toward the Axis, the complete impartiality of Spanish military writers may be open to question. Nevertheless, they have had unusual opportunities for learning what is going on inside Germany and German-occupied territory. For that reason we shall draw heavily on Sr. Barbadillo's excellent study for many of the statistics presented here.

We shall give only the lines of action open to Germany (and probably not all of these). Britain's possible methods of defense, or her resources therefor, will not be touched upon.

Since an attack on England would be in the nature of a river crossing (on a grand scale), we may divide our discussion into the following phases: Reconnaissance and Preparation; Advance to the Water Line; the Attack; and the Enlargement of the Bridgehead.

RECONNAISSANCE AND PREPARATORY PHASE

Reconnaissance and preparation for an invasion of England is now going on. It has been in progress for some time. Indeed, there are those who believe that the great air attacks of last fall were not all-out assaults but merely a reconnaissance-in-force. Be that as it may, the reconnaissance has been deliberate and thorough. All methods have been and are being used, including: espionage; aerial photography (excellent in quality and extensive as to coverage); visual reconnaissance from air and sea, and from the French side of the Channel by means of powerful telescopes; radio goniometry; meteorology; and an intensive study of the foreign press.

The purpose of this reconnaissance is

a. To locate the ground installations of the R.A.F. Significant fact: To date there has been no consolidated effort against English airdromes. Is this because the Luftwaffe has been unable to locate these bases? More likely, according to an accepted technique, the Germans don't want these vital targets to move so that they can't "put the finger on them" at the critical moment.

b. To locate naval installations—bases, anchorages, minefields, fleet units. The latter must be kept under constant surveillance.

c. To locate land defenses: Beach defenses, coast artillery, barriers, fields of land mines, mobile artillery, antiaircraft artillery, antitank defenses, communication and command installations, troop concentrations and billets, munitions and supplies. Included in this part of the preparatory phase is the adjustment of the long-range Channel guns on terrestrial *and naval* targets.

d. To locate suitable crossing routes and landing areas for

(1) Air-borne forces

(2) Water-borne forces.

e. To locate industrial and other "rear-area" targets of importance.

Doubtless the Germans have detailed maps of the British Isles, including navigational charts overprinted with such naval defenses as offshore and inshore minefields and other subacqueous barriers. As a result of their reconnaissances they will keep these up to date as to condition of beaches, locations of land installations, roads, fortifications, emplacements for mobile guns, and so on. The Germans will attempt to have timely data as to the location and condition of concrete studs, metal and wooden rails and other obstacles placed along the beaches and inland near possible air fields. All troop leaders, especially those of air-borne units, will have maps and lists showing British defensive dispositions in the area in which they are to operate, together with houses harboring Nazi sympathizers and spies, local supplies of food, water, gasoline, and transportation. They will attempt to supply their detachments with the latest data on the strength and disposition of local defense units and home guards.

The Germans spent the winter of 1939-40 preparing for the attack on France and the Low Countries. They spent the winter of 1940-41 preparing for the Balkan campaign. Unquestionably they will be equally deliberate and thorough in getting ready for an invasion of England. *However*, such a preparation may have run concurrently with the others.

The Norwegian campaign was supposed to have been a rehearsal for the invasion of England (or so it has been claimed). The Cretan campaign furnished further drill and experience—and it was no "dry run." Details are not available, but we know that Crete was taken by air-borne units supported by the air force. The Germans now have available many thousand *veterans* of this type of warfare. The uncertainty of the unknown has, to a certain extent, been dispelled for these men. They will be confident. Flaws in staff planning, logistics, and execution will have been corrected. This Cretan rehearsal is vastly different than an ordinary amphibious "exercise" participated in by, say, a brigade of marines or a skeleton infantry division (complete with footlockers) but where the enemy consists of umpires, and supporting aviation is "assumed" to be present.

If the invasion of England occurs, the German task forces will consist of selected men, carefully conditioned and trained, and equipped with all the materiel and material deemed necessary to accomplish the purpose. The blow will not be launched unless Hitler feels that he has a 90% chance of winning.

THE ADVANCE TO THE WATER LINE

Since the Germans always strive for surprise, this phase will be conducted in great secrecy or with great speed. For several months a number of German armies (adequate in number to supply the *initial* invasion force) have been stationed along the coast of France, and in Scandinavia. Germany can strike toward England without any noticeable preliminary strategic shifting of her forces. The bulk of these coastal armies are, it is to be presumed, withdrawn slightly—say 30-60 miles—from the actual coast so as to avoid excessive losses from British bombing, and for secrecy. Hence it will be necessary for water-borne invasion units to make a tactical march to the water line. Surely the British intelligence services are sufficiently sharp to detect such a movement, and British air reaction can occur almost in a matter of minutes. Possibly the Germans could avoid detection by advancing by infiltration, but this would require time and would risk detection.

The most reasonable estimate as to lines of action open to Germany is that the advance to the water line will not commence until air superiority has been secured and an air-borne invasion is well under way. This does not preclude the possibility of an embarkation on a reduced scale in some remote area such as the Baltic Sea or along the Scandinavian coast, whence a "sneak" waterborne invasion might be launched. It is difficult to visualize this as anything but a diversion, however.

The advance to the "water line" will really consist of a movement to air bases from which the air-borne invasion will be launched. This will be difficult to conceal completely, but can be made under cover of darkness and will not be so hard to hide as a water-borne invasion.

THE ATTACK

There will be no air-borne invasion of England until

a. Air superiority has been secured.

b. Local ground defenses (at selected landing areas) have been neutralized by air attack

c. Weather conditions are "right."

There will be no water-borne invasion until

a. Air superiority has been secured

b. The British Navy has been neutralized

c. Beach heads have been secured by air-borne units

German long-range guns across from Dover

Stukas over a chemical factory in middle England.

d. British coastal defenses have been neutralized

e. Weather and sea conditions are "right."

The Battle of England will not be another Crete. The R.A.F. will be present in full force. So will the Navy. The Spitfires and Hurricanes which played such havoc with the Germans last fall will be reinforced by the new Tornadoes and Typhoons, as well as by a certain number of American - built interceptors. The general characteristics of these new super fighters have been published, so the Germans know what they are up against. They will have bent their technical skill and productive resources to meet this formidable barrier. Concerning German pursuit planes, Sr. Barbadillo says:

"Germany has her famous single - engined Messerschmitt 109, the Heinkel HE-112, and the HE-113 (which is better than the former); for accompanying destroyers she has the Me-110 and the Focke-Wulf 187, the latter formidably armed and profiting from the experiences of the Me-110, whose speed exceeds 375 MPH. We know that two new engines, the Daimler-Benz DB-603, of 12 cylinders in V shape, which at 3,000 RPM develops up to 1,700 HP; and the DB-605 of 24 cylinders in the form of an X, which at 2,400 RPM develops 2,000 HP. These monsters when installed on new types of planes will cause us to take notice during the next few months."

Aerial Attack — 1st Phase. The German pattern (Poland, France, Balkans, Crete) of all-out attacks has meant at the outset a heavy assault on hostile airdromes. For the invasion of England this will require daylight bombing, which the Germans appear

not to relish at present. They will anticipate heavy initial losses, but if the bombing of airdromes is successful, the British air strength will fall off rapidly after the first few hours. The Germans are said to have strong air superiority as regards numbers of combat planes available (estimated by some writers as 30,000 planes); hence they can protect their bombers by numerous pursuit squadrons and may count on wearing the British down through exhaustion of pilots in long-continued combat.

The Luftwaffe will be faced, in turn, with British bombing attacks on its airdromes. The Germans may feel it desirable to retain part of their pursuit strength over the Continent to protect their air fields. For this purpose they can employ older types of planes, since the British bombers likely will not have strong pursuit protection. Concerning this, Sr. Barbadillo comments: "In view of the relative weakness of the bombing formations of the R.A.F. and Fleet Air Arm in comparison with Goering's air force, the German interception may be relatively effective, because although some British bombers will 'get through,' their destructive power will be incapable—except for local successes—of upsetting fundamentally the plans for invasion, taking into account, besides, the enormous dispersion of German aerial installations from Norway to France.

"All this phase of aerial activity may be characterized as preliminary, with the concrete object of gaining relative

After firing a German long-range gun disappears for the night among the dunes

supremacy, punishment and attrition of the R.A.F., and will probably last during the period necessary to attain the end."

We may visualize the British air fields as being Coventrized simultaneously by an attack whose extent and ferocity will be immeasurably greater than anything launched heretofore. In spite of this, some well-concealed fields will escape detection, some air units, by shifting to new bases, will escape destruction. The major part of this phase, then, may last for days, and, even after that, German pursuit will find employment.

A German school for glider pilots

Aerial attack — 2d phase. — There will be no sharp break between phases, but the intensity of the 2d phase will not be felt in full until the 1st phase is finished. The 2d phase will be for the purpose of breaking up the defensive dispositions.

This attack will have three general objectives:

a. To reduce local resistance at areas selected for the landing of air-borne units.

b. To neutralize mobile reserves which the British might move rapidly to meet the air-invasion groups; this will include attack on troop concentrations and movements, barracks or other billets, and on routes (especially on defiles thereon) which might logically be used by the British to rush reinforcements to threatened areas.

c. Command and communications installations. Every effort will be made to paralyze the British command system so that the high command will be unable to receive reports or to issue orders. This phase of the attack was particularly effective in Poland and in the west. It will include not only air attacks, but attacks by small groups of parachutists or small raiding parties landed by sea under cover of darkness or "artificial fog."* Possibly this action will involve other means and methods.

By concentration of air strength the Germans can obtain local superiority at almost any selected area, and can land troops there. The big problem will be to maintain this superiority for a sufficient length of time to permit thorough consolidation of the position. Hence the German pattern of attack during this phase will be to block off and isolate the areas selected for landing of air-borne troops, and to paralyze British reaction by a blank-out of their command and communication system. There may be a concerted effort to throw the civil population into panic so that the roads will be clogged with refugees to the great detriment of motorized movements of military forces. However, the Germans have probably learned by this time that such action stands little chance of success against the English.

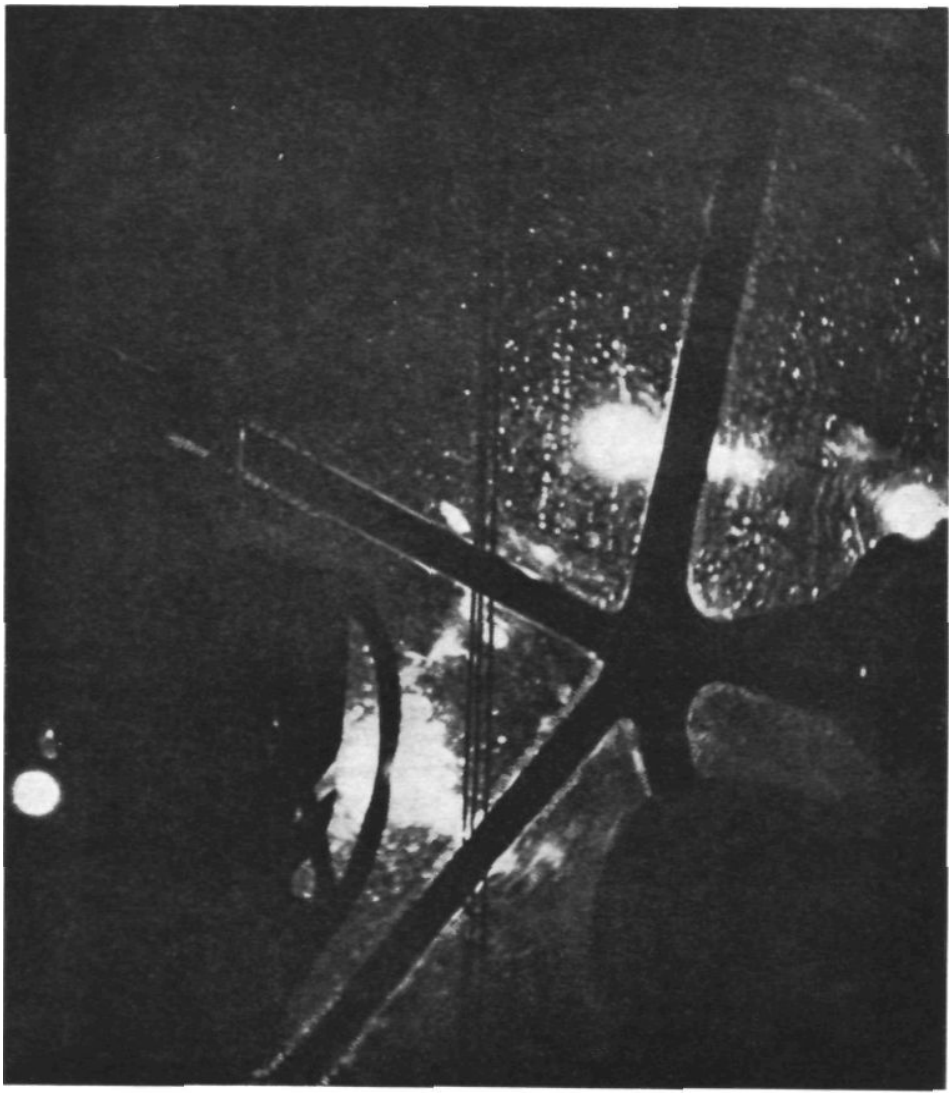
The air-borne invasion. This will commence as soon as the local landing areas have been sufficiently neutralized to permit the mass landing of parachutists. Troops may also be landed from gliders. This method, according to the press, was employed in Crete, although so far there has been no German confirmation of these reports. The areas selected for these landings will be chosen because of tactical and strategical considerations, although the latter may not at first be apparent. First

*The latest scare-name for smoke screens.

and foremost the terrain must be suitable for quick and easy installation of defense. Suitability as a landing area for transport planes will also be a consideration, but it must be remembered that the extensive use of parachutist-pioneers may enable the Germans to so utilize areas that at first glance may not appear suitable as airdromes. Another German method has been to seize an area *near* a large commercial airport, then by further ground action secure the airport itself. We may expect the landings to occur fairly near the sea, because the proximity to the shore would furnish flank or rear protection against British armored-force reaction. Such considerations, of course, will be dependent upon the neutralization of the British fleet. Another consideration in such a choice of a landing area would be the plan for linking up this area with a sea-borne invasion to be launched simultaneously or at a later time. As suggested above, *the eventual success of the invasion will depend upon the ability to land heavy materiel, including transport, tanks and artillery, which cannot be brought in by transport planes*.

German parachutists jump from a very low altitude. They are in the air for a few seconds only, and do not offer good targets for fire from ground weapons. They quickly organize a peripheral defense of the landing area. Small cannon, mortars, and automatic weapons, together with munitions and supplies, are dropped with them. Each small group has a planned, rehearsed task, and will move quickly and without confusion to its appointed place to carry the plan into effect. Groups will move far out to establish road blocks, seize local commanding terrain, establish strong points, dig fox holes and slit trenches. Pioneers will be dropped early. One of their first jobs will be to make the area tank-proof—by sowing fields of land mines and executing demolitions and placing obstacles and barriers. In the latter task they will utilize locally available material, probably objects which the British had placed there *for protection* against the air invasion. Other pioneers will be preparing the terrain for the landing of transport planes.

The transport will begin to come in as soon as the peripheral defense has secured the area against small-arm fire. Initial protection against British artillery fire will come from dive-bombers and by parachutists dropped in rear of and near the battery positions. When the transports commence to land, they will come in rapidly and recklessly. Those that crash will be quickly removed from the field. Each plane will carry ten or more soldiers, together with full field equipment and extra ammunition.



A German bomber pilot's view of London

Assume that Germany has 2,000 transport planes available for the task. If each plane makes five trips per day, it is possible thereby to land 100,000 men in a day. Perhaps Germany can muster *more* than 2,000 troop-carrying planes. *However*, the ability to carry 100,000 or more men per day to England depends also upon the number of embarkation and debarkation fields available. The main obvious lesson is that Germany can land a very large force from the air provided she

can secure sufficient landing areas. This landing, if it occurs, will be entirely beyond the reach of the British Navy, which thus will be effectively short-circuited. Nevertheless, as has been stated, the necessity for the landing of heavy equipment will require a sea-borne effort, and that is where naval action will come into the picture.

The sea-borne invasion. If the air-borne invasion precedes the attempt to cross the water, and we think that it will, the element of surprise will be gone by the time the Germans begin to get into their boats. However, the German High Command probably counts on the British air force being destroyed or neutralized by this time. There remains the British Navy, which, it may be presumed, will be rushing toward the threatened area to sacrifice itself in a grand attempt to stave off the disaster facing the British Isles. The action near Crete has indicated that such an operation of the Navy will be extremely perilous against the power of land - based bombers. Furthermore the invasion will be threatened from so wide a front that the British will have trouble in determining which is the main blow. If they disperse their forces in an effort to stop the invasion at all points, they will be too weak everywhere to stop it. If they wait to decide where the main effort is coming, they may have waited too long.

Sr. Barbadillo suggests other German lines of action: "There may be a triple action—aerial, submarine, and artillery (long-range Channel guns). Without entering into the discussion of the non-aerial aspects of the problem, we must say that the English Navy might be the object of ambush by masses of ordinary submarines and mine layers at the places where the British ships would be obliged to go to intercept the German convoys. Along the Channel, large numbers of long-range guns would be capable of preventing—or at least slowing up to a great extent—the operation of the fleet, if beforehand the Germans had attained the relative mastery of the air in the actions previously outlined."

The Channel guns are numerous and powerful. The 28-cm. guns have a range of 42,000 yards, and the 21-cm. guns a range of 132,000 yards. These guns, therefore, at the shorter ranges in the Channel itself should be quite accurate. There can be no doubt as to their efficacy against naval targets. Their current and past firing against convoys offers no evidence as to their possible effectiveness, for this firing has probably been only for adjustment. We must accept without question the known accuracy of coast-defense guns against naval targets. It is extremely unlikely that the Germans have built and emplaced these expensive machines for the sole purpose of executing harassing fire against the Dover area. They are for the purpose of dominating shipping to the limit of their effective range, at the critical time when the British Navy closes in to these waters.

The fact (see the weekly newsletter *Uncensored*, No. 86) that the German aerial minelayers have been able to keep the Suez Canal closed to British shipping for several months indicates another method which the Germans may employ in roping off a path for a sea-borne invasion.

For the successful landing of the sea-borne units there will still remain the necessity for reducing British coastal defenses. Important among these are the heavy and light guns emplaced along the coast. These will be the targets of the super Stukas and it is likely that parachutists, too, will be used against them. But it is possible to land at *some* points—the defense cannot be strong everywhere, and the German invasion will be on a broad front. The dangerous places to watch will be those areas where the German sea-borne troops can join hands with those already landed from the air. These critical areas will not necessarily be initially where there are good harbors. The Germans may count on seizing harbors and wharves by land action after sufficient maneuvering forces have been landed.

Where will the main landing occur? That will be difficult to determine, even after landings have been made. The Germans themselves may not decide this until they see where successful toeholds have been secured. Here is a thought on which the reader may ponder, however: A successful landing north of Scarborough, followed by a successful drive due west, would cut the island in two; the main British defense forces would then be severed and might be defeated separately. This is one familiar German pattern. Another would consist of two main landings on either flank, with a resultant pincer movement to destroy the forces caught between.

THE ENLARGEMENT OF THE BRIDGEHEAD

Little can be said regarding this vital phase of the invasion, for its pattern depends on the successful conclusion of the preceding phases. It will involve offensive action against the British Army, and will require the use of armored units and artillery, as well as all other supporting arms.

The Germans cannot hope to fight this battle successfully with light tanks which might be carried by planes. If the British are still holding out after the first phases—as their recent history indicates they will—the Germans will be faced with a major military effort. We may expect it to be somewhat deliberate in preparation, and may last for a considerable period. It will be a battle for which there is no precedent in all history.

★ An historical example:

★ ★ A Successful Defense Against an

★ ★ ★ AIR-BORNE INVASION

The preceding pages outline generally how an air-borne invasion might be conducted. The question will immediately arise in the reader's mind: "What is the defense against this kind of assault—what is an antidote?" It is appropriate, therefore, that we should now present an account of an actual air-borne invasion which met local defeat, the successful defense resting upon prompt counter-attack *adequately supported by artillery*. Acknowledgment is made to Lieut. Dr. Van Gunsteren and Lieut. Col. Van Hilten, Dutch Army, whose accounts (*Militaire Spectator*, November, 1940, and February, 1941) supplied the facts upon which the following study was based.—Editor.

★ ★ ★

BACKGROUND

In order to maintain all possible strength in her main attack through Sedan, Germany in May, 1940, assigned only weak forces for the holding attack against Holland. Nevertheless in order to clear up the situation in that area promptly she resorted to a vertical envelopment. One air division was assigned the task of attacking The Hague and capturing the Dutch government and GHQ. Another was to land near Rotterdam, seize the mile-long Moerdijk bridge, and thus pave the way for the advance of armored units from the east. The rest of Küchler's army was to attack frontally to pin the Dutch Army to the ground and facilitate the encircling strategy employed by the air-borne invasion.

The attack near Rotterdam was successful. The landing near The Hague was not. Although the latter had been beautifully planned and was executed desperately, the Dutch reacted so promptly and effectively that sometime after mid-day on May 10 the German command realized that their attack there was a failure. They diverted the remainder of their air-borne forces to Rotterdam. We will examine in some detail the landings near The Hague, particularly that at the Valkenburg airport.

Near The Hague the Germans selected small landing fields, one southwest of the city, the other southeast, and a third near Valkenburg some six miles northeast. The invaders generally seem to have had quite accurate information as to the strength and location of the Dutch defense units, but from what occurred at Valkenburg we judge that they met greater resistance than had been anticipated. The force assigned to land at the Valkenburg field has been estimated at a regiment of air infantry reinforced by a battalion of 75-mm. mountain artillery, together with some engineers, signal troops, medical and supply units. As near as can be deduced from the Dutch accounts, the artillery was to have come in by succeeding waves, possibly on the second day, for none appears to have been landed.

THE ATTACK AT VALKENBURG

The Dutch defense force at Valkenburg consisted of two rifle companies and a heavy machine-gun section from the 3rd Battalion 4th Infantry under the senior company commander, Reserve Captain van Zuilen. One third of this force occupied outpost and battle positions around the field (the Dutch *were expecting* an air invasion); the remainder, constituting the reserve, were assembled in Hangar A-3 under command of Reserve Captain De Vries.

About 2:40 AM foreign planes were heard flying overhead at a great height. An hour later, as the early northern dawn illumined the sky, swarms of German planes were seen. The Dutch antiaircraft artillery near The Hague commenced firing. Captain De Vries immediately moved his troops out of Hangar A-3 and took up a deployed position between the Kleidammen (Claybanks) on the north side of the flying field. He was not a moment too soon, because the Germans commenced dropping bombs on Hangar A-3 and on the Claybanks. The defenders adopted a widely-dispersed formation in the bushes along the north and west sides of the field.

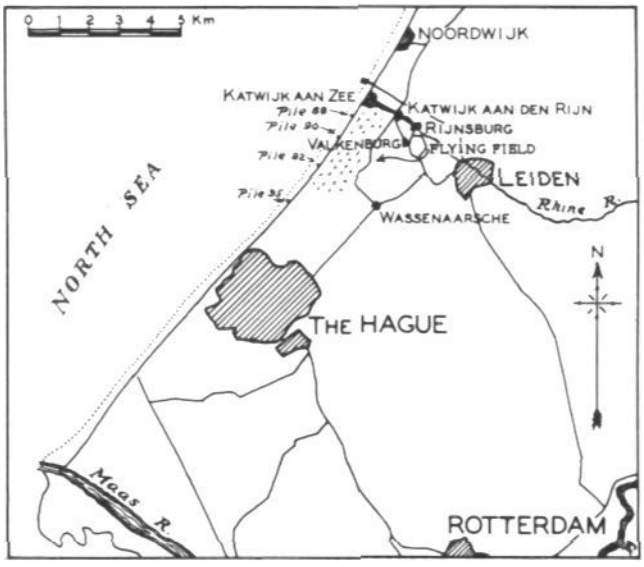
Promptly after the bombardment ceased, 18 German transport planes (JU-52's) swooped down and landed on the field. As they rolled to a stop they disgorged air infantry. One witness said that these planes carried 13 soldiers apiece, Dr. Gunsteren says 20-25 apiece. Simultaneously parachutists were dropped in the neighborhood

Both were heavily fired upon by Dutch light machine-guns in position along the edge of the field, later reinforced by rifle fire from the reserves under Capt. De Vries. As may be seen, the Germans had at once landed from 235 to 450 men—probably a headquarters detachment and 2 rifle companies. They were able to drive the Dutch defenders outward from the field, particularly towards the northwest and southeast. The Germans were supported by aircraft which circled low, using machine guns. No bombs were dropped after the German transports commenced to land; apparently the order for the attack forbade bombing in the Rotterdam-Hague area after H-hour, or during the landing of the air-borne troops.

Map No. 1—German plan of attack against Holland

Van Zuilen's Dutch infantrymen were only provided with sixty rounds of ammunition each. This supply was soon gone, and many of the machine guns were beginning to stop firing owing to malfunctioning caused by overheating. About 7:00 AM, therefore, the defense of the Valkenburg field collapsed, and some 300 Dutch were captured by combined action of the Germans on the field and parachutists who had landed in their rear.* During the fighting they had suffered sixty casualties, of whom half were killed. The Germans took their prisoners to the nearby village of Valkenburg and confined them under guard in the church. By 7:30 AM the flying field was completely in German hands.

*Apparently some parachutists had landed before daylight some distance from the field. Dr. van Gunsteren says that he was captured at 4:30 AM by a platoon of 50 parachutists whom he mistook for Dutch soldiers. The Germans were clothed in a dark-green uniform which blended well with the foliage. They were moving through the countryside capturing Dutch reservists who, having been called out, were hurrying to join their commands.



Map No. 2—Area of the air invasion near The Hague

More transports began to come in.

The Germans were now fanning out over the countryside to seize bridges, block the main roads, and commandeer local transportation. It looked as if their bold plan might succeed.

Dutch Counterattack

Meantime a strong Dutch reaction had commenced. The commander of the 4th Infantry, Lieut. Col. Buurman, had been in Noordwijk, 3 kilometers north of Valkenburg. The roaring of German planes overhead having turned him out at an early hour, he went immediately to his CP (at Noordwijk) and ordered the alarm for the entire regiment. He also directed that the light machine guns of the 1st and 2nd Battalions take the positions previously assigned them for antiaircraft defense. He then made a hurried personal reconnaissance which assured him that no parachutists had yet landed in Noordwijk, after which he went by automobile toward Katwijk aan den Rijn (on the Rhine). At about 5:30 AM he met the commander of the 3rd Battalion near the Shell filling station at the southern end of the village.

Actions of 3d Battalion

Most of the 3d Battalion was already engaged (under Capt. van Zuilen) in the ill - fated action near the flying field. The battalion commander had, by 5:30, alarmed the rest of his unit and was assembling the men for the purpose of attacking the field. These troops consisted of one rifle company, the remainder of the machine - gun company, and some loose units which were streaming

back from the hot fighting at the field. He also had a small detachment of the 2d Depot Battalion (infantry) which had been on guard at the local rifle range.

The battalion commander started his attack with three sections on the left and one section on the right with the axis of the attack along that portion of the Wassenaarsche Road leading from Katwijk toward the flying field. The Dutch soon ran into heavy fire from the front (toward the field) and from De Pan. One section, under a sergeant, detached to deal with this flank, sustained heavy losses but with the aid of a machine-gun section reduced hostile resistance in that quarter. The main attack came to a standstill 250 yards from the field owing to heavy machine-gun fire. The battalion commander, seeing that his "bob-tailed" battalion was too weak to cope with the Germans on the airport, withdrew and took up a defensive position behind a bush-covered bank on the west side of the road, toward the dunes. (See Map No. 3, p. 455.)

The regimental commander, after contacting the CO 2d Battalion at the Shell station, made a quick motor reconnaissance south and southeast of Katwijk, then returned to his CP at Noordwijk, where he had directed that the battalion commanders of the 1st and 2d Battalions report for orders.

Regimental Orders

At 6:30 AM Col. Buurman issued the following oral orders to his battalion commanders:

"Order for CO 1st Bn:

"Take your battalion (less one company and one machine-gun section) and attack the Valkenburg flying field from a northwest direction. Route of movement: Noordwijk aan Zee—Zusluizen—Katwijk aan Zee—pumping station of Duinwaterleiding (dunes water-conduit).

"Order for CO 2d Bn:

"Take your battalion (less one company and one heavy machine-gun section) and attack the Valkenburg flying field from a northeast direction. Route: Noordwijk—Katwijk aan den Rijn."

"The regimental reserve, consisting of one rifle company and one heavy machine-gun section each from 1st and 2d Battalions, to remain in Noordwijk."

The gates in the dike north of Katwijk aan Zee were guarded by a detachment of the 4th Reserve Grenadier Company, operating under command of the Leiden Group of the West Front of the Fortress of Holland. This guard was of importance to the safety of the flank of the 2d Battalion.

The regimental commander now displaced his CP forward to Katwijk. Here he was informed that his regiment, plus the 3d Battalion 2d Field Artillery, had been detached from the 1st Division and placed under the 3d Division, Col. Kraak commanding. He was ordered to retake the Valkenburg field. This order apparently came from the 3d Division CP at Oegstgeest.

This division order had not specified that the 3d Battalion 2d Field Artillery was attached to or would support the 4th Infantry in the attack. Lieut. Col. Buurman realized, however, that he would need such support. Therefore he established liaison with the artillery battalion, whose commander agreed to furnish the needed support with the two of his batteries which were in Katwijk.

Artillery Action

Things now moved fast. The artillery commander had already (at 7:00 AM) emplaced one of his batteries (the 2d) in the sand dunes below Katwijk aan Zee, and now gave similar orders to his other batteries. As there were known to be parachutists lurking in the dunes, he asked for, and received, an infantry section as protection for the artillery.

About 7:30 AM the artillery commenced firing on the flying field throughout its entire expanse. *This bombardment lasted several hours*.

Prior to this, some 20 more German transports had landed on the field and had discharged troops. During this operation a Dutch pursuit plane had attacked the Junkers as they were landing, but was shot down by three Messerschmitts. The artillery fire caught the 35 or more planes which were now on the field, demolished some and set others on fire. The planes had landed very close together and some had sunk deep into the turf. The aviators tried vainly to get them into the air, but soon gave up the attempt and commenced digging slit trenches nearby. Subsequent to this the Germans made several fruitless attempts to land more transports in nearby meadows. These unsuccessful efforts were continued during the next three days.

To return to the description of the attack of the two battalions of the 4th Infantry:

The 2d Battalion, 4th Infantry

The 2d Battalion, under Major J. J. N. Cramer, was the first to arrive in Katwijk. En route from Noordwijk it had been attacked by German aircraft, during which the two regimental communications trucks were destroyed. This mishap was a serious handicap in the coordination of the regimental effort. The 2d Battalion soon ran into the Germans near the intersection of Voorstraat and Tramstraat (Front and Tram Streets) in the village of Katwijk aan den Rijn. The Germans had occupied the seminary and the Katwijk Sandstone Factory. The latter was of considerable military importance; as it was a place for manufacturing artificial stone slabs, and was located on an island near the banks of the Rhine, it formed a natural strong point. It had been guarded by a single sentry, of which fact the Germans probably were aware.

The CO 2d Battalion was ordered to clean out these nests. By 1:45 PM his 3d Company had taken the seminary, but the sandstone factory was still holding out.

Since the artillery had been firing at the flying field and other points, no artillery support had been available up to this time. The battalion commander saw that artillery would be needed to take the sandstone factory. Apparently this help was forthcoming.

Meanwhile the 2d Company cleaned up the village's west street and proceeded along it to the Shell station. This was mostly house-to-house fighting against German parachutists who were concealed in and around the buildings.

Lieut. Col. van Hilten describes the actions of the villagers during this time. Apparently the stolid Dutch reacted quite differently than did the populace of certain other invaded countries.

"A remarkable thing under these circumstances," he writes, "was the presence of the civilian population, which carried itself during our battle operations as if these were only peace maneuvers. Various little groups of people were in the street, discussing the events and watching the battle actions with keen attention. During the fight at the seminary, a Noordwijk South Holland street-car suddenly came through the village, bell clanging. It was coming from the direction of Rijnsburg. The passengers were hanging out of the windows, watching the battle."

ACTIONS OF 1ST BATTALION

The 1st Battalion, under command of Captain W. C. Dikker, marched along the bicycle path from Noordwijk aan Zee to Katwijk aan Zee, whence it proceeded to pl. 88* on the shore. Here the battalion commander issued the following deployment order:

"2d Company (less 1 section) with one heavy machine-gun section attached, on the left.

"3d Company with 1 machine-gun section attached, on the right.

*Pl. = paal = pile. Evidently a series of numbered pilings or poles along the beach at intervals of 1 kilometer (or half-kilometer) to mark the tide and erosion of the shore.

The attack on the Valkenburg airport

"Total front, 600 meters.

"Battalion reserve: Reconnaissance detachment, with Machine Gun Company 1st Battalion (less 2 sections).

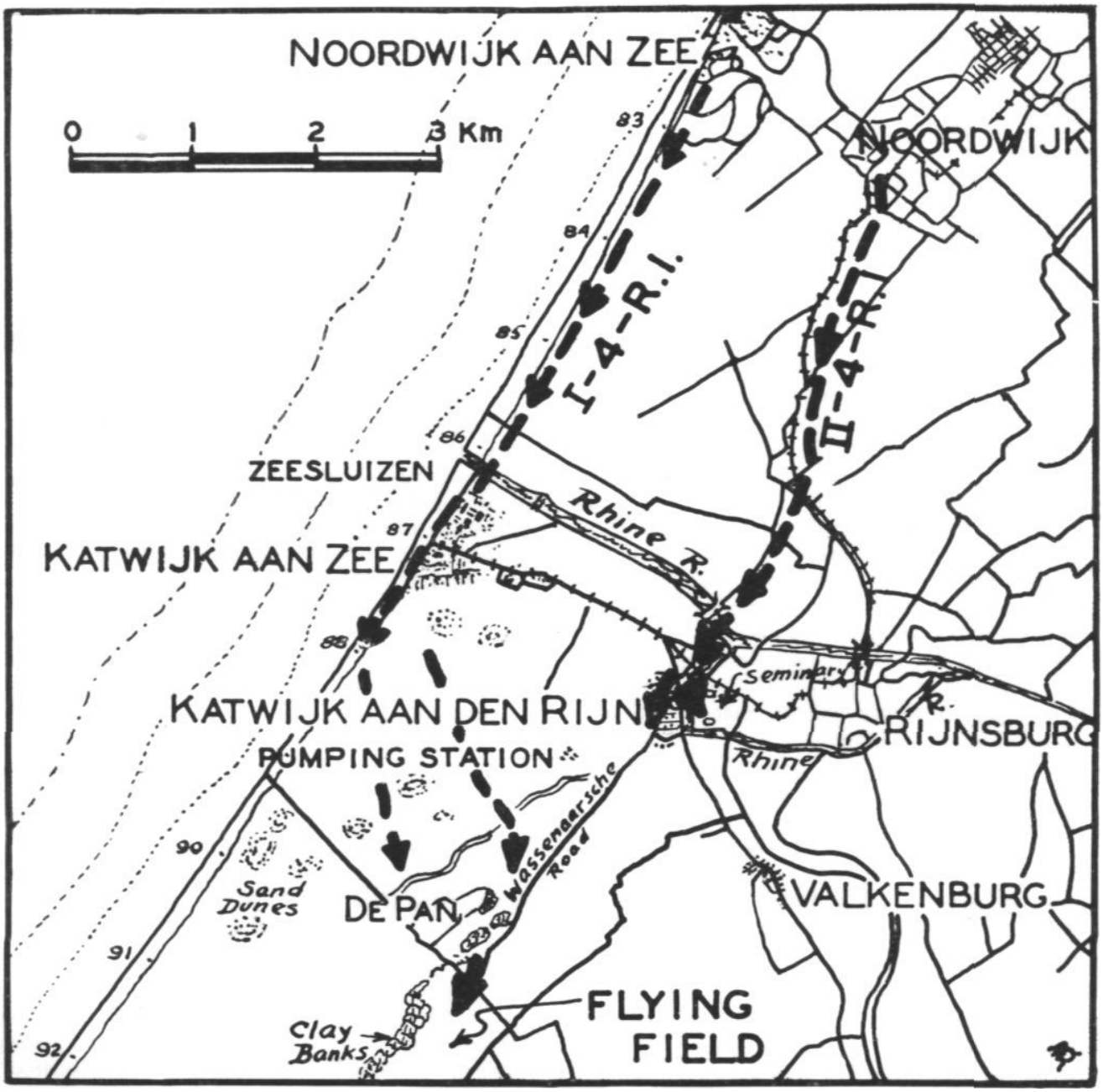
"Contact between assault companies to be maintained along Wassenaarsche Road."

One section 2d Company was sent on regimental orders to Katwijk aan den Rijn, for defense of the regimental CP.

During the march to pl. 88 the battalion had been fired on by German planes circling overhead. Later 10 or 15 planes landed on the beach, between pl. 90 and pl. 92 (southwest of Valkenburg). A group of riflemen and a machine-gun section under Lt. Engles was left behind to attack these, but the Germans made off to the south among the dunes. Seven of the planes had cracked up near Katwijk, which indicates that heavily-loaded transports require a fairly smooth airport.

The battalion now advanced inland in deployed formation toward the Valkenburg field. They traversed the sand dunes and came out into the open terrain east of the Wassenaarsche Highway. Here there were numerous ditches in the fields of tulip bulbs to be waded or jumped. The advance had progressed slowly through the heavy sand dunes, and contact between the assault companies was lost. The right company, having met heavy fire from the German air infantry landed on the beach, had dropped behind.

The left company reached the highway. Here was



Map No. 3—Actions near Valkenburg

the CO of the 3d Battalion with the remnants of his unit, lying along the bush-covered edge of the dunes. This officer, without the knowledge of the CO 1st Battalion, took the 1st Company 1st Battalion under his command. As the other sections came up he grabbed them too, and with the lot attacked the flying field. This unorthodox procedure succeeded! By 5:30 PM the flying field was in Dutch hands.

The CO 3d Bn occupied the field with the following order:

"2d Company 1st Battalion (less 2 sections) take position along north edge of field. One section along east edge.

"3d Company 1st Battalion take position along south edge.

"Liaison detachment, plus Machine Gun Company, guard approaches (roads)."

The remainder of the 3d Battalion completed the occupation.

FINAL ACTIONS

When the 4th Infantry attack and the artillery fire began to take effect the Germans who were not captured or killed retreated into the village of Valkenburg, where they seem to have maintained themselves until the surrender of Holland on the fourth day. The German regimental commander attempted to persuade the Dutch officers whom he had captive in the church that their resistance was futile. He also tried unsuccessfully to get them to tell their people to "behave like the Danes."

On the second morning the battalion of artillery at Katwijk commenced bombarding Valkenburg. The German commander tried to get a Dutch captive officer to call this off by telephone, but the latter refused. The artillery fire drove the Germans back to the edge of the village. The following day, Sunday, May 12, the 4th Dutch Infantry attacked Valkenburg from the west; although they almost penetrated the village, the attack was not pushed home.

The available accounts do not carry the action farther, but, as is known, this successful defense against the German attempt to seize The Hague was finally nullified by the general surrender of Holland.

COMMENTS

Here was a well-planned aerial invasion which failed because the defending forces were able to move promptly to the counterattack, *and were supported at the critical moment by artillery fire*. After the artillery commenced bombarding the field, the Germans were unable to land any more planes. They attempted to find other landing points in nearby fields, but these were too cut-up by ditches. They tried to land on the beach, but those planes which survived this rough treatment did not discharge sufficient troops to alter the situation.

A landing field is very vulnerable to artillery fire. The batteries can stand off at a distance, safe from infantry fire, and absolutely render the field untenable. They can maintain this fire day and night, and can scarcely miss so big a target, even without observation. Fragile planes on a field are "cold meat" for high-explosive fire.

But — this artillery must be protected against parachutists. The Dutch provided such protection.

The Dutch were fortunate in that their infantry units were within easy marching distance of their objectives. Had they been forced to rely on motor movement under heavy aerial attack, the action might have been less favorable.

AIR-BORNE FIELD ARTILLERY

By Lieut. Edward A. Raymond, 87th FA Bn.

The versatility of air-borne troops has been proved by the Battle of Crete. In Norway and Holland, advance-guard units were transported by air, but it was generally supposed that the need to reenforce them promptly by land or sea would limit their employment. The major action fought in Crete has demonstrated the ability of air-borne units to constitute the point, advance party, advance guard, support, and reserve of a large force. From the view of a field artilleryman, the Suda Bay engagement was the climax of the campaign. Here, according to newspaper accounts, the principal British harbor was brough under artillery fire from defiladed positions in the hills. The British were largely cut off from sea-borne reinforcements some time before German infantry actually seized the port. This may have lost the campaign for the English.

To date, official field artillery texts have been silent on our own experience and our own doctrines regarding air-borne artillery. Yet THE FIELD ARTILLERY JOURNAL* told how a complete battery of American artillery was moved seventy-six miles by air as long ago as 1931. Some of the circumstances of that displacement, and some of the lessons learned, are of fresh interest today.

Ten years ago the 2d Field Artillery was stationed at Camp Gatun, Canal Zone, some eight miles from France Field. It was commanded by Lt. Col. (then Major) John B. Wogan, 68th FA, whose interest in air-artillery

**Flying batteries*, by Lt. L. B. Ely, FA JOURNAL, May-June, 1931.

coordination has fathered a recent JOURNAL article on the subject and not a few of the pertinent paragraphs of F.M. 6-40, the Field Artillery Field Manual on Tactics and Technique (1940 ed.). Lt. Col. Tisdale, then a captain commanding Battery B, is given credit for suggesting a sky march for his outfit.

