The FIELD ARTILLERY Journal

IN THIS ISSUE:

Fire Direction

MARCH, 1942

"100,000 GUNS BEFORE BREAKFAST"

Oh Yeah! READ: "Signposts of Experience"

World War Memoirs of Gen. William J. Snow
Chief of Field Artillery, 1918-1927

★ ★

WHAT AUTHORITIES SAY ABOUT "SIGNPOSTS OF EXPERIENCE"

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★ ★

I neglected the first two issues of General Snow's reminiscences thinking this was just one more case of a retired Brass Hat telling how he won the World War. For some reason or other I happened to read the third installment, and became very excited about it, dug out the back issues and read those through and have been persistently recommending the thing ever since. It seems to me that no one today can fail to benefit by these reminiscences; and I don't mean people actively concerned with ordnance production alone, but with the general public, which wants to know why we don't have 100,000 guns before breakfast tomorrow. I am glad to tell everybody I can about it.

FLETCHER PRATT.
Military Analyst. *Time*, and the New York *Post*.

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★ ★

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★ ★

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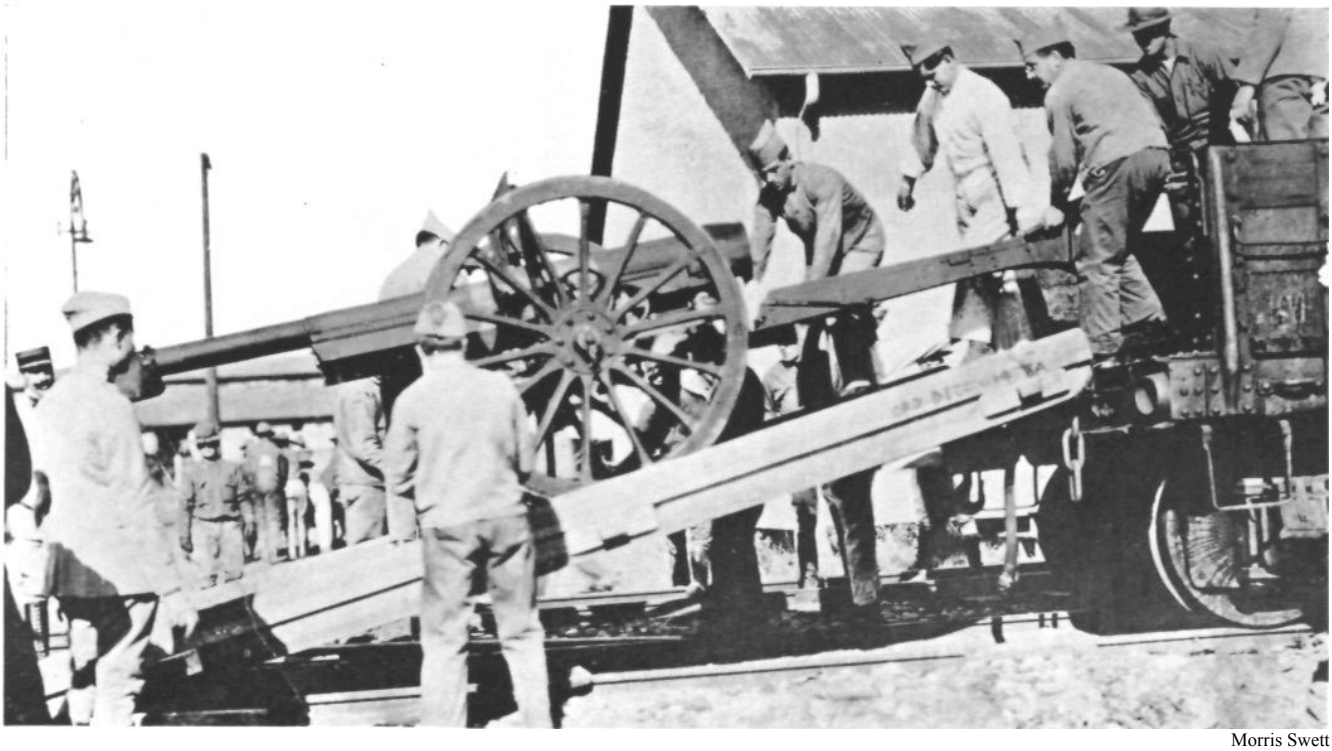
ROBERT E. RUNSER.
Readers' Adviser in Military Science
Public Library, Washington, D. C.



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LT. COLONEL W. S. NYE, *Editor*
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LITTLE OR NOTHING is to be found in training regulations covering definitely the fire-direction technique for division artillery and groupments. The lead article of this issue, consequently, should be hailed as meeting a special need at this time. Reports from the fighting abroad, both in Africa and in the Philippines, indicate the great value of massed artillery fire. This may be obtained efficiently only by the methods developed in recent years in this country. Our officers should practice these methods with confidence; and in keeping abreast with the latest developments the FIELD ARTILLERY JOURNAL will be found to be an indispensable training aid.

EXACTLY ONE year ago we published a detailed study of Japanese field artillery. Unless there is a considerable demand therefor, this article will not be reprinted. Beginning in this issue, however, is a two-part serial on Japanese tactics. The introduction to Part I contains some detailed information on identification of Japanese uniforms and insignia of rank. This material should be preserved for reference.

A NUMBER of JOURNAL subscribers who have been serving abroad during the last two years have written repeatedly to say that the JOURNAL has been almost their sole means of keeping in touch with what is going on at home, especially in a professional sense. Since, as President Roosevelt has said, a number of AEFs may be going to distant places, it seems proper to urge that all concerned make certain that they get their JOURNALS as regularly as possible. Mail will be delivered to all units, even though it may arrive only after some delay and at irregular intervals. The FIELD ARTILLERY JOURNAL will then be all the more appreciated, and experience indicates that in far corners of the world it is generally passed around from hand to hand until it is worn out. We will do everything in our power to make sure that you get your copies. In cases where enemy action or other causes makes delivery impossible, your JOURNAL will be saved for you and your account will be held open. However, everyone should cooperate by promptly sending in changes of address. It is proper to send us your APO address. Where the subscriber has not made reasonable efforts to inform the JOURNAL of his changes of address, there is likelihood that his copies will go astray.

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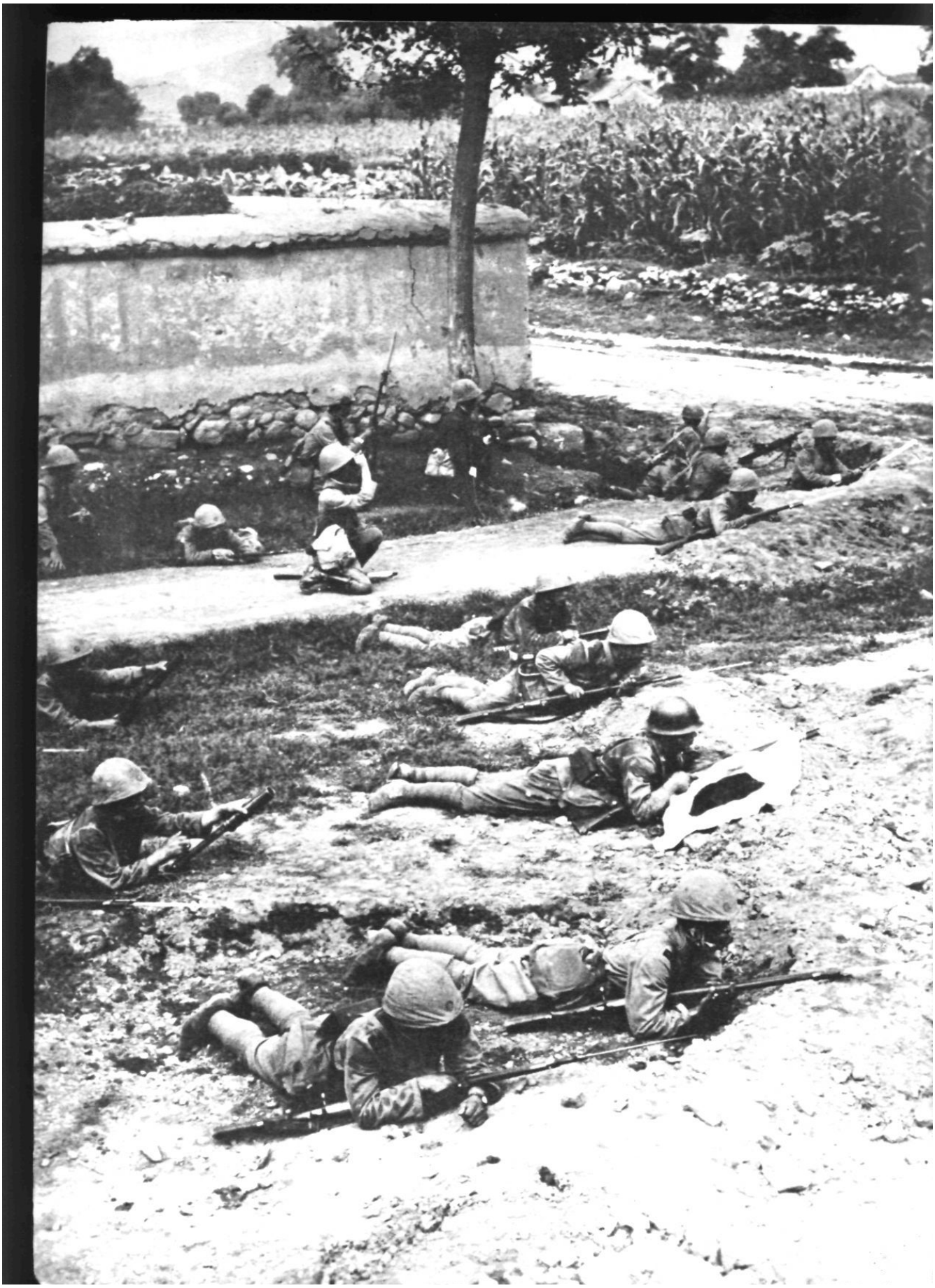


JAPANESE TACTICS

PART I of Two Parts

FOREWORD

It is the present concern of all officers and men to inform themselves concerning the enemy. The following study deals principally with Japanese tactical methods. It is preceded only by so much of a discussion of organization and armament as is necessary to orient the reader. For a more detailed study of Japanese field artillery, see THE FIELD ARTILLERY JOURNAL, *March, 1941.*

In Japan the Emperor is commander in chief of the armed forces of the nation. Under the Emperor are four agencies directly responsible for the army. The first is the Minister of War, who may not be a civilian, as in other countries, but instead must be a general on the active list. The second is the Chief of Staff and the General Staff, the latter body being made up of war plans, operations, intelligence, transport, historical, and topographical sections. The third is the Inspector General of Military Training, whose agency is charged with the tactical and technical training of the army, the preparation of manuals and regulations therefor, and military education. All these officers report directly to the Emperor. In Japan, as in the United States, the air force is still a part of the army, but its new significance was recognized by the creation in 1938 of an Inspector General for Aviation, who has immediate access to the Emperor on matters of air training.

The island of Japan is divided into four army districts for mobilization and administrative purposes. These in turn are divided into fourteen divisional areas:

Army district	*Headquarters*	*Divisions*
Northern	Asahigawa	7th, 8th
Eastern	Tokyo	1st, 2d, 9th, 14th
Central	Osaka	3d, 4th, 10th, 16th
Western	Kokura	5th, 6th, 11th, 12th

In addition to the fourteen divisions noted above, there are three more, raised from the country at large: the Guards Division, and the 19th and 20th Divisions. These seventeen divisions make up the peacetime army of Japan. Since the war with China began in July, 1937, Japan has, of course, greatly increased the size of her forces, and has added many new divisions. The first group of reserve divisions is numbered from 101 up; the second group from 31 up.

Jap platoon waits until grenade throwers have cleared path before advancing. Note the two grenade throwers on the left. This picture also shows that the Japanese always advance with fixed bayonets and that one man in each platoon carries a flag for identification purposes. (*Acme photo; plates by courtesy of "The Leatherneck."*)

Under the Japanese conscription laws, all males between the ages of 17 and 40 are liable for military service. After two years' active service with the colors the conscript passes into the first reserve, where he remains for a little over fifteen years. From the first reserve the conscript goes into the National Army reserve, and is subject to call until he reaches the age of 40.

Regular army officers are graduates of the Japanese Military Academy, or of specialized or technical colleges. There is a special group of regular officers with limited promotion, who are selected from among the warrant and noncommissioned officers. Reserve officers are graduates of the reserve military academies. All officers serve a few months with their units on probation after completing their training. Noncommissioned officers are appointed from among the candidates who have graduated from the various noncommissioned officers' and branch schools.