Since 1930 the 2d FA has been a mule organization, equipped with the 75-mm. pack howitzer, M1. On the day of its air displacement, Battery B packed out early. Each section had six mules; loads ran up to 345 pounds on a single beast. It took a good two hours to make the march to France Field, and in the latitude of the Canal an eight-mile davlight march is not quite like eating ice cream.

Between assembly in pack loads and firing position, the 75-mm. pack howitzer has an intermediate assembly in one compact, wheeled load. On reaching the field, sections placed their pieces in this assembly. Keystone LB-7 bombers of the 25th Bombardment Squadron, with special wooden racks in their bomb bays, were already on the line. Against the sound of their propellors Captain Tisdale shouted "Load up!" The howitzers were shoved under the bellies of the planes, and the husky six-footers of the Second lifted the 1,269-pound pieces into place as though they were rubber rafts. Each bomber swallowed up the complete materiel of one howitzer section, a chief of section, a gunner and a cannoneer, together with a pilot and copilot. This was in 1931. Remaining battery personnel climbed aboard Sikorsky amphibians; the armada roared off. High in the air, a 12-plane pursuit escort joined the formation.

Seventy-six miles (airline) from France Field, across the jungle-covered slopes and high peaks of the Continental Divide, and westward over the mangrove swamps of the Pacific Coast the battery flew. It reached the llanas, or plains, of upper Panama, and landed at La Venta, near where the buildings of the Department Training Center stand today. One hour and twenty-nine minutes after Captain Tisdale gave the order to load up in the Canal Zone, his executive shouted "Fire!" a hundred miles away. In three-quarters of the time it had taken to march 8 miles to the airport, Battery B had made a displacement which it could not have made in that terrain in less than a month by mules alone. The U. S. Army had proved the practicability of air-borne field artillery. The 2d Field Artillery had lived up to its motto of "The Second First."

In recollecting this experiment, several useful conclusions suggest themselves. Most important of all, it worked. Even with the relatively crude planes of that day, the battery sped at eighty miles an hour over country more impracticable for marching than any in the United States. The landing was made on an unimproved field, and with a minimum of previous negotiation with the Air Corps.

The job was done with the standard U. S. Army pack howitzer. The 75-mm. field howitzer is nearly twice as heavy—2,100 pounds against 1,300 pounds; it would take up needless cargo capacity in the plane, and be more difficult to move on the ground. A gun crew has to pull hard enough on its prolonges already to move the pack howitzer fast.

Planes carried the howitzer in one assembly. No attempt was made to drop six separate loads by parachute. If any of the six loads became lost or damaged the piece would never get into action. Furthermore, many parts of a field piece would probably suffer from hitting the ground from the air. The Germans have dropped .30 cal., and even .50 cal. machine guns, but it must be remembered that the parts of a pack howitzer are less compact, and some are in much less rugged assemblies.

The 2d FA pieces went into action with their ammunition already at hand. Even if unfuzed rounds, or ammunition with bore-safe fuzes could be dropped with safety from a plane, crews would have the greatest difficulty in collecting the ammunition and keeping up a well-nourished fire if parachute loads were scattered all over the landscape.

The 2d FA showed that a pack outfit with no previous experience can move by air. It serves as another justification of our everlasting prejudice against employing shock troops—corps d'elite chosen from the rest of the army, leaving skimmed milk behind. Since air-borne field artillery is not a parachute force and does not require special prowess or training, any battery of pack artillery is a potential air-borne unit, provided that it is disciplined and that it knows its business. Most units are in that condition now. But even if all our pack artillery could fly when the need arose, there would not be enough available to meet that need.

NOTICE TO ENLISTED MEN

A number of enlisted men have made inquiry as to whether they can subscribe to THE FIELD ARTILLERY JOURNAL. The answer is, they CAN. One does not need to be a member of the U. S. Field Artillery Association to subscribe to its JOURNAL; all he needs is three dollars. You all are cordially invited to subscribe. The JOURNAL will keep you up to date on field artillery technique; it will give you the most authoritative information on the European War. Many of you will wish to present a year's subscription to your people at home to keep them informed as to the kind of work you are now in, and to help them keep abreast of war developments. Send your application to THE FIELD ARTILLERY JOURNAL, 1624 H Street, N. W., Washington, D. C.

What about the FORWARD OBSERVER? Our field manuals and texts ignore him. Do we need him? Who is he? What enlisted assistants does he need? What communication and equipment should he have? What does he look for? How does he use what he sees? This paper is an attempt to answer some of these questions.

By

Major John F. Bird, FA.

Photo courtesy LIFE

THE FORWARD OBSERVER

Do we need him? Why do we need observation other than that afforded by the battery OP? Officers trained at Fort Sill are likely to get the idea that there will always be a hill mass overlooking the enemy position, from which the battalion base point can be selected and the battery commanders can register their batteries. However, the large-scale maneuvers of today are not held at Sill; neither are wars. The terrain is different in South Carolina, Georgia, and Louisiana, as those of us who were on maneuvers last spring can attest. We spent much time looking for our dear friends the Medicine Bluffs, Mission Ridge, and Feigel Point. Alas—they weren't there. Many times there wasn't even a Geronimo Hill.

The maneuver area "down south" was flat and covered by a dense growth of pine trees. All you could see were trees and occasional clearings. Some battery commanders thought that the tops of these pine trees would make excellent observation posts. However, on putting the thought to the test, they found that the tops of other pine trees were all that they could see. All artillerymen know that tops of trees don't make good battalion base points. Some other type of terrestrial observer was needed. The forward observer was the obvious answer. But the observers lacked experience as well as texts; they didn't always know how to go about their job; sometimes the blind were observing for the blind.

This summer, maneuvers will again be held in much the same areas, and, whether we like it or not, we will use forward observers. All too often an inexperienced junior officer will be sent forward with but a vague idea of what he is supposed to do and how he is to do it. As the field manuals still remain silent, this paper is written in the hope that it will help these battery forward observers.

Who is the battery forward observer? There are four officers assigned by Tables of Organization to the gun or howitzer battery: The battery commander, the reconnaissance officer, the executive, and the assistant executive. Which officer should be the forward observer?

The executive should not. He is responsible for the training of the firing battery and should remain with it while it is in action. Depending on the situation, the other three officers are available.

If the battery does not establish an observation post, the battery commander may well act as forward observer. An example is a battery in support of an advance guard. Here the infantry commander and the principal observation of the battery will be forward; the battery commander will certainly want to be up there with them. An incident is recalled where a battery was attached to

an advance guard as supporting artillery during a march to assembly areas. The march began in darkness with the thought that the assembly areas would be reached prior to contact with the opposing forces. As happens many times, the enemy did the unexpected. He moved covering forces out during the night, and contact was gained shortly after daybreak. The march group was caught in march formation. The road was only about thirty feet wide, no more than a slit through a dense pine forest. There were no battery positions and no observation. The battery commander adopted the only possible solution; he placed two guns in position, one on either side of the road. Then he went forward to a point on the road where he could see the infantry action and conduct the fire of his two guns, using radio communication. This he did amid much confusion but to the satisfaction of the umpires. The enemy was pushed back. However, in many situations the battery commander will want to remain with his battery to supervise its general tactical functioning.

The normal duties of the reconnaissance officer are to organize the installations at the observation post, to conduct survey operations, to observe and, in the absence of the battery commander, to conduct fire. However, the instrument sergeant can take over the duties of the reconnaissance officer, especially if the battery commander is at the observation post.

The assistant executive assists the executive and is responsible for transport. These duties do not require his full time. He is normally available and will frequently act as forward observer.

The battery commander must decide who will act as forward observer, basing his decision on the availability of his officers. Whoever goes forward must be trained in the duties he will perform in the forward area. Any battery officer may have to act as battery commander, reconnaissance officer, or executive; therefore, all should be trained in these duties. Following the same thought, since any officer may have to act as forward observer, all battery officers should be trained as such.

In addition to the normal training given any battery officer, the forward observer needs instruction in:

Methods in use at the fire-direction center in handling fire missions. The forward observer should know where his reports go and what happens to them when they get there; this knowledge will make him a more efficient member of the fire-direction system.

The communication system. The forward observer should know what lines battalion and the batteries lay. He should know what radio sets constitute each net and where they are located; he should know their call signs, frequencies, and peculiarities. This knowledge will help him if, for example, his set can't contact the set designated for it to work with. Perhaps he can get contact by moving his set a short distance, or he may be able to relay messages through another set.

The procedure used in reporting targets. The forward observer should know the proper procedure in reporting targets and observing fire; the use of proper procedure speeds transmission of messages and gains accuracy.

What enlisted assistants does the forward observer need? The forward-observer party should consist of a noncommissioned officer and two privates, with replacements for the inevitable casualties of battle and fatigue. The noncommissioned officer assistant will be in charge of the party. He should be trained in scouting; he should be able to read maps and air photos, plot points, estimate distances, and send and receive visual signals; he should be able to act as a relief radio operator. He should observe the area for targets and should be able to conduct fire, if necessary. A radio operator is necessary for the battery SCR-194 (walkie-talkie) radio set assigned the detail. One additional member is needed in the party. He should be a trained visual signalman, to form a team with the noncommissioned officer; he should be trained in map reading and messenger duties; he should have a knack for keeping oriented.

Present Tables of Organization do not provide a forward-observer party, although many artillerymen believe that they should provide one just as they provide battalion liaison details. Until Tables of Organization provide a forward-observer party, the battery commander must decide whom he can best spare for this important work. One possible selection is the instrument corporal, the radio operator who rides on the detail truck (Rad 3), and a basic private.

Communication is vital to the forward observer. Without it his observations are valueless. Primary dependence should be placed on wire communication; the details of installation will have to be decided upon in each situation. It will frequently be difficult and sometimes impossible to establish and maintain wire communication. Lack of roads or lack of defilade may prohibit the use of a wire truck, especially if the country is very wooded or mountainous. In the near future, issue of the new-type wire, the W-130, will help to solve the problem. This wire is made especially for use in forward areas. It is very light (one half mile weighs about twenty-five pounds), so that the detail can carry a sufficient quantity for most situations. One mile of this wire can be carried on the standard (DR 4) drum, and with attachment for laying by hand (Axle RL 27) the entire apparatus will weigh about eighty pounds. Its transmission range, while less than that of ordinary field wire, is adequate. Although the covering is somewhat thinner than on the heavy field wire, it is impervious to water. With its thin cover, the wire is less resistant to rough wear; but this should not be a serious problem. With this wire, the task of running the wire line forward will be much simplified. However, there is still the problem of maintaining wire broken by shell fire and vehicles. There will be occasions when the forward observer must rely on radio, supplemented by visual communication and messengers. He will have one of the three SCR-194 sets allotted to the battery. But he should endeavor to run wire forward, if it is at all possible.

To illustrate the duties of the forward observer, let

us assume that the 1st Field Artillery Battalion (truck-drawn light artillery) is in direct support of the 1st Infantry (see sketch p. 462). The terrain is similar to the southern maneuver area. The battalion commander has spcified the use of forward observers. Captain "Battery C" designated his assistant executive, Lieutenant "C," for this duty. The well-trained party consists of the instrument corporal, radio operator 3, and a basic private. In addition to the transportation and communication equipment, Lieutenant "C" decides to take the following:

Mounted map (or map substitute) covering the area in which the detail is to work.
Plotting equipment, including: Scales, pins, protractor.
Message book.
Air-Ground liaison code.
Prearranged messages.
Cold lunch and water for each member of the detail.

will need food and bedding. The battery commander must see that these items are sent forward, as the detail will be unable to carry them.

Before leaving the battery area, Lieutenant "C" wants certain information. This will normally come from the battery commander and should include the following:

Latest information on location of enemy and own front lines.
Zone of observation of his battery.
Description and location of the battalion base point and all numbered concentrations.
Lateral boundaries of supported unit.
Accurate location of all batteries of the battalion.
Plan of action of the force as a whole (attack, defense, retire).

This information should be plotted on the forward observer's map.

Lieutenant "C" is about ready to start forward. Before starting, he devotes a few minutes to a study of the terrain and his map (see sketch) to determine where he will go and a defiladed route thereto. Since their arrival unobserved in the forward area is of vital importance, the forward-observer party will, as a usual thing, walk. Our sketch shows a covered route along the stream and a small rise in rear of the line of departure. Since this rise is within the zone of observation of Battery C, Lieutenant "C" would follow the defiladed route along the stream and guide his detail toward the hill. If and when the new bantam (Blitz-Buggy) cars are issued to the batteries they will be of assistance to the party in some situations, as they can go places where the ordinary truck cannot.

Quarter ton 4×4 bantam car with DR-5 drum mounted on RL-31 frame attached. The DR-5 drum carries two miles of W-130. Five miles can be carried.

Range tables for type materiel in use.
Field glasses, compass, side arms.
Intrenching tools.

There will be times when the party will remain out after dark. The war goes on; and experience in 1918 proved that, though the observers cannot see during darkness, they can gain information by listening. When the enemy fired at night, the battalion commander had to depend on his forward observers to tell him where the fire was falling. Sometimes the firing was followed by an attack; in one instance, at least, the attack was broken up by a barrage laid down simply because the forward observer heard the attack coming. If the detail is to remain out after dark, they

Let us walk forward with Lieutenant "C" and observe his actions when he arrives in rear of the infantry lines. Undoubtedly he will seek some officer of the infantry battalion occupying that part of the line, possibly the platoon leader of the front-line platoon or the company commander of the left company. These officers have been in the area for some time, have reconnoitered it, and can give the forward observer valuable information that he greatly needs. Then, too, he will be wise to acquaint these officers with the fact that he is to remain in the area; they will no doubt be happy to have his assistance and support. This is in keeping with the policy of close cooperation and association between the artillery and the infantry in furthering the general plan. This first contact should be as brief as practicable and not greatly delay establishment of his observation.

Let us say Lieutenant "C" meets the left platoon leader. What information will he seek from this infantryman? He certainly will want to learn the present location of the lines; the location he received before he left his battery may not have been accurate and the lines may have changed since they were reported to the artillery. He will check his plotted location on the ground and make the necessary corrections. This infantry officer, in his reconnaissance of the area, has no doubt located places which overlook the enemy position. This information will save Lieutenant "C" time in selecting his own observation and may help him to avoid positions already in use. The platoon leader may have located certain targets, such as machine guns or similar weapons, which are of vital interest to the forward observer. These and other information of general interest will be of great help.

Having obtained all information possible from the platoon leader, Lieutenant "C" gives him his general location, and explains the support that the artillery can furnish. Lieutenant "C" then proceeds with his reconnaissance and selects his observation. Having decided where he can best operate, he has the operator set up the radio at once and establish contact with the battalion fire-direction center or his battery, depending on the arrangements previously made. As soon as contact is made by radio, he reports his location, using a prearranged message. While awaiting this contact and report Lieutenant "C" points out the zone of observation to the instrument corporal, orients his map, and locates the base point and the various numbered concentrations on the ground.

The forward observer is now ready to start fulfilling his mission. He studies the terrain, locates enemy installations and targets given him by the infantryman, locates additional ones by his own observation, and reports these promptly. He is assisted in his observation by all members of his party, especially by the instrument corporal. It is likely that radio may be silenced prior to the attack; in that case he sends the reports back by an alternate means of communication, either visual or messenger. If wire communication has been established either by his party or

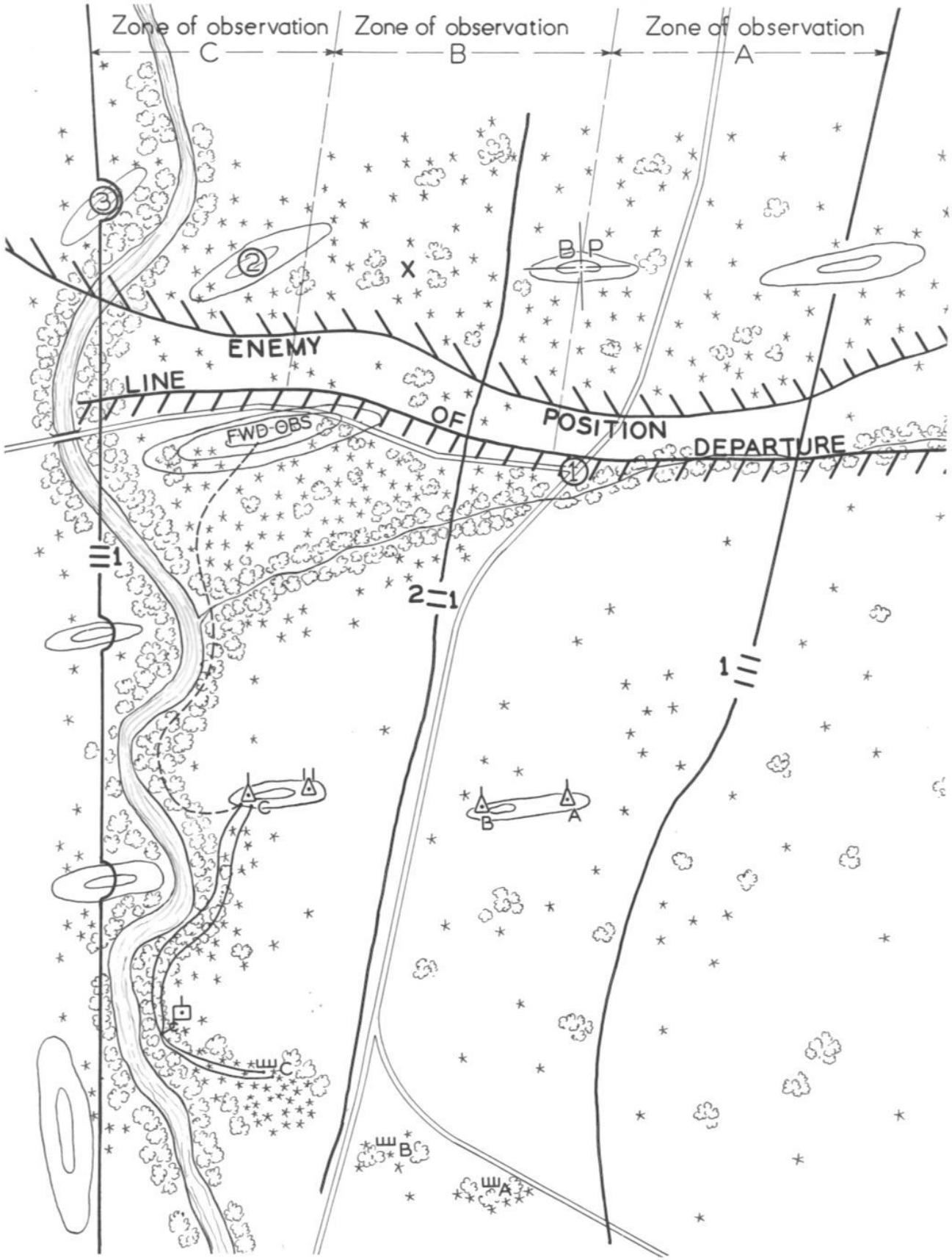
W-130 wire being laid by forward observer detail. The DR-4 drum holds one mile, and the entire load weighs about eighty pounds.

by the battery, this means would of course be used. If the terrain is such that a battery wire truck could lay wire forward, definite arrangements would have to be made with the battery signal sergeant as to where the line is to terminate.

Lieutenant "C" selected the point (see sketch) where the small stream joins the large stream. When the wire truck arrives at this point it will be met by the basic, who will guide the truck to the proper place. Often it will be necessary to pull the wire by hand from the rendezvous point forward, because of lack of roads or the need not to break defilade.

How long should Lieutenant "C" remain at his initial location? Remember, the mission of the forward observer is to observe and to adjust fire on targets. If he can observe better by remaining at his initial location, he remains; if he can observe better by following closely behind the advancing infantry, he follows. The point is.

Showing relative size of commercial spool of W-130, ordinary telephone, and DR-4 Drum. The spool holds one-half mile and weighs about 25 pounds.


Zone of observation
C
Zone of observation
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A
3
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X
B P
ENEMY
LINE
OF
POSITION
DEPARTURE
FWD OBS
1
1
2
1
1
C
B
A
C
B
A

he goes where he can best fulfill his mission. In our situation Lieutenant "C" decides to remain at his initial location until hill 2 (see sketch) is taken, and then to move forward.

How does the forward observer use what he sees? There are several possible methods; four of the most commonly used ones are discussed below.

METHOD 1—TARGET REPORTED WITH RESPECT TO THE BASE POINT

To use this method the forward observer must be able to see the base point. Lieutenant "C" locates a target at the point marked X (see sketch). He estimates the distance (in yards) that the base point is right or left, over or short, of the target and reports:

BASE POINT IS 400 RIGHT 100 OVER MACHINE GUNS WILL ADJUST.

By using this terminology Lieutenant "C" has told the battalion commander (or his battery commander) the following: "400 yards left and 100 yards short of the base point are enemy machine guns. I am in position to observe these guns and can adjust any fire you desire to bring on them. You can fire whenever you are ready." The decision whether to fire on this target is always made by the battalion commander (who is the fire director of the battalion) or by the battery commander if fire direction has been decentralized. If the decision is to fire on the target, the forward observer is so notified. In our situation, fire is conducted by the fire-direction center.

The battalion commander's decision is to fire eight volleys on the target, using the entire battalion. The fire - direction center sends the following message to Lieutenant "C" by telephone or voice radio:

CONCENTRATION 4 BATTALION WILL FIRE BAKER EIGHT VOLLEYS.

Battery B (Baker) fires. Lieutenant "C" senses these rounds and reports

100 RIGHT 100 SHORT.

Battery B fires with corrections applied, and Lieutenant "C" reports,

30 LEFT RANGE CORRECT FIRE FOR EFFECT.

The battalion fires, using the adjusted data of Battery B. The fire is effective, so Lieutenant "C" reports,

MISSION ACCOMPLISHED.

METHOD 2—TARGET REPORTED WITH RESPECT TO A NUMBERED CONCENTRATION

The procedure using this method is the same as that used in Method 1, except that a previously designated point is used instead of the base point. The point can be any visible prominent terrain feature in the area; road junctions, crossroads, hill tops, and road bends are suitable; a target previously fired on may also be used. Battalion designates the concentrations, gives them numbers, and sends them to the battery commander, who gives them to the forward observer before he leaves the battery area. In our situation, the points marked 1, 2, and 3 are numbered concentrations (see sketch). The terminology used to designate targets with respect to numbered concentrations is the same as that used in Method 1.

METHOD 3—TARGET DESIGNATED BY COORDINATES

In this method of designating targets, the forward observer plots the target on his map (usually by inspection), reads their abbreviated coordinates, and reports them to the battalion or battery, using some such terminology as follows:

COORDINATES 3296 INFANTRY MORTARS WILL ADJUST.

If an air photo is used, the target is reported by its photo coordinates, using the arbitrary grid imposed on the photo; for example,

AFFIRM MIKE 32 96.

The battalion or battery plots the target by its coordinates, gives the target a number for future reference, and decides whether to fire on the target. If the decision is to fire on the target, the forward observer is notified. The procedure in reporting observations is the same as that given in Method 1.

METHOD 4—MARKING A POINT IN THE TARGET AREA

There will be many times when the forward observer will be unable to identify the base point, any numbered concentration, or any other point known to the battalion or battery. This happened time and again on the maneuvers last spring and will happen this summer. At times the observer will be able to see only a small clearing in the trees and will have to determine his own reference point. He can do this in two ways: He can call on the battalion (or battery) to mark the base point or one of the numbered concentrations by firing a volley; or he can send data for fire on a point which he himself has located. In the first case, the battalion will designate a battery to fire on the point requested and will notify the forward observer what battery is firing and the ammunition it will use. In the second case, the battalion will plot the point using the data sent and give the point a number for future reference. A battery will be designated to fire and the forward observer notified as above.

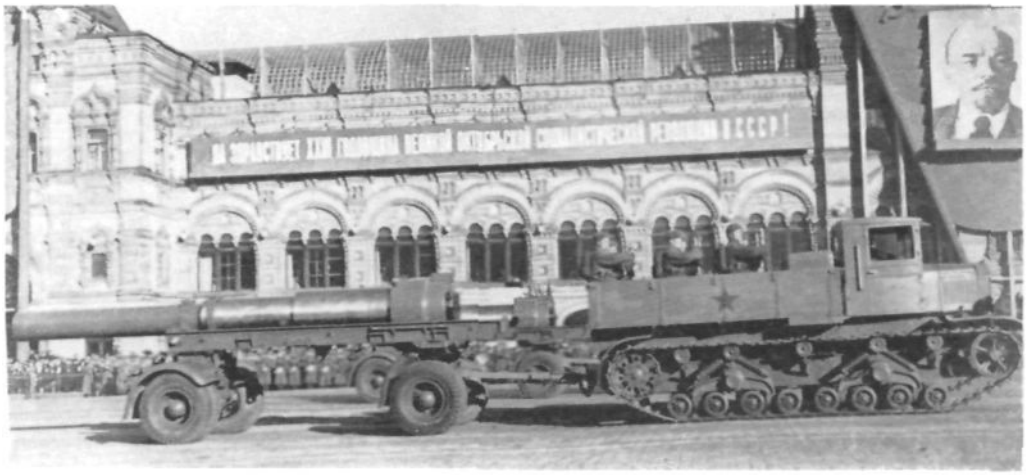
In closing this brief article on the forward observer it is desired to emphasize one or two points. Prearranged terms and phrases save time and should be used. However, do not allow yourself to become ensnarled in them. In case you, as forward observer, have forgotten whether you should say *can observe* or *will adjust*, for goodness' sake make up a phrase of your own that will convey the thought. The idea is to get the job done. Let me emphasize that this discussion is written not with the idea that it is the *only* method of using the forward observer, but simply as a starting point. It is a method on which to build. As experience dictates changes let changes be made. "There is nothing so constant as change."

THE RED ARTILLERY

21-cm. howitzer—interchangeable, on same carriage, with 15-cm. gun.

76-mm. guns M1933 (Bofors type)—can be used as AAA.

122-mm. gun-howitzer.



Believed to be the 305-mm. "Obukov" howitzer.

Artillery of the cavalry corps is equipped with 114-mm. howitzers.

A recent article published in the "Krasnaya Zvezda" refers to the progress, especially with respect to the artillery, made in recent years by the Red Army now engaging the Germans on the western borders of Russia.

The number of infantry divisions has been multiplied by ten, and the number of effectives of each division, and especially of its artillery, has been increased from 13,000 to 18,000 men.

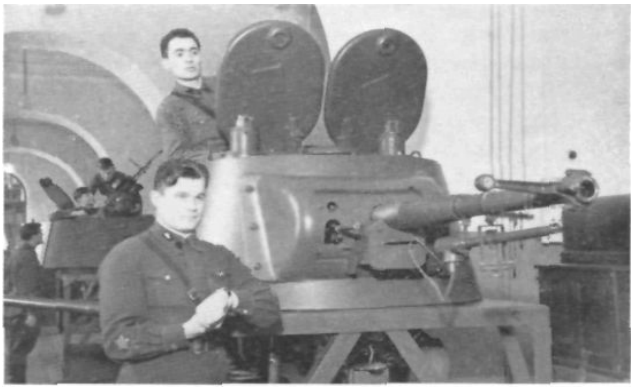
The light artillery has been increased by 34%, the medium-caliber artillery by 26%, the large-caliber artillery by 85%, and and the AA artillery by 169%. According to the Russian periodical, the range of the heavy artillery has also been increased 50 to 75%.

The number of tanks equipped with cannon, of armored cars provided with machine guns, of grenade throwers, and of airplanes has also been increased.

A group of two batteries, each comprising three 76.2-mm. guns M28, has been assigned to every infantry regiment as its accompanying artillery. These guns, which were originally designed for animal traction, are now motorized. The tractors, which are also used in transporting the gun crews, have an armored compartment for the commander and are equipped with a machine gun. They can also be employed like armored cars in reconnoitering for artillery in close combat.

Each infantry division comprises a field artillery regiment composed of 3 or 4 groups. Three of these groups are armed with 76.2-mm. guns and light 122-mm. howitzers,

76-mm. gun. M1933.



The artillery laboratory of the Soviet tank school. 45-mm. gun mounted in Soviet Christie "BT" tank.

Indoor range for tank artillery.

The Dzerzhinsky Artillery Academy—120 years old! The guns shown are probably the 122-mm. gun-howitzer. Note muzzle brakes.

while the fourth group, which does not exist in every regiment, has 107-mm. guns and 152-mm. howitzers.

The Putilov 76-2-mm. gun M62, which was used during the World War (weight of projectile 6.58 kg., muzzle velocity 588 m/s), has been modernized. Its length has been increased from 30 to 50 calibers and its range from 8,750 to 13,000 meters.

The Krupp 122-mm. M09 and Schneider M10 howitzers (range, 7,500 meters) have been replaced by the 120-mm. howitzer M10/30, having a maximum range of 9,500 meters.

Each *cavalry corps* is armed with a 114-mm. howitzer, whose principal characteristics are as follows: weight of projectile, 15.9 kg.; range, 7,500 meters, weight of piece, 1,380 kg.

The *mountain artillery* is armed with the Schneider 76.2-mm. gun M09. Its principal characteristics are as follows: weight of projectile, 6.4 kg.; range, 7,100 meters; weight of piece in battery, 625 kg.

The *corps artillery* consists of the 107-mm. gun M10/30 and the 152-mm. howitzer M09. Both guns, which are of French origin (Schneider-Creuzot), have been modernized: the barrel of the 107-mm. gun has been lengthened and its range has been increased from 8,700 to 12,000 meters.

The *heavy artillery* comprises, in addition to the guns used during the World War, a new 150-mm. gun, a 210-mm. gun, and 210-mm., 280-mm., and 305-mm. howitzers. These cannon are transported on caterpillar tractors.

The *railway artillery* comprises 305-mm. and 406.4-mm. howitzers.

The *AA artillery* comprises 40-mm. Vickers guns of two models, 76-mm. gun M28, 76-mm. gun M33, and "Leningrad" 105-mm. gun M34.

While the 76-mm. gun M28 has a horizontal range of 11,000 meters and a vertical range of 7,000 meters, the 76-mm. M33 gun has a horizontal range of 14,500 meters and a vertical range of 9,500 meters.

The "Leningrad" 105-mm. gun M34 fires a projectile weighing 15 kg. and has a horizontal range of 18,000 meters and a vertical range of 13,000 meters.

The Rosenberg and Maklen 37-mm. antitank cannon, which were employed during the World War, have been replaced by a modern gun of the same caliber.

MAY AND JUNE ISSUES, FIELD ARTILLERY JOURNAL

We still have a limited supply of the May and June, 1941, issues of the JOURNAL. Prices, 25 cents per copy to subscribers, 35 cents to nonsubscribers. These issues were packed with value; for the benefit of those "who came in late," here are the tables of contents:

May: *Antitank Defense,* by Maj. Wedemeyer; *Ft. Bragg Replacement Center,* by Lt. Col. Parker; *Centralized Training,* by Lt. Col. Delahaye, British Army; *Fire Direction* (F.A. School text); *Value of Artillery in Modern War*—German translation; *Service in Panama,* by Lt. Raymond; *Wha Makes an Army?* by Lt. Col. Riley; *Gun Procurement,* by Gen. Snow; *Incidents from the War; Conduct of Fire* (School text), Part I; *Learning from the Engineers,* by Maj. Kehm; *Minimum Elevation Table,* by Capt. Hercz; *Motor Maintenance* (School text); *From the Chief's Office;* and *With the Armies of Foreign Nations.*

June: *Fall of Belgium,* by Col. Lanza; *Capture of Eben Emael,* by Lt. Sprengling; *German Assaults on Permanent Fortifications,* by Capt. Schmidt; *Loading of F.A. Materiel for Railway Transport* (School text); *Antitank Fire with Minus Site,* by Lt. Francisco; *Replacement Centers at Sill and Camp Roberts,* by Lt. Cols. Egan and Marston; *Wartime Production,* by Gen. Snow; *Marking Artillery Fires,* by Maj. Lewis; *Artillery Action in Somaliland; War in Mediterranean* (pictures); *With Other Arms and Services—Engineers,* by Map. North; *Secret German Weapon,* by Capt. Crystal; *Incidents from the War; Versatile Jeep,* by Capt. Ruhlen; *Device for Measuring Powder Temperature; Graphical Resection,* by Lt. Beavers; *Military Progress,* by Col. Crockett; *Automotive Driver* (School text); *Self-Propelled Artillery; Conduct of Fire—II; Type Problems; Liaison Method of Conduct of Fire,* by Gen. Wallace; *Hints for Laying Battery,* by Capt. Duell; *New Autogiro; Artillery in Direct Support of Tanks* (German article); *From Chief's Office.*

Wartime Production
Ammunition

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

The only battle action field artillery has is fire. Field artillery to be effective must be accurate in its fire. And accuracy results only from thorough training, so the finishing part of training must be actual firing. Much preliminary and essential training can be accomplished without actual firing of full charges and service ammunition. This saves money. But ultimately the point is reached where battle practice with real ammunition is just as essential in making a good field artilleryman as playing on a real piano is in making a pianist. There was a shortage of ammunition in this country during the World War, and it was a bad handicap to our training.

Ammunition and Ordnance Yard, Mehun

In April, 1918, I called on the Ordnance Department for a statement of ammunition, and on the 27th of the same month was furnished the following by the supply division of that Department:

AMMUNITION ON HAND AND UNOBLIGATED

	3-inch Gun	75-mm. Gun	4.7-inch Gun	4.7-inch Howitzer	6-inch Howitzer
Shell	400,300	0	11,955	4,000	26,778
Shrapnel	1,071,900	0	20,752	688	1,650

Although what I was really seeking in asking for these figures was information upon which to base firing programs for the various field artillery activities just authorized, yet not the least significance of the figures lies in showing how small a reserve of ammunition had been built up during the year since we entered the war. Reduced to rounds per gun, this amounts to only the following for each training weapon in this country: 3-inch gun, 2,441: 4.7-inch gun, 2,180; 4.7-inch howitzer, 44; 6-inch howitzer, 728.

As at that time (late in April) I was working on the establishment of the field artillery activities authorized in our General Training Scheme, and as I knew that each would call for the firing of considerable quantities of ammunition, it is seen that I was deeply interested in ammunition for each of the above - listed calibers for the following reasons:

The 3-inch gun, because I knew it would form our principal firing weapon in training;

The 75-mm. gun, because we hoped to get these weapons and would then have to divide ammunition with the A.E.F.;

The 4.7-inch gun, because both the A.E.F. and the United States already each had some of this caliber and hence must divide ammunition; and

The 4.7-inch and 6-inch howitzer, because they were to be kept in the United States, and were to be our only howitzers for training in firing until we could get the 155-mm. howitzer, and this prospect, even then, was hopeless for at least a year.

Starting in April, then, this ammunition question was to bother me until the close of the war.

3-Inch Gun Ammunition

About a month after we entered the war the Ordnance Department placed contracts for 9,000,000 rounds of 3-inch shell and shrapnel. My first experience with this was in the fall of the same year (1917) when, as Commandant of the School of Fire at Sill, I fired shrapnel made by the Bartlett & Hayward Company, of Baltimore. It was the best shrapnel I have ever fired. And there was never any shortage of this caliber of ammunition, either shrapnel or shell, in the United States during the war.

The ample supply of ammunition for this gun enabled us to conduct a large part of the firing instruction carried on in this country during the war, and after the establishment of the Firing Center this instruction was thorough and really efficient. Prior to that time and to the appointment of a Chief of Field Artillery, and under

the old divisional plan then in use, not much firing was held and this little was practically a waste. At that time, preliminary instruction of officers in handling the sheaf of fire was taught, if at all, with ammunition costing $16.00 a round instead of with a piece of chalk and a blackboard.

The ample supply of 3-inch ammunition, all during the war, was a "life saver" for training in the United States.

75-MM. GUN AMMUNITION

I have already mentioned the arrival of the French Mission over here shortly after we entered the war, and our decision, based on their advice, to change the caliber of our 3-inch gun to 75-mm. The principal reason was to make our ammunition interchangeable with theirs, for, as the difference in caliber is only about .04 inches, this could not appreciably affect the power of the gun. The 3-inch and 75-mm. were therefore equal in that respect. The decision was reached July 17, 1917. Then followed the delays which, according to my experience, are inevitable when entering upon business relations with the French. They believed in shell rather than shrapnel, and accordingly their shell specifications were radically different from ours, or from those of the British, for that matter. Of course a delay occurred while our Ordnance Department awaited drawings of shell, boosters, fuzes, and adapters, from France; then another delay in translating their metric units to those familiar to mechanics in the United States; then a further delay in preparing specifications due to certain metallurgical practices the French insisted on and to which our steel people objected as merely time consuming. This last question was settled only when we had made shell in our own way, sent it to France for test, and the French Commission there reported: "To sum up, from the test of 10,000 rounds of 75-mm., it may be concluded that the American ammunition is, in every way, comparable to French ammunition, and that the two may be considered as interchangeable."

I quote this decision of the French for the reason that the statement has frequently been made since the Armistice that there was not a round of American-made artillery ammunition fired during the war.

The implication to be drawn from this statement is that either we could not make as good ammunition as the French, or that if we could we sent none to France. Like all half truths, it is the worst kind of a lie. I am not, of course, in a position to state whether any of such ammunition was or was not actually fired, but I do know something about the quantity and quality sent abroad.

I once laughingly quoted this statement, that no American-made ammunition was used in the war, to an Ordnance officer and he replied that it was not true, as he had personally seen American-made artillery ammunition fired at the enemy in battle. And he added that, having heard this charge made in France, he took 6 rounds of such ammunition up to the front himself and watched it fired. He was, therefore, in a position to positively deny the slander.

The British program was based on 60% shrapnel and 40% shell; the French on 10% shrapnel and 90% shell. We adopted a compromise program of 23% shrapnel and 77% shell, for the 75-mm. guns.[1]

There was no difficulty in producing shrapnel, and with our 21-second fuze it was the best shrapnel on the Western Front. On May 6, 1918, Pershing was told by cable that 2,000,000 rounds of shrapnel was ready for shipment to him and that a continuous quantity production was assured. However, on July 18, 1918, he cabled that he had large quantities of this ammunition on hand, but lacked fuze setters. Within a week he was sent 500 by courier. The same month he cabled for 2,200 bracket fuze setters and 3,600 hand setters. Possibly the delay in fuze setters may have contributed to the limited use of shrapnel by the A.E.F. Possibly the field artillery was not highly enough trained to use it skillfully. In any case, 5,432,100 rounds of 75-mm. shrapnel were sent overseas, while the total production here to November 15th was 7,412,231 rounds.

As of April 10, 1918, the following estimated production of 75-mm. shrapnel was furnished me by the Ordnance Department:

Up to Jan. 30:	141,356	June	725,000
February	123,167	July	600,000
March	483,216	August	600,000
April	725,000	September	700,000
May	725,000	October	375,000

As the above indicates, there was plenty of shrapnel, both at home and abroad. The production here of 75-mm. shell was by no means so satisfactory.

Just how much shell was produced for the 75-mm. gun in the United States, I do not know. Various figures are given, but none was produced until the summer of 1918, and it was not until the last month or six weeks of the war that shell for this gun came through fast. The difficulty lay principally in the adapters and boosters, particularly the latter, which had not been component parts of our shell prior to the war.[2] They came with our adoption of the French shell with its nose fuze, instead of our base fuze. As far as making the actual projectile (forging and machining) goes, that

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[1] A British officer once remarked that "shrapnel, not being wet, did less damage to the enemy trenches than rain." He made no comment on shrapnel's effect on personnel.

[2] The following table of successive estimates of total deliveries of complete rounds of 75-mm. shell to September 1, 1918, compared with the reality, shows the devastating effect of booster difficulties:

Date of Estimate	Number of rounds estimated to be delivered by September 1, 1918
January 1, 1918	17,744,000
March 1, 1918	10,601,000
April 1, 1918	6,752,000
June 1, 1918	3,068,000
July 1, 1918	1,267,000
September 1, 1918	942,000

This slump was due almost entirely to booster troubles.

never bothered the Ordnance Department, as is shown by the fact that up to November 15, 1918, nearly 13 million shell bodies had been forged and machined, and were ready to be filled with explosive.

Beginning with midsummer, 1918, the cables were full of references to 75-mm. gun shell, which later on came through in large quantities but too late for the 1918 campaign.

After the war and in order to locate the choke points, a comprehensive study was made by Colonel Leonard P. Ayres, of the War Department Statistical Division, of the production here of 75-mm. shell during the war. While this study is of special interest to the Ordnance Department, it is of interest also to our present discussion in the following deductions:

"An interval of six months may be considered as fairly representative of the delay in production caused by the adoption of the French caliber."

Also:

"Coming just as the manufacture of 3-inch ammunition was beginning, about two months after the declaration of war, this delay, resulting from the adoption of the French calibers, deferred the real start of the procurement of field gun shell until about December 1, 1917. By that time, we had 129,000 men overseas, and 1,060,000 in training in the United States. This handicap was too great to be materially reduced by any possible acceleration of the actual manufacturing processes."

But the essential point to note from the above is that, while there was plenty of shrapnel for the 75-mm. gun in the United States, there was but little high explosive shell, and as shell was the principal projectile (77%) for this gun in France, it should have formed our principal training projectile over here; it is apparent that this absence was another handicap to our training.

75-MM. GUN GAS SHELL

When we consider gas shell, the situation was much worse, due again to the booster. Only a few thousand of such loaded shell were produced. However, this was not a matter of such serious moment as was the shortage of high-explosive shell, for I never contemplated the use of gas shell in training in this country, due to its uncontrollable danger. The Chemical Warfare Service shipped enormous quantities of gas in bulk to France, where it was exchanged for loaded gas shell for the use of our troops. Quantities of gas were also sold to England.

4.7-INCH GUN AMMUNITION

In April, 1918, we had on hand and unobligated, according to the Ordnance Department, 11,955 shell and 20,752 shrapnel for the 4.7-inch gun. That was not much. But the shrapnel continued to be manufactured, and there was always plenty of it during the war. The shell was a different matter. Here again the adoption of the nose fuze from the French, instead of continuing the base fuze we had always used, introduced the same booster and adapter troubles mentioned in connection with the other calibers. The result was that, although contracts for 600,000 shell had been made in the summer of 1917, no shell were produced for this gun until September, 1918, when 32,000 came through, but the Armistice arrived before any of this could be delivered to the guns. It was just as well that none of this shell reached the guns promptly, for when tested, it proved to be very inaccurate. The dispersion was far too great to tolerate. The difficulty was finally located by Major F. R. Moulton and corrected, but that took time.

Major Moulton, who had been and still is, Professor of Astronomy at Chicago University, during the war was commissioned in the Ordnance Department and was used as a ballistician. He applied his knowledge of astronomical mathematics to the flight of projectiles. He corrected the 4.7-inch shell inaccuracy in the same way that he had previously corrected the 6-inch seacoast gun shell inaccuracy which had been much worse than that of the 4.7-inch shell.

In the 6-inch seacoast gun he reduced the dispersion to one-quarter of what it had been and thereby added to the range, by reducing the copper in the rotating band and bevelling it off at the rear. He discovered that the excess copper caused an irregular flange of copper on the projectile, like a ballet skirt.

From the beginning of the war up to November 30, 1918, there was actually accepted the following number of complete 4.7-inch rounds:

Shrapnel	217,358
Shell	124,653

As far as the A.E.F. is concerned, my recollection is that the only artillery ammunition lost during the war by submarine torpedo attack was a shipment of this caliber, and as it was a caliber not used in European armies the loss could not be replaced by the Allies. There were actually shipped overseas 195,000 rounds of 4.7-inch shrapnel. The first lot of high explosive shell (46,614 rounds) was sent in October, 1918. On the 18th of that month General Harbord cabled that the 4.7-inch ammunition shortage was serious. No shell had been received, and regiments in action were forced to use shrapnel only. Up to the signing of the Armistice, 72,000 shell had been shipped overseas. In connection with General Harbord's cable, just referred to, it is interesting to note that a cablegram, dated February 12, 1920, gave only 233 as the total number of rounds of 4.7-inch ammunition fired from February 18, 1918, when the 1st Division, as a complete unit, entered the line, until firing ceased on November 11, 1918. There seems to be a conflict between this figure and General Harbord's cablegram.

However, as far as we are concerned, the essential point to note is that the shortage of 4.7-inch shell in the United States seriously interfered with our training.

THE 4.7-INCH AND 6-INCH HOWITZER AMMUNITION

The ammunition for the 4.7-inch and 6-inch howitzers may be considered together, for the reason that, as will

be recalled, we decided, on the advice of the French Mission early in 1917, to make no more of these calibers but to substitute their 155-mm. for the three calibers, 3.8-inch, 4.7-inch and 6-inch. Consequently, no howitzer of any of these three calibers was actually made during the war. As these howitzers were to be no part of our war equipment, we bent every effort to produce the 155-mm. howitzer, which would be a part of the war equipment, and we also bent every effort to produce ammunition for the recently adopted howitzer, at the expense of course of the old 4.7-inch and 6-inch. However, notwithstanding this, a fairly satisfactory supply of 4.7-inch howitzer ammunition was always available. This was due to the fact that we had on hand, as heretofore shown, 688 rounds of shrapnel and 4,000 rounds of shell for the 4.7-inch howitzer on April 27, 1918, and further to the fact that the Ordnance Department made 60,787 rounds of shrapnel and 39,198 rounds of shell from the time we entered the war to November 30, 1918. All of this production remained in the United States. We thus had plenty of ammunition for the small number of 4.7-inch howitzers we had on hand.

As to the 6-inch howitzer, we had on hand, as previously stated, 1,650 rounds of shrapnel and 26,778 rounds of shell on April 27, 1918; 83,000 rounds of shell were produced to April 30, 1918, when manufacture ceased; 4,000 rounds of shrapnel were also produced (1,000 in June, 1918, and 3,000 in August, 1918), and then that ceased also. This, however, was enough for the 39 howitzers on hand. It will thus be seen that there was no dearth of ammunition for the 4.7-inch and 6-inch howitzers that we had. The real trouble was that we did not have enough howitzers and those we did have were pretty "junky" by the end of the war. However, we had gotten a lot of valuable training out of them in the meantime.

155-MM. HOWITZER AMMUNITION

All that need be said about the 155-mm. howitzer ammunition is that, on November 11, 1918, we had on hand for training use in this country four of these weapons while we needed four hundred and ninety-two! An unlimited supply of ammunition for the four howitzers we had would not have helped the training situation very materially. Actually, the first eleven rounds were produced in June, 1918, and up to the Armistice only five hundred had been made.

Even at the risk of repetition, I want to again try to impress upon the reader what a serious handicap the shortage of this howitzer and its ammunition was to training in this country. Next to the light gun regiments in a field artillery brigade, the greatest number of regiments were of the 155-mm. howitzer type. Or to put it another way, and considering only the heavy regiments, the number of 155-mm. howitzer regiments far exceeded the number of 4.7-inch gun regiments or the 15-mm. gun regiments. The importance of the howitzer and ample ammunition for it is, therefore, apparent, yet not a single one of these 155-mm. howitzer regiments in this country had a single 155-mm. howitzer with it from the beginning to the end of the war. Not an enlisted man in any of these regiments ever saw such a howitzer until he got to France, and none of the officers of these regiments was any more fortunate, unless he had attended the Sill School, where we had four and needed twenty-four. So, even at that school, the training in this weapon, and especially in firing ammunition, had to be sketchy. As a result, not an officer or enlisted man in such a regiment could possibly be made into a real howitzer artilleryman here. He had to get his training in France. Of course we used the old American howitzers, as I have stated, to give such training as we could, and we really accomplished considerable. But it is not correct to say that "a howitzer is a howitzer" and thus give the impression that training with one model is as good as training with another. It is not so. And, moreover, these old American howitzers were almost worn out, and accurate fire with them was out of the question. So, like everything else in the field artillery training in this country during the war, we simply did the best we could with the limited means available, while we hoped that sometime, somehow, we would have enough equipment to enable us to produce the results we knew we were capable of producing. But the absence of these 155-mm. howitzers and ample ammunition for them was a serious embarrassment, and one of our greatest handicaps all during the war.

155-MM. GUN AMMUNITION

There was not a 155-mm. gun with any of our regiments in this country during the war. Therefore, the remarks I have made under the 155-mm. howitzer, showing our handicap in training, apply also to the 155-mm. gun. The only difference is that there were fewer gun regiments than howitzer regiments. At the Sill School we had the same number of 155-mm. guns (four) as howitzers of the same caliber. In view of these conditions it is useless to waste time discussing ammunition. Actually, the gun ammunition was further behind than the howitzer ammunition. The first nine rounds of gun ammunition were produced in October, 1918. We were therefore able to do some actual firing at the Sill School with this gun just before the Armistice. But of course this firing did not amount to much. And, wholly unconnected with any question of shortage of guns and ammunition, the fact that it did not amount to much was a welcome relief, for, due to the great range of this gun, we had to fire over the Post of Fort Sill, to the great anxiety of the officers and the consternation of the families living on the post.

MISCELLANEOUS EQUIPMENT

In addition to guns, howitzers and fire-control equipment, the shortage of which I have discussed somewhat

in detail, there are many other articles that go to make up complete equipment for a field artillery unit and of which there was also a shortage. It would make dry and uninteresting reading to treat of them all, so I shall just select a few of the more important ones.

At the time I became Chief the following was the situation as to these few:

Limbers and caissons—Enough for the guns on hand.
Battery and store wagons and their limbers—All camps stripped, gone to France.
Six-horse reels and carts — All camps stripped, gone to France.
Reel carts, battery, 2-horse—None yet made.
Caisson reels—None yet made.

In some of these items, the shortage was promptly remedied, in some gradually, and in some never during the war. All this was merely another handicap to training in the United States.

PISTOLS

The shortage of training equipment in the field artillery extended all the way down the line, even to pistols. On March 1, 1918, shortly after I became Chief, an agreement was reached whereby all automatic pistols having gone to the A.E.F. (which was still short about 25,000), the Regular Field Artillery in the United States would be supplied with Colt revolvers and the National Guard with Smith & Wesson revolvers (then being made at the rate of about 600 per day); that all .38 Colts would be given to the Navy in return for letting the Army have full priority on manufacture of the caliber .45; and that all National Guard and National Army divisions then on the priority list for sailing were to get ten per cent of these weapons at once and the remaining ninety per cent some time after they got to France.

HARNESS

There was a serious shortage of artillery harness during the entire first year of the war. (Food for thought as to our unpreparedness for war and the length of time required for the greatest industrial nation on earth to overcome such neglect.) As an illustration of how this shortage handicapped training, it may be mentioned that in the fall of 1917, in some National Army field artillery brigades crude wooden sleds (representing guns and caissons) were made and these were dragged around by the drivers, thus simulating mounted drill. By this means, distances and intervals between carriages, arm signals, and battery maneuvers were taught. While, of course, this pitiful procedure was somewhat instructive, yet its value was almost nil, as it did not teach the drivers either to ride or to drive. This shortage in harness continued for months after horses were supplied. As mounted service supplies came in gradually, I was amused upon one occasion when I was a brigade commander at Camp Jackson to note the results of the enterprise and initiative of the three regimental supply officers in the brigade. Whenever any supplies arrived at the camp, there was a rush to see which one could capture the lion's share. In this way it developed upon the occasion I speak of, that one regiment had practically all the horses, another regiment had practically all the halters, and the third regiment had practically all the horseshoes. These supply officers considered that they had suffered a loss in prestige as "rustlers" when I required a redistribution so as to give each regiment its share of horses, harness and horseshoes.

A checkup on February 18, a few days after my appointment as Chief of Field Artillery, still showed a considerable shortage of harness and in addition an inequitable assignment to field artillery brigades. Thus, 12 National Guard brigades had 2,252 sets of lead and 1,262 sets of wheel harness, while 16 National Army brigades had but 472 sets of lead and 290 sets of wheel—or in other words, the National Guard with but three-fourths as many brigades as the National Army, had five times as much harness.

I remember standing on a railroad track (not a good place for a conference) at Aberdeen Proving Ground shortly after I became Chief, and discussing needs and prospects with Colonel J. Byram, who was in charge of harness production. He gave the reassuring news that in a few weeks it would come through gradually and would increase to a flood; and it did. Harness to the value of over forty-five million dollars was ordered in this country and over thirty-six million dollars' worth was delivered. In addition, General Pershing procured over six million dollars' worth in France. The harness produced in the United States was divided into two grades, the better grade being sent to France. It was returned to the United States after the war; and evidently some boxing and marking was rather hastily done in France, for some boxes shipped from there and marked "Artillery Harness" were found, when opened, to contain nurses' uniforms!

Field Artilleryman Honored at Purdue University

"For the greatest contribution to the welfare, success, and reputation of the University," reads the citation given last night to Master Sergeant T. J. "Shorty" Purchla, for 22 years a member of the military faculty of the University. Sgt. Purchla received the Sigma Delta Chi leather medal, awarded annually by the Purdue chapter of the journalistic fraternity at the banquet concluding the "Newspaper Day" program sponsored by the chapter.

Sgt. Purchla joined the Purdue faculty in 1919 after serving in the infantry, cavalry, and artillery of the regular army for many years, and for 18 years since coming to Purdue has directed the marching formations of the nationally known Purdue "All-American" Military Band. Among those who have received the leather medal in past years have been Dean Stanley Coulter, Ward Lambert, David E. Ross, Edward C. Elliott, George Ade, former governor Harry G. Leslie, Dean A. A. Potter, T. R. Johnson, and Noble E. Kizer.

The Field Artillery Journal's military analyst contributes another outstanding study of current European history

By Col. Conrad H. Lanza, FA.

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THE FALL OF BELGIUM

IN THREE INSTALLMENTS

Part II

The Melee

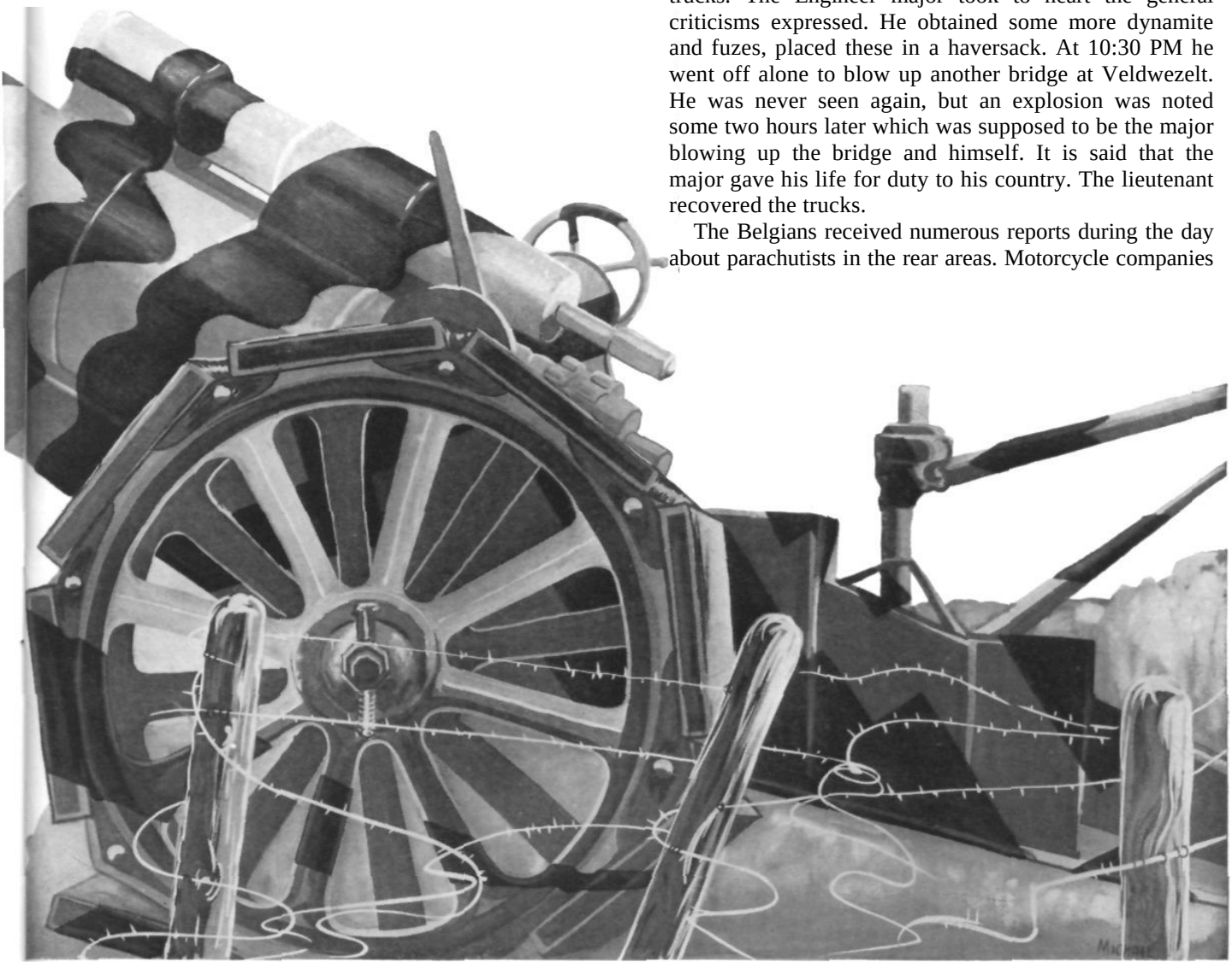
Editor's note: **In Part I Col. Lanza discussed the political maneuvers immediately prior to the invasion of Holland and Belgium, then described the tense moments when the attack was imminent, and finally related the opening events of the campaign, including the reduction of Fort Eben Emael.**

THE GERMANS CROSS THE ALBERT CANAL IN FORCE

While Eben Emael was being attacked, the Belgian 7th and 6th Divisions in line beyond met the German assault on 10 May. During the morning the front line was repeatedly bombed by dive bombers and subjected to a strong artillery fire. There were heavy casualties, and some Belgians appear to have become demoralized. Under this fire, German infantry crossed the Albert Canal in their rubber boats. As this was a slow process, the number that got over does not appear to have been very large. Detachments with radio located targets and radioed locations to the artillery and air corps. With the help of these arms, the infantry cleared before night the line of observation, and in places penetrated to a depth of a few kilometers. As they met numerous Belgian counterattacks, the total penetration was not great.

Around 6:00 PM, 10 May, the Belgians noted that the Germans were using a bridge over the Albert Canal, near Briegden. Some tanks and a battery had been reported coming across. The 6th Division directed their Engineer battalion to see what they could do to blow up this bridge. The engineer demolition outfit happened to be close by in a truck. Other trucks were secured, and a major was detailed with a detachment of men to proceed to the bridge, after nightfall, and destroy it. The detail drove away. They were not again heard from until around 10:00 PM, when they returned without the trucks. They explained that the trucks had been stopped by shell fire, and that they had been unable to accomplish their mission. The division commander stated that he was not impressed with this story. He selected a lieutenant to go out and recover the trucks. The Engineer major took to heart the general criticisms expressed. He obtained some more dynamite and fuzes, placed these in a haversack. At 10:30 PM he went off alone to blow up another bridge at Veldwezelt. He was never seen again, but an explosion was noted some two hours later which was supposed to be the major blowing up the bridge and himself. It is said that the major gave his life for duty to his country. The lieutenant recovered the trucks.

The Belgians received numerous reports during the day about parachutists in the rear areas. Motorcycle companies



ran around all day fruitlessly looking for these.

Much has been written as to the failure to destroy the bridges over the Albert Canal. Treason has been alleged. Accounts also describe brave sentinels being stabbed in the back by plain-clothes German soldiers representing themselves as refugees, and so entitled to pass. Other accounts make fifth columnists responsible for killing the demolition detachments. These stories may be true. There were a number of bridges, and the stories may relate to different ones. There are two better explanations as to why a few bridges escaped being blown up.

First: bridges had been prepared for destruction. The switch to cause the explosion was in each case in a special OP, located at a distance. The OPs were manned, had telephone communications, and each was in charge of an officer whose orders were to blow up his bridge only on orders from Belgian GHQ. The latter was in distant Brussels. The OP officer had no authority to destroy the bridge on his own initiative, or on request of local commanders.

GHQ did not at once order the destruction of the bridges. They waited until after the German artillery had opened fire. It was around 6:00 AM, or later, that the order went out. Upon receipt of the order some of the bridges were blown up, including the one opposite Fort Eben Emael. Three bridges were not destroyed. Two of these at Veldwezelt and Vroenhoven were opposite Maastricht, in the sector of the 7th Division, and one was further west near Briegden, in the sector of the 6th Division.

The local troops do not appear to have been unduly concerned about the undestroyed bridges until afternoon of the 10th. By this time there were many Germans across the canal, and under the terrific artillery fire and dive bombing the Belgians were being pushed back. It was then "suspected" that the Germans were using these bridges. The 7th Division sent a patrol to the bridge OPs to ascertain whether it was still possible to blow them up; incidentally to find out why it had not already been done.

The patrol started around 4:00 PM. Owing to enemy fire it took an hour to reach the Veldwezelt OP. It was surrounded by a mass of shell holes and the OP had been partly demolished. The patrol entered. Yes, the officer was there at his table, with his record sheet still before him. His telephone was nearby. He was dead; so were the rest of the detail. They had been struck by a shell-burst. The patrol could not tell at what hour the OP personnel had been killed. It seems probable that when it occurred the order to blow up the bridge had not been received. The Vroenhoven bridge, according to the 7th Division, was certainly not used by the Germans at any time this date during which it was observed.

Second: the Belgians lost their line of observation overlooking the canal by the end of 10 May. Because of the destruction of planes early in the morning, they had no air observation this day. The artillery line had not been materially changed before the night of 10-11 May; batteries could fire until then on the bridges, using indirect fire.

According to statements of civilians living in the area, the Germans did not use the intact bridges. When darkness fell, German engineers brought up sectionalized bridges and laid them across the Canal, not too close to the permanent bridges. It was immaterial to their plans whether the Belgian artillery barrage came down on the permanent bridges or not. The German troops detoured around these.

Belgians Appeal for Aid

While the Belgian Army was fighting, other events were occurring. The Belgian Government formally "appealed" to France and Great Britain for aid. The appeal was delivered at 7:35 AM, at the same time as a similar one from Holland. The French Government replied at 7:55 AM that aid would be given at once, and with all means possible.

Allied GHQ issued orders, which had been prepared in advance, directing that:

a. The Seventh French Army (General Giraud), mechanized and motorized, to advance rapidly near the coast through Antwerp on into Holland. To be ready by morning 12 May, to act against the enemy right flank from the general vicinity of Breda, Holland.

b. The Belgian Army north of Liége to delay the enemy at least until 11 May, inclusive. If necessary then fall back to the K-W Line from Antwerp to Wavre, both inclusive.

c. The British Expeditionary Force (General Gort) to advance to the K-W Line; left in contact with the Belgians, right at Louvain, inclusive.

d. The First French Army (General Billotte) to advance on the right of the British, and occupy the K-W Line from junction with them to Namur, exclusive.

e. The Belgian Army south of Liége to delay the enemy at least to include 11 May. If necessary then fall back and occupy Namur and vicinity.

f. The Ninth French Army (General Corap) to wheel with Sedan as pivot and occupy the west bank of the Meuse from Namur, exclusive, to Sedan, inclusive; there connecting with the ("Little") Maginot Line.

x. The occupations of the K-W Line directed in para*graphs c, d* and *f* above, to be completed by evening of 11 May. Troops to be prepared to move beyond, if so ordered.

The Allied troops had been complaining about what they called the "phony" war, and which had been explained away by the impossibility of attacking the Germans behind their famous West Wall. Now the Germans were out in front of it; the objection was no longer valid. The troops were elated. The Belgian citizens received them with free beer, and gave them lilacs, at that date in profuse bloom. The leading elements of the Ninth Army reached their positions along the Meuse on 10 May; the other troops made good progress. It

Belgian village after aerial bombardment. Official French photo.

was the general belief that the Allies were marching to certain victory. Only a few saw the danger of abandoning the prepared line of defense along the north French boundary. Perhaps General Gamelin was one of these.

The German attack on 10 May had been furious. Ammunition was not spared. The artillery fire was very heavy, bombing continuous and extensive. Towns and villages back of the front were in flames. In some cases the garrisons appear to have been wiped out. Still, there had been considerable resistance. North of Liége the Germans reached the line Genck-Tongres, an advance of nearly 12 miles. South of Liége the penetration was irregular and about the same. The fighting continued until 10:00 PM, the greatest advance having been in the late hours.

At the end of the day the 6th and 7th Belgian Divisions north of Liége, who had borne the brunt of the battle, were approaching exhaustion. The majority of the officers and noncommissioned officers were casualties. For the men this was their first war experience. Sixteen hours of nearly uninterrupted combat was too much for them. Every time a shell passed overhead they dashed for cover of trees or jumped behind hedges. Groups were completely cowed. They were unable to understand orders, could not speak coherently. They were out of their heads through fatigue, wounds, hunger and thirst, nervous strain. Shell-shocked troops!

Back of the Belgian lines were crowds of soldiers and civilians—stragglers from a zone twenty-odd miles deep. They had seen the power of the German air force, of the German artillery. They had seen entire towns blown to pieces and burnt to glowing cinders. They could not understand how the enemy could so quickly and accurately destroy so much. The people were bitter and crazy. Many had lost relatives; nearly all had lost acquaintances. They attributed their misery to fifth columnists and traitors, to concealed parachutists, supposed to be radioing information to the enemy. They were willing to fight an enemy in front; what could they do against an unseen enemy within?

Women were weeping, children crying, men howling with anger. They rushed through the night, going they knew not where, hoping only to reach safety. Many were only partially clothed. There was lack of food.

An insane asylum near Liége was hit by a shell. The inmates were thereupon released. Some were in night clothes. They joined the passing crowds, ran wildly in all directions, spreading terror wherever they went.

This was the origin of the refugee problem. Belgium, 10 May, 1940, night time. The General Staffs had not figured on this—a feature of the modern total war. They will remember it hereafter.

GHQ Does Not Realize Situation

Allied GHQ was just outside of Paris. By 11:00 PM, it had the approximate location of the front lines. Nothing was known about refugees. This did not yet trouble them. The general impression was that in view of the fact that the enemy had had the advantage of surprise his gains were really small. It was assumed that the enemy had suffered huge losses, with great expenditures of ammunition, gasoline and supplies, which he could ill spare. Victory was considered as certain. GHQ could not understand why Hitler had deliberately added the Dutch and Belgian Armies, with 1½ million men under arms, to the enemies which he already had. In their opinion he had made a serious strategical error.

Morning of 11 May arrived. The night reports had been encouraging, as they showed no change in the situation. Perhaps the German attack would slow up today. It was hoped so, for the Belgian line had been weakened. There had been a lowering of morale; many men were absent. In Brussels, the main streets contained numerous soldiers, with their equipment, who were just

loafing around. Curious citizens questioned them for late news from the front. Many refugees had arrived and were seeking relief. From the fugitive soldiers and the dispirited refugees came stories of defeat, of the terrible fifth column, of treachery. Some suggested a catastrophe. By exaggerating losses and the might and fright-fulness of the German advance, they created a feeling of uneasiness. Some bombs fell on Brussels and reports spread as to numbers killed. Through tales, stories and reports, some citizens arrived at a condition bordering on panic. Many joined the refugees, and fled further away from bombs and the approaching enemy.

The local police seized the military stragglers and gathered them into hastily organized reception centers on the Exposition grounds, Efforts to organize them into provisional units were unsuccessful. The men were too demoralized.

Exodus of the Belgian population. Official French photo.

7TH DIVISION LOSES CP

At an early hour the Germans violently renewed their attack all along the front. They now had tanks and artillery north of Liége and used them. Everywhere the Belgians were forced back. The 7th Belgian Division had had its CP at Genoels, northwest of Liége. About 8:00 AM the headquarters commandant unexpectedly reported the enemy in the vicinity. The division commander ordered the CP to move by echelon to Pirange, a few kilometers to the southwest. The first echelon left immediately, while the second echelon packed the papers, typewriters and office supplies. At 8:20 AM they failed to recognize some approaching vehicles until the enemy descended and captured them and their papers.

When the division commander heard this bad news he ordered a counterattack to recover the old CP and rescue the papers and missing members of his staff. Men from miscellaneous units were grabbed together and formed into some sort of an attack formation. Some infantry and cyclists drifted back. They reported having been chased by hostile tanks, which they could not stop, having no suitable weapons. They stated that the hostile tanks were coming up rapidly. It now appeared that in withdrawing from the old CP there had been so much haste that the 47-mm. anti-tank guns had been left behind. Enemy planes arrived and machine-gunned the assembled men. The artillery had been in front of the CP, and communication with it was lost; consequently there was no artillery support.

The commander of the 6th Division arrived at this moment. The two division commanders consulted with each other. They made a new decision. The proposed counterattack was called off. In place, each division commander detailed a 2nd lieutenant with a few men to defend the village, while the division CPs were withdrawn still further. The 2nd lieutenants took appropriate positions at the exits of the village, prepared to oppose the enemy. The generals drove away.

They had not been gone more than a few minutes when the enemy tanks entered the village from the rear, where there were no 2nd lieutenants waiting for them. The 7th Division lost its chief of staff and all the papers which had escaped the earlier capture. The German tanks had detoured around the village without having been seen.

The tanks attacked the artillery. They appeared from flanks and rear. The Belgian batteries had 25-mm. and 37-mm. antitank guns, but these were incapable of stopping the Germans. No 47-mm. antitank guns remained;

French tanks moving up to the front. Official French photo.

all had been lost. Nobody had prepared any bridges or culverts for destruction, with a view to delaying enemy mechanized troops. Many batteries were lost.

The 7th and 6th Divisions, and the Cavalry Division, farther left, were very hard pressed. By 1:30 PM there was doubt as to whether they could hold. Most of their artillery was out of action, and other units were scattered.

TANK BATTLE

Luckily French troops arrived. They were mechanized and motorized units from five different divisions belonging to the First Army, who had been rushed beyond the K-W Line ahead of time. In all there were around 400 armored cars and tanks. Near St. Trond they came in contact with the enemy.

A fierce tank battle ensued, apparently the first large-scale battle of its kind. Artillery did not take much part in it, due to difficulty of identifying targets. The fighting was most confused, and no connected account has yet been written. Tanks and armored cars dashed in all directions. They were unable to always identify each other. Some seemed to have fired at anything that came along, without knowing for certain whether it was foe or friend. Smoke screens were laid; huge dust clouds arose. Villages were on fire; troops on the outside fired into the roaring mass of armored vehicles. Planes from both sides flew overhead, and bombed what they believed were hostile targets.

Both sides have claimed the victory of this first battle of large mechanized forces. The German advance in this sector was stopped; but the field of combat remained in their hands, the Allied forces retiring to the vicinity of the K-W Line.

The general results of this day's fighting were that the Germans did not reach the K-W Line. The Belgians were driven back, but they were yet in front of their main line of resistance. The British and French troops occupied their respective parts of this line before evening, without opposition. Liége was isolated, and the Germans made progress in breaking through the outer fortifications.

Evening had arrived, and it was necessary for Belgian GHQ to decide on orders for the following day. The situation appeared to be that the main German effort was north of Liége, just where it had been expected to be. There was a strong German effort south of Liége, through the Ardennes, and it was now recognized that this was more important than had been foreseen. Yet this seemed to be the secondary attack. Allied GHQ was consulted.

It now appeared that the Seventh French Army already had two divisions in the vicinity of Breda, Holland. They were 14 hours ahead of schedule. The rest

of the Army was following. The commander of the advance divisions understood that he was to act against the right of the Germans supposed to be moving southwest, north of Liége. His position would ordinarily be excellent for this purpose. He had, however, been advised by the Dutch that strong enemy forces were directly to the east. If the French turned south these would be able to attack his left flank. Worse, air observation disclosed a column of hostile mechanized troops 20 kilometers long, passing to the north, going west. They were apparently en route to join other hostile forces, known to be farther west, but to two days had been accomplished. The Allies had arrived, and were in position.

BELGIANS WITHDRAW TO K-W LINE

Belgian GHQ decided to withdraw, less the fortress of Liége, which would continue to resist the enemy, and thereby to block the enemy lines of communication through or near that city. The troops south of Liége were ordered to withdraw to the fortress of Namur; the troops north of Liége to that part of the K-W Line from Antwerp to Wavre. The 7th Division was relieved from line and

Following advanced bombing planes, parachute troops, and infantrymen, a German artillery battalion moves into Belgium

the north of the French. No Dutch troops, other than reconnaissance detachments, were nearby. Any way the French turned, the enemy would be on three sides, and they might cut in behind. The commander could have attacked early that afternoon, but under the circumstances he didn't. He remained in readiness—the men were supposed to be tired after their long march. He was in a pocket; great caution was necessary.

Reports to Belgian GHQ indicated that their own troops were greatly exhausted, and not in good condition to continue the delaying action in front of the K-W Line. Casualties had been high, and there had been considerable loss of materiel. The mission of delaying the enemy for ordered to France for reorganization. Only 3,500 men were reported left out of an original 24,000. This left 4 divisions for Namur, 15 for the west sector of the K-W Line.

By morning of 12 May, the movements ordered were well on the way. They were completed during the day, witthout noticeable interference by the enemy. Belgian GHQ was at the Chateau de Benghem, near Lippelo. Their impression was that the K-W Line would hold. It had been built to do so, and was fully manned. The surprise element had disappeared. The troops were now familiar with the German methods of attack, and were ready with suitable counter measures. The only disagreeable factor was the refugees. They had increased

enormously. Everybody who lived in front of the K-W Line seemed to have arrived at the simultaneous conclusion that he had to flee back of it. Roads were jammed with refugees. They caused extreme disorder, filled the rear areas, delayed the withdrawal, got in everyone's way. However, it was expected that this condition was transitory and that the situation would stabilize (at least temporarily) on the K-W Line.

German troops followed the withdrawal and closed in on the K-W Line. They reached opposite the advance works of Namur and the east bank of the Meuse River. According to reports of civilians, not known to Belgian GHQ at the time, the Germans had ponton trains drawn by large tractors, and pneumatic mattresses, motor boats, rubber boats, etc., which they assembled in ravines on their side of the Meuse.

GAMELIN BECOMES ALLIED C-IN-C

King Leopold on this day conferred at Gasteaux, near Mons, with Lord Gort, British C-in-C, and General Billotte, commanding the First French Army. The three commanded the forces which Allied GHQ had hopes of employing for an offensive, while their right was protected by the Ninth French Army with a defensive role and the left supported by the enveloping movement of the Seventh French Army. On a British motion, which was unanimously carried, it was agreed that General Gamelin, of Allied GHQ, be accepted as such by the Belgians and the Dutch, now joined in a common battle with the original allies. In accordance with this decision, King Leopold placed his army at the disposition of Allied GHQ and recognized the authority of General Gamelin. Belgian GHQ now ceased to be responsible for the further conduct of the war.

Allied GHQ estimated the German offensive as employing about 60 divisions. About 10 divisions were supposed to be in Norway. There might be 100 divisions remaining, which would include about 20 to hold the Rhine frontier, keep the Poles from revolting, watch the Czechs, and so on. The German strength was greater than had been previously estimated, but it could be held. The situation was considered as satisfactory.

On 13 May nothing of importance occurred in the Belgian sector. Severe fighting was reported in the sector of the First French Army, but it was in advance of the K-W Line, where the French mechanized elements still were. The British reported that around Louvain the situation appeared to be stabilizing. The Ninth French Army below Namur was engaged, but Belgian GHQ did not hear about what happened there until after night. During the afternoon the situation seemed to be so good that they issued a General Order, reading:

> Our situation is becoming better, hour by hour; our ranks are closing. In these decisive days, you will know how to employ all your energies, how to submit to necessary sacrifices, in order to stop the invasion. As in 1914 on the banks of the Yser, French and British troops are with us, for the safety and honor of the fatherland.
>
> LEOPOLD.

Hours after the foregoing order was issued, news arrived from Namur. The enemy had made a most violent attack that afternoon. Using very heavy artillery, he had shelled the forts having a field of fire towards the south. The fire was so heavy and accurate that the Belgian turret forts had been neutralized. Thereupon the enemy started to force a crossing of the Meuse on a broad front with three divisions. The stream, 300 to 400 meters wide, had been swum under protection of smoke screens by individual soldiers who carried tow lines. Having reached the opposite bank, these men pulled rubber boats carrying troops across. An artillery barrage fell constantly on the OPs and concrete pill boxes. Dive bombers attacked supports and French batteries.

The German troops crossing had motorcycles and submachine guns. Under the protection of their artillery they advanced in small detachments up to the heights and cleared the edge overlooking the valley. It seems to have taken between 3 and 4 hours for this phase of the battle. As soon as the French had been driven off the heights the Germans started to construct bridges across the Meuse. Subsequent investigation as to the reason why such a strongly defended river line was overcome in such short time has developed the following:

a. The German artillery was heavier than had been expected, and had greater destructive effect on the concrete pill boxes than had been foreseen.

b. Some of the pill boxes were occupied by personnel, newly arrived, who were unfamiliar with the operation of the machine guns and 47-mm. antitank guns in them.

c. In general, the French personnel was totally unacquainted with the terrain.

d. The Ninth French Army was assigned a sector which was intended to be purely defensive. This was supposed to be strongly fortified, so much so that a serious attack was improbable. In consequence, the Ninth Army was not very strong. Only 1 division was in line for each 10 kilometers of front. For each 2 divisions in line, 1 other was in corps or army reserve, not engaged on this day.

In contrast with this deployed strength, north of Namur, the Allied disposition allowed about 1 division, including reserve divisions, to each 2½ kilometers' front.

In addition to the breakthrough of the enemy south of Namur, there was another on the same day near Sedan, brought about by approximately the same conditions.

Belgian GHQ learned about both breakthroughs on the evening of the 13th. The gravity of the situation was at once appreciated. That their right was in danger of being turned, with resulting disaster to all, was clear. There was nothing the Belgians could do. The fault was the erroneous assumption that the main enemy blow would be to the north. As a result of this the Allied right had been weak. The enemy had ascertained this and had burst through; he would undoubtedly keep going if he could. The only possibility of saving the situation was to employ reserves to arrest the German advance. The Ninth Army still had its reserve divisions, but there were only 3 or 4 to cover 90 kilometers of front. Of course these were in addition to the front-line divisions,

and the Allied GHQ seemed to think they would be able to accomplish the mission of holding the Meuse River line. Not a single division was ordered from north of Namur to the endangered sector south of the fortress. Allied GHQ did not appear to be worried, but the Belgians were. After all it was their country.

BELGIANS LOSE CONFIDENCE IN FRENCH

The Belgians immediately lost confidence in the French Army, feeling that if it could not hold a strongly prepared line, covered by a formidable river obstacle, it was not likely to stop the enemy now that he was over. From the Belgian point of view the more dangerous of the two crossings was that south of Namur.

All that seemed possible was to have the air forces concentrate on assisting the Ninth Army. It appeared that the Germans would this day start crossing their divisions into the bridgeheads they had secured. If the bridges could be destroyed, it might be possible for the Ninth Army to reestablish the situation, or at least avoid having it become worse. It was agreed to do all possible on this line.

Through their liaison officer, Belgian GHQ heard about the conference. They were not impressed by the decision, doubted whether it would accomplish anything. They thought that those Germans over the Meuse might advance northwest towards Brussels. They decided to take no chances. The first order directed the Department of National Defense to proceed without delay to Ostend.

Inter-Continent Photo, courtesy "The Military Engineer"

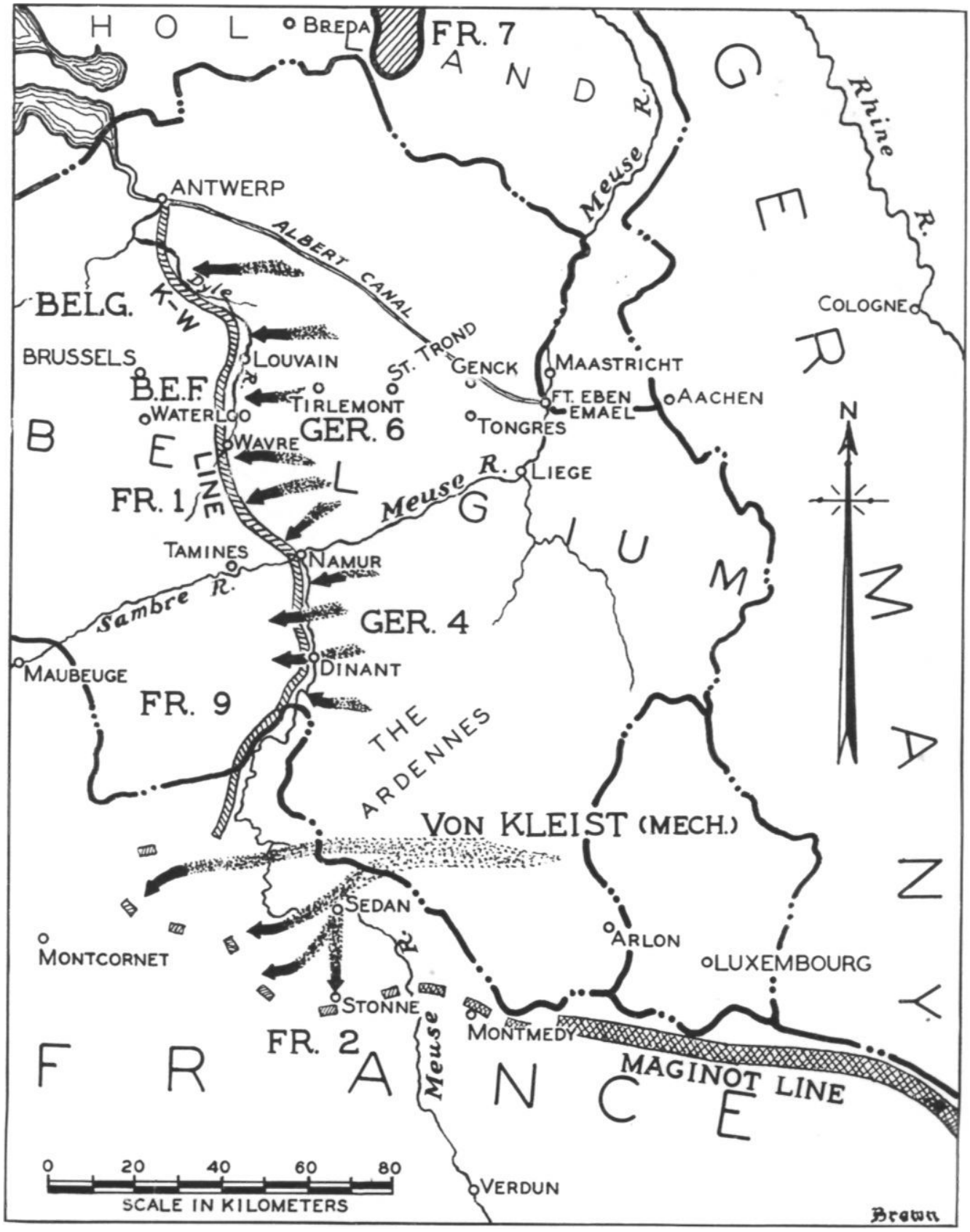
Antitank fortifications in defense line of national Belgian fortification

Before daylight on 14 May, General Billotte, commanding the First French Army, convened a conference at his CP. Being just north of Namur, he was most directly interested in the German advance a short distance south. As known at that time, the enemy held a salient west of the Meuse about 15 kilometers wide and of a maximum depth of 10 kilometers. The chief of the British Air Force, a representative of the French Air Force, and the liaison officers of the British and Belgian armies were present. The seriousness of the situation was recognized. No one could understand how the Ninth Army could have given up their strongly prepared line. The French officers had no excuses to offer; many were in tears. They felt overwhelmed with the stigma of shame. It was known that the Ninth Army intended to counterattack; also known that they didn't have many troops with which to do it. What could the conference do to remedy matters, even a little bit?

Important archives were also ordered there. A heavy truck movement started promptly from government offices in the capital. The citizens interpreted this to mean that the enemy was advancing; many thousands thereupon decided to leave themselves before it became too late. The horde of refugees received large reenforcements, and all moved out headed for the coast or for France.