The relative positions of American and Japanese commissioned personnel are shown below:

Japanese	*Command*	*American*
field marshal (gensui)	group of armies	general
general (taisho)	army	lieutenant general
lieutenant general (chujo)	division[1]	major general
major general (shosho)	brigade	brigadier general
colonel (taisa)	regiment	colonel
lieutenant colonel (chusa)	less than regiment	lieutenant colonel
major (shosa)	battalion	major
captain (taii)	company	captain
first lieutenant (chui)	platoon	first lieutenant
second lieutenant (shoi)	platoon	second lieutenant

The seven noncommissioned grades are as follows: warrant officer (junshikan); sergeant major (tokumusocho); sergeant (gunso); corporal (gocho); superior private (jotohei); first class private (ittohei); and second class private (nitohei).

The star is the universal insignia of grade in the Japanese Army. Grade may be determined by the number of stars and the collar patch on which they appear.[2] Privates wear a red cloth collar patch with yellow cloth stars sewed onto it. One star means a second class private, two stars a first class private, and three stars a superior private. Noncommissioned officers have a red patch with a gold center stripe on which the yellow stars are sewed—one star for corporals, two stars for sergeants, and three stars for sergeant majors. The collar patches of officers are distinguishable from those of enlisted men because the former all have borders of gold braid. Company

[1] There is no corps commander in the Japanese army.

[2] An exception is the warrant officer, who wears a plain officers' patch without any star. A recent press dispatch states that in combat the Japanese remove all insignia.

officers wear a red patch with a gold center stripe: one yellow metal star stands for a second lieutenant, two for a first lieutenant, and three for a captain. Field officers have a red patch with two gold stripes, and one yellow metal star indicates a major, two a lieutenant colonel, and three a colonel. The insignia of general officers is an all-gold patch, one star denoting a major general, two stars a lieutenant general, and three stars a general.

There is no branch insignia because there is no outward differentiation between branches.

With regard to tactical organization, in Japan an army will normally consist of anything from two to six infantry divisions which, together with attached army troops, will usually vary in strength from 110,000 to 135,000 officers and men. There is no army corps in the Japanese Army, so that the next smaller unit is the infantry division. The latter will differ in number from 11,530 to about 20,000 officers and men.

As in the United States, the Japanese army is in the process of changing over from the square to the triangular infantry division. The extent to which this has been accomplished, and the degree to which the reorganization has been effected by the fact that the bulk of the army is on active service, cannot be estimated accurately. However, during the early part of the war in China the square division was found to be too large and unwieldy, and in practice its size was somewhat reduced. In 1936 a triangular organization was tentatively adopted, and eventually this form will become standard throughout the army.

The triangular infantry division is made up about as follows:

Infantry—three regiments
Field artillery—one regiment (four battalions)
Cavalry—one regiment
Engineers—one regiment
Tanks—one company
Heavy machine-guns—one battalion
Transport—one regiment (in which trucks are replacing horses)
Medical—one regiment

The square division differs principally in that it has four infantry regiments (in two brigades), and it does not have the heavy machine-gun battalion.

The infantry regiment has a headquarters and signal section, three rifle battalions, a field train, a combat train, and a battery of accompanying artillery. The latter consists of four 75-mm. mountain guns. The infantry battalion has a headquarters and signal section, four rifle companies, a combat train, a field train, and a heavy weapons company. In the last are a heavy machine-gun platoon and a gun platoon having two 70-mm. and two 37-mm. guns. The principal infantry weapon is the Arisaka rifle, model 1905. This is a Mauser type, 5-shot, bolt-action rifle. The caliber is 6.5-mm., which likewise is the caliber of both the light and heavy machine-guns. The Japs are now changing over to an Arisaka, 7.65-mm. caliber.

The field artillery regiment has a headquarters battery, three battalions of 75-mm. guns and one battalion of 105-mm. howitzers, and a combat and field train. The field artillery battalion consists of a headquarters battery, three firing batteries of four guns each, a combat train, and a field train. The 75-mm. gun and the 105-mm. howitzer battalions are organized alike. The divisional artillery is all horse-drawn.

In number, the principal weapons of the triangular division are: pistols, 1,916; carbines, 727 (some are issued to the field artillery); rifles, 5,904; light machine-guns, 379; heavy machine-guns, 82; 37-mm. guns, 20 (cavalry regiment has 2); 70-mm. guns, 18; 75-mm. mountain

Japanese forward observation post.

Light field piece similar to those now in use on Luzon Island clears the stubble field ahead for these camouflaged Jap troops. (Acme.)

guns, 12; 75-mm. guns, 36; 105-mm. howitzers, 12.

In time of peace the field artillery of the Japanese Army consisted of fourteen divisional artillery regiments of the type described above. There were also three pack artillery regiments, attached to the 9th, 11th, and 19th pack divisions. In addition, there were three independent pack artillery regiments, and a regiment of horse artillery. What the Japanese term heavy artillery was made up of six regiments of 155-mm. howitzers and two regiments of 105-mm. guns, grouped into four brigades of two regiments each. Two of these brigades had a regiment each of 155-mm. howitzers and 105-mm. guns.

The pack artillery regiment uses horses, and has three battalions of three batteries each of 75-mm. howitzers. The 155-mm. regiment is horse-drawn, and has two battalions of three batteries each. The 105-mm. gun regiment has two battalions of two batteries each, and is tractor-drawn. The principal field artillery weapon is a Krupp type 75-mm. gun, model 1906. The weight of the gun and limber loaded is 4,500 pounds. It has a horizontal sliding breech-block and a hydro-spring recoil system. The range is 9,000 yards for shrapnel, and up to 11,800 yards for shell. A panoramic sight is used. The shield is made of three-sixteenths of an inch thick armor plate, and the trail is the open box type.

TACTICS

Japanese tactical doctrine insists vigorously on the inherent superiority of the offensive. The object of all maneuver is to close quickly with the enemy, where the assumed superiority of the Japanese in close combat can be realized to the utmost. Like the French army at the outbreak of the Great War, the Japanese seem to feel that in the attack there is some mystic virtue which can overcome material weapons in profane hands; that it is more important to have spirit than men or weapons. The corollary to this fetish of the offensive is the rejection of defensive combat as a negative form of action unworthy of the Japanese Army. Trained in the faith of this offensive doctrine, Japanese officers reach attack decisions in map and field maneuvers where, by all orthodox tactics, the situation patently requires some form of defensive action.