No good reports were received from south of Namur. So around noon the Belgian Government decided to move all offices to Ostend and issued emergency orders therefor. Every available truck and railroad train was utilized. The civilian population became more disorganized. Refugees increased enormously in a remarkably short time, everybody yelling and dashing around, getting in everyone else's way.

On 14 May the military operations north of Namur were not unfavorable to the Allied cause. The Germans



The situation on May 14

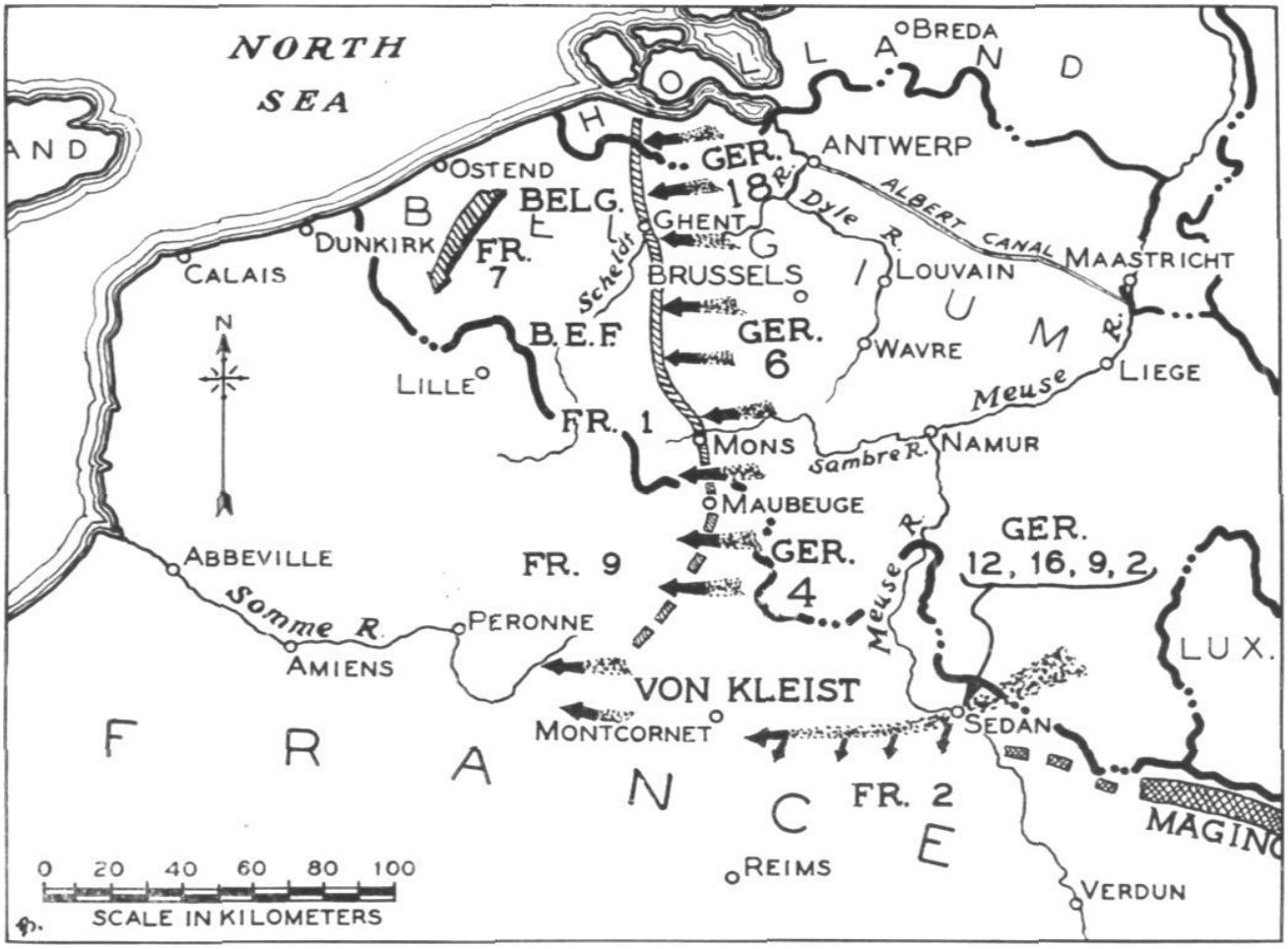
British field gun emplaced in hedge

generally reached the K-W Line throughout. They violently attacked the Belgian sector near Tillemont, and secured a foothold which they lost through a vigorous Belgian counterattack which reestablished the line. The British similarly attacked at Louvain, held it in spite of furious efforts to oust them from their positions. The First French Army held its sector intact.

Communication was maintained with Liége by pigeons. It reported that some forts had fallen, but the city was holding out. Namur made a similar report.

The bad news came from south of Namur. The Germans at daylight had their bridgeheads filled with fresh troops which had crossed during the night. These included mechanized divisions and strong artillery. The Ninth Army's counterattack never got started. The Germans attacked first. With terrific artillery support, strong air assistance, and great numbers of armored vehicles, the Germans made extraordinary progress. They pushed the French near Sedan south and southwest, those near Namur to the west. The two sets of retreating French lost contact, and by night there was a 50-kilometer gap between the two.

After the conference held by General Billotte, the French and British air commanders consulted one another as to the details for bombing the bridges over the Meuse. The French did not have sufficient fighter planes to protect the bombers. The British could make up the deficiency but the British Air Force was an independent command with its CP in London, Their consent had to be obtained. The British Air Force commander in the field appears to have recommended through Allied GHQ, who approved it, an all-out knockout blow by



The situation on May 17

using every plane available. Allied GHQ submitted this to London. London wanted to know more about the facts. All morning passed while messages between London and the Air Forces in the field and between the French and British Governments were exchanged. London eventually disapproved it. They did not desire to risk all their planes.

Allied GHQ eventually agreed to accept 100 bombers with suitable fighter protection. London approved this plan. The required orders were now issued, as near as can now be determined after 2:15 PM. It was an hour later when the bombers departed on the mission assigned them. They looked for the permanent bridges over the Meuse, had no information as to temporary bridges. They found the targets, also found fierce resistance from air and ground. They suffered staggering losses, but bombed what was left of the permanent bridges and some temporary ones close by. It appears doubtful whether all bridges were destroyed. In any case, the Germans were already over the Meuse.

At the end of the day, the Germans had reached a line 40 kilometers beyond Sedan; south of Namur they had reached the Sambre. Allied GHQ gave up the idea of having the Seventh French Army attack the German right as it passed through Belgium. Holland was surrendering, and the Seventh Army was in danger of being completely surrounded. It was ordered to withdraw as rapidly as possible through Antwerp to France.

The idea of this move appears to have been to obtain reserves to meet the enemy advance through Sedan. If the Seventh Army retired as fast as it had advanced, it would reach the vicinity of Lille on the 16th, and might then be directed east, or wherever it might be needed.

GERMANS ATTACK K-W LINE

On 15 May the Germans attacked all along the K-W Line north of Namur. They gave no one any rest, made no progress. The British Army was particularly encouraged. They believed they were much better soldiers than their opponents, could whip them any day, even against big odds. The Belgians and the First French Army, although satisfied with the local situation, were horrified by the reports from south of Namur. Beyond Sedan the Germans moved west another 20 kilometers; in Belgium they broke across the Sambre.

The Allied Supreme War Council convened at Paris at 6:00 PM. It was a stormy session. Who was responsible for what everyone could see was a disaster? Allied GHQ recommended that the troops on the K-W Line, north of Namur, be withdrawn immediately. The British Prime Minister, Mr. Winston Churchill, with great vigor and anger, and with the example of the British ranks standing fast at Louvain, stated that this was no time to retire. He minimized the importance of the German advance across the Meuse. He recommended a counterattack from the K-W Line. He was completely opposed to abandoning Louvain or Brussels. He wanted to fight, not withdraw. Two and one-half hours passed by. At 8:30 PM the Council accepted the recommendation of Allied GHQ.

Allied GHQ sent out the orders already prepared, providing:

a. The Belgian troops, in the vicinity of Namur less the garrison, of about 4 divisions, to withdraw to the Sambre south of Tamines;
b. The Belgian garrisons at Namur and Liége to hold;
c. The First French Army to withdraw to the line: Tamines—vicinity of Waterloo;
d. The B.E.F. to continue this line to Brussels, inclusive;
e. The main Belgian Army to extend this line to Antwerp, inclusive.

The First French Army had received a warning as to withdrawing. Early in the evening they proceeded to evacuate the civil population in rear of their lines, without leaving them time to assemble baggage or provisions. More unfortunate, helpless refugees by the thousands were thrown onto the roads.

BELGIANS AGAIN WITHDRAW

On 16 May, the Belgian Army withdrew to the new line. They felt bitter, thought that this catastrophe was no fault of theirs; it was the French ally, or Allied GHQ, who were responsible. The marches were tiresome, as the roads were filled with refugees. Everybody between the K-W Line and Brussels who had transportation (and many who had none) appears independently to have decided to leave for France. Automobiles, trucks, hand carts, bicycles, wagons were utilized. Those who had no transportation climbed on every freight or passenger train going away from the front. The enemy followed the retreat closely and bombed the roads.

The troops of all armies reached the new line, had time to occupy it. Many supplies had to be abandoned at the K-W Line, including the depots which supplied this line. The Belgians had a shortage of ammunition, found difficulty in issuing rations.

Bad feeling grew up between the Allies. Each seemed to feel that the others were trying to save themselves. The Belgians claimed that the British were seizing all boats along the coast, and were apparently homeward bound. The Belgians, in their opinion, had resisted the Germans on promises that they were to be supported by such strong forces that their country would surely be saved. The French had broken in four days; within six days the British were preparing to flee to England. They lost confidence in the British, had already lost it with regard to the French.

There were more discussions during the day between the air commanders in the field and the British Air Ministry in London. The troops wanted maximum air support, wanted all the British fighter planes fit for duty. The British declined. They needed a strong force to defend London, and would not release it. Both French and Belgians were dissatisfied over this.

Next day, 17 May, the right of the troops on the

Sambre being menaced by the German advance to the south, the First Army and the British Army were withdrawn to a line west of Brussels. The Belgian troops withdrew to connect with the British left. The right of the Allies in Belgium was completely separated from the French forces in France. Communication with France existed by using roads and railroads close to the coast, but these were congested and inadequate to supply the mass of troops in Belgium. During the afternoon, the enemy without opposition occupied Brussels. He advanced in France, always toward the sea; made astonishing progress.

The Allied GHQ estimate of the situation was that the enemy had formed a non-fortified pocket, which was subject to attack from either or both flanks. He was under a necessity of continuing to expand this pocket, or else of defending it under unfavorable circumstances. Should the enemy succeed in enlarging the pocket he would in this case menace the south flank of the armies in Belgium. Other plans open to the enemy were to attack the Maginot Line from the rear, for which it was not prepared; march on Paris; or continue west separating the armies in Belgium from those in France.

General Gamelin conferred at length this day with the French Premier, M. Daladier. Later Daladier conferred with Mr. Winston Churchill, who lost no time expressing his disapproval of General Gamelin. He could not see why the general had not already been dismissed. He promised to send two British divisions, one of them mechanized, to France. The present record is silent as to this, but the promise appears to have been contingent on the French Government agreeing to rid itself of Gamelin.

The loss of Brussels forced the Belgian Government to leave that city. They departed for Ostend, but proceeded via Belgian GHQ, where they had a conference with King Leopold. The future of Belgium was at stake. As they saw it, Holland had surrendered; the Seventh French Army which was to have attacked the German right hadn't done so, instead was dashing back to France. It was reasonably certain that the British were preparing to evacuate their men to England as soon as they could. The First French Army was making forced marches in an attempt to reach its own country before it was cut off by the German advance south of Belgium. The Ninth French Army which was to have protected the right of the Allies had completely disappeared, leaving a huge gap through which strong hostile forces were swiftly advancing around the right of the forces in Belgium. The strongly prepared K-W Line, with its depots, fortifications and armament, was gone. Against these unfavorable factors there was the possibility that the French in France might stop the enemy and reestablish the situation.

King Leopold did not have much hope. He felt that his Allies were vanishing, and that for Belgium the war was over. He saw no escape for his own army. Surrender might be necessary. The General Staff and the Cabinet Ministers were dispirited. They agreed with their King.

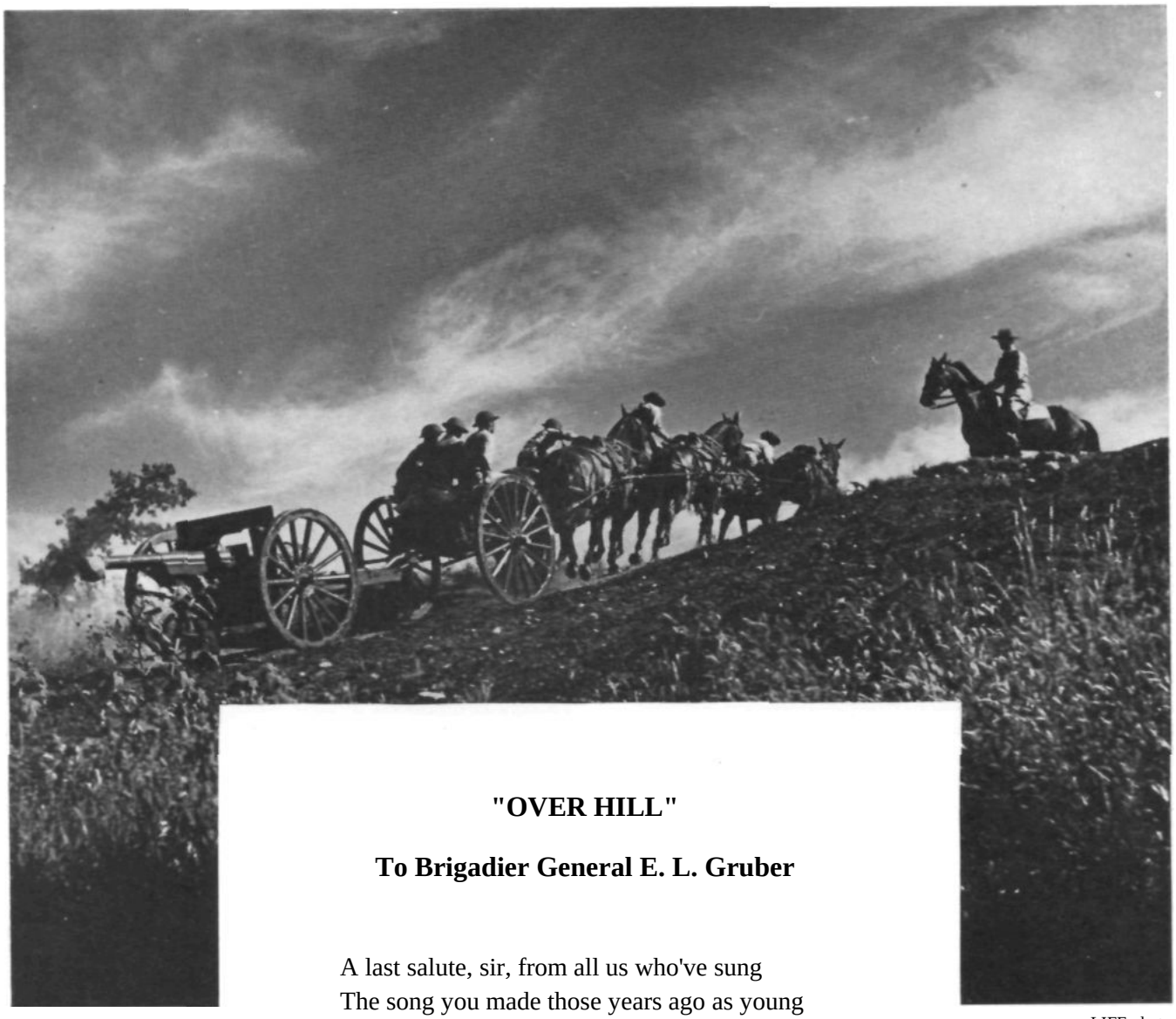
There was one difference of opinion—what should the King himself do, should surrender occur? The King wished to remain with the army which had fought with him; its fate would be his. The Civil Cabinet thought this was the narrow viewpoint of a soldier, understandable, but undesirable. The King ought to look at the matter from the broader view of the leader of his nation. In their opinion, the King should flee, as had already been done by the rulers of Poland, Norway, Luxembourg and Holland. On this matter no agreement was reached. It was decided to give the French a last opportunity to reestablish the situation, and leave the question of surrender to be determined later. In the meantime they would carry on. Belgium would not leave her Allies as long as a single chance remained.

The Civil Cabinet then left for Ostend. To keep the record straight, the Prime Minister, M. Pierlot, wrote an official letter to the King, advising him that the opinion of his ministers was that in case of surrender he flee to a neutral country, on the ground that he would then be free to negotiate a peace, which as a prisoner of war he would be unable to do. It was just one week since the campaign had commenced!

"NOT IN THE BOOK"

Our artillery texts do not treat of a situation which we in the 15th FA encountered during the World War near Vierzy. We were going into position in a large wheat field in sight of the enemy artillery. Our own and the hostile infantry were concealed by the wheat, but our field guns were in plain view. Our problem was to execute counterbattery promptly so as to knock out those German guns before they got us. Deflection was easy; range had to be determined quickly, yet accurately enough to avoid shooting up our own doughboys. The wagon carrying our instruments had not arrived. All the detail had was a small right-angle triangle. I stepped off 100 yards from the right gun, shifted my position until I could line up that piece along one edge of the triangle and the target along the other. I had the gunner of No. 1 piece read the angle between the target and me. This angle plus 90 degrees, subtracted from 180 degrees, gave the angle that subtended my 100-yard base line. From this relation we computed the range. This proved accurate, and we ran the enemy battery out before they got us.

—H. H. CRANE, *formerly instrument corporal, 2d Bn. 15th FA.*



LIFE photo

"OVER HILL"

To Brigadier General E. L. Gruber

A last salute, sir, from all us who've sung
The song you made those years ago as young
Lieutenant in the Philippines. We sang
On "dusty trail," in dugouts, hall, and though
Men songless into modern battle go,
That song of yours could not be set apart,
For many a one still heard it in his heart.

The guidon glows as red as setting sun.
On the parade ground booms the final gun.
The flag-draped caisson, as your song forecast,
Rolls for the field artilleryman at last.
"Taps" in farewell, three echoing volleys shot.
But you, good soldier, will not be forgot
By gallant arm you loved and served so long,
Catching its spirit in a stirring song.

FAIRFAX DOWNEY

Technique and Drill of the 75-mm. Antitank Battery

Current thought and recent developments

SECTION I

ORGANIZATION AND TRAINING

1. GENERAL. — This memorandum is written as a provisional guide for the battery commander in training, maneuvering, and firing until such time as Field Manuals can be prepared for the 75-mm. Antitank Battery. The following training literature should be used in conjunction with this memorandum: Instruction Memorandum T-46, Field Artillery School; Training Circular No. 3, WD, 23 September 1940; FM 100-5; FM 6-5; FM 6-55; FM 5-20; FM 5-30; FM 25-10; and FM 23-70.

2. ORGANIZATION.—The battery is organized as prescribed in paragraph 10, FM 6-5, except that the principal divisions are the battery headquarters, four platoons of two sections each, an ammunition section, and a maintenance section. For purposes of administration and basic training of the individual, the battery may be organized as shown in the chart on page 2. When basic training has been completed, platoon commanders are responsible for training their platoons as a unit. In combat training with the battery as a whole and in combat, each lieutenant must be with his platoon and the battery commander must direct the operations of the ammunition and maintenance sections.

Editor's note: **This study was prepared at the Field Artillery School as Instruction Memorandum G-8. The School authorities wish to call attention to the very tentative nature of this pamphlet, since complete equipment has not been available for the formulation and testing of doctrines and methods. In this connection, attention is directed especially to paragraph 1.**

3. FORMATIONS.

a. General.—Basic formations for the battery, platoons, and sections are listed below. The necessity for thorough fundamental training in simple formations and certain standing operating procedure in an antitank battery is discussed in later paragraphs.

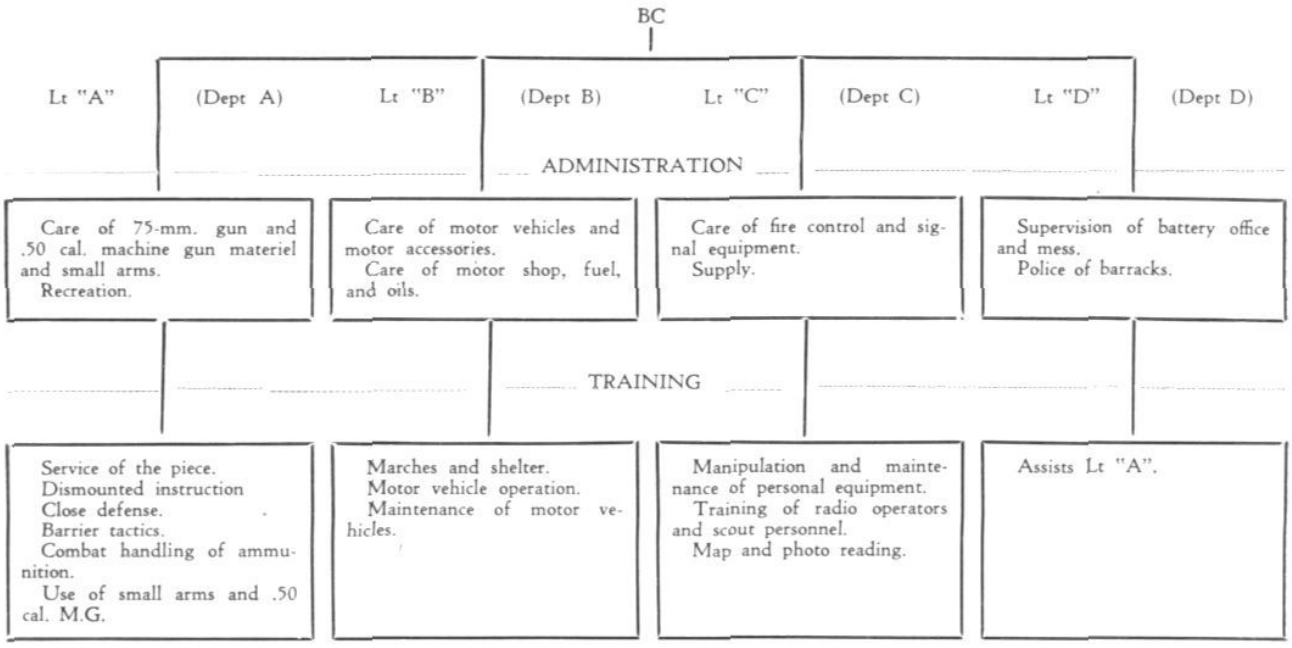
b. The battery dismounted.—The battery is formed as prescribed in paragraph 152, FM 6-5.

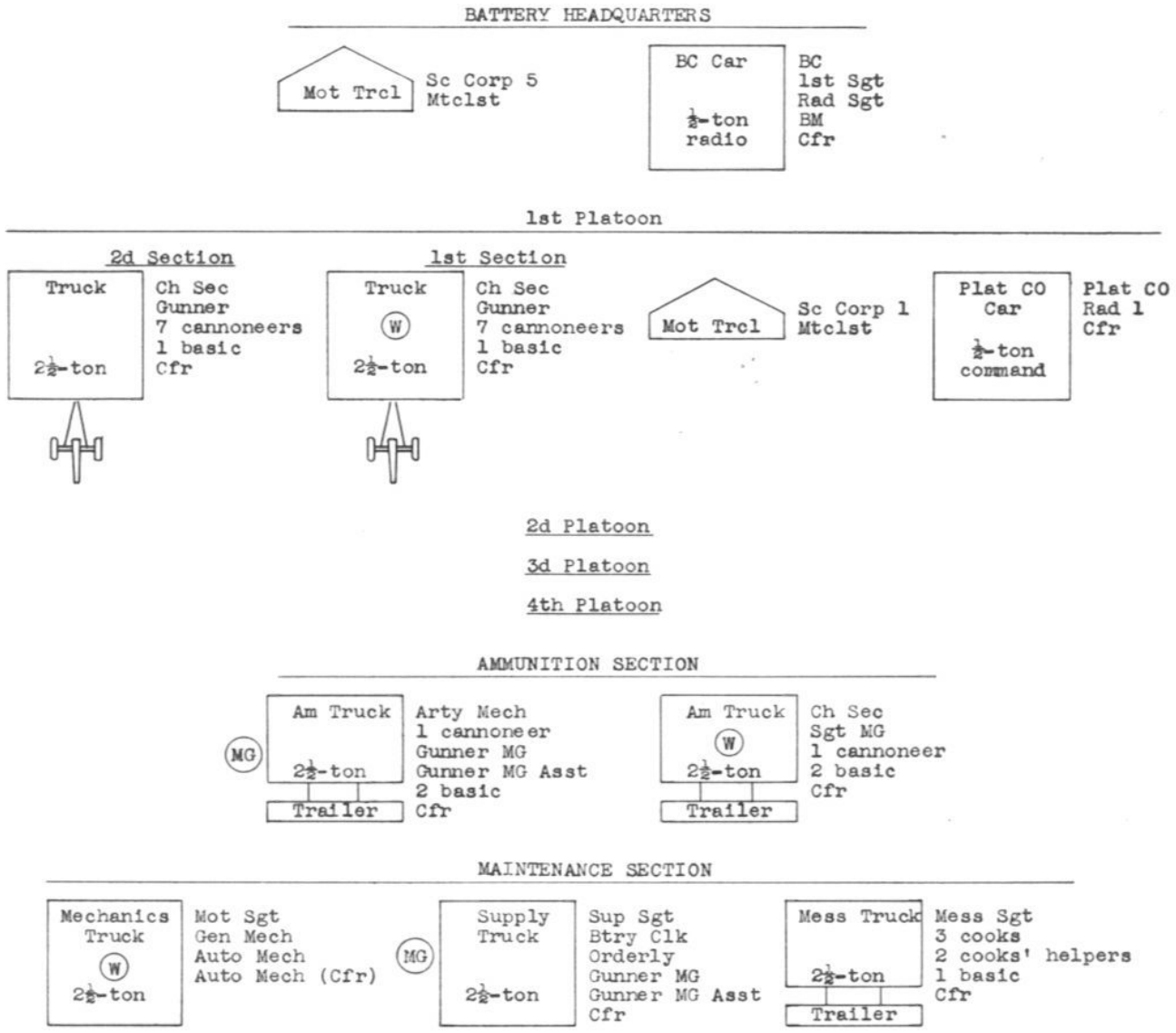
c. Formations of the battery.—The formations prescribed in paragraph 122, FM 6-5, are applicable. A type formation, showing loading, is given in Figure 1.

4. TRAINING.

a. General.—All training should be conducted in accordance with principles set forth in Training Circular No. 3, WD, 23 September 1940, and in FM 100-5.

ORGANIZATION OF THE BATTERY FOR ADMINISTRATION AND TRAINING





SUMMARY:

Commissioned officers	5
Enlisted men - - - -	141
Aggregate	146
Motor tricycle - - -	5
Truck, ½-ton, command	4
Truck, ½-ton, radio -	1
Truck, 2½-ton - - - -	13
Trailer, 1-ton - - -	3
Total - -	26

LEGEND:

Rad	Radio
Sc	Scout
(W)	Winch
BM	Bugler and Messenger
MG	Machine Gun
Cfr	Chauffeur

AMMUNITION LOADING DATA

		75-mm Gun
Average packed weight of all types, per round		23 lbs
MAXIMUM LOAD ADDITIONAL TO NORMAL PERSONNEL AND EQUIPMENT		
2½-ton prime mover		90 rds
2½-ton ammunition truck		130 rds
1-ton trailer		87 rds
TOTAL IN BATTERY		1154 rds
MAXIMUM RESUPPLY LOADS		
2½-ton truck	on good roads	216 rds
	on bad roads or cross-country	130 rds
1-ton trailer, on all roads and cross-country		87 rds

NOTES: 1. Articles of equipment normally are carried in the vehicle which transports the operator of such equipment.

2. Motor tricycles probably will be replaced by ¼-ton, 4x4, cross-country cars.

Figure 1.—Formation, showing loading.

b. Object.—An antitank unit should be trained habitually to perform its sole mission: The destruction of tanks on the battlefield. No secondary mission, such as destruction of gun emplacements, should ever be considered in training. Such missions would be ordered only in special operations. Antitank soldiers should be taught that when a tank attack occurs the action is fast and furious and of short duration; that it is shock action which must be met by shock action (the fire of as many antitank guns as can be placed *in the path* of the tanks). They must be trained to realize that tanks will appear with little or no warning and must be engaged speedily; more than anything else they must realize that the fire they bring to bear initially must be extremely accurate, for there will be little or no time to make adjustments. This requires that all men be trained most thoroughly in a few set, simple maneuvers that can be executed under great stress without frustration; for once committed to action, guns are fought individually by their full or reduced squads. They should also be trained to service the piece in twos or threes, in the event casualties or close-defense requirements deplete the gun squads.

c. Training groups.—The number of things a man must be taught to do in an antitank battery are few. Perfection in these few is essential. The three essential elements in the functioning of the battery are fire power, mobility, and signal communication. The personnel of the battery should be divided into these three groups and trained until each man is thoroughly familiar with every other man's duty in his group. Even the basic private in the gun squad should be a potential chief of section. Chauffeurs should be trained as apprentice mechanics and taught to make emergency roadside repairs. When group training has progressed sufficiently, each group should be trained in certain duties of another group; for example, the members of a gun section should be trained to drive a prime mover or a motorcycle. Likewise, chauffeurs and cannoneers should be taught to use visual signals and the radio sets.

d. Security.—Caliber .50 machine guns and automatic rifles are issued for the close defense of the battery. These weapons, and any other small weapons that may be made available, should be placed in combat as ordered by the battery commander. They may be placed on the flanks of a platoon, with the prime movers, or with the ammunition or maintenance sections. It is a matter of prime importance that as many men as possible should be trained not only in the operation but in the tactical use of small weapons for local defense.

e. Barriers and obstacles.—The erection of barriers is normally a function of the combat engineers. However, the personnel of all antitank units should be familiar with the use and creation of artificial tank obstacles. The antitank battery may be issued tank mines, wire rolls, or demolitions to create obstacles for use in their own local defense or as a part of the general area defense. The personnel of the battery must be trained to use such equipment efficiently. This subject is covered in an excellent manner in FM 5-30.

f. Coordination with other units.—Whenever conditions permit, the antitank battery should have joint training with other antimechanized units. For example, the division antitank battery may train with the division engineer troops, the antitank guns being placed in position with respect to the natural obstacles and the artificial barriers placed by the engineers. Training with the 37-mm. antitank platoons is also important, as positions of such units will greatly affect the local defense measures of the antitank battery and will give the personnel a broader view of antitank defense in general.

g. Identification of tanks.—The personnel of the antitank battery should be trained to distinguish between hostile and friendly tanks. Since it is impracticable to obtain data on all hostile tanks, troops should be trained to identify friendly tanks, combat cars, and reconnaissance vehicles. To accomplish this, photographs and silhouettes of all friendly vehicles should be used in training and kept posted in the barracks.

5. SELECTION OF POSITION.

a. Mission.—The force commander is the only person having sufficient knowledge of the situation to issue orders to employ antitank batteries. Orders should be sufficiently exact so that battery commanders can intelligently employ their platoons. In the case of a triangular division, the division commander's order might assign a mission to the antitank battery as follows:

(1) "The antitank battery will prevent hostile tank movements across X stream between A Village and B Hill, operating in close conjunction with the commander of the reconnaissance units."

or

(2) "The antitank battery will protect the flank of the division from positions in the neighborhood of A Village, on both sides of A—B road."

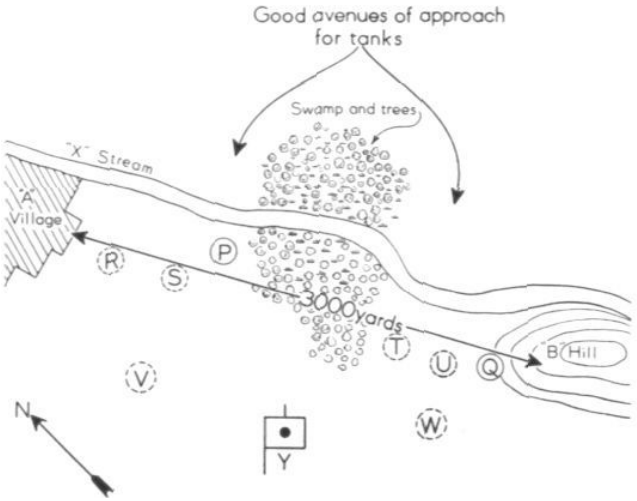
b. Procedure.—Having received an order similar to the one stated in subparagraph *a* (1) above, the battery commander decides whether to place all of his guns in position, some in position and some in readiness, or all in readiness. This will depend upon the terrain, width of front, artificial and natural obstacles, and the mobility possible with the antitank platoons. A possible situation is shown in Figure 2.

c. Points to consider.—In selecting a position for a platoon, the following should be considered:

(1) *Field of fire*.—A field of fire of 1,000 to 1,500 yards is highly desirable in order that tanks may be seen and tracked before fire is opened.

(2) *Ease of occupation*. — Gun positions must be readily accessible from a position of readiness.

(3) *Camouflage and concealment*. — Antitank positions are normally well forward and within view of hostile observation: therefore every effort should be made



a. BC places first platoon in position at P; second platoon in position at Q; and third and fourth platoons in readiness at Y.

b. If attack develops to left, R and S are occupied; if time does not permit such action, V is occupied.

c. If attack develops to right, T and U are occupied; if time does not permit such action, W is occupied.

d. At positions such as P and Q, the guns may be in position to fire; or they may be held under cover from 10 to 50 yards away from firing positions and moved in by hand when tanks appear.

e. Alternate emplacement positions should be selected in advance to which guns may be moved by hand to give an all-around field of fire.

f. Once having fired from a position, the guns should be immediately moved to a new position (preferably previously reconnoitered) before hostile counterbattery fire can be delivered.

g. All positions must be reconnoitered in advance.

Figure 2.—Employment of platoons.

to secure camouflage and concealment through use of natural cover.

(4) *Local protection*.—Local protection is afforded by natural obstacles, artificial obstacles, other friendly units, and the small arms of the platoon.

(5) *Coordination with adjacent platoons*.—A good firing position for two adjacent platoons is shown in Figure 3.

6. OCCUPATION OF POSITION.—Positions must be occupied with the greatest possible speed and concealment. To prevent hostile observation, guns are normally uncoupled under cover and moved into their firing position by hand. An exact limber position and route thereto must be pointed out to the truck driver. Whenever possible, the chief of section should accompany the platoon commander on reconnaissance.

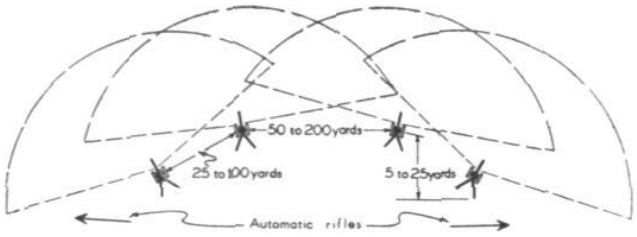


Figure 3.—Adjacent platoons in coordinated defense.

7. ORGANIZATION OF POSITION.—Immediately upon occupation, the position is organized for defense by the chief of section. The gun is camouflaged, ammunition is made ready for speedy service of the piece, circulation instructions are issued, and arrangements for local protection are made. The position may then be further improved by constructing barriers and by emplacing tank mines. The range to a number of critical points is then estimated or determined by the best means available. These ranges should be recorded on a rough sketch. Critical ranges should be memorized by the gunner and No. 1.

8. SIGNAL COMMUNICATION. — Signal communication, radio, visual, and motorcycle messenger, is provided solely for the purpose of establishing a warning system to notify platoons of the approach of a mechanized attack and to issue timely instructions to the platoons so the attack can be met with the maximum number of guns in position ready to fire. Full use should always be made of the equipment without attempting to conform to a set organization. For example, the five radio sets do not necessarily have to be used so that one is in each platoon and one with battery headquarters. In carrying out the mission discussed in paragraph 5 *a* and *b*, the command cars with their radios should be employed as follows (Figure 2): The radio sets of the first and second platoons should be near their respective positions at P and Q. The command radio of battery headquarters should be near Y "operating in close conjunction with the commander of the reconnaissance units" as prescribed in the division commander's order. The third platoon radio should also be with its platoon at Y, but would be working with the radios of the first, second, and fourth platoons under the orders of the battery commander. The fourth platoon radio should be in the best position for observing deep into the hostile territory for tanks approaching the defensive position "along X stream between A Village and B Hill." Messages should be brief and prearranged when possible; for example, the radio at the observation post might report "Tanks, three miles away, attacking toward Q from northeast."

Since the communication necessary in an antitank unit can be reduced to a few simple code groups and since an antitank unit will function in daylight rather than dark, visual signaling is particularly well adapted to the needs of the antitank battery. Lengthy messages should habitually be sent by motorcycle, unless the emergency demands radio. All communication plans must include the establishment of alternate means and checks to insure that messages have been delivered.

9. AMMUNITION.—A limited number of rounds must be ready for immediate use whenever action is imminent. These rounds must be ready to load in the piece as soon as the piece is prepared for action. Such an arrangement as a few prepared rounds in a box that can be unloaded when the gun is uncoupled, or rounds strapped

together in groups of three or four so that they can be carried with the gun should suffice until some more appropriate carrier is developed. When point-detonating ammunition is used, fuzes should not be screwed in until after the ammunition has been unloaded from the carrier.

SECTION II

FIRING

10. GENERAL. — The training of the gun squads should be made realistic as to mission; that is, the destruction or disabling of hostile tanks. In order to stop a tank, it must be *hit* with a force sufficient to penetrate the armor or to damage a vital part of the mechanism. The 75-mm. gun, firing high-velocity armor-piercing ammunition, will fulfill this condition when employed against the tanks now being employed by foreign armies. From a gunnery standpoint, the accuracy of direct fire on a moving tank is a function of the muzzle velocity of the materiel and the range at which the tank is brought under fire (Figure 4 and tables, paragraph 11 *c*).

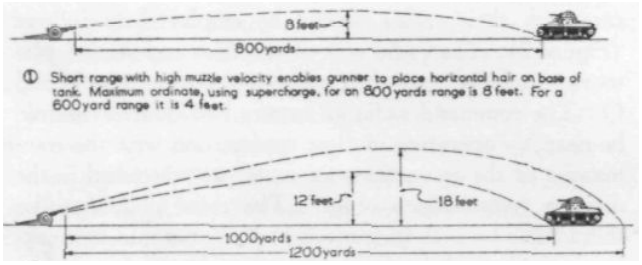


Figure 4.—Effect of range and muzzle velocity.

11. LAYING FOR DIRECTION.

a. Gunners should be taught to lead tanks for direction and not attempt to set off deflections. Setting deflections becomes difficult when a tank changes direction or a switch is made to a new target. The lead should be expressed in terms of tank lengths and not in terms of angular or linear measure (Figure 5).

b. Gunners should be taught to lay on the tank, take the estimated necessary lead, traverse maintaining the estimated lead, and fire. It is wrong to lay on a point in front of the tank and wait for the tank to reach that point.

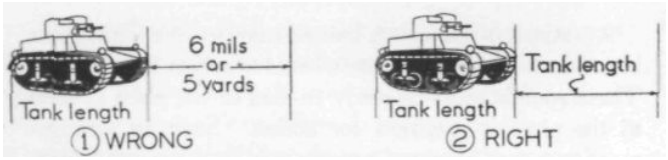


Figure 5.—Laying for direction.

c. The table below shows the leads in tank lengths necessary to fire with supercharge ammunition (muzzle velocity 1,950 feet per second) at tanks of indicated size traveling at 15 miles per hour.

(1) *Tank moving perpendicular to line of fire.*

Range in yards	Tank length 4 yards	Tank length 6 yards	Tank length 8 yards
200	Forward edge	Forward edge	Forward edge
400	½	Forward edge	Forward edge
600	1¼	¾	¼
800	2	1¼	¾

(2) *Tank moving at 45 degrees to line of fire.*

Range in yards	Tank length 8 yard	Tank length 6 yards	Tank length 8 yards
200	Forward edge	Forward edge	Forward edge
400	¼	Forward edge	Forward edge
600	¾	¼	Forward edge
800	1¼	¾	¼

(3) The above leads are those necessary to hit the center of the tank. A lead differing by less than one-half of a tank length from the above should be sufficiently accurate to hit some part of the tank.

(4) The gunner must continue to lead the tank until the gun is fired.

12. LAYING FOR RANGE.—When fire is started at a short range and with a flat trajectory, the range setting on the gun is relatively unimportant when compared with the accuracy with which the horizontal hair is placed on the tank. The horizontal hair, in effect, applies the angle of site (Figure 6).

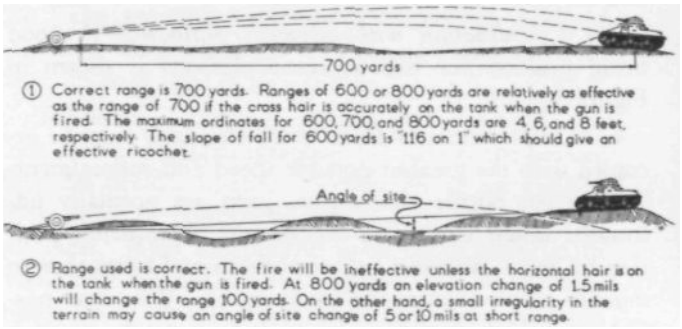


Figure 6.—Laying for range.

13. PRINCIPLES OF ANTITANK FIRING.—The following general principles should govern antitank firing:

a. Fire should not be opened at a range greater than 800 yards, as the maximum ordinate increases rapidly beyond this range and hits are difficult to secure. Fire should be opened as prescribed by the platoon commander.

b. The tank which is most menacing (usually the closest) to the gun should be fired upon until hit; then

the next nearest (or most menacing) tank should be fired upon. No effort should be made to destroy disabled tanks as long as a mobile tank is within range or view, unless the disabled tank is firing upon friendly troops.

c. Platoons should normally be assigned zones of first priority. No zones of fire should be given guns within a platoon, although each gun squad may be assigned a zone of vigilance prior to the appearance of tanks.

14. SERVICE OF THE PIECE.—The service of the piece is covered in the pertinent FM of the 6-series. The following expedients for firing at tanks with direct fire have been found to give the best results with the materiel listed (as modified) below:

a. 75-mm. gun. M2A2.

(1) *Direction*.—The panoramic sight is set at zero. The gunner takes and maintains the appropriate lead until the gun is fired.

(2) *Range*.—No. 1 sets site 300 and the range scale at the estimated range, and levels the bubble. He watches the burst and estimates the range change, which he sets off with the handwheel. (One turn of the handwheel causes a range change of 400 yards.) The range scale is not reset. The procedure is continued until the tank is hit. The bubble is leveled for the second round when the trail spades have not been set. This method is rapid and gives good results on reasonably level ground.

b. 75-mm. gun, M2A2, with elbow sight.

(1) *Direction*.—Same as *a* above.

(2) *Range*.—No. 1 causes the horizontal hair corresponding to the estimated range to pass through the base of the tank. He continues to track the tank until the gun is fired.

c. 75-mm. gun, M2A3.—With this gun, the gunner operates both the elevating and traversing handwheels, which enable him to lay for direction and range.

15. TRAINING OF THE GUN SQUAD,

a. General. — Gun squads should habitually be trained with the type of gun and ammunition with which they will be armed in combat. The gunner (or gunner and No. 1) should get the touch of the handwheels; that is, they should learn what effort each fraction of a turn has upon the cross hairs. The gunner should be so trained that he is able without hesitation to estimate and lay off the proper lead for a tank moving in any direction or at any rate. Such training can best be achieved by firing service ammunition. However, it is neither practical nor possible to train habitually by firing service ammunition. Many expedients simulating service conditions may be devised for preliminary training. Such expedients should be made realistic. For example, in training on a miniature range, the dimensions of tanks and their rates of movement should be comparable to the dimensions and speed of actual tanks. The four steps in training gun squads are: Tracking targets, firing on the miniature range, and firing subcaliber and service ammunition.

b. Tracking targets.—Many schemes for practice in tracking targets may be devised. The following are practicable:

(1) Have the gunner keep horizontal and vertical cross hairs on the curved line as he traverses from left to right (Figure 7). This can be done in the gun park.

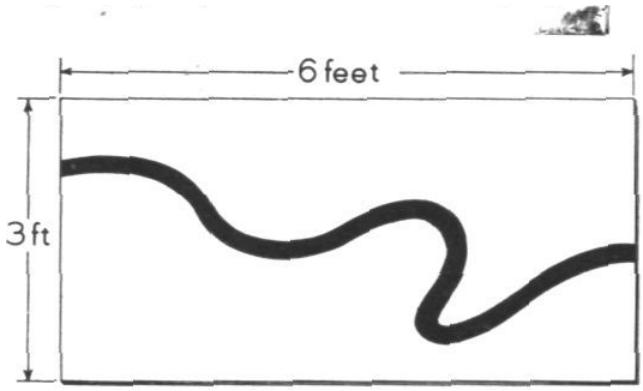


Figure 7.—Tracking-practice target.

(2) Make a cardboard tank of appropriate size and have a cannoneer carry the tank toward the gun at proper speed. Many such targets can be used in the gun park simultaneously.

(3) Place guns near a road or highway and have the gun squads practice tracking vehicles traveling thereon.

(4) Have motor vehicle make "attacks" on your position.

c. Miniature range.—The only requirements for a miniature range are a small-caliber weapon and a place to shoot it. The most satisfactory weapon is the .22 caliber rifle. Either a subcaliber tube that fits in the bore of the antitank gun or a rifle bracketed on top of the tube will give good results. Ranges may vary from an ordinary piece of ground with a towed box for a target to an elaborate sand box having trees, roads, and houses, with many wooden tanks operated by a series of pulleys and wires.

The utilization of a ray of light on a sensitized object has many possibilities for training antitank gunners. The ray of light emanates from the bore when the piece is "fired." The light strikes a sensitized tank to indicate a hit.

d. Subcaliber.—Tables of Basic Allowance 6-1 authorize four 37-mm. guns for subcaliber practice. Full use should be made of subcaliber firing at the actual type of moving target that will be used for firing service ammunition. Multiple tanks should habitually be pulled so that gun squads are trained in shifting to a new tank each time a hit is scored.

e. Service ammunition.—This is the most essential phase of antitank firing. None of the preliminary drills referred to above are an adequate substitute. The target runs should be made as realistic as possible. Gun positions should be tactical whenever possible. An outline of a target practice follows:

(1) Fire with one gun at one target.

(2) Fire with one gun on 2, 3, or 4 targets; shift to a new target each time a hit is scored.

(3) Fire two or more guns on as many targets as can be drawn.

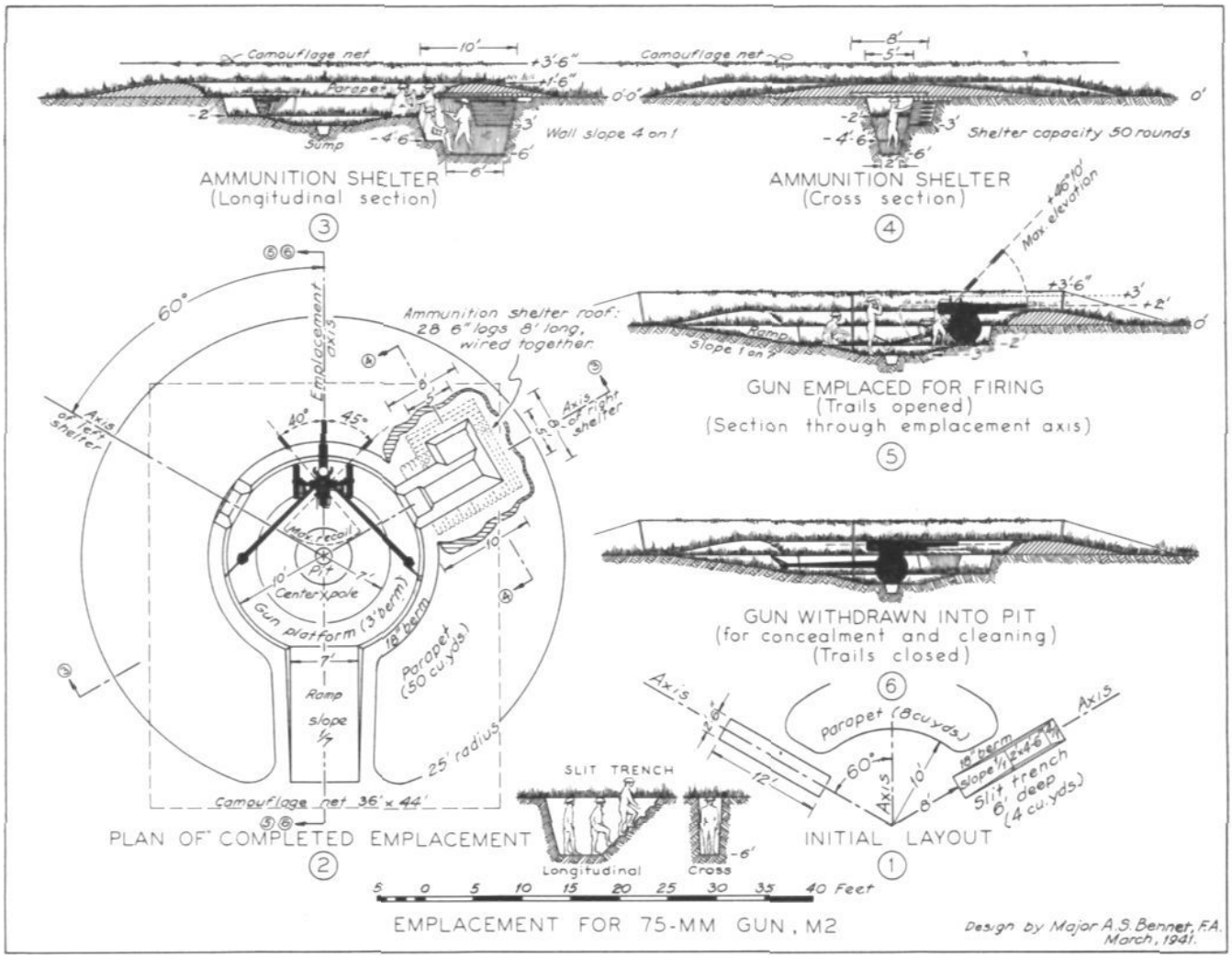
The essence of antitank firing is speed: Speed in getting on the target; speed in hitting the target; and speed in changing to a new target.

AN EMPLACEMENT FOR THE 75-MM. M2

By Major Alexander S. Bennet, FA

The circular design of this emplacement (Figure 2) permits all-around fire, as the gun may be emplaced on any part of the platform. While waiting for the direction of fire to develop, the gun is held in a "position in readiness" in the center of the pit (Figure 6) with trails closed and extending into the ramp. In this position the entire carriage is below the level of the parapet and therefore concealed (compare with the Coast Artillery disappearing gun principle). When the direction of fire is determined, the trails are lifted onto the parapet berm and swung around until the gun is pointed at the target area. The gun is then run forward onto the platform and the trails spread for firing.

Cleaning the slides (with tube level) and the bore



(with tube slightly elevated) is conveniently done when the gun is at the center of the pit (Figure 6).

This emplacement, because of its similarity in plan and profile, may be developed from a shell or bomb crater of suitable size. If a crater is not available one may be blasted at the desired location to save much of the time and labor of excavation.

The initial layout (Figure 1) is designed to permit development into the completed emplacement (Figure 2) when it is impracticable to start with a crater.

The ammunition shelters (Figures 2, 3, 4) are developed from the initial personnel shelters (Figure 1), which are slit trenches. The final shelters are both weatherproof and splinterproof. New slit trenches for personnel are then dug at any convenient location outside the completed emplacement.

Protective obstacles (such as barbed wire entanglements) to prevent foot troops from rushing the position may be placed beyond hand grenade range (40 to 100 yards). A mine field may be placed to prevent tanks from rushing the position. An auxiliary antitank weapon (caliber .50 or 37-mm.) may be emplaced alongside the 75, or in a separate emplacement in the vicinity, to reinforce the fire of the heavier weapon. If the position is penetrated by tanks the parapet berm furnishes a handy "Molotov" cocktail bar for dispensing drinks to the visitors.

Sodding the parapet, berms, ramp, and pit will add to concealment, prevent much dust from muzzle blast, and improve the footing in wet weather. Drainage into the sump may be removed by bailing.

As a temporary expedient when rain falls, a circular fly may be pitched under the camouflage net to keep the emplacement from flooding. This fly may be painted with mud or camouflage colors to match the locality. When the ground is covered with snow a circular white sheet replaces the camouflage net.

Slits are provided in net and fly or the material may be folded back to provide openings for fire at higher elevations. The parapet under the muzzle is kept wetted or covered with wet burlap to control muzzle blast. The grass on the crown of the parapet may be cut short if desired. Slit trenches are concealed under brush and grass.

The camouflage net is erected prior to the commencement of any work at the position. It may be stretched crosswise for the initial layout (Figure 1), and 6½ feet above ground level, being changed around and lowered to its final position 3½ feet above ground level when the work is finished. All spoil is incorporated into the parapet. Waterproofing material, such as tar paper or corrugated iron, should be placed on top of the shelter roofs before covering them with the parapet. It is practicable but not always necessary to revet along the parapet berm with sandbags or sod blocks. Care, however, must be exercised not to build the revetment too high, otherwise it will touch the gun (Figure 5). Small movable mats or platforms may be used to shim up the wheels or jack if it is desired to have greater clearance in any specific instance between muzzle and parapet. If the jack is used a small niche in the wall of the emplacement may be necessary to permit operation of the jack handles.

The emplacement furnishes protection against flat trajectory fire by foot troops or tanks within 600 yards (maximum effective range). There is no embrasure to cast revealing shadows in an air photo, or to limit the direction of fire.

CANNED LANGUAGE

Official military correspondence, despite all efforts to simplify and rationalize it, still contains certain stuffed-shirt expressions which usually are about as expressive and explicit as the familiar "etc." Indorsements (and even buck slips) are as degenerate offenders as "original communications." *The Gunner* (London) lists a few in current British usage, and they bear a remarkable resemblance to our own military verbal tripe:

SIMPLE SENTENCES FOR SOLDIERS

Under consideration ..... *Never heard of it.*

Under active consideration ..... *Will have a shot at finding the file.*

Has received careful consideration ..... *A period of inactivity covering time-lag.*

Have you any remarks? ..... *Can you give me an idea what it is about?*

Putting him in the picture ..... *A long, confusing and inaccurate statement to a newcomer.*

Rather in the air ..... *Completely ignorant of the whole subject.*

You will remember ..... *You have either forgotten or never knew.*

Passed to you ..... *You try nursing the baby. I'm tired of it.*

Concur generally ..... *Have not read the document and don't want to be bound by anything I say.*

Will have it laid on ..... *Will ask another department to do my job for me.*

In conference ..... *Gone out, don't know where he is.*

Kindly expedite reply ..... *For God's sake try and find the papers.*

We have taken the very best advice available ..... *We have briefed our honorary adviser.*

Passed to higher level ..... *Laid to rest in a more sumptuous apartment.*

In abeyance ..... *A state of grace for a disgraceful state.*

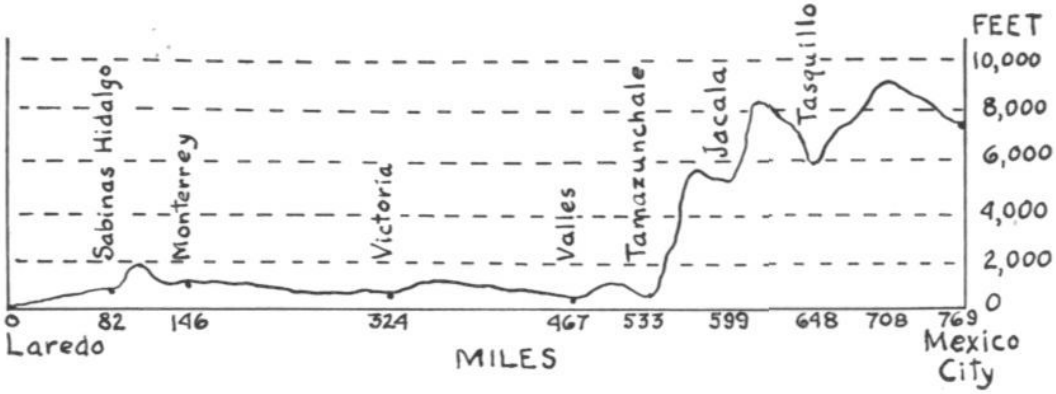
For action as necessary ..... *Do you know what to do with it, we don't?*

Players at "El Patio," Mexico City

Vacation

Part I
of Two Parts

By Captain T. L. Crystal, Jr., FA.



Profile of the route from Laredo to Mexico City

It is hot in Oklahoma in June. It is hotter in July. 'Way back "before the war" the Field Artillery School closed shop in the summer, and people could get leave. We got a month, and neither Patti nor I had been to Mexico. Someone had told us that Mexico City was cool. It was.

On June 21st, 1939, we headed for San Antonio. We had a Buick coupe, a few bags filled with summer sport clothes,[1] and a small edition of a delicatessen. A book box upended with shelves and removable pins made of coat-hanger wire to keep the contents from roving made a very workable pantry. Add a small camp icebox, a five-gallon water bottle with a siphon, and a plentiful supply of fruit juices, crackers, soups, jams, and canned date and nut bread, and you have a "Crystal cafe roulant."

It *is* worth the effort.

Roads out west are made for driving, and tourist camps make most hotels look shabby. A Conoco *Touraide* gave us an excellent trip plan, and we followed it.

San Antonio was delightful, and Fort Sam Houston beautiful. We stayed with some artillery friends there and met some others infected with the Mexico bug. In San Antonio we went to see Mr. William Harrison Furlong of the Inter-American Highway Association on the mezzanine floor of the St. Anthony Hotel. He supplied us with excellent last-minute road information, Mexican automobile insurance, and membership in the Association Mexicana Automovilistica. We both felt that the last two were well worth while and would recommend them for others making the trip.

in Mexico

About 9 AM on a beautifully clear day we left San Antonio and headed for Nuevo Laredo, Texas. As I was an Army officer, the Mexican Consul in Laredo gave us a complimentary courtesy card that saved a Mexican border entry fee. It also provided an identification, written in Spanish, that might be of assistance in case of an accident. The Consul was most courteous and expressed a sincere desire to assist us in every way possible.

Crossing the border was very simple. The American customs didn't even look at us. The Mexicans inspected our baggage very cursorily, and gawked amusedly at our tremendous storeroom of provisions in the rear and the pantry, camp icebox and thermosii in front.

On crossing the border, one is carried back 500 years. Countryside, inhabitants, atmosphere, all are different. We had a card with all the road signs in Spanish, and had great sport trying to translate each one before we passed it. The road was excellent, and for the first 45 miles was perfectly straight over flat country with great hills in the distance. We were stopped 13 miles

[1]Wool clothing would be comfortable; also a top coat.—Ed.

Mexican costumes: top—the "China Poblana," most characteristic of the Mesa Central, and below, another design of the same costume worn by Miss Patricia Bowman, daughter of the Consul General.

out by an auxiliary customs station, who glanced at our credentials and waved us on. We reached Monterrey about 7:30 PM and wandered through it for about 30 minutes. We stopped in front of the largest hotel and inspected it. Then we looked through an-another one. A very industrious guide appeared and offered to show us others. We accepted, and looked over three more. Finally, and as a result of this inspection, we found what we wanted: a most delightful, clean, new Mexican hotel. It was the Hotel Central, at the intersection of Escobedo and Aramberri Streets, with a delightful patio and thoroughly charming atmosphere.

Ambassador Daniels in a group of villagers. The village "Chief" is standing at Mr. Daniels' left.

We might at this point make a very definite statement that we were in Mexico to see as much as we could of things Mexican and to meet as many Mexicans as possible. We studiously avoided the accepted tourists' centers and made definite efforts to see the Mexican people at first hand. In the event that you are desirous of touring Mexico in order to take advantage of the many American tourist homes, restaurants and entertainment centers that the country now offers, I am afraid that my journal may prove unsatisfactory. In the United States we are always in contact with American things. One travels to find out something about unfamiliar things. It is perfectly possible for an American to tour Mexico and never see anything except American surroundings. We felt most fortunate in that we saw some of the real beauty that is Mexico. I might add a warning that one cannot tell what beauty lies behind a most uninviting exterior. Some of the hostelries in Mexico are in ancient houses with romantic historical pasts. The general intent of the builder must be remembered, in that the Spanish built for beauty inside and in general ignored the outside. Thus a most reprehensible looking facade may cover up a perfectly gorgeous patio, filled with colorful flowering trees and other exotic plants. It may also hide many clean, comfortable individual rooms all opening on this garden. *Do* look inside.

On the morning of the 23rd, we took a guide to drive us around Monterrey and show us the main things in the town. We had fun making him explain it all in Spanish. He had done it so often in English that at times he groped for Spanish words. We ate dinner at Sanbornes, and had quite a good meal. We went out to the Terpsichore night club after dinner to dance. It turned out to be an attractive private home that had been converted into a club with dancing in a large flower garden of a patio. There were, in all, about ten tourists in this wasted magnificence.

Laying of a cornerstone, July 4th, for a primary school at El Pilar, Torreon, Mexico.

Next day we drove easily to Valles, through scenery which varied from arid mountains through old lava flows to the dense

tropical jungles of the coastal area. The towns are small collections of adobe houses with thatched straw roofs. Other buildings have woven walls and most of them have outside stoves built on clay topped tables. Nearly all the peasants we met carried wicked-looking machetes. But they were headed for work in cane fields or in their *milpas* (fields of maize). Along nearly every road were swarms of people carrying loads two or three times bigger than themselves. After looking all over town for a recommended hostelry, we put up very comfortably at the Hotel Valles. The rooms were tastefully decorated in Moroccan style, and there were a few deer and a small alligator in the yard. (The latter was well secured.) The dining room was open on all sides and had a foot-thick thatch roof, thus affording a welcome relief from the lowland heat. After an excellent meal we enjoyed the regular evening serenade. Regardless of the fact that the serenading was for tourist consumption, it still is infinitely beautiful in its own setting, and we never got enough of it. Life is more tranquil in rural Mexico.

Seen from the highway into Mexico City

SUNDAY, JUNE 25—MEXICO CITY, DISTRICTO FEDERAL

We left Valles about 8:00 AM and soon reached Tamazunchale. The only way we have heard anyone pronounce this name is to slur over quickly "Thomas un Charlie." We gassed up, made a check of oil and air, and started our climb. In the next 70 miles we ascended over 8,000 feet. The grandeur of the road makes Storm King Highway a Coney Island attraction by comparison. It is a marvelous engineering feat, and one of which Mexico can justly be proud. After reaching a height of 8,500 feet at the summit, we started down to the plain of Mexico City, at about 7,500 feet. Clouds and storms seemed to be threatening all around us throughout the day, but they never materialized.

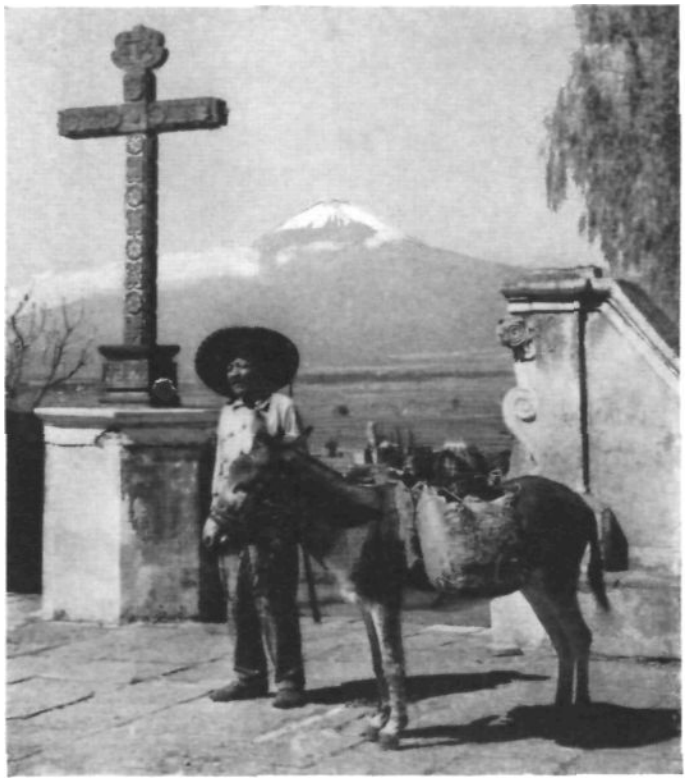
About 20 kilometers out from Mexico City, Pats noticed the smell of steam and saw the engine temperature gauge at 212 F. She woke me up, and I found the fan belt ripped to shreds. I had a spare along, and in about 10 minutes we were again on our way. We had to use up three gallons of our pure spring water to refill the radiator after losing that amount by condensation. We were fortunate to have it with us. As a reward for the work, we opened a can of red hot, entrée size, Vienna sausages that we had had cooking in their can on the exhaust manifold of the engine. There's nothing like having a little kitchenette along with you!

At the entrance to the city we were stopped by some federal inspectors who looked over our papers, and we were asked to take one of them in with us. Not knowing the way, we agreed readily. He spoke no English, and with our Spanish we both had a swell time. He got lost at one point well inside the city, and then in a very congested intersection poked his head out of the window and tooted his whistle. The cop there deserted his post, and nearly did a handstand when he saw our friend's badge. The cop then stood on our running board in style, made a "U" turn through this nearly impossible intersection, and in state conducted us to our destination—The

Diana, at Avenida de los Insurgentes and Oaxaca. Our friend, Jesus Burgos, came in with me while I made an investigation. Of course, all the advertised rooms were not to be had, but they had an available suite for 15 pesos a night. To make a long story short, and due, I feel, to the presence of old Burgos, we got the suite for the price of the room we were looking for (at 5 pesos a night). The building was new and the rooms fine and clean. There was a sitting room, bath, kitchen, hall and bedroom.

MONDAY, JUNE 26, 1939—MEXICO, D. F.

The Diana being situated at a rather busy corner, the clatter of the streets bothered us a bit. We were tired enough, though, not to mind 'most anything; after getting clean and rested, we set out to see what we could see. We were only three blocks away from the American Embassy, so we walked there; but they had not yet started business for the day. We retraced our steps to the Hotel Geneve for a very nice breakfast. The place was infested with a convention of American school teachers who bustled hither and yon with great cackling. At the Embassy we had a talk with Col. Freehoff, the Military Attache, and were invited to the Fourth of July Celebration, a reception in the afternoon, and a dance that night. We ate dinner at Prendes. It reminded us of Marconi's in Baltimore. We ordered chicken, but found out later that the specialty is inch-and-a-half steaks.



A shrine beside the Inter-American highway

Tuesday we wandered around town with a guide we had contacted at the Ritz Hotel, Sr. Henry Munoz. He had driven Lindbergh and Ambassador Morrow around, according to his story. We did not meet a guide who hadn't. He took us, in our car, around the city and showed us elegant residential sections and gardens. By federal law, all bank deposits above some amount not only do not draw interest, but have charges made against them. Therefore all over the city new houses, apartments, and stores are springing up apace. We went through Chapultepec Park and the Palace, historically interesting and affording a fine view of the city.

Wednesday we drove out to the Pyramids—sacrificial altars used by the Aztecs for their worship, and only preserved because the Aztecs covered them over with earth to conceal them from the Spaniards. The Spaniards completely destroyed the records of a civilization thousands of years older than their own. But then, it is ever thus!

We had luncheon at Sanbornes, and were not too impressed; then had the best meal we had in Mexico at Paolo's. We took the Chef's Specialty, a nest of rice and spaghetti gumbo, deliciously seasoned and flavored, some asparagus tips, and a half of a barbecued chicken that was sabroso! As soon as we finished, we went to Riveroli's Art Gallery for an hour or so of Mexican songs and dances and our first tequila cocktails.*

THURSDAY, JUNE 29, 1939 — TEHUACAN, PUEBLA, MEXICO

We got off at 9:30 AM and headed for the American Embassy to leave an itinerary and route map. Next stop was at a Panaderia for some fresh rolls and tasty cookies, and then a stop at Henry's house for his bags and a case of Coke and Moctezuma beer. About 11:15 we finally got started out of the city on a paved road for Puebla. We climbed out of the valley of Mexico over the Sierra Madre Oriental, and started down gradually over some green farming country past many deserted and gradually crumbling haciendas. We passed a farm on which a man was driving a team of four horses in a small circle over a layer of sebada (wheat), thus threshing it with the hooves. We stopped to take a movie of the scene.

Puebla, the capital city of the state of Puebla, is remarkable for its cleanliness. We were both amazed at the "Hidden Convent." About 1857, when convents and monasteries were outlawed in Mexico, a complete convent was built inside a block of houses, and only discovered by the police through an informer in 1934. The

*"MOUNTAIN DEW—A LA MEXICANA." The distillate of the century plant maquey. It packs a mean wallop. Fresh from the plant it may be drunk with impunity. After some fermentation as pulque, it causes color blindness to weaklings. After distillation and storage, and accompanied by salted dried insects taken also from the plant, it has the savour and quality of cognac, and double the potency. Don't say you weren't warned.

Catholic families who concealed the entrance through a bookcase in one of the dining rooms kept the sixty or so nuns there supplied with food through the proceeds of the sale of the handiwork of the Sisters. They had a complete establishment with chapels, patios, and even a cemetery.

Tehuacan was our last stop for the day; on arrival there we inquired for prices and accommodations at the Hotel Garci-Crespo, a regular Hot Springs or White Sulphur Springs type of place. The rates were three times those of the Diana—although extremely reasonable on an American comparison—so we went on into town. There we saw a perfectly horrible (from the outside) hotel. Henry said it was the best the town had, so I went in to look. We stayed. The Hotel Mexico had five patios, tile floors and was clean as a whistle. The tariff was quite agreeable, the atmosphere thoroughly Mexican and friendly. We parked our car outside our door in the patio, cleaned up and had a grand meal with a bottle of good Mexican wine (Riojo-Fernandez), then went out for a promenade. A very surprising, though, according to Henry, typically good band was symphonizing in the Zocalo. It was lots of fun, but we quickly got into trouble: Henry got a store to open for us and we saw some of the most beautiful costumes that we had run into in Mexico, and at a price that made us blush. Patti got a charming one for herself and a similar one as a present. I had a Roman holiday on one American dollar, and came out with a basket filled with munecas—straw caballeros and machete wielders.

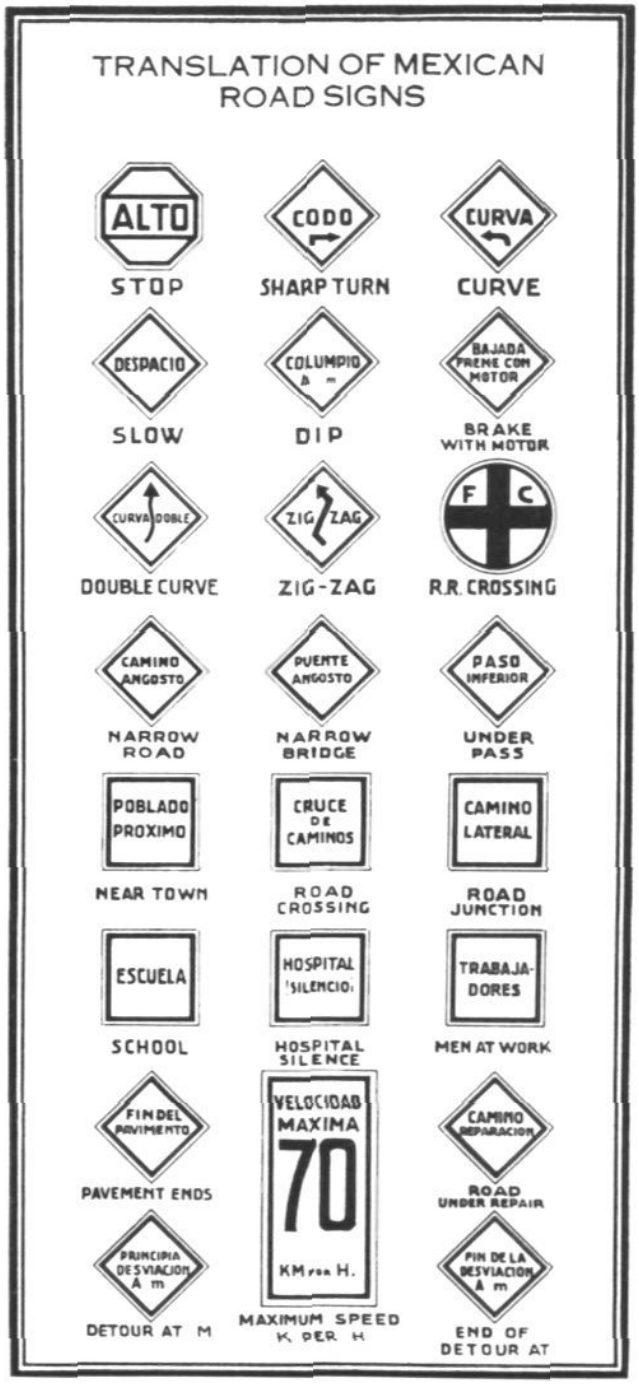
Tehuacan is noted over the country for its natural spring water which is medicinal yet agreeable to taste. All over Mexico you can buy it bottled, and its purity makes it the traveler's friend. The Garci-Crespo Hotel is situated at the spring, where they have several swimming pools. Quite surprising to us was the fact that the water is, if anything, injurious to plant or rather flower life. The natives have to use rain water to cultivate flowers with, or even to wash cars clean.

Our room at the hotel provided us with a few more surprises. Patti noticed that the artistic ceiling had four one- or two-inch brass grommets in the corners, and that the light was hung from a horizontal cord from the center of the room rather than from the ceiling. We could hardly believe Henry when he told us that the ceiling was canvas. It was impossible to tell from the ground that it was other than plaster. Then in the morning I stormed and stomped around a bit for some hot water. Henry finally showed me the miniature boiler with which each room was equipped, and that I could fire if I so chose with the fuel there provided. I did not so choose.

FRIDAY, JUNE 30, 1939—EN ROUTE TEHUACAN-OAXACA

After, according to my beloved wife, "the best sleep since Fort Sill," we awoke to the bustle of people passing our dormer (well-barred) window carrying the most amazing things to market. We packed that morning so that we had one bag apiece for our train trip to Oaxaca (pronounced "Wa-haca" with a's sounding like the sound Little Bo Beep heard) plus my brief case holding our notes, credentials, itinerary, etc., a box of cameras and films plus our complete first-aid kit (a bottle of milk of magnesia) and the trusty typewriter. We also had a canvas sack holding our lunch and some cans of fruit juice and other foods for our trip down and back. In all we needed only a National Geographic flag and a button from the Explorers' Club.

Patti set to work with our Vienna rolls and the last of our Fort Sill butter and made up sandwiches of minced ham, peanut butter and jelly. I felt quite good



about our train ride! We had a breakfast of tea and rolls and buns, started off with a delicious mango. The mango looks like an overgrown Japanese persimmon, with an inside the color of the yellow meat of a cantaloupe. The taste is a sweetened orange flavored one that isn't easy to describe; e.g., my description! We both liked it.

Coffee in the cafes here surprises you. It is delivered to your table as a thick, black oily liquid, to which you add the hot milk also offered. We evidently do not take well to it, and tea—usually packed by a Baltimore merchant—is our main standby. Next time we may add a sterno, a pot, and a couple cans of Maxwell House to our commissary, if the springs of the car will permit.

After breakfast we locked up the car, parked it in one of the patios, collected our bags and rode in state in a two-horse cab to the station. The train was only 50 minutes late. We lost out in the rush for seats, but with the help of two other American couples and Henry we finally got settled down in our "Primera." The country through which we traveled was full of peaks that reach up into and are covered by the clouds. It was one of the dustiest train rides we've ever been on. The track was narrow gauge; we moved along at a remarkable clip over a none-too-level bed. An attractive American couple riding with us expressed grave doubts as to my ability to balance the typewriter on my knee and withstand the pitching and tossing.

I can readily understand why they made the railroad only narrow gauge. How they ever put in a train bed of any description on that route is a wonder to me. It makes crossing the Alps look childish. The gorges that we went through, the streams we crossed again and again, the sheer drops on one side and the vertical rises on the other, the sparsely populated country, all make us wonder how anything got through it. The answer is, of course, that we passed several gold and silver mines, all about umpteen miles from nowhere. There is a road from Tehuacan to Oaxaca, but it is only passable for cargo trucks that carry all their provisions and a complete supply of gas and oil. It takes them at least two days for the trip. The vegetation changed from banana trees along the route near Tehuacan to nearly a Maine growth, with the possible exception of the ever-present and apparently endlessly usable Maguey plant.

Upon arrival in Oaxaca we were besieged by hotel representatives all claiming impossible things. We decided to stick together, and went to the Hotel Francia en masse. *No me gusta*, so we piled into our cabs and started out. The next one we hit was the Hispano-Americano, a typically Mexican hotel with tile floors, twenty-foot ceilings, huge windows with little iron balconies, nice bathrooms, and, believe it or not, Simmons mattresses. We were in a group now and united in our desire for baths and complete changes after our dusty and dirty train ride. A slight matter of collective bargaining and we got the rooms with meals for the immense sum of 12 pesos (about $1.50) a couple a day.

About forty minutes later we met in the dining room for an excellent meal topped off with a few bottles of Vino Tinto I supplied to celebrate our eleventh-month anniversary. Bud Mabbitt had a bottle of 25-year-old brandy; with that as a chaser we retired to our rooms feeling that the day had been very well spent.

Patti and I had a corner room on the second floor with two huge balconied windows. Our room on the inside opened on the main patio, which in this case had a glass roof. Twenty feet under our balcony was what corresponds to the main entrance lobby. In the lobby, as in all these hotels, there was a blackboard on which each guest writes his name in chalk so that all the hotel will know who is there. Our Americano names seemed quite out of place mixed in with Hernandez, Philipe de la Monte, Rodriguez, etc.

We looked at most meat with a quite suspicious eye, as a few trips to any market would unfold some primary facts about the lack of any principles of refrigeration.* And so, before we ate our dinner, I caused quite a stir by requesting, with my none-too-secure Spanish, permission to look at the meat. Much to my surprise, I found three filets of beef, each about two and a half feet long, and quite fresh. The Mexican conception of a steak is a small thin thing that quite resembles a tortilla. By means of a visual demonstration, I cut a steak about two inches thick. When it was served, it looked swell. I regret to add that evidently the steer in question had had quite a bit of exercise that apparently involved his filet.

Throughout our journey we had passed many boxcars that contained the living quarters of the railroad workmen. In this country, man is inseparable from his wife and bambinos. Even in the Army, each soldier is not expected to live away from them, and if not furnished quarters lives in town with his family. I saw no beds in barracks.

On the railroad each box car is divided in two at the center door by a wooden partition, and one family lives in each side. A most natural and normal addition to nearly all cars so used is a cluster of tin cans nailed to the sides of the car and containing beautiful growing plants and often cages of birds. The most desolate and wretched hovel in the country will have at least several exquisite flowering plants in its front yard.

SATURDAY, JULY 1, 1939—OAXACA, OAX.

The kitchen force didn't seem to be in the least surprised when I arrived there to cook our breakfast. I decided that it would be impossible to explain how to scramble eggs in a double boiler, and so with the enthusiastic help of at least eight of the people in the kitchen, I got a large pan of boiling water, two small four-inch pans, milk, butter, and eggs. With great difficulty I combined them and succeeded in keeping the

*As well as opinions concerning what constitute edible portions of a carcass—Ed.

two pans floating without capsizing in the larger bowl of boiling water. My results weren't perfect, but tasted good, were clean, unique for Oaxaca, and gained me the admiration of the whole kitchen. As I look back at it now they certainly were courteous to a most rude guest.

After breakfast, we went to the cathedral. I had never seen so many churches or such gorgeous cathedrals in my life. They make Notre Dame and Rheims look shabby and even small. The gold and silver decorations, the murals, paintings, sculpturing, bas reliefs, and windows have in many cases been executed by noted artists. The devotion of the poor peon to the church is humbling in its depth. Next to the cathedral stands a convent that, like the other thousands of them, was confiscated by the government in 1857. It is now a military barracks, and contains a battalion of infantry and a troop of cavalry. They were having their accustomed first-of-the-month physical inventory of men, and an inspector from the War Department was there. They looked excellent, and were snappy, shiny and clean. I sent Patti and Henry—our guide—to the market, and went back to the hotel to get my military *Targeta de cortesia*, and went to look through the barracks. I got the second-in-command, but did not get in. If I came back later, etc., but I had a fine talk with some of the officers and came away with a very good opinion of the group.

Patti and Henry being at the market, and seeing an open window of a school, I asked if I could come in and look that over. They turned the place inside out for me, and I was greatly impressed by the way the Government is trying to raise the literate rate and to educate the people to health, cleanliness, and pride in their country. The teachers were of a high caliber, and their efforts with the youngsters were readily apparent. Mottoes were on the walls: "Cleanliness is the luxury of the poor"—"A school that does not teach its pupils hygiene and health fails in its great mission," etc. I invited two of the teachers who had taken me around (and put up with my Spanish) to have lunch with us, but they were unable to make it. Throughout my visit in Mexico I was impressed with the strenuous efforts made by the Government to educate its people. In all corners of the country, in the most inaccessible portions we have been, there we have found the newest building to be the "Escuela Federal."

I had no trouble finding my wife in the market. I regret to admit that the most interesting thing for me turned out to be a stall that sold rope equipment for

The route numerals refer to trunk highways suitable for the average motorist

burros. I ended up with a wooden saddle, a horsetail bridle and a silver inlaid bit, a rope cincha, saddleblanket, and cargo harness—all for the immense sum of nearly one dollar. I thought that for a pair class (costume) in a horse show, Patti and I would make an excellent set.

We had luncheon with Bud and Helen (our Americano companions) and then they took us to some shops which they had found to be excellent. Forbes shop meant for Patti some beautiful Huiraches (leather sandals—pronounced "Weiratchez"; the "Weir" like the thing engineers put in rivers and the "atchez" like "Natches"), and at Mrs. Thompson's we found some native hand-loom linen work that we liked. Bud had some dope on an excellent potter here by the name of Jiminez, and there we found beautiful glazed ware at really remarkable prices. I was fascinated by the potter making dishes, vases, and jugs on his foot-propelled wheel. His long, thin fingers were dextrous and sure. It looked easy, and soon I was trying to keep the wheel going and model a dish or so. It was *not* easy! The Mexicans are very, very courteous.

That night being Saturday, and looking for an excuse in a band concert or something else, we each got a bottle of Mumm's Champagne for about $3.70 (U. S.) and turned the hotel inside out 'till we got a bucket of ice and a boy to turn the bottle in the bucket. It was swell. The trip planned to the ruins that have been discovered at Mitla the next day costing the equivalent of about two bottles of champagne, Bud and I got very forceful in our toasts of "Viva Champagne!" and "Down with Mitla!" In all, our evening was quite a success. Henry told a story of the three grades of native tequila: The first, a mild one for tourists, the second, a stronger for snakebite, and the third and best, a smoking liquid for mother-in-law.

SUNDAY, JULY 2, 1939—OAXACA, OAX.