In keeping with usual military theory, the Japanese consider the envelopment, single or double, as the preferred offensive maneuver. Envelopment implies frontal, direct pressure to hold the enemy while the attacker maneuvers to strike a flank. In ascending order of effectiveness, the envelopment may be single, double, or a complete encirclement. In conflict with tactical teachings elsewhere, the Japanese are willing to try a double envelopment without any considerable numerical superiority, and regard it as sometimes possible even by an inferior force. The Japanese commander usually seeks to obtain envelopment by advancing his force in parallel columns, one or more of which are directed against the enemy flank and rear during the advance to contact. Where the attack is an envelopment it is likely to be of a shallow close-in type obtained by an overlapping of the hostile flank by parallel columns. It is characterized

by speed and energy rather than by intricacy of maneuver and careful coordination of arms.

The Japanese are known to have launched many frontal attacks in China, often without the (presumably) necessary superiority of men and materiel. More recent news reports from the fighting in Luzon and Malaya indicate that they have changed their style considerably, especially when operating against white troops. They feign a frontal attack, making a great noise by wild shooting (it is even said that they employ fire crackers), then when the defenders' attention is firmly fixed to the front they slip around his flanks in light, mobile groups. In wooded country they also practice infiltration extensively. These infiltrating groups operate like American Indians of frontier days. They are adept at ruse and ambush, and are hard to dislodge. They should not, however, cause the main body to retire, provided they are promptly and vigorously attacked.

The meeting engagement as defined in Japanese military writings is the collision either of two hostile forces in motion or of a force in motion and one which has halted but has not had time to organize a detailed position. The training of the Japanese Army strongly emphasizes this form of combat, for it is felt that the meeting engagement allows an optimum development of the alleged Japanese aptitude for swift and decisive offensive action. In contrast to the doctrine of Western armies, which tends to regard the meeting engagement as a dangerous gamble, the Japanese seek it deliberately. Aside from the question of the assumed superiority of Japanese fighting spirit, the meeting engagement offers to them the added advantage of minimizing the deficiency in materiel, especially in artillery, of the Japanese division, a deficiency which is necessarily felt more acutely in the case of the deliberate attack of a position. Also, the objection that the meeting engagement disrupts the coordinated control of the several arms is not felt to be particularly valid, for the combined use of the arms has never been a strong point of the Japanese, whereas their rugged infantry can look after itself where the fighting becomes a matter only of the rifle and bayonet. In spite of the progress of aviation, which tends to eliminate surprise from the battlefield, Japanese commentators feel that meeting engagements will continue to be of frequent occurrence, since fog, night, etc., will often blind observation from the air. The meeting engagement is thus made the basis of Japanese combat training, the official regulations giving much more space to it than to any other form of combat. In the words of one Japanese writer, "The Imperial Army seeks to wage a short war to a quick and decisive conclusion. The meeting engagement conforms to this spirit, and is to be sought whenever possible."

In the advance the two column formation is used in the vast majority of cases, other dispositions being rare exceptions. Supposing that the commander of the division (square) wished to envelop his opponents' left flank, he would then concentrate the bulk of his troops in his right column, and would dispose them about as follows. Preceding both columns would be the cavalry regiment, operating as a reconnaissance detachment. If the division was to advance at night, the division commander might send forward in daylight a mixed detachment of cavalry and motorized infantry to seize important terrain features and to cover the movement at night.

In the above situation the left column would be the weaker. Its basic elements would be a regiment of infantry and a battalion of field artillery, from which the column commander would assign appropriate detachments as an advance guard. The column commander would be a major general commanding one of the brigades. The right column would consist of an advance guard of a regiment of infantry and a battalion of field artillery under the other brigade major general, and a main body of two regiments of infantry and two battalions of field artillery under the lieutenant general commanding the division. The longest column (right) would have an overall length of about eight miles. The attack would normally be made with three of the infantry regiments, the fourth being held in reserve.

In the above formation the infantry strength in the advance guards of the two columns amounts to about four battalions, or one-third of the infantry of the division. Strong advance guards in approaching a meeting engagement are a Japanese characteristic. Left to his own devices, the advance guard commander usually elects to drive headlong into the advancing enemy, unless specifically restrained by division order.

The advance guard artillery, as the advance guard closes to contact, prepares to furnish continuous support by leap-frogging batteries from position to position in rear of the infantry. Normal missions are to interdict the movement of enemy columns, to support the action of the advance guard infantry, and to perform limited counterbattery. Positions are chosen with a view to supporting the attack of the main body without change of position. The advance guard artillery may be reinforced from that of the main body, but the paucity of divisional artillery often makes this impossible. The advance guard artillery reverts to the control of the artillery regimental commander at the time of the attack of the main body.

As contact becomes imminent, the division commander, who has been marching at the head of the main body of the principal column, moves forward on personal reconnaissance accompanied by appropriate staff officers. As the result of his personal reconnaissance and the reports of his reconnaissance agencies, the division commander determines the area in which the division will make its decisive effort, his plan of maneuver, and the location of his command post. Combat Regulations warn against waiting for over-detailed information before reaching a decision. This injunction seems to authorize a very short reconnaissance phase.

In his basic decision for the deployment of his division,

the division commander decides whether it will be coordinated or piecemeal. The basis for this decision is found in the Combat Regulations: "The division commander in order to profit by or to extend an advantage won by the advance guard may have to commit to combat each march column and each element of the main body successively upon arrival. However, if the situation permits, the division commander should seek the coordinated entry into action of his units, in which case he orders the deployment of each unit, establishes close cooperation between infantry and artillery, and coordinates the time of the infantry attack." Thus the question of whether to make a piecemeal attack appears to be decided largely by the success of the advance guard action.

If a coordinated attack has been decided upon, the division commander will assign a line of departure behind which the major units of his command are to deploy for the attack, make detailed arrangements to assure coordination between the infantry and the artillery, and announce an hour for crossing the line of departure. The line of departure is usually in extension of the line held by the advance guard. If the enemy has secured the advantage of priority in development, however, the main body of the division may deploy along a line behind or to the flank and rear of the advance guard, in order to escape a threatened envelopment or premature engagement with superior numbers. In the latter case the advance guard, supported by all the division artillery, covers the deployment and delays the advance of the enemy.

If a piecemeal attack has been decided upon, the troops are committed to action in order of arrival on the field. The division commander, decentralizing control to his column commanders, limits himself to a designation of routes of advance with a view to subsequent attack in the desired directions. There is no division line of departure, and no common hour of attack. There are no detailed plans for coordination between the various arms. The piecemeal method is very common. Often this is the result of the precipitate action of the advance guard commander, who gets himself seriously engaged on his own initiative.