Mitla was the order of the day, and after Bud and I had rejected the proposed taxi driver's bid of 40 pesos for the trip, we went down town (two blocks) and shopped 'till we got the correct price. It was exactly half. Most things here are quoted to all tourists at two or three times the actual price, and I enjoy thoroughly beating it down to some impossible fraction and finding out about what the real price should be. Any goose that accepts the first price ought to be fleeced—or Bud says "plucked." Mitla was 52 kilometers away over a rather poor excuse for a road. It was quite something, but I wouldn't walk too many miles to see it! We lunched on the hotel's idea of sandwiches—two big hunks of bread and the light imprint of a chicken's claw between. Fortunately they had neglected to put any butter on it, as it is extremely strong and tastes like cottage cheese—but not quite. More fortunately, Patti had brought some crackers and cheese and cookies from our grand commissary, and no one starved.

That afternoon we returned to the pottery factory, and picked out our final selections. They packed them in wicker baskets and sent them to the hotel for us. We think we picked up some beautiful ware.

After supper we went down to the Zocalo to listen to the band concert, walk around the square (the whole performance is called a Serenata), and look and be looked at. I picked up about one third of the band during an intermission and told them that four Americanos enjoyed it very much. No one ever applauds. That does have certain advantages over our rather easy seal flipping at the slightest excuse. Everybody and his sisters and brothers comes and sits or strolls or sips cones (ice cream or flavored ice) or queer looking drinks. The music was excellent, and the youngsters showed why everyone here is so musical. At the drop of a hat a merchant, taxi driver, shoe shiner or what have you will drop his work and break into a tune. Where they hide their guitars always is a mystery to me, but they are omnipresent.

Fences here are quite easy to build. You merely transplant a row of Organo cactus, and that's that. It is called thusly because of its resemblance to the pipes of an organ. It grows as high as you want, and is about one foot in diameter and straight up as a plumb bob. The Bougainvillea was in bloom. There are blooms over some trees fifty feet high, and it peeks out at you from the most unexpected places.

All over this section of Mexico the oxen reigns supreme. He plows with a wooden plow, and surges down the road with his heavy carts loaded with people of all ages and sexes peeking out at you. His harness consists of a heavy wooden yoke with two sorts of wooden sombreros just behind his poll. The yoke is secured to the pole without benefit of traces, breeching, or any other gadgets. He is guided by a long pole and a determined nature.

We saw a Savin (Sabinas Hidalgo is the same type) tree that has a circumference of 160 feet at the base. It just missed being taken to the World's Fair. Near Mitla, we ran into the beginnings—though now abandoned—of a highway proposed to reach Guatemala and the Canal Zone. There is only about a 15-mile stretch of ditches and eroding road-fill to show for this dream.

MONDAY, JULY 3, 1939—ORIZABA, MEX.

With all our possessions and bags in a long wavering line, we just made the 7:15 AM train out of Oaxaca. The train was delayed about 20 minutes, however, because our Washington debutante in the Wells-Fargo party forgot her camera at her hotel and they held the train while she tried to locate it. She was unsuccessful, though, and the train had to leave without her camera. That is one grand characteristic of Mexican trains. Our day's trip even had a 20-minute scheduled stop at a midway station for the passengers to get their lunch. I'm afraid I got Mexican minded.

In Tehuacan, we picked up our car at the Hotel Mexico, and filled up our five-gallon jug with water out of the Garci-Crespo spring. Then, over a perfect road, we drove to Orizaba.

The trip is beyond telling in the beauty we saw. Mt. Orizaba, the highest peak in Mexico and perpetually snow covered, was not hidden with its accustomed mantle of clouds. It was nearing dusk, and the colors in the mountains around us were unusually delicate. All of a sudden we found ourselves on the brink of a 5,000-foot drop, and 'way below us stretched a beautiful and breathtaking valley. We hairpinned down this end of it nearly in a vertical direction, so that when we finally reached the bottom, we were less than a mile from where we had stood on top—i.e., as a brick drops.

In Orizaba, we went to the Grand Hotel de France, where we had a meal, for 2 pesos apiece, that made life worth living. There was an excellent thick soup, a cold chicken course with French dressing and pickled string beans, a large shell filled with fine baked whitefish, a most amazingly delicious beefsteak and vegetables, and all topped off with a spiced fruit dessert. This seemed pretty grand for a town whose textile mills were all closed by inter-labor strife strikes. It seems that the U. S. has a lot in common with Mexico.

TUESDAY, JULY 4, 1939—MEXICO, D. F.

After a good night's sleep, we got off at eight AM and kept on down the road toward Cordoba. Shortly after leaving Orizaba, Henry turned us off the road to get a view of a hydro-electric plant that is powered by a tremendous dam deep below us in the valley of the Rio Blanco. The valley is choked with orchid plants that bloom twice a year. We just missed the summer bloom season, and though we were a bit disappointed, the other scenery more than made up for it.

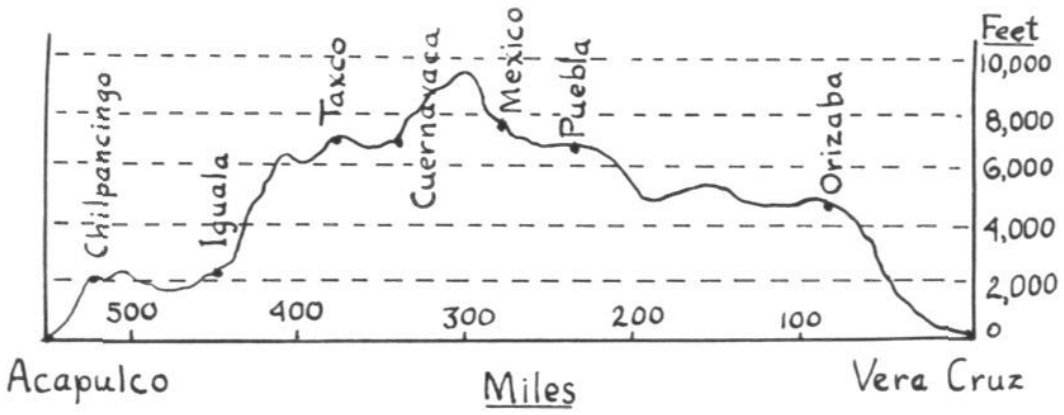
We kept descending on the road to Cordoba (it eventually leads to Vera Cruz) and the plant life became immediately tropical. Banana trees with coffee bushes below them were everywhere, and the vegetation was bewilderingly dense. For the first time we felt definitely in the tropics. We reached Cordoba about 10:00 AM, and had breakfast in a hotel there on the Zocalo. On the way back we stopped at El Fortin and bought flowers, all packaged in hollowed-out sections of a banana tree trunk. We got an exquisite box of 12 camelias for 1.25 pesos ($0.25 U. S.), a triple spray of orchids for 50 centavos, and several boxes crammed full of gardenias for 20 centavos a box. What a flower mart!

On the way back, Henry was driving Patti and Helen in the Buick, and Bud and I were in their Pontiac station wagon, when his radiator boiled dry. The hills are not easy. After about a 45-minute wait, the girls came back; it broke my heart to pour four gallons of pure Garci-Crespo water into Bud's rusty radiator. We stopped to take a look at the market in San Martin, and found it the cleanest ever. By now, we were quite indifferent to markets, and they vied with churches in being overlooked as far as we were concerned. About halfway up the mountain to get back in the valley of Mexico City, we stopped and pulled off the road in a pine thicket. From where we ate our lunch (about 4:30 PM) we could see Popo and Itzo peacefully sleeping. (Two most beautiful mountains: "Popo" is short for "Popocatepetl," an Aztec name that means "Smoking mountain," and "Itzo" is a contraction of "Ixtaccihuatl," which means "White Woman." The "White" had nothing to do with the white race. It referred to the snow. Modern glamorizers now call it "Sleeping Maiden.") It was one of the prettiest picnic spots any of us had ever seen.

In Mexico City, the Diana was full, so we went to the Montejo. Bud took us to one of the best meals we have ever had at Henri's, a little French restaurant where the proprietor himself does the cooking, and the dining room only has about eight or ten tables and is little larger than our living room at Fort Sill. The onion soup came in an individual soup bowl, had been baked with a delectable gratin crust and was hot enough to melt the spoon. The piece de resistance came with a filet mignon that is supposedly world famous. It lived up to its reputation, and the sparkling burgundy with which Bud celebrated the Fourth topped off a memorable meal. The dessert was a spiced rum sauced sponge cake that still tastes good. . . .

Desiring nothing further out of life at that time, we trooped contentedly to bed.

(*To be concluded*)



Profile of the route from Vera Cruz to Acapulco

WITH THE OTHER ARMS AND SERVICES

Editor's note: **Here is the second of a new series, each of which will describe one of the other arms and services. The complete series, together with articles on the War Department, General Headquarters, etc., will constitute a valuable hand book on the Army as a whole; so we suggest that readers preserve each issue of the *Journal* containing this series.**

II—THE INFANTRY IN 1941

By Major Ridgely Gaither, Infantry

When you say soldier to the average person, the picture that comes to his mind is the image of a footsoldier, in full field equipment with his rifle and bayonet. He is the personification of the armed land force of the nation. Few people take the time to look into his history or to analyze the many varieties that go to make up the complex organization of modern infantry.

Before we begin to describe the infantry of today, it is not amiss to go back into the pages of history to indicate the course of events that have gone before to make up the *spirit* that inhabits the soul of a good infantry and which has contributed the impulse that has earned for the infantry its title "Queen of Battles."

Naturally the infantry is the oldest branch of any army. This simply because man's natural state is walking on his own two legs, and he still does that a trifle better than other means of movement. When he undertook to wage war in mass formation, it was an infantry force that he first created. However, it wasn't long before he invented other means of inflicting bodily injury on his antagonists and subjected the horse to transport him about the field of battle. Then along came the forefather of the artillery and heaved a rock, which introduced the first combat which was not hand to hand. The first barrage of sling-impelled stones and the first body of horsemen introduced on the battlefield gave birth to the "infantry element" as set apart from the other means of fighting. From the earliest beginnings the most essential feature of infantry in combat was *solidarity*. The maneuver of the ancients on the battlefield sought to work the solid mass of trained infantry to where its compact unyielding force would prove the irresistible power that smashed the hostile force and shattered its solidarity. From this need for solidarity and the consequent infusion of a singleness of purpose through the ranks come the first infantry battlecry, "Stand steady," and its companion, "Forward," that the mass might close with the enemy. The acme of this spirit was the Macedonian Phalanx with its twenty-foot spears. From this heredity comes the present motto of the American Infantry — a bare bayonet under the inscription, "Follow me."

Against the phalanx was hurled all the might of Persia, the military power of that day. Huge armored chariots with wide scythes played the part of the modern tank, but because their antagonist's motive power was made of flesh and blood, the solid Greek infantry mass stood firm. Not until the phalanx collided with the

Roman legion did it meet its master. The secret of the legion's success was a new factor, the firmness of smaller subdivisions of infantry, and their ability to respond to battlefield control of their leaders. Thus, solidarity plus flexibility overcame the hitherto unbeatable phalanx. The infantryman had learned his second great lesson—maneuver without loss of solidarity. To this day the problem of successful infantry organization is still a balance between maneuverability, with its necessary control measures, as against the need to exert a powerful shock action at the right place and time.

The decay of the legion was from within. Its discipline and consequent solidarity waned and infantry went into a long eclipse, dominated by the knight in armor—the first "armored force" of history. Small armies, strong in armored heavy cavalry, dominated the field except in those isolated cases where infantry units stood successfully against them. War became a pageant. The infantry was only the setting for the show. Some draw an apt comparison today. They reckon, however, without the true nature of an infantry steeled to "stand steady" and "close with the enemy," and an infantry equipped to produce the power to do so.

The invention of gunpowder put the knight out of his seat, and restored to the infantry its ability to stand the impact of any force. This ability has never been seriously challenged until today. Not until the mass of armored motor vehicles—called by accident "tanks"—again changed the aspect of the battlefield. Gunpowder introduced to the battlefield a powerful ally for the infantry—artillery; and it marked the beginning of a combat team which has become inseparable and so fused in battle as to be almost an inseparable battle combination. The need for various types of close artillery support for infantry has so increased that one almost wonders if the "Infantillery" as described in a recent article in the *Infantry Journal* isn't a distinct possibility, and an answer to the question of who is to shoot which gun at the tanks!

An infantry soldier's field equipment. Note new-style helmet. (*Photos by U. S. Army Signal Corps.*)

With its own small firearms and its team mate, the artillery, the infantry entered a new era. To gain solidarity it must discipline its men to walk through hostile fires delivered from sources at which it could not fight back.

Frederick the Great devised maneuvers which carried his infantry through the storm of battle, closing serried ranks as they went. Only in late years have we discarded his close order system of disciplinary drills, so well designed to carry the foot soldier forward. In World War I the infantry reached the peak of disciplined courage, marching forward through a storm of shot and shell for over a mile of hell-strewn terrain while the soldier never saw an enemy. Modern bombardment aviation can hold no more terror to deployed infantry than the artillery barrages of 1914-1918, provided the age-old spirit of solidarity and control are installed, and the determination to push forward established.

In 1941 the infantry soldier looks into a dreadful inferno on the new battlefield. The chariots are back, the flamethrowers are back, the artillery shells still roar from the ground and bombs spew from the air. Any semblance of his old Frederickian formations, his solidarity measures, are certain to be blotted from the face of the earth. The word "solidarity" seems to mock him from the ages! The battle flows and undulates, but cannot be formed. Everything that a good foot soldier could reckon as his kind of a war has become confused and elusive. Is he headed for another

eclipse — destined to be "trimmings" for another age?

"Send up the bloody infantry," radioed the victorious tank commander at Sidi Barani. He wanted someone to take over the horde of prisoners he had captured! A sad commentary to tarnish the crown of the "Queen of Battles"—more apt for a scullery maid!

Air infantry loading antitank gun

What has the infantryman to meet the test of modern battle? What aids to stand by him when he pits his flesh and blood against all the steel around him? What does an infantry regiment consist of?

First, he has the age-old shock echelon—the rifle element. Out of a regiment of 3,300 men, there are about 900 tough riflemen still with bayonets (the atrophied spear of old) on their new semi-automatic rifles. Theirs is still the function to close with the enemy—until *they* arrive at the assault, the infantry battle has not become complete. Until they arrive on the objective, the wires do not flash home the news of victory. Gone is their old shoulder-to-shoulder advance. Gone even any semblance of a "line of advance." These men fight in small groups, make up a "battle of blobs." Never before has such a premium been put on the training of the individual soldier, on the superior quality of leadership of the junior noncommissioned officer. At no point in history has the problem of control, communication, and liaison been so difficult. The "combat team" must be carried down to the smallest echelon, lest the "battle of blobs" become a senseless melée and the infantry lose its sense of cohesion—its solidarity—which today exists only in the singleness of purpose of groups of individuals, whose well directed, concerted action spells the same irresistible force of the old massed ranks of pikemen.

Air infantry in transport plane

The rifle echelon is divided into nine rifle companies, grouped three to a battalion. Each rifle company has almost equal fire power of a World War battalion. The company is divided into three rifle platoons and a supporting weapons platoon. The rifle platoon in turn comprises three twelve-man squads and a supporting automatic rifle squad. The weapons platoon contains two light machine guns and three 60-mm. mortars.

The tactics

of the rifle company are simple and direct. Push forward the independent "blobs" or small units. Jam the supporting weapons up close and rake the enemy where it hurts most. Work the semi-automatic rifles up where their superior fire power can still put down the deadliest fire on the battlefield—accurate, individually-aimed rifle fire. On defense a rifle company can quickly transform a tactical locality into a hornets' nest for an attacker.

Behind each three-rifle-company battalion is the battalion heavy weapons company, forming the first close-support echelon. The heavy weapons company contains two caliber .30 machine-gun platoons of four guns each, an antitank platoon of four caliber .50 machine guns, and a platoon of four 81-mm. mortars.

The caliber .30 machine guns form the support echelon for early stages of the attack, protect the flanks against counterattack by hostile ground troops and are an able close supporting weapon when our own tanks attack, as they are poison to enemy antitank guns, and are able to spatter them even while friendly tanks are on the hostile position. On defense these guns still furnish the deadly final protection lines of fire for the position.

60-mm. infantry mortar

The caliber .50 guns, manhandled by their crews right up into the front lines, are the protection against mechanized attack by light hostile armored vehicles and the trucks and other motor vehicles which are encountered by the rifle elements at fleeting moments during an attack.

The 81-mm. mortar platoon keeps close to the attacking echelon, its observers frequently mingling with the rifle elements. The fire of its mortars is brought down on targets either defiladed from the artillery or those which time and liaison arrangements make impracticable to utilize artillery fire.

Behind the battalion heavy weapons company is the regimental antitank company of twelve 37-mm. antitank guns. This is the unit upon which the infantry depends for front-line protection against enemy tanks. Though the artillery combat team mate can engage enemy tanks, it does so to the detriment of its fire-support mission to the rifle troops. To this latter end all other means must be subordinated. For powerful concentrated fire support, the infantry regiment depends upon its supporting artillery and upon light bombardment aviation. In World War I, artillery fire support in the attack could be arranged to the limit of fire of the artillery from initial positions, but after displacement it frequently fell off in volume and accuracy. Today supporting aviation can supply the need for close support in later stages of an attack, and in adding to the flexibility of supporting fire on the defense.

In this modern "battle of blobs," the vision of artillery liaison officers, and indeed of the higher infantry commanders, is greatly limited. Confusion as to locations, objectives and targets comes earlier. Hostile and friendly tanks roar through the formations. Artillery units will have liaison with infantry headquarters but the location of only the rifle troops of a small sector near them may be known. When the enemy tanks come, trained, disciplined infantry will take to the ground until they pass to be engaged by rearward echelons. Then the infantry will press on to engage the enemy infantry following the tanks or disgorged by armored vehicles in the vicinity. In such a melée the artillery is apt to find itself attached by circumstances if not by orders to small infantry units—absorbed in a "blob." On defense a small force of infantry and artillery may be isolated in a tank-proof locality where it may remain a determined thorn in the side of the enemy advance. All this seems to indicate that the fight will be furious but relatively brief, and that long-winded, carefully prearranged liaison and cooperation will be swept aside frequently, junior officers and NCOs of both infantry and artillery will be left to improvise an effective combat team on the spot!

Aside from the fighting organization of the combat infantry regiment, many variations of transport have been devised to give the infantry units tactical or strategic mobility. The "standard" rifle regiment, organic to an infantry division (either square or triangular) has

all weapons carriers and supply vehicles entirely motorized. The only marching infantry is the rifle element. The motorized infantry regiment simply provides motors for everyone and rolls to the battlefield on trucks. There is no difference in the fighting power.

The so-called armored infantry regiment rides in armored personnel carriers, which enable it to enter the battlefield itself on trucks, where the regiment follows the tanks to seize a vital locality. Since its battle mission is more apt to be defensive in character, its organization has a smaller rifle element, all units carry a heavier complement of automatic weapons. The regiment has only two battalions, since its third or maneuver battalion is not necessary during an armored action.

The infantry has also taken to the air, both as parachute troops and air-borne infantry.

The parachute infantryman is one of the most versatile fighting men yet produced in modern war. Conceived originally as a small-time, rear area destructive force, which could be landed unawares to the enemy, and destroy vital communications, the parachute unit has grown, until we see large hard-hitting forces landed in a major effort, capable of seizing vital strategic objectives, and acting as an advance guard to larger bodies of air-borne troops landed in planes and gliders. For the ultimate use of parachute and air-borne infantry, the sky is literally, as well as figuratively, the limit. In the recent Crete invasion, a relatively small, but powerfully equipped, air-borne force was able to plummet down on a ground force and, aided by superior air support, to successfully win a major battle. In the main, in such attacks the infantry depends almost entirely on combat aviation for artillery supporting fires. However, field pieces were landed, and there is no reason to believe that the artillery combat team mate of the infantry will not also take to the air.

The essential difference between air-borne and parachute infantry lies in the fact that in the case of parachute troops the air corps only guarantees to get them over their objective, the landing is an infantry matter. In the case of air-borne troops the air corps must actually place the troops on the ground. For this reason the parachute infantry is equipped with light automatic weapons and light mortars, and every man must be trained to operate any weapon in the unit. One cannot be sure, for instance, that the mortar will always drop alongside of the mortar crew.

In the case of air-borne infantry, however, once landed its problem is much the same as ordinary ground infantry, except that it will be initially devoid of transport, and must manhandle all of its supporting weapons.

In the American infantry today there is organized one parachute battalion with three more coming into being in the near future. Each battalion consists of about 500 men and is divided into three companies of about 120 men each. The heaviest weapon carried is a 60-mm. mortar.

The battalions are a part of a provisional parachute

11th Infantry on the march, passing horse-mechanized cavalry unit

group for training purposes. Tactical groupings for combat and relationship with other arms and services are still in the development stage.

No essentially air-borne infantry units have been formed, although training has been conducted in this important means of transportation. It is not difficult to foresee that the transport plane may well replace the truck in many of our infantry units, just as the truck replaced the escort wagon. Speed, ever more speed "to get there fustest with the mostest men."

The final development for infantry, not yet attempted, but quite feasible, is a truly armored infantry regiment, whose fighting units man guns in slow-moving mobile forts which can be rolled onto the battlefield, seizing all important objectives and holding them against all but siege artillery and heavy air concentration. This indeed would be a reincarnation of the ancient phalanx — its twenty-foot spears replaced with bristling gun barrels, but essentially the same. Warfare like all other historical matters swings in a slow circle, doubling back on itself.

So long as infantry can be armed or armored to retain its offensive power, to close with the enemy and exert the pressure of its solid mass to win a decision, it remains the deciding influence of all combat, whether or not it uses tanks or any other type of weapon, whether or not it floats to battle in a parachute, glider, or what have you. The basic characteristics remain unchanged.

AA PROTECTION FOR GERMAN FIELD ARTILLERY

According to the German regulations all artillery units are thoroughly trained to protect themselves against low-flying planes. The following are extracts from these regulations:

When machine guns are used against aerial targets, an effort should be made to have all the rifles of a platoon also used in the defense under the orders of the platoon commander.

Riflemen will, as a rule, fire at the plane nearest to them.

Riflemen will fire standing, kneeling or sitting, depending on the configuration of the terrain. It is permissible to dispose the men for firing in any position in which they will not hinder each other in firing.

The range is usually estimated when the battery is firing.

When machine guns are used, aerial targets cannot be fired upon effectively unless several guns are employed. In selecting fire positions for the machine guns, care must be taken to see that approaching planes can be brought under fire promptly. The best machine-gun positions are 300 meters from the unit to be protected.

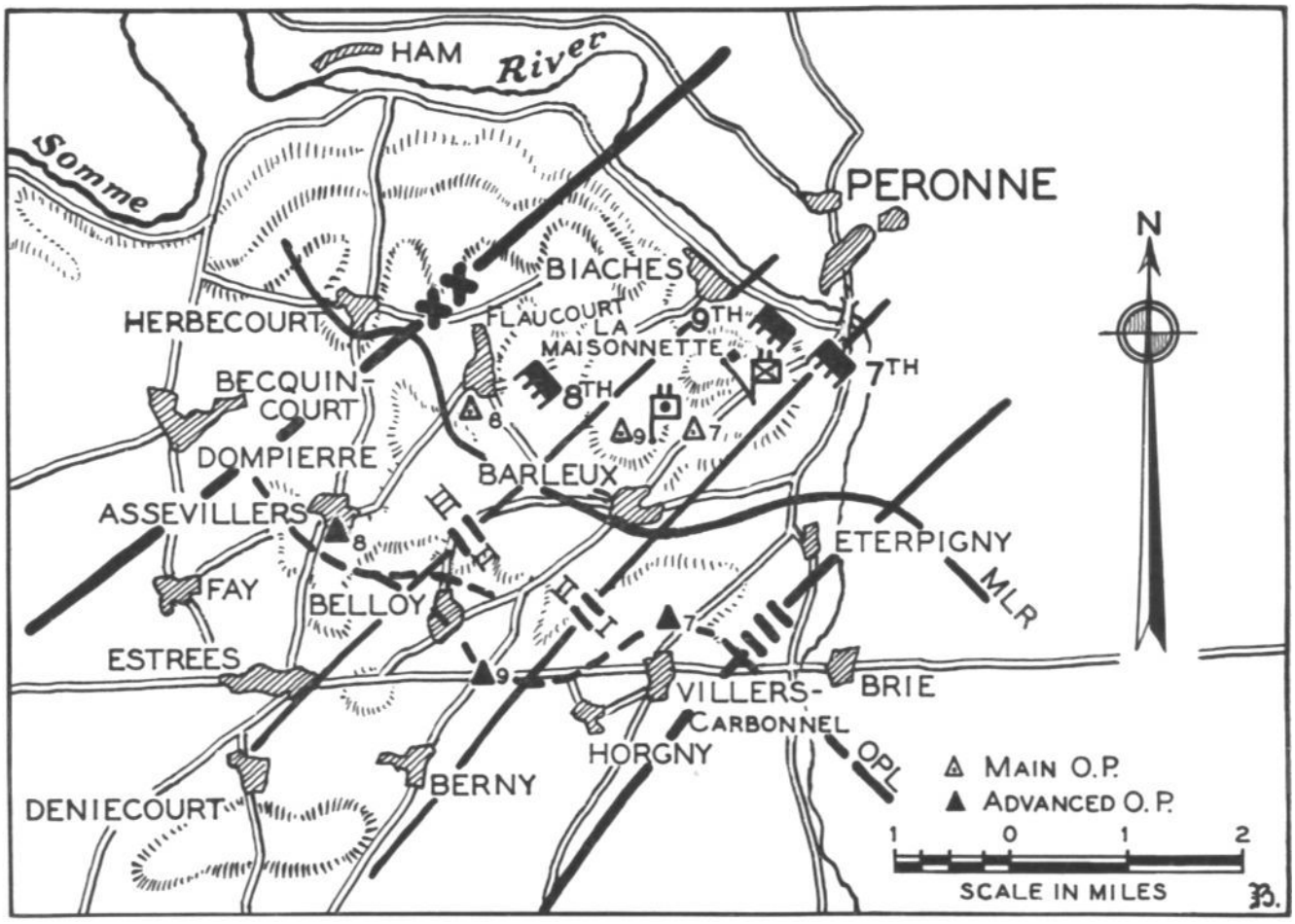
In order to eliminate the dead space over each machine gun, it is expedient to echelon the guns at intervals and distances of about 50 to 60 meters.

One should make sure that each machine gun has an unobstructed view, and can be fired without hindrance in all directions. Machine guns located in the vicinity of trees, buildings, etc., can either not be fired at all or cannot be fully effective. Objects that can be removed quickly (branches, etc.) should be used in camouflaging them. Avoidance of all movement until fire is opened is the best camouflage.

As soon as aerial targets are visible, the guns should be trained on them, even when it is not certain that they are enemy planes. If this is not done, the guns cannot be fired promptly. As soon as it is certain that the planes belong to the enemy, the commander orders fire opened by giving a prearranged signal or by ordering the directing gun fired.

As a rule, a target cannot be assigned to each individual machine gun. The machine guns therefore at first concentrate their fire on the leading or lowest-flying plane. During the further defense, the target at which the directing machine gun (the one at which the commander is stationed) is firing is brought under fire by all the machine guns.

Strictly
ACCORDING TO THE BOOK



I

While the Battle of Flanders was in full swing, the infantry division to which this battalion of light artillery belonged was acting as flank protection in a sector along the Somme from Peronne to Ham. It developed that the far bank of the Somme was only weakly held by the enemy; and therefore "Combat Team G" was given the mission of crossing the river and establishing a bridgehead near Peronne. The bridgehead was to serve as a base for future operations. "Combat Team G" was composed of an infantry regiment, reinforced. Among the units attached to the infantry regiment was the artillery battalion with which this account is concerned.

In due course, the commander of the infantry regiment and the commander of the artillery battalion drove out by motorcar for the purpose of making a personal reconnaissance of the terrain. The artillery commander formed his estimtate of the situation, and on the spot he gave his views to the infantry commander (see map):

"The mission requires a deep bridgehead. From the standpoint of the artillery, observation points as follows must be secured: The ridge west of Flaucourt and the heights north of Barleux. This will give observation up to the general line Assevillers-Beloy-Villers Carbonnel. In order that an approaching enemy may be kept longer under observed fire, advanced observation posts should be established near the line of infantry outposts. Thus, advanced observation posts should be established on the ridge west of Assevillers, on the flat ground south of Belloy, and on the ridge near Villers Carbonnel. From these advanced posts, observation may be extended to the general line Fay-Estrees-Deniecourt-Berny-Fresnes."

Baptism of fire of a battalion of German light artillery in the campaign in France

(Major Reinicke, in Artilleristische Rundschau, February, 1941)

After the reconnaissance, the infantry commander decided to locate his MLR and his OPL about as indicated on the sketch. The various OP's of the artillery battalion were located about as already described—and as plotted on the sketch.

The batteries of the battalion, which were in position on the east bank, now were to be brought on across the river in order to increase their effective ranges, and in order to shorten lines of communication. Concealed positions were located for two batteries on the reverse slopes of the river bluffs near Maisonnette, and for the other battery just east of Flaucourt.

The batteries received the order to move to the new positions west of the river on the evening of May 23. By the following morning, they were in the new positions, ready for action. The locations of the various elements of the battalion—CP, OP's, batteries—are indicated on the sketch.

II

During the morning of May 24, members of the battalion CP and of the battalion OP details dug themselves simple vertical - sided holes, each as deep as a man's height. It was historic ground, fought over during the World War. In digging, one constantly was encountering old rusty grenades and items of equipment. Nearby was a great war cemetery.

Meanwhile, reconnaissance and observation were carried on with vigor. Still, there was no evidence of the enemy. Into the battalion CP came a steady stream of messages, including sketches of the surrounding terrain.

The batteries moved in column to the new positions, each vehicle using the same tracks. The guns were placed left and right along the road. They were carefully camouflaged. Ammunition was concealed in holes dug in the ground. There were no dug-in emplacements for the guns, since it was not expected that the positions would be occupied very long. The machine guns were set up to the rear and to the sides, as protection against air attacks.

The guns were brought into position early in the morning—in some cases, near dawn. At first, they were oriented by magnetic compass, used in connection with the available maps and the recognizable terrain features. The maps were to the scale 1:80,000; the recognizable terrain features were mostly church towers. Later, the orientations were checked and improved by survey.

Observed targets were assigned the batteries as follows:

a. Targets beyond the OPL, under observation from the advanced OP's: the villages Fay, Estrees, Deniecourt, Berny.

b. Targets beyond the MLR, under observation from the main OP's: the villages Assevillers, Belloy and Horgny, and the woods northeast of Belloy.

The 8th Battery, located on the right of the sector, covered an area so broad that it could not all be observed from the battalion CP. Thus, the 8th Battery was given the independent mission of covering the front of the III Infantry Battalion immediately on the approach of the enemy.

Communication between the battalion CP and the CP of the Combat Team (the latter in La Maisonnette) was effected by telephone wire, laid by the artillery signal detachment. Later, the battalion CP itself laid a wire to the nearby CP of the II Infantry Battalion.

Finally the hour arrived! Finally, after the long and uneventful marches through southern Belgium and France, the battalion was able to fire a shot in anger. It was the first real shot of the campaign.

At 8:30 AM came the order: *Fire when ready*. The batteries proceeded to check their survey data. Occasional enemy shells fell in the vicinity; but now, as later in the campaign, there was no question of any important enemy attack.

About 9:00 AM, the commander of the 8th Battery, who had been observing from his OP, noticed individual soldiers moving in the woods just south of Assevillers. Friend or enemy? Could these be German scout patrols?

The commander of the 8th Battery talked the situation over with the commander of the III Infantry Battalion, who happened to be in the vicinity. The latter was certain that the individuals in question were enemy. By then, it was possible to make out vehicles—vehicles that definitely were French. There no longer was any doubt. Fire was opened immediately. The fire was observed, and it was accurate. It appeared that a prospective enemy attack, to be made by units sent forward in trucks, had been nipped in the bud.

After the incident just described, the battery commander travelled by motorcycle to his advanced OP on the eastern edge of Assevillers. There, in front of the OP, the battery commander saw the following picture: a detachment of French infantry had advanced from the south in trucks, had detrucked and had moved toward

Assevillers. German outposts were firing on the enemy, and the latter now were pinned to the ground a few hundred yards away. They were returning the German fire with their own machine guns. The battery commander saw that his observer was away apparently on a reconnaissance mission. However, the radio section was still at the (forward) OP. Thereupon, the battery commander decided to take over the OP and to bring the fire of his battery on the enemy without delay. First, he looked for a better point of vantage, and soon found a window in a nearby house. There he installed the radio set, and soon was in contact with his battery. The first rounds were laid far beyond the French, this in order not to endanger the German infantry. Progressively, the fire was brought nearer the French, until finally it was registered squarely on them. It turned out that the enemy were Moroccans. Within a few minutes they had been completely shattered. Afterwards, a short counterattack by the Germans yielded 30 prisoners, 12 motorcycles, and considerable other booty.

While awaiting further evidence of enemy action, the battery commander directed some fire on the northern exits of Estrees and Deniecourt. Meanwhile, he established personal contact with the outpost company of the III Infantry Battalion. The CP of that company was in Assevillers. Through the remainder of that day, and through the next day, the battery commander directed the battery's fire from the advanced OP. Always he maintained close contact with the infantry company.

While the events described above were in progress, the 7th and 9th Batteries proceeded to take designated targets under fire. Among other things, the 9th Battery used the village of Berny for adjustment (for use as a check concentration). Only the low church steeple and the roofs of some houses of that village were visible. However, the battery succeeded in bringing the bursts and the roofs into coincidence. The data were recorded, and were to prove very useful in the following days.

The forward observer of the 9th Battery meanwhile had moved to the vicinity of the outposts of the II Infantry Battalion, near the road junction just south of Belloy. There he had established contact with the commander of the outpost company, and had established telephone communication with the OP of the battery.

The advanced observer of the 7th Battery meanwhile had gone forward with the outposts of the I Infantry Battalion in the direction of Villers Carbonnel. Between 9:00 AM and 10:00 AM, as the outpost detachment approached the village, there came from the latter a hail of machine-gun fire. Hostile artillery fire also was falling in the vicinity. At the same time, the observers at the battalion OP got a fleeting glimpse of enemy tanks on the edge of the village. Thereafter, despite the most careful observation, nothing more of the enemy could be seen. Acting on its own responsibility, the 7th Battery opened fire on the village. A few rounds fell short. Then, since the exact locations of friends and enemy were not known, fire was suspended.

After a short time, the forward observer of the 7th Battery reported to the battalion CP as follows: "The outpost detachments of the I Infantry Battalion which were advancing to Villers Carbonnel have been surprised in and near that village by French tanks. Villers Carbonnel is occupied by the French. Possibly some of our own infantry is there also." Due to the latter possibility it was not practicable to resume fire on Villers Carbonnel. However, the batteries were ordered to shift to new aiming points, and to make ready to fire on the village.

Meanwhile, the commander of the 7th Battery had gone forward on his own responsibility in order to clear up the situation as regarded the German infantry. He returned shortly to his own OP and reported to the battalion that the entire village was occupied by the French. About the same time, the II Infantry (which was in contact with the artillery battalion) reported as follows: "The village of Villers Carbonnel is occupied completely by the French." Thereupon, the 7th and 9th Batteries were ordered to open fire. The batteries opened simultaneously. Only a few siting-in shots were required—thanks to the careful calculations which had been made on the 1:80,000 map. The fire of the batteries was accurate, and was interspersed with pauses.

After a time, the battalion received a message from the II Infantry Battalion stating that enemy movements had been observed in the draw just south of Horgny, in the direction of Villers Carbonnel. The 9th Battery was ordered to lay a planned (schedule) fire over the area. The center of the area to be covered was designated as the road junction in the draw 400 yards southeast of Horgny. It would be necessary for the enemy to cross that point. Since the fire could not be observed, the battery first fired a few rounds with high bursts in order to check the firing data for deflection. After that, several salvos were distributed over the area.

About 11:00 AM, enemy movement again was observed on the northern edge of Villers Carbonnel. Through the range finders there could be seen individual riflemen, advancing by bounds through the village. It appeared that the enemy infantry was preparing to attack. Appropriate orders went out immediately to the 7th and 9th Batteries: "7th and 9th Batteries prepare to fire on northern edge of Villers Carbonnel." The two batteries had only to apply the data previously obtained. Therefore, after a very short time, came the further order: "7th and 9th Batteries, prepare to fire—20 rounds each—in one minute—ready—20 seconds—10 seconds—ready—FIRE." Instantly the trajectories of the projectiles of the two batteries were traced in smoke over the OP. Clouds of smoke arose from the edge of the village as the shells exploded. The houses were completely obscured. When the clouds had cleared away, no trace of the enemy could be seen. The batteries were ordered to fire a few more salvos, at irregular intervals, through

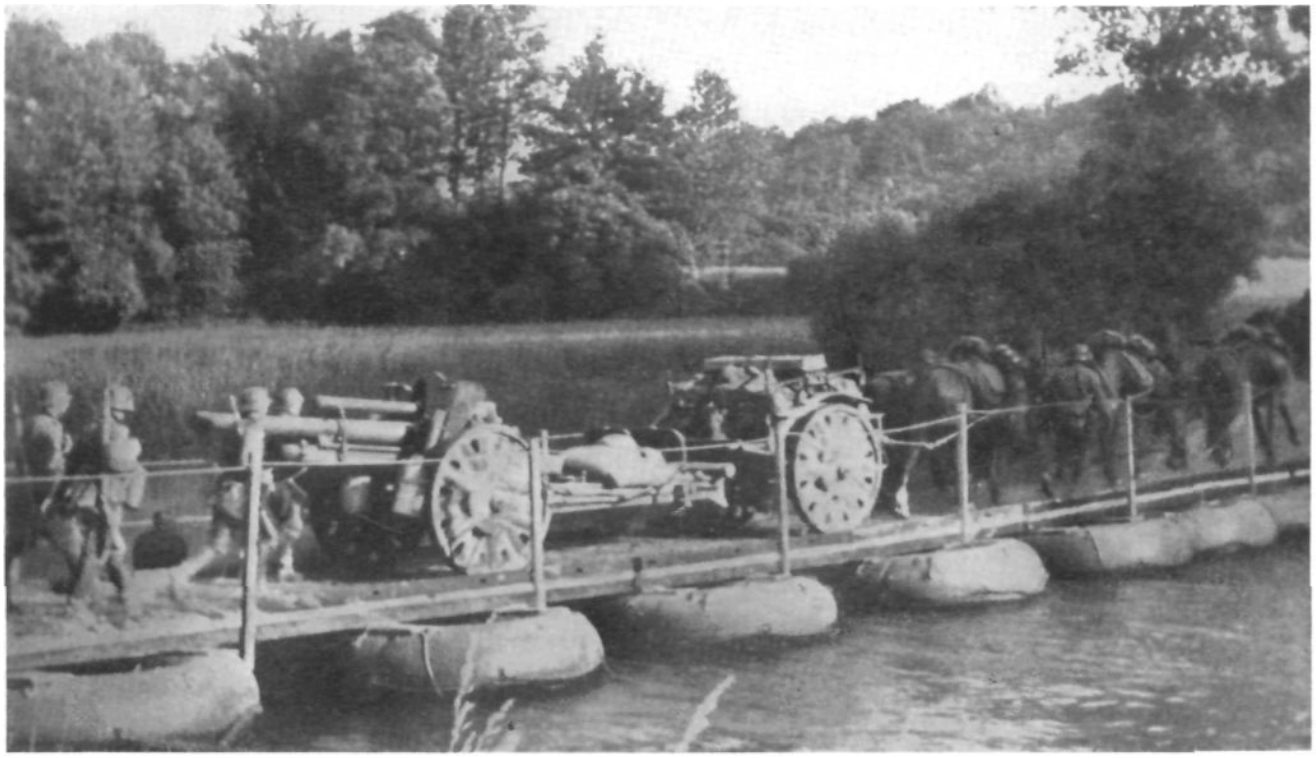
the village. Meanwhile, in the village, a fire had broken out.

About 11:30 AM, there came a message from the artillery liaison officer with the Infantry Regiment: "Western part of Villers Carbonnel strongly held by enemy, with many tanks." Immediately came the order: "7th and 9th Batteries—prepare to fire against enemy tanks in west part of Villers Carbonnel—30 rounds per battery—in two minutes—ready—FIRE." The fire again was accurate. According to reports received later from German infantrymen who had been trapped in houses in the village, about 30 French tanks and many French troops fled from the village after the concentration began to fall. Two damaged tanks were found in this part of the village when it finally was occupied by the Germans.

About noon, the battery commander of the 8th Battery had observed enemy soldiers apparently attempting to dig themselves positions about one mile west of Belloy. He ordered his battery to fire on the area at once. The enemy troops dropped their digging tools and ran for cover. Later, the battery dropped a few rounds on an assembly area behind a woods west of Belloy. Here again, the French troops were shattered.

After these events, there followed a period of quiet. It was an early-summer day, clear and warm. Here and there were fields of half-grown grain, and fields of turnips and other vegetables. From the south there came sounds of artillery fire. Everyone was tense, expecting an enemy attack at any time.

About 3:00 PM, the forward observer of the 9th Battery, who was with the outposts of the II Infantry Battalion south of Belloy, reported that strong enemy units were assembling in Berny. He asked for fire on that village. It will be recalled that during the morning the battery had fired on the rooftops of Berny (a check concentration), and therefore some firing data was available. However, the forward observer was ordered to observe the fire and to correct it so that it would fall on the occupied parts of the village. Over the telephone, the observer reported that he was far off to the side (lateral observation), and that his view of the bursts accordingly was not very satisfactory. He reported: "200 yards to the left. 100 yards shorter." The corrections were made. Then came another report: "Just a shade to the right. 50 yards longer." Again the corrections were made. Then came another report: "Fire is accurate. Fire for effect." By order of the battalion, the battery fired 40 rounds.



German horse-drawn artillery crossing a stream by ponton on their early summer drive

The forward observer of the 9th Battery continued to observe and report in the manner just described throughout the day. The enemy continually sought to escape the fire by changing positions. The outposts, who also assisted in the observation duties, were relieved of much hard fighting by the artillery fire.