Attacking units do not try to retain alinement. Where the going is easy, they press ahead. The artillery leapfrogs batteries forward close behind the infantry. Its forward observers advance with the infantry. "Victory is won by closing with the bayonet." At this moment infantry and artillery fire is increased, and reserve units are brought up. The cavalry closes in on the enemy flank and rear. The division reserve is used to extend and exploit an advantage gained, to meet a counterattack, or to extend the flank of the enveloping force.

In a Japanese meeting engagement there is a praiseworthy boldness and vigor in the behavior of all

Two Jap gunners man light 70-mm. infantry-accompanying gun. Adequate for its purpose, gun has proven a failure in anti-tank defense. (*American Rifleman*.)

echelons of the division. Speed in decision and execution is stressed in regulations and carried out in application. A hostile force encountering a Japanese division may expect to receive a quick and energetic attack, and unless the covering forces are solidly deployed on their position, the Japanese attack is likely to upset the plans for a coordinated attack of the opposing commander.

Regulations and their application suggest, however, an over-willingness to engage in piecemeal action. It is believed that this tendency towards wasteful piecemeal action develops a dangerous over-confidence when first class troops are faced. The attack itself tends to be a frontal or a very flat, close-in envelopment. The cramped style of envelopment often employed arises out of the desire to get the attack off quickly, and from the weakness of the organic artillery of the division. The Japanese try to keep the latter in a central location where their fire can be maneuvered over most of the front of both holding and enveloping attacks. This restricts the scope of the possible attack directions.

In general, the Japanese Army has been organized with the idea of fighting Asiatic opponents. By contrast, while in Europe the close grouping of a number of large military powers produced a lively competition in motorization and mechanization, in Japan—as in the United States—this pressure was not felt so keenly, due to the relative isolation of its position. Firepower, too, is not so pointedly emphasized in Japan as elsewhere. The infantryman is taught to place real reliance upon his bayonets, and all officers carry sabers, which they are expected to use as a weapon in battle. All of which is not to say, however, that the Japanese have not given thought to the problem of fighting opponents other than Asiatics, for it is obvious that they have.

[To be continued]

Fire Direction Technique for Groupment and Division Artillery

By Lieutenant Colonel E. B. Gjelsteen, FA

General

The battalion is the largest unit which computes firing data, and is the only unit which has a section of its headquarters termed "the fire-direction center." The headquarters of groupments, division artillery, corps artillery brigade, and corps artillery officer do not have personnel for determining the data to be set on the guns or howitzers. Units larger than the battalion conduct fire direction by assigning targets to battalions by rectangular coordinates or overlays.

Groupment Fire-Direction Technique

The simplest and the best working form of a groupment is that in which but two battalions are involved. Consider the case of a battalion of artillery attached to a battalion of organic artillery. These two battalions are tied together by a common survey. Under favorable conditions of observation and frontages they use the same observers, the observers of the organic battalion. The same registrations are applicable to both battalions. The most efficient set-up is that in which the two battalion fire-direction centers are close together, say within 100 yards of each other. We can term this the "boot-to-boot" set-up. The organic battalion commander (assisted by his S-3) is in charge of both fire-direction centers. Each fire-direction center has its own HCO and VCO charts and each fire-direction center has the usual simplexed wire communication with its firing batteries. No attempt should be made to plot all six batteries on a single firing chart and to conduct the fire as a battalion of six batteries. When fire missions arrive in the battalion fire-direction center of the organic battalion, the organic battalion commander decides whether the mission is to be fired. When he decides to fire the mission, his S-3 will either fire it with his own fire-direction center or will turn the assignment over to the S-3 of the attached battalion to be fired by that battalion. Often the fire mission will be fired by both battalions. If it is decided to open fire simultaneously, the time of opening fire is controlled by the organic S-3. In the "boot-to-boot" set-up a maximum of coordination between the two S-3s is secured.

Another installation is with fire-direction centers of the two battalions being established beyond voice distance. In this case they are connected by wire. The organic S-3 sends missions to the S-3 of the attached battalion by telephone; liaison is not as close as in the "boot-to-boot" installation.

When the two battalions use observed-fire charts, the organic battalion commander assigns to his base point arbitrary coordinates, including altitude. Plotting the batteries on the back-azimuth rays from the plotted position of the base point coordinates the battalion observed-fire chart of the organic battalion into the arbitrary control assigned by the battalion commander.

The best coordination between the two battalion observed-fire charts obtains when the attached battalion uses the same base point as the organic battalion. In this case the procedure in the attached battalion is the same as for the organic battalion. To get greater possibilities of fire the organic battalion commander may assign to the attached battalion a different base point than the one his own battalion is using. In this case the attached battalion coordinates its observed-fire chart into the arbitrary control by having one of its batteries (preferably the center battery) register on both base points. The procedure is the same as discussed below for division artillery; the attached battalion uses the organic battalion's base point as a division artillery check point. References: Paragraphs 466, 470 and 473, *FAB 161, Gunnery, 1941 Edition*, and discussion below of division artillery fire-direction technique, without survey.

With a groupment of but two battalions there is no supervising headquarters; that is, no specially constituted headquarters placed above the two battalions. The battalion commander of the organic battalion functions as the battalion commander of both battalions in the allotment of fire missions.

When more than two battalions are in a groupment generally a higher headquarters, a groupment headquarters, must be established. In this case the fire-direction technique is the same as the fire-direction technique of division artillery, which is discussed below.

Examples of Groupment Fire-Direction Technique, Surveyed Positions

The firing chart is a battle map (1 20,000, gridded, 50-ft. contour interval). The 38th Field Artillery Battalion (of the 2d Division Artillery), with the 70th Field Artillery Battalion attached, is in direct support of the 38th Infantry. The battalion surveys have been completed. The fire-direction centers of the two battalions are about 75 yards apart.

Example 1.—Liaison Officer No. 2 reports: "3d BATTALION ATTACKS STRONGPOINT AT (67.34-98.70) at 3:40. REQUEST BOTH BATTALIONS." Lieutenant Colonel "38th Field Artillery Battalion" confers

by phone with Colonel "38th Infantry," decides to use both battalions on the mission and directs his S-3: "USE BOTH BATTALIONS. EIGHT VOLLEYS, BEGINNING AT 3:40." S-3, 38th Field Artillery Battalion, gives his fire order to his team and to S-3, 70th Field Artillery Battalion, as follows: "CONCENTRATION 12, BOTH BATTALIONS. EIGHT VOLLEYS. 1-C APART. AT MY COMMAND." S-3, 70th Field Artillery Battalion, has been maintaining close liaison with S-3, 38th Field Artillery Battalion. The target had been plotted on the charts in both fire-direction centers as soon as reported, and both fire-direction centers had started computing data. On receipt of the organic S-3's fire order, data were sent to all batteries. At 3:40 the organic S-3 gives the order to fire, which is repeated to all batteries by all computers. Each battery fires BATTERY 8 ROUNDS as quickly as accuracy permits.

Example 2.—Liaison Officer No. 1 reports: "CONCENTRATION 9 IS 500 RIGHT, 200 SHORT. COUNTERATTACK. WILL ADJUST. REQUEST BOTH BATTALIONS." The battalion commander decides to use both battalions on the mission and directs his S-3 "USE BOTH BATTALIONS. SIX VOLLEYS." S-3, 38th Field Artillery Battalion, gives his fire order to his team: "CHARGE 5. CONCENTRATION 13, BATTALION, BAKER. SIX VOLLEYS, 1-C APART. WHEN READY." As soon as the HCO has completed his work the S-3 has him read the coordinates of his initial plot, and then gives his fire order to S-3, 70th Field Artillery Battalion, as follows: "INITIAL PLOT 66.12-99.20. CONCENTRATION 13, BATTALION. SIX VOLLEYS, 1-C APART. BAKER NOW ADJUSTING. GET CORRECTIONS FROM MY TEAM. WHEN READY." When the adjustment is completed the adjusting computer (B of the 38th Field Artillery Battalion) gives his commands to the battery for fire for effect, and determines and announces the corrections. All other computers of both fire-direction centers apply corrections and give commands for fire for effect. Liaison Officer No. 1, observing the fire, sees that it is effective but hasn't covered the left part of the target. He reports: "200 RIGHT. REPEAT RANGE. FIRE FOR EFFECT." The battalion commander directs: "MAKE THE CORRECTIONS AND REPEAT THE FIRE." S-3, 38th Field Artillery Battalion, orders his team and S-3, 70th Field Artillery Battalion: "SHIFT LEFT 200 YARDS AND REPEAT." The methods described above are the fastest methods, but serious errors result if the battalions are 1,000 yards or more apart, and the observer's designation of target is in error by more than a few hundred yards. When the battalions are 1,000 or more yards apart the attached battalion should be brought in for fire for effect as prescribed below in division artillery fire-direction technique. For a complete discussion of the procedure in the fire-direction center during a "WILL ADJUST" mission see paragraph 511 *c, FAB 161, Gunnery, 1941 Edition*.

DIVISION ARTILLERY FIRE-DIRECTION TECHNIQUE—GENERAL

The scope of this discussion is division artillery fire-direction technique for use when emergencies, or the necessity for massing fires, arise during the course of battle; other phases of division artillery fire-direction, such as organization for combat, lines to reach with fire, and prearranged fires are not included. The term "division artillery fire-direction technique" as used in this discussion means the ability of the division artillery commander to concentrate quickly the fires of all or a part of the division artillery.

The division artillery is a part of the reserve of the division commander. To be useful as a reserve the artillery must be capable of firing in the area designated by the division commander. Massed artillery fire has influenced the course of battle in the past and will influence the course of battle in the future. The quick shifting of artillery fire to critical areas is obviously an excellent way to influence the course of the action. All commanders in the past have felt the desirability of massing large quantities of artillery. Before the development of the field telephone, artillery fire was massed by a physical grouping of the artillery itself. With the advent of electrical means of communication artillery battalions could be scattered and their fires concentrated on a single point or area by means of electrical communications and maps. In order that the artillery may be responsive to the will of the commander our present fire-direction technique has been developed.

Division artillery fire-direction technique, both with and without survey, is dependent on four considerations:

(1) Before the fires of the division artillery can be massed, a common control must be established. This common control can be established either by survey (preferable) or by firing.

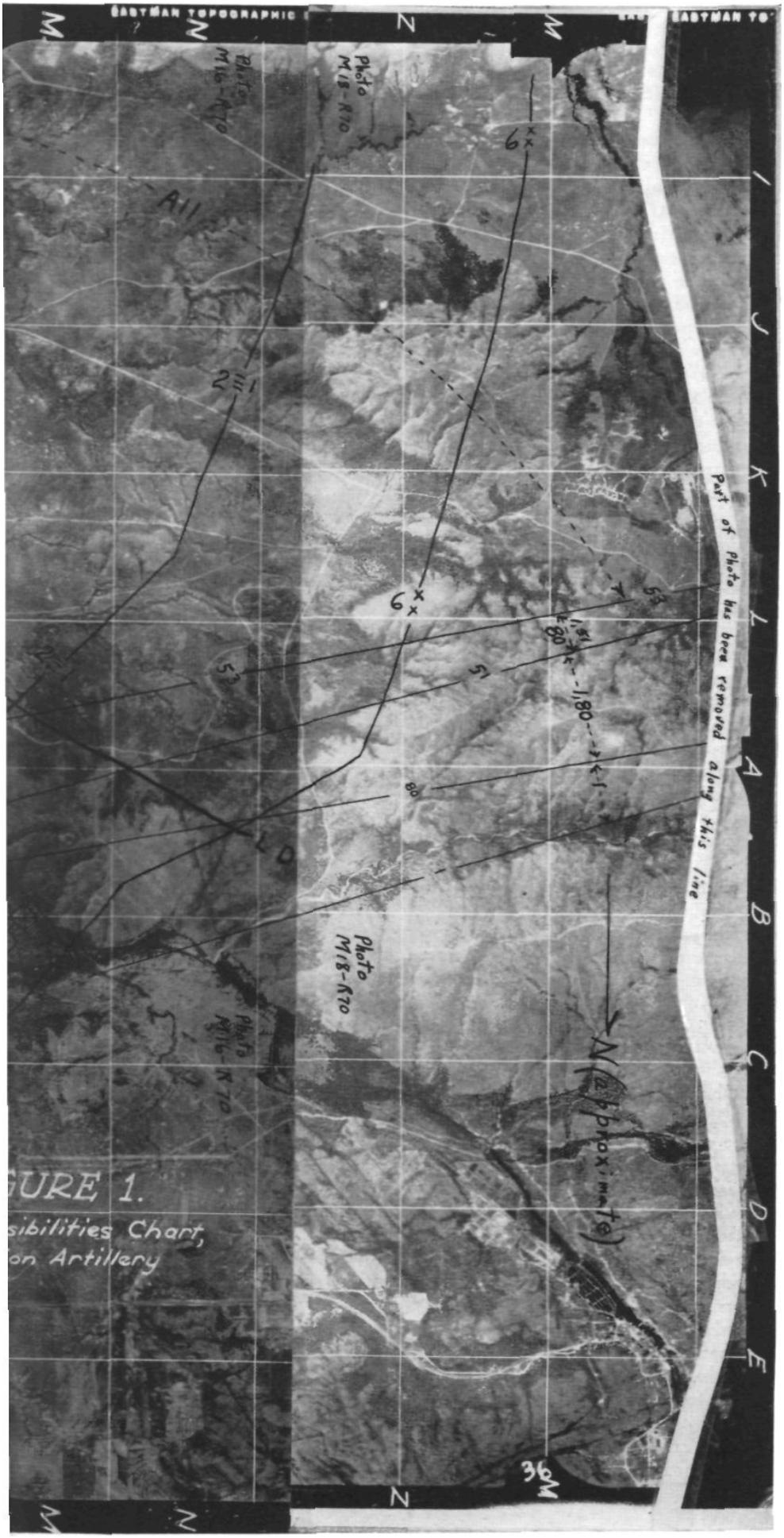
(2) The second consideration is the fire possibilities of the battalions. These determine the areas into which the battalions can fire. Division artillery headquarters plots on a chart the fire possibilities of each battalion. The most convenient chart to use is the situation map; it is then immediately apparent whether any contemplated fires will endanger our own infantry. To avoid cluttering up the situation map an overlay can be used. A color scheme will be useful. With the fire possibilities of the battalions plotted on the situation map or overlay, the division artillery commander can determine quickly what battalions can fire in any area. The division artillery commander must know before he assigns a mission to a battalion that the mission is within the fire possibilities of that battalion. See Figure 1.