Later in the day, after the 9th Battery had expended a great deal of ammunition, the 7th Battery took over the mission of keeping Berny under fire. In this connection, the forward observer of the 9th Battery assisted the 7th Battery.

About 5:00 PM, the forward observer of the 9th Battery reported: "Enemy is attacking from Berny." This movement could not be observed from the battalion OP. The battalion commander immediately ordered the batteries to fire on order from this forward observer. The 9th Battery and, later, the 7th Battery, thereupon engaged the advancing enemy. The latter now had deployed over a width of about 200 yards. All fire was observed, and, with ranges constantly decreasing, the fire was accurate. Finally, the attacking hostile ranks broke, and their troops withdrew into the village.

Next, the enemy brought up machine guns, emplaced them along the edge of the village, and took the German outposts under fire. Under the cover of this machine-gun fire, the enemy renewed the attack in another direction. Again, the forward observer (of the 9th Battery) ordered the batteries to fire, and again he furnished observation for that fire. At times, he was scarcely able to raise his head above the ditch in which he was lying, due to the heavy grazing fire of the French machine guns. However, he directed the fire on the targets, and once again the French troops were forced back into the village. They left many casualties on the field. The commander of the infantry outposts sent his thanks for the artillery support, to the artillery battalion commander through the telephone of the forward observer.

Following the attacks from Berny, the 7th and 9th Batteries were ordered to conserve ammunition. Thereafter, they fired only a few harassing rounds into Berny every now and then. It was desired to conserve ammunition against the prospect of a major French attack, which might occur with tank support.

The commander of the 8th Battery observed about 7:00 PM strong motorized enemy units leaving Estrees-Deniecourt. The battery took the column under fire immediately, whereupon the enemy soon was forced back into the villages. In about one-half hour, another incipient attack from Estrees-Deniecourt was smothered by fire from the 8th Battery. During these actions, the German outposts had not fired a shot.

The expected French attack had not materialized by nightfall. During the night, it was planned to fire concentrations over areas selected in conference with the commander of the infantry regiment. These areas consisted chiefly of the villages which lay just beyond the outpost line. In the firing positions and behind the OP's, tents were pitched. Under cover of darkness, the anxiously-awaited ammunition replenishments came up. Six hundred rounds were taken from the ammunition train direct to the firing positions.

III

By morning, all posts in the firing positions and in the OP's were manned. Already, it was known that German motorized divisions had advanced beyond Amiens on the way to the coast. The situation in general was such as to indicate that the enemy would be preparing heavy counterattacks. However, at dawn on May 25, everything still was quiet.

German artillery preparing to cross ponton bridge

In the course of a shifting of units, it now was announced that another infantry division would take over this sector. At noon (May 25) the commander of the relief artillery battalion and his battery commanders arrived at the battalion CP in order to become advised on the situation. The batteries in position were ordered to get all data in shape to turn over to the relief batteries.

Throughout the day, things remained quiet, the only activity being furnished by an occasional French reconnaissance airplane. However, about 7:00 PM, with the commander of the relief battalion still at the battalion CP, reports of enemy activity began to come in. Machine-gun fire was reported from the direction of Berny. Enemy artillery fire was falling on the outpost position of the II Infantry Battalion along the road northeast of Berny. Communication with the forward observer of the 9th Battery was lost. Flares sent up by front-line units carried the words "Enemy attack."

About this time, the battalion commander was called to the telephone, where the commander of the II Infantry Battalion reported strong enemy units in Belloy, and requested fire on that point. The decision was to lay the fire of the 9th Battery on the attack coming from Berny, and the fire of the 7th Battery on the attack coming from Belloy.

Since the terrain around Berny could not be observed from the main OP's, the 9th Battery went ahead and fired several ranges on data which had been secured previously when the forward observer was operating. When enemy activity around Berny subsided, the fire of the 9th Battery was shifted to Belloy.

About 8:00 PM, the II Infantry Battalion reported that several companies of French troops appeared to be moving from Berny toward Villers Carbonnel, over the draw east of Berney. It was assumed that the enemy would have reached Villers Carbonnel by the time the message arrived; therefore the 7th Battery was ordered

to drop a few rounds at irregular intervals on the western edge of that village.

Meanwhile, in the firing positions, the relief of the old units had begun. The guns were pulled out and replaced one at a time. As a new gun would go into position it immediately would take up the firing mission. In this way, the relief proceeded without interfering greatly with the firing of the batteries. By 9:00 PM, the commander of the 9th Battery had the four relief guns in position and was directing their fire. However, due to the tenseness of the situation, it was not practicable at this time to effect the relief of OP's and communication systems.

While these events were in progress, the enemy artillery shifted its fire to the draw and woods west of Barleux. Shells were exploding within 100 yards of the battalion CP. However, it appeared that the exact location of the OP was not known to the enemy.

At 9:00 PM it was just twilight (summer time). At that time, the battalion commander was called to the phone, there to receive two urgent messages. One was from the commander of the II Infantry Battalion, the other from the commander of the Infantry Regiment. Both messages requested heavy fire to be laid immediately on strong French units in Belloy. Thereupon, the battalion commander gave the order: "All three batteries, fire immediately on Belloy."

German artillery OP in tree

The first rounds had scarcely fallen on Belloy when there came new messages: "Enemy attack from Villers Carbonnel." The situation was about as follows: Two or three companies of enemy troops were moving along a front several hundred yards wide from the northern edge of Villers Carbonnel toward Barleux. Among the infantry units there could be seen a few horse-drawn vehicles, assumed to be mortars. No fire, machine gun or otherwise, was coming from the advancing troops. The outposts of the II Infantry Battalion, entrenched to the front of Barleux, could not see and therefore could not fire on the enemy units moving on the plateau of Villers Carbonnel. The battalion commander gave his orders: "7th and 9th Batteries, discontinue fire on Belloy. Fire on enemy attack near Villers Carbonnel. Range, 400 yards short of the edge of the village. 8th Battery continue to fire on Belloy."

The guns were swung around against Villers Carbonel within a few seconds. The first rounds hit too close to the village, since the enemy was advancing all the time. Then came the order: "Range 400 yards shorter." The next volleys lay just right for range, but all shells were falling on the enemy's left flank. Therefore, another order: "9th Battery fire right from church tower: 8th Battery left from church tower." By now, parts of the enemy had reached a half-grown grain field, and had concealed themselves in it. The field was searched with high explosive. The detonations raised clouds of smoke and dust, plainly visible at the OP's. The enemy advance had come to a halt. The smoke and dust prevented accurate observation, and led therefore to a short pause in the firing. The enemy now attempted to slip to the left by bounds of small units, this in order to get out of range of the artillery fire. The moves were followed by the 7th Battery, which shifted its fire as the enemy moved.

Near the center of the enemy attacking force there now was noticed considerable activity near a wooden house. It seemed that the enemy troops were taking cover behind the house. The 9th Battery therefore was ordered to take the house under precision fire with one gun. Meanwhile, under cover of the clouds of smoke and dust (which hung in the air for minutes), the enemy had withdrawn back into the village. The fire of both batteries again was directed on the latter. This fire was irregularly spaced, and was concentrated on the northern edge of the village.

It now was 10:00 PM, and darkness had fallen. The 9th Battery reported it had only nine shells on hand; but the relief battery eased the situation by turning over about 200 rounds. It developed that most of the 600 rounds with which the battalion had started the day now were gone. By far the greatest number had been fired since 7:00 PM.

There was to be yet another alarm. It came by way of a motorcycle messenger who drove up with the report: "French tanks. Heaviest type."

In the darkness nothing could be seen. The report seemed questionable but not impossible. The 7th Battery was ordered to fire a few rounds at the range at which it had last been firing. Then from the front came the word: "French tanks in Barleux." At the same moment, several antitank guns, drawn by trucks, drove by, headed for the front. The 7th Battery was ordered to suspend its fire. Up ahead, the darkness was pierced by a searchlight which had been brought into position and now was lighting up the terrain toward Barleux. However, still there were no tanks to be seen. Later it was learned that a few French tanks had indeed advanced toward Barleux after dark, but they had turned around and returned to Villers Carbonnel before reaching Barleux.

Now the relief of the OP's and the telephone systems went ahead. The batteries assembled on the road Biaches-Peronne, and moved away in the dark to new missions.

Fortunately, the battalion had been able to test its organization and training in the simple engagements described above during the first days of the campaign. The gun crews had learned a great deal in the two-day action along the Somme. After every firing mission, as soon as time would allow, the purpose and results of the firing were explained to the cannoneers. Thus, throughout the batteries, morale was high. All enemy attacks had been repulsed, many without the necessity for action by German infantry. The latter had learned that they could have complete faith in their artillery.

EDITORIAL COMMENTS

1. Although this was a semi-defensive situation, the guns were not dug in. They were carefully camouflaged, however, and slit trenches were dug by the personnel at battery positions, CP, and OPs. Ammunition, too, was protected.

2. Forward OPs were established for each battery, as well as the ordinary OPs. Thus there were at least six OPs for the battalion. Note that the forward observer goes out from the battery, not from battalion, and he fires his own battery, usually, unless he sees a mission which requires the battalion. Then the fire of all three batteries may be directed by him. Thus the Germans employ decentralization or centralization of fire direction, according to the needs of the situation.

3. Wire was used, even to the forward OPs. This differs from other German accounts where, in fast-moving situations, only radio was employed for fire control.

4. Initial laying was by compass, later checked by survey.

5. There appeared to have been more observed fires than schedule fires. But schedule fires were fast and effective because of prior registration or because the results of previous firing were recorded.

6. The Germans check instrument direction with high bursts, for schedule fires, just as we do. Their methods of liaison conduct of fire appear to be exactly like ours.

7. Note the repeated precautions exercised to prevent shelling friendly infantry.

8. Apparently the nearby infantry outposts assisted the artillery forward observation details in watching the sector. Remember, the forward observer party usually consists of an officer and two radio operators, and they are on duty 24 hours.

9. The Germans use shelter tents and range finders, two items of equipment considered outmoded by some of our fast thinkers.

10. The ammunition train delivered 600 rounds of ammunition direct to firing positions after dark.

11. Relief was by section; thus there was no interruption of fire during a critical stage; OP details remained in place where necessary.

12. The battery commander was not a figurehead; and he took over the duties of the forward observer when the latter was away from the forward OP.

13. Note use of searchlights in the front lines when a French tank attack seemed impending after dark.

14. IMPORTANT: After every firing mission, as soon as time would permit, the purpose and results of the firing were explained to the cannoneers—a great morale booster.

In a forthcoming issue we hope to print another article by Major Reinicke describing further actions of his battalion.

COUPLING

By Major Thomas North, FA.

Field Artillerymen interested in German technical professional publications have been interested by the growing use of the term "coupling." In the November, 1940, issue of the *Artilleristische Rundschau* appeared an article by Major Bloedhorn which discusses this procedure in considerable detail. A German Artillery Bulletin, No. 5, has apparently been issued for the purpose of explaining the concept of coupling; previously the term had appeared only in unofficial publications and there had always been some doubt as to its exact meaning. It has been frequently confused, for instance, with massing of fire, whereas it is but a means to achieve this end.

Bulletin No. 5 describes coupling thus:

"If there are available no maps, or only maps of such small scale as 1:50,000, or inaccurate maps of larger scale such as enlargements, then in order to be able to mass the fire [of the battalion] after a careful adjustment of one piece it is necessary that the base pieces, duty pieces, and, if necessary, alternative positions, together with their base lines, be located accurately in their own special survey system. On occasion it may be advantageous also to include the observation posts in the coupling. With maps of 1:50,000 or larger scale, coupling may be helpful in laying the batteries in dense country, or in verifying a base deflection obtained by other means."

The essential characteristic of coupling consists in the fact that all points and lines concerned, i.e., battery positions, OPs and base lines, are surveyed into an arbitrary control system.

The author considers the situation in which no map is available; in this case the necessity for an arbitrary control system is obvious. A similar situation exists in the case of maps of small scale such as 1:200,000 or 1:300,000, which are quite useless for exact work in locating of battery positions, base lines, etc.

The procedure is as follows: An initial survey point such as the base piece of the center battery is given arbitrary coordinates, for instance, x = 50,000, y = 30,000. An initial direction is assumed, namely, the base line of the base piece of the center battery. This base line is made to coincide with the y-line of the arbitrary grid system so that its azimuth is therefore 0 or 6400 mils. On a plain 1/25,000 grid sheet the x = 50,000, y = 30,000 intersection is selected so that it falls near the center and in the lower part of the sheet. The base line falls along the 50,000 y-line. For simplicity, assume that the "duty piece" of the right battery is visible from the base piece of the center battery—the "duty piece" is the piece whose crew remains on duty while the other crews are resting or are otherwise occupied. The angle from the base line of the base piece of the center battery to the duty piece of the right battery may be read with the panoramic sight (or aiming circle) and the distance measured by stadia. If the batteries are not intervisible, a traverse must be run. The coordinates of the duty piece of the right battery may then be obtained by solution of the right angled triangle or by traverse computation. The deflection of the base line of the duty piece of the right battery may be "tied in" by reading the angle to the base piece of the center battery with the panoramic sight, or by traverse. (The author points out that time should not be wasted on too careful alignment in measuring distances; for instance, in a distance of 300 yards measured by stadia, if the instrument is set up at the mid-point but off the line by 5 yards, the resulting error in measurement is only 6 inches.) The left battery is "tied in" by similar procedures. Thus the positions and base lines of each battery may be surveyed into the arbitrary control system and plotted on the firing chart. German texts insist upon the necessity for checking survey operations; in the case of coupling, it is pointed out that no existing control or map data are available. Therefore, there is but one reference direction, and that one is assumed; traverses cannot be closed on known points; backsights cannot be taken with the panoramic sight. Accordingly, the survey procedures should be verified by re-running, using different stations wherever possible.

If 1:100,000 or better maps are available some attempt should be made to orient the arbitrary grid to the map grid system, measuring the latter as accurately as possible. Of course, in such a case, the base deflection of the base piece of the center battery will not be 0 mils in the general case.

The author quotes Bulletin No. 5: "When maps of 1:50,000 or larger scale are available, coupling may be used as a means of facilitating the laying of batteries in wooded country, or to verify a deflection obtained by other means." However, he emphasizes that if good large-scale maps are available (1:50,000 or larger) work is done on the map grid system and not on an arbitrary grid; this is therefore not coupling.

In the December, 1940, issue of the same magazine Major Bloedhorn gives several examples of battalion survey, and of coupling. The American reader will note the tendency in the German procedure, as in the French, to classify as distinct operations certain closely related, similar procedures which in our Service are called by a general name—surveying, traversing, etc., as the case may be. Perhaps the explanation lies in the more highly specialized training of the European soldier; perhaps the poverty of our language is to blame. Once more, also, one cannot fail to remark the reiterated assumption in most of the illustrative examples in the second article that accurate maps are available. Is this but a repetition of the warning prefixed to the discussion of deliberate preparation of fire in our abandoned TR 430-85 to the effect that deliberate methods are given disproportionate emphasis because they are harder to teach? Finally, note the omission of the common orienting line.

The potential value of coupling would seem to lie in

a. Its contribution to the possibility of sudden, accurate, massed fires of the battalion based upon registration by one piece, using a K factor.

b. The possibility of firing map data corrected (having obtained a new VE) a month after registering one piece.

ILLUSTRATIVE EXAMPLES

Pertaining to Chapter 3 of Conduct of Fire

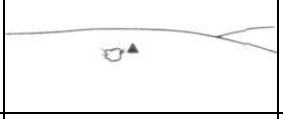
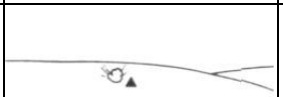
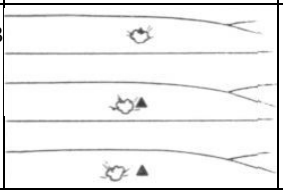
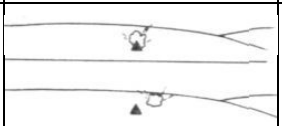
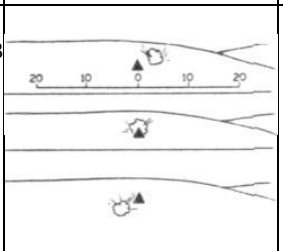
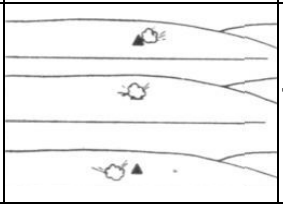
EXAMPLE 5

PRECISION, SMALL *T*

Target: Base point. Mission: Registration. Materiel: 75-mm. gun. Ammunition: HE shell, quick fuze.

T = 200; *r/R* = 0.7; *s* = 6; *c* = 4.

Initial commands: B Adj, Ca 960, Sh Mk I, FQ, No 1 1 Rd,

Commands	Results	Sensings Rn.	Sensings Df.	Remarks
Q. 90		?		22 × 0.7 = 15.
R 15, 90		–		Short on forward slope. Small deviation is ignored. *2-c initial* bound.
L 12, 98		+		
R 6, 94		+		Small deviation, averaging 3 mils left, has persisted, and correction should be made.
R 5, 3 Rds. 92		– – –	- ? ?	Deviation correction: (3 × .7) = R2 ½ *s* = R3 Total = R5
L 3, 2 Rds. 94		+ +	+ ?	3 overs at 94: 3 shorts at 92. All are assumed to have been fired at 93.
R 2, 3 Rds, 93		+ + –	? + ?	With deflection bracket of 1 mil, deflection may be considered correct. 3 more rounds needed to complete second group of 6.
93		+ Target –	? Correct ?	3 overs. 2 shorts. 1 target.

Adjusted elevation: 92.8 [93 — (1/2×1/12×4)].

Two groups of six rounds give sufficient accuracy for the registration.

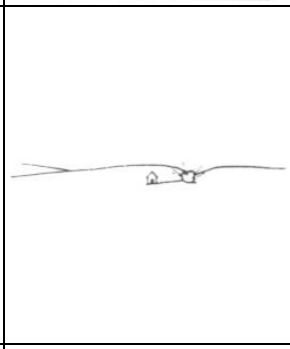
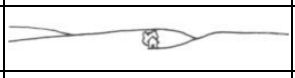
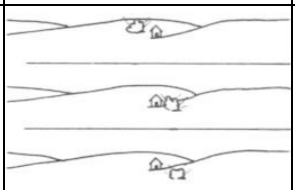
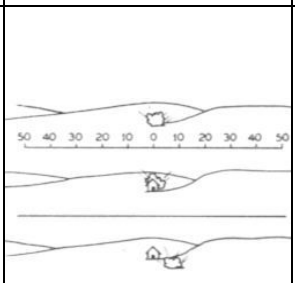
EXAMPLE 6

PRECISION, SMALL *T*

Target: Check point. Mission: Registration. Materiel: 155-mm. gun. Ammunition: HE shell, quick fuze.

T = 270; *r/R* = 0.4; fork = 14; *s* (modified) = 6 [(Fork in yards) 100 × *s*].

Initial commands: No 1 Adj, BDR 380, Sh Mk III, FQ, No 1 1 Rd,

Commands	Results	Sensings Rn.	Sensings Df.	Remarks
Q, 340		?		50×0.4=20.
R 20, 340		?		The apparent error of *r/R* may be due to dispersion and irregular terrain. Therefore, without additional information, it should not be changed.
L 6, 340		+		2 - fork initial bound.
L 12, 312		–		Small deviation is ignored.
R 6, 326		–		
R 3, 333 333 333		+ – –	? ? ?	Because of lingering dust and smoke, rounds for effect are fired one at a time.
333 333 333		– + –	– + ?	Deflection is correct, because sensings of *deflection over* and *deflection short* have been obtained with the same deflection setting. 4 shorts. 2 overs.

Adjusted elevation: 335.3[333 + 2/12 × 14)].

One group of six rounds is considered sufficient for this registration.

CONDUCT OF FIRE

CHAPTER 3

LATERAL CONDUCT OF FIRE

SECTION I—GENERAL

26. DEFINITION AND GENERAL PROCEDURE.— Conduct of fire is termed *lateral* when the target offset exceeds 100 mils. Deflection errors cannot be measured accurately. Procedure during adjustment consists, in general, of two operations: Bringing the bursts to the *OT* line; and keeping them on this line during the changes incident to adjustment.

27. CHOICE OF PROCEDURE. — Choice of procedure for lateral adjustment depends primarily upon the size of the angle *T*. *Small-T* procedure is designed to facilitate range adjustment, and is preferable for angles less than 300 mils. *Large-T* procedure is designed to facilitate deflection adjustment, and is preferable for angles greater than 500 mils. Between 300 and 500 mils, either method is satisfactory.

28. PROCEDURE DURING ADJUSTMENT.

a. When small-*T* procedure is used, the target is bracketed for range; with large-*T* procedure, the target is bracketed for deflection. The bracket is split until a point is reached where fire for effect may be started. These brackets are established by bursts, on or near the *OT* line, which have been sensed for the element sought (range or deflection).

b. When sensings are obtained, small deviations, which may be caused by dispersion or minor irregularities of the ground, are ignored. Larger deviations, which may hamper future sensings, are corrected by a computation to place the shot on the *OT* line. Any deviation upon which a range or deflection change is based is measured. The measured deviation need not be announced aloud.

c. When the initial round or salvo is greatly in error, the element (range or deflection) in error, if apparent, should be corrected by the next command, even though the procedure to be used during the adjustment indicates that rounds should be brought to the line by correcting the other element.

29. DEFLECTION SHIFT TO KEEP BURST ON LINE.

a. When making a range change of 100 yards, the deflection shift necessary to keep a burst on the *OT* line is denoted by the letter *s* (Figure 2). Its values are given in the firing tables. An approximate value, when *T* is less than 600 mils, is (1/10 *T*)/(*R*). A more accurate value (for any value of *T*) is (100 tangent T)/(*R*). A table of natural trigonometric functions is given in the firing tables; the values of the tangent for each 100 mils can be memorized readily.

b. When the unit of range change is the fork, the value of *s* is modified by applying the ratio: (Fork in mils)/(*c*), or (Fork in yards)/(100). The latter is more accurate, and the fork in yards can be quickly obtained by multiplying the range probable error by 4.

c. The value of *s* may be determined approximately, when firing, by comparing the amount of the deflection shift with the results actually obtained.

The following notes on Conduct of Observed Fires were prepared at the Field Artillery School as Instruction Memorandum G-7. Although at present they can only be said to represent methods and trends now being tested at the School it is expected that later they will be incorporated in a revision of FM 6-40. The methods contained herein depart from those of the current edition of FM 6-40 in brief as follows:

a. PRECISION.

(1)In light and medium artillery, except when special accuracy is desired, the c is used instead of the fork.

(2)Deviations are measured (when they are to be acted upon) but are not announced aloud.

(3)In lateral adjustments, small deviations are not computed to the line. Usually when sensings are obtained the deviation need not be considered.

b. BRACKET.

(1)There is no set rule for bringing in the battery. To save ammunition or to assist in obtaining surprise, the adjustment may be conducted with one gun as desired. Unless there is some reason to open with one gun, the adjustment is commenced with a battery salvo.

(2)The 100-yard sheaf is used for adjustment of all calibers. (The same sheaf is used for forward observation and air adjustment.)

(3)In axial, fire for effect is opened at the center of the bracket except when the target is moving.

(4)In general, the sheaf is considered as a group of bursts. The burst center is moved to the desired point.

(5)In small-T, deflection is not sensed until effect is started; On going into effect the effort is to place the burst center on the observing line.

(6)Deviations are measured (when they are to be acted upon) but are not announced aloud.

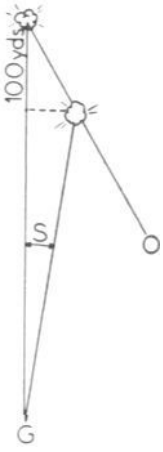


Figure 2.

d. To facilitate splitting the bracket during precision fire, it is convenient, and usually sufficiently accurate, to take the *s* to the nearest even number.

30. SENSING.

a. Deflection.—Deflection is sensed as *short* if the burst appears on the observer's side of the *GT* line; as *over* if the burst appears on the far side of the *GT* line. For precision fire, it is considered *correct* if a target hit is obtained, if a 2-mil deflection bracket is split, or if sensings of *deflection over* and *deflection short* are obtained at the same deflection setting. For bracket fire, deflection is considered correct when the mean line of fire passes through the center of the target.

b. Sensing under difficult conditions.—In precision fire, when the time of flight is long and it is difficult to obtain sensings with single rounds, groups of two rounds may be fired.

c. Sensing range by rule.—In precision fire, when the deflection error is not greater than ½ *s*, a burst whose deviation is on the side of the observing line toward the guns may be sensed *short* for range; when on the other side, it may be sensed *over*. *Bursts should be sensed by this rule only when they cannot be sensed on the target or on terrain*.

SECTION II—SMALL TARGET OFFSET

31. GENERAL.—Small-*T* procedure is generally the same as that used in axial conduct of fire except that, when range bounds are made, appropriate deflection changes must be made to keep the bursts on or near the *OT* line.

32. PRECISION FIRE.

a. Adjustment.

(1) *General*.—Adjustment is by single piece. The gunner's quadrant is used. The normal method of fire is *one round*. Each burst is sensed for range; for example, *over; doubtful*.

(2) *To get on the line*.—If a burst cannot be sensed for range because of its deviation, the next burst is brought to the *OT* line by a deflection change of *r/R* times the deviation. When dispersion or irregular ground makes the use of *r/R* impracticable, a deflection change, estimated to meet the special conditions, is made. Facility in this respect is acquired by experience.

(3) *To stay on the line*.—When the first range sensing has been obtained, a range bound of the proper number of *c*'s is made. To keep the burst on the *OT* line, a deflection change of an equal number of *s*-bounds is applied. If the next burst cannot be sensed because of its distance from the *OT* line, a shift is made to put the burst on that line; a check on the value of *s* may be made by comparing the total shift from line shot to line shot with the number of *c*-bounds. However, the computed value of *s* should not be changed unless it is obviously wrong; an error of less than 2 mils should be ignored; an estimated correction usually is satisfactory. When a round can be sensed, but the deviation is so large that the next round probably will be *doubtful*. a shift to put the burst on the line should be applied in conjunction with the indicated number of *s*-bounds.

b. Fire for effect.—Fire for effect is started at the trial elevation and with a shift of ½ *s* in the proper direction. If, during adjustment, a small deviation has persisted in the same direction, an additional deflection shift should be applied. Since the deflection error should not be greater than ½ *s*, range may be sensed by rule. After a positive deflection sensing, the deflection is changed ½ *s* or 2 mils, whichever is greater, until a deflection bracket is obtained. This bracket is split until the deflection is correct (Par. 30 *a*). Rounds are fired in half-groups of three until the deflection is correct. Each round is sensed for range and deflection; for example, *short, deflection doubtful; over, deflection over*.

33. PERCUSSION BRACKET FIRE.

a. Adjustment.—Adjustment is commenced with a 100-yard sheaf. Battery salvos are used initially except when necessary to conserve ammunition. Each burst is sensed for range: this is facilitated by keeping the burst center on or near the *OT* line. The necessary deflection shift is determined by a rapid and approximate calculation of the shift to put the bursts on the line combined with the shift to stay on the line. Small deviations are ignored. Experienced observers may use estimated shifts.

b. Fire for effect.—The range for starting fire for effect is the same as in axial bracket fire (Par. 25 *d*). The deflection used for the initial volley should keep the group of bursts on the *OT* line; in general, the deflection shift to open fire for effect corresponds to the range change. When positive deflection sensings can be made, the deflection is improved and the width of sheaf is changed, if necessary, to conform to the size of the target. In general, however, the open sheaf is used. The range and deflection of each volley as a whole are sensed; for example, *over, deflection over*. When the deflection has been adjusted satisfactorily, the sensing of deflection may be omitted.

SECTION III—LARGE TARGET OFFSET

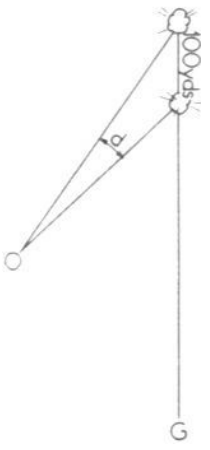


Figure 3.

34. GENERAL.

a. Procedure.—In large-*T* procedure, bursts are brought to the *OT l*ine by range changes. The deflection is changed only when a deflection sensing is obtained.

b. Range deviation.—If two bursts are fired with the same deflection, 100 yards apart in range (Figure 3), the deviation between them is denoted by the letter *d*. An approximate value of *d*. when *T* is less than 600 mils, is (1/10 T)/(*r*); a more accurate value (for any value of *T*) is (100 sin *T*)/(*r*). Its value is

also given in the firing tables.

c. Initial shift.—The size of the initial deflection shift depends upon the accuracy of the initial data, except when information of the deflection error warrants a different shift. Based on the initial data, the following shifts should be made:

(1) One *s*, when using transfers or map data corrected.

(2) Two *s*'s, when using map data uncorrected or a properly adjusted range finder, or when making a small change in range or deflection from a previous target.

(3) Four *s*'s, when using estimated data.

d. Shift when the deflection error is known approximately.—If at any time during adjustment it is possible to sense the approximate amount of the deflection error, a corresponding shift should be made. If the error is excessive, a bold shift should be made. If the burst is obviously very close to the target, *fire for effect should begin at once.*

35. PRECISION FIRE.

a. Adjustment.

(1) *General.*—Adjustment is by single piece. The gunner's quadrant is used. The method of fire is *one round*. Each burst is sensed for deflection; for example, *deflection short; deflection doubtful*.

(2) *To get on the line.*

(a) If a burst cannot be sensed for deflection because of its deviation, the next burst is brought to the *OT* line by an elevation change. Suppose the deviation is 30 mils, and $d = 10$; the burst is 300 yards, in range, from the line ($30/10 = 3$). If $c = 6$, an elevation change of 18 mils (3×6) is required. Therefore, the required change is equal to the deviation multiplied by c/d.

(b) The factor c/d often appears to be wrong because of dispersion and irregular ground, and therefore should be changed only when obviously in error. If necessary, it may be discarded and the *OT* line bracketed by estimated range changes; or it may be applied with an estimated correction to meet the special conditions. The value of c/d may be determined approximately during firing by comparing the deviations obtained with the elevations used. Facility in these respects is acquired by experience.

(3) *To stay on the line.*—When a deflection sensing has been obtained, a shift of the proper number of *s*-bounds is made. The same number of *c*-bounds is made from the elevation that gave the sensing. If the next burst cannot be sensed because of its distance from the *OT* line, it is brought to the line by an appropriate range change. When a deflection bracket has been obtained, it is split. Normally, the bursts are kept on or near the line by splitting the range bracket between sensed rounds. However, when a burst which has been sensed for deflection has such a wide deviation that the next round probably will be doubtful, an elevation change to put the burst on the line should be applied in conjunction with the indicated number of *c*-bounds. The brackets are narrowed until a trial deflection is determined.

(4) *Trial deflection.*—A trial deflection is a deflection giving a target hit, the center of a 1-*s* bracket, or the center of a 16-mil or less bracket when *s* is greater than 16 mils.

b. Fire for effect.—Fire for effect is started at the trial deflection and at the range to put the bursts on or near the *OT* line. Normally, a range halfway between those which established the trial deflection bracket is satisfactory. If, during adjustment, a small deviation has persisted in the same direction, an additional range change should be applied. Since the deflection error should not be greater than ½ *s*, range may be sensed by rule. The range adjustment is continued as in axial precision fire; no rounds fired during adjustment—except a target hit—are considered during fire for effect. The deflection bracket is split after each positive deflection sensing. Rounds are fired in half-groups of three until the deflection is correct. Each round is sensed for range and deflection; for example, *over, deflection doubtful*.

36. PERCUSSION BRACKET FIRE.

a. Adjustment.—Adjustment is commenced with a 100-yard sheaf. Battery salvos, usually starting from the side away from the observer, are used initially except when necessary to conserve ammunition. The deflection of each salvo is sensed as a whole. The group of bursts is brought to and kept on the *OT* line by methods used in precision adjustment, except that when the range scale is used, range changes are made in hundreds of yards (deviation divided by *d*) unless smaller changes are found necessary to obtain deflection sensings. When the quadrant or elevation scale is used, the bursts are brought to the line by changes made without regard to even hundreds; the ratio c/d is applied. The deviation of a salvo is that of its burst center.

b. Fire for effect.—Fire for effect is started when splitting a deflection bracket the width of an open sheaf or less. The range which will keep the group of bursts on the *OT* line is taken as the center of the range bracket appropriate for the target, and fire for effect is started at this range. When positive deflection sensings can be made, the deflection is improved, and the width of the sheaf is changed, if necessary, to conform to the size of the target. In general, however, the open sheaf is used. The range and deflection of each volley as a whole are sensed; for example, *short, deflection short*. When the deflection has been adjusted satisfactorily, the sensing of deflection may be omitted.

37. TARGET OFFSET GREATER THAN 1300 MILS.

a. To get on the line.—When *T* is greater than

1300 mils, the range change to bring the burst to the *OT* line may be determined by the mil relation. For example, if $r = 2$ and the observed deviation is 50 mils, the range change necessary to bring the burst to the line is $50 \times 2 = 100$ yards.

b. To stay on the line.

(1) *Deflection*.—When *T* is greater than 1300 mils, *s* is very large; therefore, the size of the deflection shift may first be considered in yards, and then determined in mils. For example, after sensing the first burst, it is decided to make a deflection shift of 400 yards at the target range; if $R = 5$, this shift is 80 mils (400/5).

(2) *Range*.—The corresponding range change is determined by the relation: Range change in yards = deflection change in yards × tangent (1600-*T*). In the example of (1) above, assume $T = 1450$ mils; the range change would be 400 × tangent 150 = 400 × .15 = 60 yards.

NOTES ON LIAISON

By Colonel Mert Proctor, FA

1. COMMAND LIAISON AS EXECUTED BY THE COMMANDER OF A LIGHT ARTILLERY BATTALION IN SUPPORT OF AN INFANTRY REGIMENT. *a. How established*.—Whenever circumstances permit, the commander (or his executive) of a light artillery battalion in support of an infantry regiment establishes command liaison by conference, prior to an action, with the commanders of the supported infantry regiment and the assault battalions of that regiment. The purpose of this liaison is to coordinate prearranged fires. Command liaison is established first by a visit to the commander of the supported infantry regiment and then, if time permits, by visits to the commanders of both infantry assault battalions. These visits must be completed before the coordinated action of the infantry takes place. If time permits command liaison with only one infantry battalion commander, he should be the one whose battalion is to make the main effort of the regiment. Command liaison is in addition to that established by liaison officers; however, liaison officers should be present when the artillery commander confers with the commander of the battalion to which the liaison officer is assigned.

b. Procedure.—The two examples which follow illustrate the procedure of establishing command liaison.

(1) *When the artillery battalion is a part of an infantry-artillery team which is executing a semi-independent mission* (*security detachment, or a combat team brushing aside or developing hostile resistance*).—The general procedure is the same whether the artillery is attached to the infantry or is in support. The artillery battalion commander establishes command liaison by accompanying the infantry commander until the latter has formulated his plan for entry into action. During this period, the two commanders should confer as often as necessary upon the plans of artillery support and should arrive at a complete understanding upon questions of coordinating the infantry-artillery action; whether the final agreement is in the form of orders or agreements is of no consequence. The artillery commander should then proceed, in the usual manner, to place his battalion in position. As soon as he has made the necessary reconnaissance and decisions for occupation of position and has issued instructions for the delivery of fire missions in accordance with the general plan of fire support, the artillery battalion commander (or his executive) establishes command liaison by visits to the infantry battalion commanders. This command liaison is to arrange the more detailed plan of fire support for the initial phase of the action; the liaison officer should be present. Upon completion of the initial phase or when a change of plan is decided upon by the infantry commander, the artillery battalion commander (or his executive) should again establish command liaison for planning the next phase of the action; this continues throughout the action.

(2) *When the artillery battalion, under division control, is in direct support of an infantry regiment during the execution of a coordinated action*.—The artillery battalion commander must first get his battalion into position as directed by the division artillery commander. As he may have missions from the division artillery commander to be executed prior to the time set for the coordinated action, he cannot rely upon accompanying the infantry commander during the latter's reconnaissance. This joint reconnaissance is highly desirable but possibly the best he can do is to establish brief command liaison after he has disposed of his battalion. Thereafter, his procedure is the same as in example (1).

c. Value.—Command liaison enables the artillery and infantry commanders to arrive quickly at the best solution for coordinating infantry-artillery fires. It facilitates arrangements for communication. It enables the artillery commander to give his liaison officers last-minute instructions; liaison officers then carry out the details of the plans.

2. STARTING AND STOPPING THE ARTILLERY PREPARATION.

a. Methods.—The infantry and artillery commanders must have a clear understanding of when the artillery preparation is to start and to stop. There are two general

methods of prescribing this: On signal from the infantry, or on a time schedule.

b. Signal.—The use of a signal from the infantry to start and stop the artillery preparation has the advantage of providing the closest cooperation with the infantry; it provides for unforeseen contingencies and delays. As the signal must apply to the entire front, it is applicable only to infantry-artillery teams on semi-independent missions.

c. Time schedule.—Starting and stopping the artillery preparation on a time schedule is a less flexible method than is the use of a signal. It should be remembered, however, that direct-support battalions are only a portion of the artillery participating in a preparation; that general-support artillery, possibly including some units under army corps control, will be directed to participate in the delivery of fire on the forward elements of the hostile battle position during the final phase of the preparation; and that direct-support artillery may be scheduled to execute distant missions during the initial phase of the preparation. Furthermore, the preparation is designed to assist the command as a whole. It may be prescribed by the army, the army corps, or the division. In any case, its different phases are for a specific purpose and are closely related to each other. To permit each infantry battalion or regiment to control the start and ending of such preparation will nullify much of it and disorganize all of it. Accordingly, in a coordinated action, the preparation must start and stop on a time schedule.

U. S. FIELD ARTILLERY ASSOCIATION

NOTE: In accordance with the Constitution, the following notice is published in each issue for six months prior to the Annual Meeting.

Proposed Amendments to the Constitution

TO THE SECRETARY, UNITED STATES FIELD ARTILLERY ASSOCIATION, WASHINGTON, D. C.

1. *Amendment to the Constitution*. The committee appointed by the President at the annual meeting December 16, 1940, proposes that the Constitution of the United States Field Artillery Association be amended as follows; (suggested changes are italicized)

ARTICLE V. Combine sections 3 and 4 to read: *Active and* associate members shall be entitled to receive the JOURNAL without payment other than the annual dues.

ARTICLE VI, Section 1—The Executive Council shall be composed of nine active members, five of whom shall be officers of the regular army, two officers of the *National Guard* and two officers of the Field Artillery Section of the Officers' Reserve Corps, to be elected biennially for a term of two years by a majority vote; *such majority vote to consist of a majority of active officers present or represented by written proxies at a meeting of the Association*. The Council shall hold its meetings at the headquarters of the Association, which shall be in the city of Washington.

ARTICLE VII, Section 1—The regular meetings of the Association shall be held annually at Washington, D. C., or at such other place as may be designated by the Executive Council, who shall also prescribe the time of meeting and *give* at least thirty days' notice *of same, by publication in* THE FIELD ARTILLERY JOURNAL *or by such other means as the Council may prescribe*.

ARTICLE VII, Section 3—Special meetings may be called by the Executive Council, upon written request therefor signed by twenty members. At least thirty days' notice thereof shall be given in THE FIELD ARTILLERY JOURNAL, or by mail, to active members. The object of the meeting shall be stated in the request and in the notice.

ARTICLE VII, Section 4—*The number of active members present at a meeting or represented thereat by written proxies*, shall constitute a quorum, except as provided in Article IX.

2. *Reasons for the amendments*.

a. Sections 3 and 4 of Article V should be combined as indicated to permit the Association to augment its income by publishing books or pamphlets (if so desired) for profit.

b. The reasons for the other changes are as follows:

(1) It has now become practically impossible to obtain a quorum, which, according to the Constitution as now written, must consist of fifty per cent (by proxy) of all active members in the United States. This failure to secure a quorum arises because erroneous mailing addresses or frequent changes in address prevent proxy cards from reaching many members; and also because many members fail to return signed proxies.

(2) The proposed changes will obviate the necessity for sending out proxy cards. This will save the Association $100 (or more) annually. No member who desires to vote will be deprived of his vote; he still will receive due and timely notice in the JOURNAL, and will still have the privilege of sending in his proxy if he so desires.

(3) In effect, and in brief, the changes will merely mean that all members and proxies on hand at a meeting will be counted, and a majority of this count will constitute a majority vote.

(4) There is no change in the authority of the Council, which will still continue to administer the affairs of the Association as in the past.

3. In accordance with Article IX of the Constitution, we (members whose signatures are appended below) accept the report of the committee, and propose that the foregoing amendments be made to the Constitution.