(3) In order that the division artillery commander may send his fire missions to the battalions, communications are necessary. Wire communication is preferable. Radio must be available as an alternate means, and for use before wire communication is established. Communication personnel must be trained to connect quickly by telephone the persons concerned. The assignment of

missions should be by "officer to officer" conversation. A good plan is to have four local phones in the division artillery command post, each marked by a battalion number. When the division artillery commander (or staff officer) calls, for example, "FIRE MISSION, 80th FIELD ARTILLERY BATTALION," the communication personnel have the local phone marked "80" connected with the local phone at the fire-direction center of the 80th Field Artillery Battalion, and have an officer in the fire-direction center of that battalion ready to receive the mission. With remote-control radio equipment in all command posts the division artillery commander (or staff officer) can assign missions by radio to any or all of the battalion commanders (or staff officers in battalion fire-direction centers). Communication personnel must be trained to realize that fire missions take priority over all other messages, and that the communications system is the servant of gunnery.

(4) The ability of the division artillery commander to mass the fires of the division artillery is dependent upon the ability of the battalions to apply the battalion fire-direction technique prescribed in *FAB 161, 1941* Edition. Before any division fire-direction exercises are attempted the battalions must be thoroughly schooled in that technique.

Just as there are probable errors among successive rounds and among the guns of a battery, so there are probable errors among the batteries of a battalion and among battalions. Experience



at the Field Artillery School shows that with three batteries firing with open sheaf at center range, the area covered with fire is between 150 × 150 yards and 200 × 200 yards. Under same conditions as above (open sheaf and center range) the area covered by two battalions will be close to 300 × 300 yards, by three battalions (one of them a 155-mm. howitzer battalion) close to 400 × 400 yards, and by four battalions approximately 400 × 400 yards or slightly greater. More battalions will not increase this area materially. When the area to be covered and the number of battalions available agree with the figures above, the method of attack should be with open sheaf and center range. When the area is too large to be covered by this method each battalion is assigned its part of the target. If a battalion's part of the target is so large that it cannot cover the objective with open sheaf and center range it may use a range spread or attack the parts successively.

Most reenforcement missions ordered by the division artillery commander will be fired by the battalions at maximum rates of fire. The most effective form of artillery concentration is a great number of projectiles falling in an area in a short space of time.

There are two general cases as to the availability of battalions for the missions of the division artillery commander. General support artillery can be used to reenforce the fires of other artillery units without disturbing direct support artillery. The division artillery commander

employs the general support artillery in accordance with general instructions of the division commander. It may be necessary to reenforce a battalion with not only the general support artillery, but also with the direct support artillery of other units. In this case the authority of the division commander, or the officer acting for and in the absence of the division commander, is necessary. Obviously no officer other than the division commander should take direct support artillery away from an infantry unit and employ it to help another infantry unit. To summarize: on the same mission there will often be two battalions employed, sometimes three, and occasionally all the division artillery.

In the assignment of fire missions there are two types. The first type is that in which the chart location of the target is known. This chart location may be determined from a study of the ground, it may come from the reports of liaison officers and observers, particularly air observers, or it may be assigned to the division by higher headquarters. In assigning missions to battalions, the division artillery commander includes in his order the following: The coordinates of the target; the nature of the target; the amount of ammunition; and the time. The above is not necessarily the sequence in which the orders are given, except that the coordinates should be given first in order that the battalion fire-direction center can start work. The second type of assignment of fire missions is that in which the chart location of the target is not known initially, but is determined by the adjustment of one of the batteries of the battalion requesting additional fire. In this case all elements of the order are given except the coordinates. When the battalion fire-direction center has determined the coordinates from the replot they are sent to the division artillery command post, which relays them to the battalions which are to fire. Communication channels must be kept clear so that no time is lost in the transmission of the coordinates.

SURVEYED POSITIONS

Division artillery fire-direction technique is most efficient when common control is established by survey. Four considerations are applicable:

(1) The first consideration is the map or map substitute available. This is of constant concern to the division artillery commander. The difficulties of fire-direction technique increase with the lack of good maps. Fires can be massed best if one of the following maps is available: Battle map (1 20.000, gridded, 50-ft. contour interval), controlled mosaic, or wide-angle photo. If wide-angle photos are used, and more than one photo is necessary, they should be pieced together by the division artillery. If the assembly of the photos is left to the battalions the battalion charts will not be uniform. Small single verticals are generally too small for division artillery work. Uncontrolled mosaics are not accurate over the fronts covered by the entire division artillery, but if no other chart is available, several registrations will be helpful. An assembly of wide-angle photos is an uncontrolled mosaic, but the sections are so large that its accuracy approaches that of the controlled mosaic. A grid sheet survey is slow, and targets cannot be selected from the chart itself. But the grid sheet can be used if no other chart is available.

(2) The second consideration is survey control by division artillery. If the division artillery is to be capable of massing the fires of all battalions on a single target, the battalion surveys must be controlled by the division artillery topographic platoon.