1. R. M. Danford
2. W. C. Potter
3. I. T. Wyche
4. Thomas North
5. J. V. Phelps
6. M. McClure
7. Rex Chandler
8. J. A. Stewart
9. J. F. Uncles
10. Rex W. Beasley
11. Stuart L. Cowles
12. John B. Anderson
13. David S. Rumbough
14. J. A. Lester
15. L. M. Riley
16. H. E. Maguire
17. Townsend Heard
18. B. M. Sawbridge
19. C. G. Helmick
20. I. Spalding
21. B. M. Bryan
22. A. W. Waldron
23. J. W. Mackelvie
24. A. F. Kibler
25. I. L. Foster
26. W. H. Maris
27. A. C. McAuliffe
28. F. A. Henning
29. John H. Hinds
30. L. Whitlock

WITH THE ARMIES OF FOREIGN NATIONS

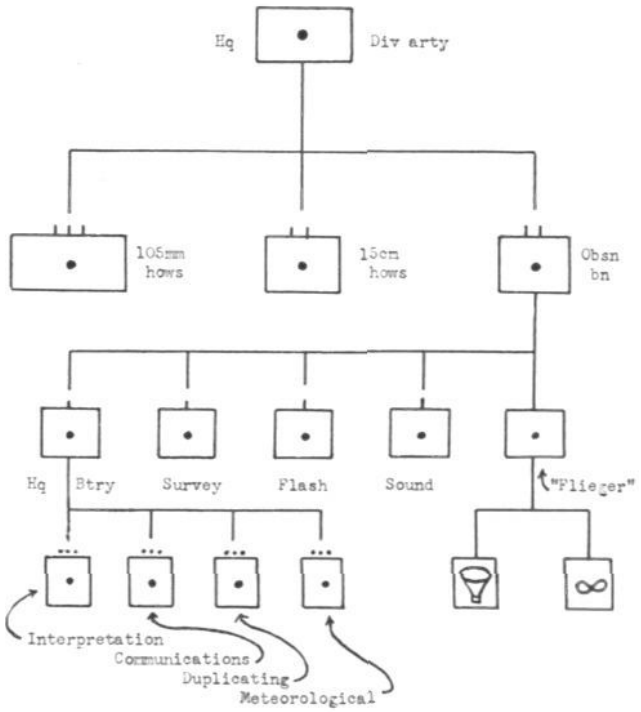
ARTILLERYMEN WITHOUT GUNS

THE GERMAN OBSERVATION BATTALION

By Lieut. Kurt Gunther, Translated from "Unser Heer" January 20, 1941

The soldiers of an observation battalion wear the distinctive bright red color of the Arm. They are artillerymen. Nevertheless, one would look in vain for guns in the batteries of an observation battalion. This modern branch of artillery does not make itself very conspicuous, since its various agencies are stationed long distances from one another in the combat zone. It is not their mission to fire, but to furnish the artillery with the necessary firing data. Observation battalions undertake to find the range of targets invisible to the batteries' ground observers, and to observe and control the fire, especially of long-range artillery; they can determine the enemy's battery positions by locating, through intersection, the flashes and sounds produced by the fire of the enemy's guns. In order that they may execute this twofold task, namely, the observation, registration, and control of the fire of their own artillery, on the one hand, and the location of enemy batteries, on the other, our observation battalions are organized in batteries having very different missions, which naturally supplement one another and constitute, within the battalion, a reliable and many-sided control instrument in the hands of division and artillery commanders.

The origin of the observation battalions goes back to the experiments made during the World War. Even then, the attainment of greater range had necessitated the modernization of observation. It was necessary to discover ways and means of observing fire at ranges of 20 km. or more, and to be able to locate enemy batteries when the field glass and battery commander's telescope were inadequate. As the natural vision is limited by the formation of clouds and haze, and since fire can never be observed perfectly at night or in twilight, artillerymen tried, even then, to supplement the human vision by artificial means. When the experiments began in measuring with stop watches, from different points, the time that elapsed between the flash produced by an enemy gun and the instant at which the sound of the shot was heard, and in computing therefrom the range and direction of the fire, the experience required for the subsequent development of observation battalions was gained. Just as the infantrymen

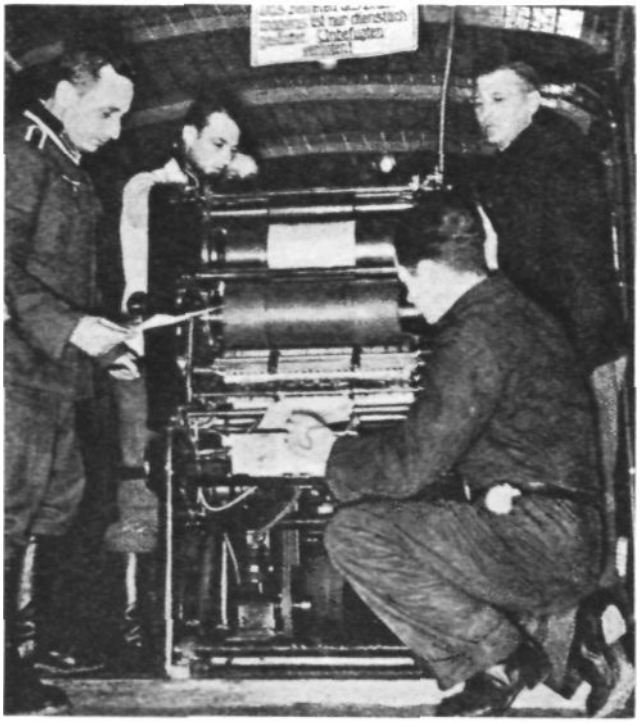


Organization of the German observation battalion

serving in the present war have been given, in addition to the rifle, hand grenade, and machine gun, light and heavy grenade dischargers, machine pistols, and antitank guns which were not available to them during the World War in their present numbers and state of perfection, so the artilleryman has also been given survey, sound-ranging, and flash-ranging batteries, meteorological platoons, duplicating sections, artillery aviators, and highly developed radio and telephone equipment which make it possible for batteries, without seeing the enemy, to beat with accurate fire from a covered position, areas many kilometers in the interior of the enemy's territory. Observed fire gives the best practice in training the artillery officer and forms the basis of all skill in gunnery, but the complete utilization of all artillery materiel during every

phase of combat is made possible only by cooperation with the observation battalion.

The work of a very complicated agency like the observation battalion must be performed rapidly, as well as accurately. A rapid advance has always made it necessary for observation battalions to do their work quickly, reliably, and accurately. Our highly developed military technique has provided the observation battalions with equipment which both functions accurately and can be easily used. The soldiers are consequently trained to perform many special tasks requiring each of them to have a thorough knowledge of gunnery.



Interior of the vehicle carrying the Duplicating Section. This group reproduces maps and charts for the artillery of the division, and also for other units.

A Survey Is First Made

The existence of an accurate firing chart is a prerequisite for the harmonious work of the different batteries and the observation battalion. Until a scale of 1:50,000 is reached, the artillerist can rely on his maps. It is then the task of the survey battery to increase the number of accurately determined points on the chart, that is, to locate points not shown on the map and enter them in the chart, so that the location of every survey station and battery position will be marked accurately on the chart. A battery that has arrived in meadow - land will find no points within a radius of 1,500 meters which can be located on the map. By finding the range and direction of a point which can be located on the map, such as a church tower in the vicinity, a survey battery can then determine the battery's location and enter on the map the data obtained on the terrain. A new accurately determined point, namely, the battery position located by means of the survey, is then obtained on the meadow land.

The utilization of all the results of observation, as well as the Command's computations, are based on the correctness of the measurements obtained. We shall not try to evaluate the various aspects of the work of an observation battalion, but it can be said that a survey is the essential prerequisite for successful firing.

Artillery and Tactical Reconnaissance

After the survey has been completed, the work of the *flash - ranging battery* can begin; as the name of this battery implies, it takes over the functions of the human eye. Flash-ranging stations locate by intersection from their different positions the puffs of smoke produced by a shell equipped with a double-action (combination time - and - percussion) fuze during fire for adjustment, and make angular measurements which, on being transferred from the terrain to the map, permit the location of the shell's position. If the identification of an enemy battery is involved, the location of the flash of an enemy gun is determined by intersection instead of the puff of a shell with a double-action fuze, and the enemy's battery is thus located. In addition to this mission, the flash-ranging batteries also execute a mission consisting in observing enemy territory from their survey stations, and in making a tactical reconnaissance. Even while the troops are rapidly

Exercises in the use of flash-ranging instruments for night firing. The students of the military school sit in a darkened room in front of a sand box containing an electric lamp which emits flashes resembling lightning from time to time. These represent the flashes of the enemy's guns. They first practice correctly locating the enemy batteries by intersection in the school room, and go out into the field later.

advancing, the flash-ranging batteries have already given the commander-in-chief important information concerning the combat situation at the front, which often changes so rapidly that flash-ranging batteries are the only units directly subordinate to the divisional and artillery commanders that can promptly send them reliable information.

Concealed Microphones Are Set Up, Ready for Use

The work of the *sound-ranging battery* leads to the same goal. Just as the human ear supplements the perceptions of the eyes, so the sound-ranging battery supplements the observations of the flash-ranging battery. In the daytime, especially, when the flashes cannot be seen, the sound-ranging battery must take over the missions of the artillery observer. The main advantage of these two batteries consists in the fact that the enemy cannot identify them when they are at work. The survey stations of the sound-ranging and flash-ranging batteries, which, camouflaged so as to be invisible to the enemy, are installed in all parts of the terrain, locate by intersection the sounds or flashes produced by the enemy's fire and thus supply their own artillery with the necessary firing data, while the enemy knows nothing about it until shells explode in his position. The sounds of firing picked up by the small microphones used in constantly listening for them are conducted to a station where they are interpreted. The location and range of the enemy gun can be determined by the length of time it takes the sound to travel from the gun to the microphones that have been set up.

Obtaining a View Behind Any Cover

During the last few years, and especially during the stabilized warfare waged last winter, the captive balloon, a means of observations used during the World War but never before employed by artillery, was carried by the *balloon batteries* of observation battalions. When one ascends in the gondola of a balloon, an extensive zone of terrain is spread out like a carpet before one's eyes. One looks over the slight elevations and gazes far into the interior of the enemy territory. It is thus possible to see into every covered position.

When the map has previously been thoroughly examined, this view showing the true state of the terrain reveals many secrets which even the best modern instruments cannot discover. Silent enemy batteries can be recognized. Stereoscopic photographs make it possible to effect the interpretation at one's leisure and to interpret the slightest detail.

The weather conditions set limits to balloon observation. Air observation from a captive balloon supplements the observations of the artillery aviator, who can fly a long distance into the zone to be beaten by artillery fire. In order to be able to employ the captive balloon, one must control the air and be capable of protecting this worthwhile target from enemy aviators.

The Meteorological Platoon and Duplicating Section

The prior determination of weather data is of primary importance when more distant objectives are to be beaten by an accurate artillery fire. The wind, atmospheric humidity, and difference in the direction of the air currents at different altitudes exert an influence on the flight of the projectile and cause it to deviate from a straight course. The meteorological platoon of the observation battalion issues reports announcing changes in weather conditions to all the artillery at intervals of a few hours. The "Schallwettermeldung" (a report showing the effect of weather conditions on the propagation of sound) is utilized in correcting the results of the reconnaissance conducted by the sound-ranging battery. Most of the influences acting on the projectile after it has left the bore can thereby be excluded.

Since every battery cannot carry small-scale maps covering the entire combat zone, the observation battalion comprises a duplicating section. Like the meteorological platoon, this belongs to the *headquarters battery*. Copies of the maps needed for the combat sector in question are printed from the originals by the duplicating section, and the exact data necessary for the firing chart are thereby obtained.

The battalion HQ carries with it a large situation map on which the positions of all the agencies of the observation battalion are marked. The various reports of the batteries are evaluated and utilized here. All the work of the survey stations scattered at long intervals throughout the combat zone would be useless if information and orders were not sure to be transmitted quickly and accurately. This task devolves upon the communication platoon of the Hq battery, which has radio and telephone equipment at its disposal. The report blanks of the members of this platoon contain all the results of observation and measurement, which are compiled in the "Interpretation." The many details of the individual reports are here converted into an intelligible whole. The data obtained are now transmitted to the "firing artillery." The command post of the observation battalion is connected by means of a direct wire with the artillery commander's station.

The Conduct of Fire

Several artillery regiments equipped with heavy howitzers, cannon, and horsedrawn and motorized guns are combined in a division or corps. The various batteries and battalions are naturally employed in many ways which differ greatly with the tactical situation. Every type of gun has a specific tactical mission which it is designed to perform. The batteries of long-range cannon can harass the zone through which the enemy is approaching. Since, however, their projectiles have a flat trajectory, they cannot reach a target located behind an elevation. In such a case, it is necessary to use a

battery of howitzers, whose projectiles describe a more curved trajectory because of their low velocity.

It is the artillery commander's duty to employ the artillery under his control in such a way that he can bring under fire any target appearing in his sector. On forming a point at which the main effort is to be concentrated, batteries of army artillery are also called upon and placed under the artillery commander. All lines converge at his command post. As leader of the artillery, the artillery commander therefore orders the observation battalion to cooperate with the firing batteries. Thus, a battery of 105-mm. cannon may be instructed to fire with the cooperation of the flash-ranging battery. The observation battalion gets in touch with the position of the battery of cannon and observes the bursts located far within the enemy's territory which are invisible from the observation post of the battery in question. A heavy 150-mm. howitzer battery is to cooperate with a sound-ranging unit. The survey battery of the observation battalion supplements the work of the NCO's operating the aiming circle, who have surveyed the fire positions, and obtains new reference points. The meteorological platoon of the Hq battery issues the weather report, which is sent to every battery. The duplicating section supplies the command posts with maps. All parts of the observation battalion thus do their duty by assisting the artillery in obtaining the data that is important in making its fire effective.

Moreover, by identifying hostile battery positions, the observation battalion enables our artillery to bombard the enemy artillery. The high-extended tubes and thundering roar of the guns are strong evidence of the strength and fire power of our artillery.

The "artillerymen without guns" understand gunnery no less well because they are not "firing artillerymen." The men of the observation battalion know as much about the way in which the guns function as they do about their trajectory, the measurement of angles, the map square, and the mil. Unobserved and almost invisible, the agencies of the observation battalion scattered over the terrain assist in making volleys, group fire, and bursts of fire effective and accurate. They thus have a large share in the success of the German artillery.

Conductors for Simultaneous Transmission of Telephonic and Televisual Signals

There is under way in Germany the establishment of a net which can be employed equally well and even simultaneously for telephony, telegraphy and television.

Interesting and numerous have been the technical problems which have had to be confronted and overcome for the realization of such a net. It has been necessary, first of all, to adapt the characteristics of the telegraph and telephone lines to the special requirements of television, for which, since it requires currents of very high frequency, it has been necessary to study and construct special cables of the coaxial type. Furthermore, it has been necessary to provide for eliminating the characteristic distortions of telephone communications, the non-linear ones of the amplifiers, and the phenomena of crosstalk (diaphony) to which simultaneous transmissions give rise.

Japanese Diesel Engines

In Japan, the "Izupu" Co. has undertaken the manufacture of automobiles equipped with Diesel engines. The production program provides for the manufacture, during the initial period, of chassis for motor buses and trucks of the normal type of construction. The chassis of both types of vehicle have two axles and double rear wheels. It is planned to equip these chassis with Diesel engines provided with 6 cylinders, which have a diameter of 95 mm., a piston stroke of 120-mm., and a piston displacement of 5.1 liters. The ratio of compression is 1:17. The cylinders form a single piece with the upper half of the crank case. The motor vehicles are equipped with a hydraulic brake acting on 4 wheels and a differential brake operated by hand.

The time is approaching when all personnel and property administrative records for tactical units will be handled by consolidated administrative centers. This progressive step is being gradually realized by installation of machine record units in the various Service Commands. The ultimate possibilities of such procedure is something that will require experience and time before definite conclusions and procedure are formulated. However, the prospects of having many of the present multifarious records and reports handled in this efficient and modern fashion is the beginning of the answer to a line officer's prayer.

The following general analysis of some of the possibilities for future application of the machine system might serve to hasten the adoption of these modern methods to the point where tactical units will be relieved of all personnel, property and fund administration. The sooner we get away from the present prodigious, so-called barrack system of administration and begin operating along simplified field and combat lines the easier it will be to adjust ourselves in case of actual combat. Now is the time to change to field methods, rather than waiting until we are forced to do so. If we do not, we will either continue to be bogged down in administrative mire or suffer a total collapse of administrative details.

Machine-Record Section in operation; clerks in new type helmet.

A LINE OFFICER'S DREAM

By Major R. A. Ellsworth, FA.

The eventual goal of machining records is to be able to keep all permanent and semi-permanent records. When this goal is reached there will be no further need for Service Records, Morning Reports, Sick Reports, Rosters, Strength Returns, Pay Rolls, Ration Returns, etc., being kept by the tactical units. Surveys, boards, and courts will be a thing of the past as far as the Line is concerned. With all of these burdensome headaches out of the way, training to fight and doing battle will become the sole purpose of the Line. Efficiency in training, and in battle, will then increase to the point where we will be able to engage an enemy with confidence and energy.

We of the Line agree that the mounting trend of administrative detail is an awful "pain in the neck." Furthermore, that our attention to the prime purpose for our existence is constantly interrupted by administrative work. Our sole reason for being in a line branch is to train in the technique and leadership of battle. We complain bitterly and "cry in our beer" about being continually side-tracked from this mission by having to comply with the maze of reports, records, bookkeeping, and checking which have been imposed upon us by regulations, orders, and N.C.O. staffs. We continually "gripe" and "cuss" as we get to the bottom of our baskets, which are seldom clear of some additional administrative work which is not essential to training. The trouble is, we cry in vain without making any effort to remedy the situation. After all, it is our problem as well as the Adjutant General's Department and the Office of the Chief of Staff. We of the Line are the ones that will benefit by obtaining relief from these arduous non-essentials; it should behoove us to offer practical suggestions for correcting the situation. That is the purpose of this article. At least it is an effort to keep the ball rolling in the direction of clearing away the administrative obstructions which are now in the path of progressive training for combat.

With the installation of the machine records in the administrative sections, we should be thinking out a plan whereby all non-tactical administration can be efficiently centralized. Decentralized training methods and centralized administration is a solution to our mobilization program. There is no reason why this can't be done, even if it does require a change in our present habits and routine. We must get out of the groove before we can approach a satisfactory state of preparedness.

There is no reason why all of the present Service Record entries and Morning Report changes, on both enlisted and officer personnel, with unit remarks, can't be

made in indelible pencil on Change of Status cards by each unit commanding officer and forwarded through battalion message centers direct to each Corps Machine Unit Administrative Center. After a close study of Morning Reports and Service Records, it is believed that there is nothing essential contained thereon that can't be taken care of by the Machine Section. Payrolls, Monthly Rosters, Strength Returns, and Ration Returns are already being successfully experimented with by machine methods. The additional undertakings would call for further elaboration of the coded information now being handled by the machines, but it is definitely not beyond normal expectancy or the capabilities of this modern system.

In the final analysis, the only permanent information we need to keep on any member of the Army, in addition to the data on his initial status card, are brief remarks on the important changes in his military history, along with a hospital record. These remarks could be classified in certain categories, pretty much the same as those now listed in the Service Record. We don't have any Service Records for officers, simply because the number hasn't necessitated any such procedure. Now, with the machine operation, which has cut the recording down to one one-thousandths in time and labor, we can dispense with this unwieldy record for the enlisted personnel. This procedure would not only eliminate the possibilities of lost records with the ensuing inconvenience to the men, but would also do away with the task of transporting this bulky mass of records in the field.

The present Change of Status card being machined completely does away with any need for a Morning Report. Each unit could be given an original status card, similar to the individual form (perhaps a different color), and model remarks can be made on change cards to record all changes in strength, grades, ratings and the history of the unit. Perhaps some first sergeants and unit commanders would be lost without a Sick Book, Morning Report, or Service Records cluttering up the place. They might be at a loss for some means of keeping track of where their men are or where to find information for grades, ratings, strength, absences, promotions, etc., and for keeping up their elaborate but meaningless manning boards and charts. Well, a good first sergeant or a capable unit commander can keep all of this data in his head, or at least in his hip pocket, or at the most in a dispatch case. A good private first class, as an assistant, can handle all changes affecting the personnel, rations, strength, and the property of the unit. Above all, no typewriters will be required—a phone, reliable messengers, an indelible pencil, and change-of-status blanks (which are not absolutely essential) would constitute the requirements of a first class administrative center for our lower units. This can be done when we relieve our fighting units of all records of a permanent nature.

Many officers are familiar with the "Snow Flake" procedure used in the last war. This was an attempt to accomplish a positive record system on each man by a similar report of change procedure. It is common knowledge that this method was a huge failure, simply because the clerical force just couldn't handle such a volume of transactions by manual methods. However, the fact remains that even then the War Department recognized the necessity for some centralized administrative routine. But now, with the machine doing the thinking as well as recording, we are ready to accomplish what we failed to do during the last war.

Now how about boards, courts, investigations, property accountability, funds, pay, surveys, personnel correspondence and all such activities that belong to the Services? Why shouldn't these various time-consuming and routine procedures be concentrated in our centralized service commands? Take boards, courts, and surveys for example, and consider all the time and soiree involved for the Line. We get check lists galore on these activities, with as many interpretations of the regulations and local ground rules as there are posts. The procedure has become so complicated that it takes a Philadelphia lawyer and several clerks weeks to make the proper investigations and come to the correct findings. Even with the most scrutinizing, painstaking efforts, it is practically impossible to get one of these records through without some item being in error and the whole proceedings returned for correction. All of this duplication of effort could be avoided by having the checking department of the administrative section, where the rules originate, conduct the entire procedure. This would save a world of time and mind-reading. Let the Judge Advocate General's department take care of the courts—there should be plenty of young lawyers available to augment this department, in case they are needed. All court and legal business could then be entirely weaned from the Line, except for presenting facts for investigation and charges, and testifying as witnesses. Also, let the Medical Corps take care of their own line-of-duty boards.

Most of our headaches would then be taken care of, except a remedy for the present fund, pay, and property situation. These burdens all need to be lifted from the shoulders of the Line and placed in experienced hands, who specialize in those matters. With the machine record units turning out the payrolls direct to the Finance there is no need of a tactical unit commander ever being bothered with pay matters. The machine records are capable of extracting a payroll any time during the month on any prearranged schedule which will suit the convenience of the unit and Finance. There is no good reason why we have to hold so tenaciously to the first-of-the-month rush. Neither is there any reason why the Finance can't pay each man twice a month. This would permit the soldier to go on a cash basis and put an end to collection sheets and funds. All revenues from recreational activities,

such as post exchange dividends, bowling, theaters, etc., could be received and dispensed by a recreation and morale section which would be an integral part of the administration center. These funds would be allotted to the various sub-units, credited to their accounts, and drawn on at their request for authorized purchases. Some such arrangement would be a relief from the present bookkeeping and financial accountability, which is loaded with dynamite for the inexperienced line officers who are having to handle these ticklish matters.

Property accountability has been greatly reduced by the recent changes on clothing and individual equipment. These steps are just a good beginning. Economy, safeguarding, location, classification, and cost are the principles that cover all property regulations. The procedure for accomplishing these essentials is now too slow for keeping up with modern trends in training. A system of establishing property status with changes has been machined by the Air Corps for some time. At present the Quartermaster is experimenting with a machined stock record account with remarkable results. These methods can be passed on down to each tactical unit, where the present status of property can be established and daily changes furnished to the machines. This would provide a continuous running account and balance of all property; in other words, cost, location, and classification can all be taken care of in this expeditious manner. We must devise a simple way of handling, economizing, and safeguarding of property. Financial accountability by the Line isn't satisfactory or in keeping with present combat and field conditions. Survey procedure has developed into a cover-up routine.

The Germans are using a method of periodic inventory by issuing services. Shortages and overages from Tables of Allowances are taken care of by reports from the unit commanders; while condition, care, wear and tear, salvage, repair, and replacement for each unit are taken care of by the various services, on the ground, during a lull in the campaign. No requisitions, O S & D, surveys or salvage proceedings are needed. If the representative of the service decides there has been negligence, carelessness or inefficiency in the economy and safeguarding of property, the responsible persons are so informed (in no gentle way, incidentally) and the officers may even be relieved from command on the spot, and tried and fined if the dereliction warrants. Such a procedure certainly keeps officers property-minded and at the same time cuts out all the red tape and channel procedure which clutters up and slows down supply systems.

Just one more suggestion—many of our new officers are having trouble making proper entries on Efficiency Reports. In many cases they are having to make these reports three and four times before they are passed on, simply because their entries don't coincide with some stereotyped check list or somebody's personal interpretation of some lengthy mimeograph which has been gotten up to clarify the regulations. Incidentally, these check lists and additional instructions have only served to confuse the issue and complicate the regulations. After all the corrections and suggestions which ensue during the conforming process, the reporting officer invariably complains that he is not permitted to give the true picture of the officer reported upon or make a correct estimate of his value to the service. Efficiency Reports might be simplified to the extent that they could be made a brief statement, with a general rating, which could be entered on a change-of-status card.

The above ideas are all general suggestions for improving conditions. We need collective thinking and constructive recommendations if we are going to keep up with the present-day progress and advancement in the art of war. We of the Line must present our side of the picture if we expect the Services to give us the cooperation and help that they so earnestly desire to render. The sooner this dream comes true the quicker the illusion of our present administrative nightmare will disappear.

Picture of BC and 1st Sergeant without usual paper work.

FROM  THE CHIEF'S OFFICE

SELECTION OF OFFICERS TO ATTEND COURSES OF INSTRUCTION AT THE FIELD ARTILLERY SCHOOL

In this period of rapid expansion of the Field Artillery, it is essential that the maximum results be obtained from the output of the Field Artillery School. In order to accomplish this, careful consideration should be given to the selection of officers to attend the different courses at the School.

In all courses, it is essential that the officer have suitable background in field artillery work. These courses are of only eight to twelve weeks' duration. In this short time it is not possible for the School to give basic instruction. This basic instruction should be given in the organization troop schools. For example, officers who transfer from other branches of the service and who have had no field artillery experience should not be sent immediately to the Battery Officers' Course. They should first attend troop schools in their organizations and perform some troop duty with a field artillery organization. This will enable the officer to get the maximum from the instruction at the Field Artillery School, and also will enable the School to keep the instruction on a high standard.

The objective of the course should be kept in mind when officers are selected for the different courses. For example, the object of the Advanced Course (Special) is to instruct senior field officers in tactical employment of field artillery, stressing the employment of the higher field artillery echelons and the staff work connected therewith. The purpose of this course is defeated if officers are detailed who haven't a thorough knowledge of the tactics of the combined arms as well as a thorough knowledge of field artillery.

On July 10, 1941, a Field Officers' Course (Special) will be started. This is an eight-weeks' course for selected regimental and battalion commanders, and senior staff officers of regiments and battalions. Experienced field artillery officers should be sent to this course. Also they should be officers whom it is contemplated placing in positions where the instruction can be used.

In all cases, officers should be selected who will make suitable instructors upon their return to their organizations.

The following courses for field artillery officers are now being conducted at the Field Artillery School:

(1) Advanced Course (Special)—12 weeks' duration
(2) Field Officers' Course (Special)—8 weeks' duration
(3) Battery Officers' Course—12 weeks' duration
(4) Officers' Specialists' Courses, in Horsemanship, Communications and Motors—12 weeks' duration
(5) Course in Survey and Fire Direction—4 weeks' duration
(6) Officers' Candidate Course—12 weeks' duration

The enlisted specialists' course at the Field Artillery School includes the following:

(1) Motor Mechanics' Course
(2) Battery Mechanics' Course
(3) Horseshoers' Course
(4) Saddlers' Course
(5) Communications Course
(6) Horsemanship Course

These courses should fill the principal needs of the Field Artillery.

SIGNAL EQUIPMENT

Authority has been granted to amend TBA 6-1, 6-2, and 6-3, for Field Artillery and TBA 6-Special, Field Artillery Replacement Training Centers, to include Wire W-71 with a basis of issue as follows:

3 lbs.	Per headquarters battery and observation battery per quarter. Expendable.
1½ lbs.	Per firing battery per quarter. Expendable.
6 lbs.	Per wire communication specialist battery at Field Artillery Replacement Training Centers per quarter. Expendable.

Wire W-71 is being issued to provide Field Artillery wire sections with seizing wire to make the field wire splice prescribed in paragraph 186, FM 24-5, Signal Communication.

THE SCR-245 RADIO SET

Tables of Basic Allowances 6-1, dated November 1, 1940, authorize the issue of SCR-245 radio sets to field artillery units on the following basis:

2 per battalion headquarters battery (light and medium; truck-drawn, horse-drawn, and horse).
1 per brigade headquarters battery or division artillery headquarters battery.

2 per regimental headquatrers battery, 155-mm. gun.
2 per regimental headquarters battery, 240-mm. howitzer.

The distribution of the sets has already begun.

The SCR-245 radio set is designed for installation in vehicles and provides intervehicular communiation whether the vehicles are stationary or moving. For field artillery use the radio is mounted in the ½-ton 4×4 command radio truck.

The primary source of power for operating the transmitter and the receiver is the 12-volt vehicular storage-battery shown with its case open in Figure 1. The

Fig. 1. Right side of the radio truck, showing 12-volt storage battery with battery case opened.

battery is not a component part of the radio set; it belongs to the radio truck, which is equipped with a special heavy-duty generator for battery charging. Other modifications in the radio truck include shielding the ignition system to eliminate motor noises. A special voltage regulator and a voltmeter are installed for maintaining and checking the battery voltage. The truck is also provided with all necessary mounting holes and fittings, and with a convenient battery-terminal box.

The antenna is of the mast type and is mounted on the left side of the truck. Figure 2 shows a close-up view of mast-base bracket MP-41, which furnishes the support for the antenna and the mast-base. This item is not issued with the SCR-245 set at present. Action has been taken to insure its procurement at an early date. Figure 3 shows an improvised mast-base which was made at the Field Artillery School.

It is expected that the principal use of this set by field artillery units will be in the antiaircraft-antitank radio net as a means for warning and control. Messages pertaining to the approach and attack of hostile tanks and airplanes will normally be transmitted by voice and in clear text.

The SCR-245 may be used in two-way net communication with any other radio set that operates within its frequency band. The distances over which

Fig. 2. Close-up view of mast bracket MP-41.

communication may be established for two SCR-245's do not apply when communication is with another type of set. In general, two-way communication will be available up to the limit of the maximum range of the least powerful set in the net.

WINCHES Reference is made to a note in the May issue of the JOURNAL relative to Motor transport Technical Service Bulletin Z-10, dealing with operation and maintenance of winches. Requests should not be made for copies of this bulletin, as the Chief of

Fig. 3. Improvised mast bracket, constructed at F.A. School, mounted on radio truck.

Field Artillery's office has arranged for the Quartermaster General to supply them in adequate quantities to all organizations upon completion of their printing.

MOTOR VEHICLE NOTES

Excessive Maintenance on Brake Linings and Brake Drums.

Reports are being received by the Chief's Office indicating an excessive amount of wear on brake linings and brake drums because of mud working into the drums. As a matter of information to units in general, report is made that this unsatisfactory situation has been investigated by actual test work at the Holabird Quartermaster Depot. The depot and manufacturerers are pursuing further investigation to eliminate or alleviate this condition. No satisfactory solution can be offered at this time. It is anticipated that studies will eventually produce a satisfactory solution. Pending such a solution commanders should give particular attention to this matter to the end that frequent cleaning of brake drums and brake mechanisms inclosed therein is effected in order to reduce the amount of relining of brake shoes and reconditioning of drums.

Quartermaster Corps Motor Transport Technical Service Bulletins.

The following extracts from published comments on these bulletins by the Quartermaster General's Office are indicative of the purpose and importance of these bulletins:

Definition. The Quartermaster Corps, Motor Transport, Technical Service Bulletin is promulgated as information and a guide, by a detailed technical treatise of the various phases of care, protection, maintenance and repair of motor vehicles of the Army.

Purpose. The purpose of the Quartermaster Corps, Motor Transport, Technical Service Bulletin is to provide a medium devoted exclusively to the dissemination of technical information and engineering and other data pertaining to Army motor vehicles. It is intended eventually to include all information of a purely technical character necessarily required, but omitted from the vehicle manufacturers' trade catalogues and/or instruction manuals, to the end that all personnel responsible for the operation and maintenance of motor vehicles may have available in one volume, all the essential technical information and data pertaining to the motor vehicles of the Army.

Use. The Quartermaster Corps, Motor Transport. Technical Service Bulletins are proper for use of all military and civilian personnel engaged in the operation, servicing, maintenance and repair of Army motor vehicles, and for the training of military personnel.

Distribution. The Quartermaster Corps, Motor Transport, Technical Service Bulletins may be distributed to all officers and others charged with the supervision of operation, servicing and maintenance of motor vehicles of the Army, and the training of military personnel.

When Issued. New bulletins, amendments, modifications and cancellation of obsolete bulletins will be accomplished as the exigencies of the service require.

The Check List and Index Sheet of April 15, 1941, lists bulletins on such important items as:

Lubricants — Transmission, Driving Axle and Hypoid Gears.

Brace for Track of Superstructure of 1½-2½ Ton Wrecker Truck.

Front Axle Universal Drive Shaft Failures VC-½ Ton-1940 Dodge Army Trucks.

Dodge ½ Ton 4×4 Trucks, End Play Adjustment, Front Axle Shaft.

G.M.C.,—2½ Ton 6×6 Truck—Overfilling Engine Crankcase.

Water Pump Leaks and Bearing Failure VF-1½ Ton 1940-4×4 Dodge Army Trucks.

Front Wheel Shake and Rapid Front Tire Wear. VF-1½ Ton-1940 Dodge Army Trucks.

Bendix-Westinghouse Automotive Air Brakes.

Bendix-Weiss Universal Joints and Axle Shafts Used in Front Axles of 4×4 and 6×6 Trucks.

Cause of Unusual Tire Wear.

Care of Tires.

Bleeding Tires—Under-inflation.

Metal Corners and 3-Piece Top Bows for Cargo Bodies.

Truck Covers, End Curtains, Safety Straps, Bows, Ridge Poles and Component Parts.

Recommended Mounting for Pioneer Tool Bracket.

Cold Weather Protection of Motor Vehicles.

Defects and Deficiencies of New Motor Vehicles.

Safety in Handling and Using OXYACETYLENE Equipment.

Method of Using Front Mounted Winch (Gar-Wood).

Reception, Inspection and Breaking-In of New Motor Vehicles.

How Issued. Regimental and battalion commanders charged with the operation, servicing and maintenance of motor vehicles and the training of automotive personnel, who are not now receiving these bulletins, may be placed on the mailing list by applying directly to the Commanding Officer, Holabird Quartermaster Depot, Baltimore, Maryland.

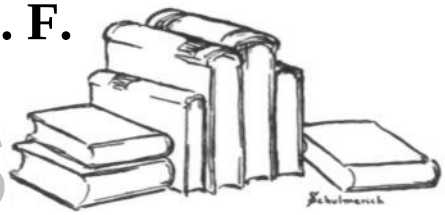
Motor Transport Technical Service Bulletins will be issued on the basis of:

20—for an entire regiment
5—for a battalion

Notes. These bulletins are intended as technical guides and references for shop use and for the personnel charged with responsibility for motor maintenance and operations. They are not administrative in character and consequently are not intended to be filed in a headquarters; they should be issued for use of motor transport personnel.

BOOK REVIEWS

By H. S. F.



"Read over and over again the campaigns of Alexander, Hannibal, Caesar, Gustavus, Turenne, Eugene and Frederic. Make them your models."
—NAPOLEON.

UNITED WE STAND. By Hanson W. Baldwin. Whittlesey House, New York, 1941. $3.00.

It is difficult to review adequately this detail-packed book, but it may be said without qualification that it is the best treatment of current defense problems yet to be published. To use a trite phrase, Mr. Baldwin "faces facts." He finds the defense program hastily conceived, and lacking in a basic all-embracing plan. Our present policy of drifting, half in and half out of the war, finds no favor with him; we should either go in or stay out. If the former, Mr. Baldwin warns us to remember that wars cannot be won without fighting, and that in many respects we are a long way from being ready for battle. Moreover, we are far from being united in favor of war, and it is hard to fight a modern war without the wholehearted support of the overwhelming majority of the population. If we are to stay out, Mr. Baldwin advises that we be genuinely neutral—and prepare to take the consequences of the decision in Europe. The author makes no dogmatic answers to these difficult questions; he realizes that there is no easy solution. But all will concur in his concluding statement: "Only America can defeat America."

OUR NEW ARMY. By Leslie W. Dunlap. The New York Public Library, New York, 1941. 10c.

An excellent bibliography of published material on the new army, particularly valuable for its many periodical references.

AMERICA CAN WIN. By Major Malcolm Wheeler-Nicholson. The Macmillan Company. New York, 1941. $1.75.

The last sentence in this book is "America must fight." It is surprising that the sentence was not used as the book's title for Major Wheeler-Nicholson's book is primarily an argument for entering the war at once. His discussion of the possible ways of immediate use of our non-military means and of our armed forces is interesting, if not always convincing. The author refers to himself as a professional soldier, and the implication is that he is an officer of the Regular Army. Clarification of his status would have been desirable.

H. W. B.

MUTINY. By T. H. Wintringham. Fortuny's, New York. 1941. $2.00.

The subject of this book is usually avoided by military historians because of its obvious unpleasantness. Nonetheless, mutiny is definitely a military problem, and deserves serious consideration. Beginning with Spartacus and the slave revolt in ancient Rome, the author takes up in succession the revolt of the Levellers against Cromwell, the English naval mutiny of 1797, the great Indian Mutiny, the paralyzing mutiny of the French army in 1917, the Russian mutinies of 1905 and 1917, the mutinies of the German High Seas Fleet in the Great War and the French Fleet in the Black Sea in 1919, the English mutinies at the end of the Great War, and the British fleet mutiny at Invergordon in 1931. The author concludes that military mutinies are a manifestation of the class struggle, and that the reason there has never been a serious mutiny in the armed forces of the United States is because, up until a few years ago, the class struggle played no significant part in American life. In criticism, however, it may be said that prolonged investigation would doubtless show that incompetent military leadership has been the cause of the vast majority of the mutinies. Nevertheless, this is a fascinating book, well worth reading.

BATTLE FOR THE WORLD. By Max Werner. Modern Age Books, New York 1941. $3.00.

The many excellent qualities of this book are to a considerable extent offset by the author's inability to forget his political convictions and write objectively. Readers of his pre-war "Military Strength of the Powers" will recall that he concluded that Russia was the strongest of all, and he continues to hold this belief, despite the fiasco in Finland. Indeed, he professes to believe the Finnish War to have been in many respects a defensive war on Russia's part. He believes also that a Russo-German war is probable, that it may find its origin in the Balkans, and that Russia should be favored to win. Needless to say, this was written before the Balkan campaign had begun, and before Russia had fully complied in the German victory. The author's linguistic ability enables him to present many aspects of foreign military thought unfamiliar to most Americans.

AMERICA IN ARMS. By John McAuley Palmer. Yale University Press, New Haven, 1941. $2.00.

In this book General Palmer restates the thesis that has become associated with his name. Thirty years ago General Leonard Wood directed him to prepare a plan for the organization of the United States Army. Beginning with Upton's idea of an expansible regular army. Palmer soon discarded it and adopted instead a scheme for creating a well-organized militia—definitely not the type that "springs up over night." Palmer was strengthened in his views by the discovery of some forgotten papers of Washington's which demonstrated that the latter, contrary to general belief, felt that our armed forces should be composed almost altogether of citizen soldiers, and that only a few regulars were needed for frontier guards. In tracing the development of the citizen army the author gives a concise history of American military policy.

THE ARMED FORCES OF THE PACIFIC. By W. D. Puleston. Yale University Press. New Haven. 1941. $2.75.

Captain Puleston here considers the probable course of a war between Japan and the United States, a war which he considers neither "inevitable nor unthinkable." He does not make the usual mistake of underestimating the ability and fighting qualiites of the Japanese, and records his opinion that we are under certain disadvantages because of the navy's lack of a general staff, and because our naval officers are, on the average, older than the Japanese officers. Nevertheless, in view of America's crushing naval superiority, he considers final victory for the United States as inevitable. One wonders how his conclusions might be modified in view of recent developments, i.e., the concentration of a large part of the fleet in the Atlantic, and the German air victory over the British fleet in the Eastern Mediterranean. However, this is the most rational and factual discussion of the Pacific problem to date.

MILITARY SCIENCE TO-DAY. By Lt. Col. Donald Portway. With a foreword by Major-General J. H. Beith (*Ian Hay*). *Oxford University Press, 1940. $1.75.*

Unfortunately, much of this book was written before the outbreak of the current war, and all of it before the Allied disaster last summer. This fact is responsible for the occurrence of such phrases as, "the defense is now technically superior," and "La Ligne Maginot guarantees the liberty and security of the whole democratic world." Nevertheless, this book serves a good purpose. It points out and explains the close relationship between science and the technical branches, including, of course, the Field Artillery. It may be added that it is also a useful reference guide to the armament and equipment

of the British armed forces. Finally, one must agree with the author's conclusion that "the scientist who revolutionizes warfare belongs to the sensational novel rather than to the world of everyday realism, but this is not to say that he is not wanted in the modern army."

BRITISH STRATEGY. By Admiral Sir Herbert Richmond. The Macmillan Company, New York, 1941. $1.25.

Britain's most distinguished naval writer here outlines a short history of British strategy since the wars of Queen Elizabeth. It immediately appears that Britain's problem has always been the same: whether to land a large army on the continent of Europe and take a leading part in the land fighting, or whether to send only auxiliary forces, attack the flanks and outposts of the enemy, destroy his shipping, and blockade him. Coupled with this is the ever-present difficulty which the British have always had in cooperating with their many and various allies. The book has particular significance to Americans, for, excluding wars in the Western Hemisphere, the United States must always face the same strategical dilemma. Sir Herbert does not attempt a definitive solution, but he does remind us that it is extremely difficult for the same nation to make the major effort on both land and sea.

THE DIARY OF GINO SPERANZA. ITALY 1915-1919. Edited by Florence Colgate Speranza. 2 vols., Columbia University Press, New York, 1941. $6.00.

Gino Speranza was born in America of Italian parents, and he became a distinguished lawyer, specializing in the many complicated problems arising from the great migration of Italians to this country in the 1890's. When Italy entered the Great War he was sent to that country as special correspondent of the New York *Evening Post* and the *Outlook*. When the United States entered the war he became a volunteer worker in the office of the American military attache, and later was given an official diplomatic appointment by Secretary Lansing. His diary covers Italy's three war years and the year of the peace negotiations, during all of which time Speranza was in an excellent position to witness men and events.

Speranza made it his business to interview common soldiers and laborers as well as statesmen, generals, diplomats and journalists, and the record of his impressions is of the highest interest and value. His pictures of Austrian air raids on Venice, the fighting on the Isonzo front, and the conditions within the Italian army are most vivid. In these two volumes there is a great deal which explains the Italian disintegration during and after the Great War, and the consequent rise of the present authoritarian regime. Therefore they constitute historical documents of genuine significance.