(3) The third consideration is progress of survey in the battalions. The most effective fire-direction technique obtains when the battalion fire-direction centers are using surveyed charts.

(4) The fourth consideration is the status of registration. When registration is prohibited, the battalion surveys must be complete. When registration is unrestricted, the surveys in the battalions are reduced; also more accurate firing is possible. When partial registration is permitted, registration positions must be surveyed and registration data transferred from registering to nonregistering units.

EXAMPLES OF DIVISION ARTILLERY FIRE-DIRECTION TECHNIQUE—SURVEYED POSITIONS

Example 1.—The firing chart is a wide-angle photo. The battalions of the 6th Division Artillery have completed their surveys. The fire possibilities of the battalions are plotted on the situation map. See Figure 1. The organization for combat is as follows: 1st Field Artillery Battalion (105-mm. How.), direct support of 1st Infantry; 51st Field Artillery Battalion (105-mm. How.), direct support of 2d Infantry; 53d Field Artillery Battalion (105-mm. How.), initially general support, prepared for direct support of 20th Infantry (in reserve); 80th Field Artillery Battalion (155-mm. How.), general support. During the attack of the 6th Division the main-effort regiment, the 2d Infantry, is stopped. It is confronted by a terrain obstacle, strongly held. The advance of the 2d Infantry is vital to the success of the 6th Division. Liaison Officer No. 1 of the 51st Field Artillery Battalion (in direct support of the 2d Infantry) has reported to his battalion commander the following: "2d INFANTRY STOPPED BY STRONG ENEMY POSITIONS AT PHOTO M16-R70, KING MIKE 4888. REQUEST ALL POSSIBLE ADDITIONAL FIRE." From Colonel "2d Infantry" the battalion commander learns that the 2d Infantry will renew the attack at 7:40. The battalion commander calls the division artillery commander, gives him the coordinates of the target, and explains the situation to him, requesting all possible additional fire. The target is plotted on the division artillery chart. The division artillery commander notes that all battalions can fire on the target. He orders his S-3 to put the 53d

and 80th Field Artillery Battalions (in general support) on the target, and then informs the division commander of the situation. In the meantime Colonel "2d Infantry" has reported the situation to the division commander. The division commander orders his artillery commander to have all artillery fire in support of the 2d Infantry for 5 minutes. The division artillery commander orders his S-3 to put all battalions on the target for 5 minutes. The S-3 (and division artillery staff officers assisting him) sends the following order to the 1st, 53d, and 80th Field Artillery Battalions: "NEUTRALIZE PHOTO M16-R17, KING MIKE 4888, FROM 7:35 TO 7:40 IN PREPARATION FOR ATTACK OF SECOND INFANTRY. MAXIMUM RATE." The 51st Field Artillery Battalion is notified that all the division artillery will fire on the target from 7:35 to 7:40. The battalion commander notifies his liaison officers and Colonel "2d Infantry."

Example 2.—The 2d Infantry, as a result of above fire by the entire division artillery, captured the terrain obstacle. They are now reorganizing preparatory to resuming the advance, and are threatened with a counterattack. Liaison Officer No. 1 of the 51st Field Artillery Battalion reports to his battalion commander: "PHOTO M16-R70, JIG MIKE 8052. COUNTERATTACK. REQUEST ALL POSSIBLE ADDITIONAL FIRE." The battalion commander, after examining the plot of the target, issues his direction for fire, as follows: "USE BATTALION, MAXIMUM RATE." He then sends the following request to the division artillery commander: "PHOTO M16-R70, JIG MIKE 8052. COUNTERATTACK. REQUEST ALL POSSIBLE ADDITIONAL FIRE." From the plot of the target on the division artillery chart the division artillery commander notes that all battalions can fire on it. He orders his S-3 to put the 53d and 80th Field Artillery Battalions on the target; the S-3 (and division artillery staff officer assisting him) sends a fire order to the battalions, as follows: "PHOTO M16-R70, JIG MIKE 8052. COUNTERATTACK. MAXIMUM RATE FOR FIVE MINUTES, MAXIMUM SUSTAINED RATE UNTIL FURTHER ORDERS. FIRE AT ONCE." The S-3 notifies the battalion commander of the 51st Field Artillery Battalion of the above fire order to the two general support battalions, and directs him to notify division artillery as soon as the mission has been accomplished. The battalion commander notifies his liaison officer that the 53d and 80th Field Artillery Battalions will fire on the mission, and directs him to report when the mission has been accomplished. When the liaison officer reports "MISSION ACCOMPLISHED" the fire-direction center of the 51st Field Artillery Battalion relays this report to division artillery, which relays it to the other two battalions. The above procedure requires continuous liaison among all concerned: communication channels must be kept clear.

Example 3.—The 2d Infantry cannot advance until the 1st Infantry has captured the high ground in the vicinity of PHOTO M18-R70, JIG YOKE 25. (Note: The YOKE grid line does not show on Photo M18-R70, the photo having been cut through the YOKE strip when the photos were assembled into a mosaic. In plotting the target, 500 yards must be subtracted from 1,000 and the distance plotted below the ZED line.) The 1st Infantry is held up by heavy fire from a woods line, about 500 yards in width at the base of the high ground. It will attack at 10:15. The battalion commander of the 1st Field Artillery Battalion (in direct support of the 1st Infantry), familiar with the situation through the reports of his liaison officers and conference with Colonel "1st Infantry," sends the following request to the division artillery commander: "1st INFANTRY ATTACKS TO SEIZE HIGH GROUND AT PHOTO M18-R70, JIG YOKE 25, AT 10:15. REQUEST ALL POSSIBLE ADDITIONAL FIRE ON WOODS LINE FROM PHOTO M18-R70, KING YOKE 0287 TO PHOTO M18-R70, JIG YOKE 7548. IF GRANTED ASSIGN ME MY PART OF THE TARGET." The target is approximately 500 yards wide. The division G-3 informs the division artillery commander that the 2d Infantry will also attack at 10:15 to assist the 1st Infantry. The division artillery commander notes from his chart that all battalions can fire on the target. He decides to use the 53d and 80th Field Artillery Battalions, as well as the 1st Field Artillery Battalion (which requested the additional fire), and orders his S-3 to put the three battalions on the target for 5 minutes. The battalion commander of the 1st Field Artillery Battalion is notified that the 53d and 80th Field Artillery Battalions will fire on the target, and that he will be assigned his part of the target by division artillery. The division artillery S-3 divides the target into three parts and sends each battalion the coordinates of its part of the target, the description, ammunition, and time. Following is the order sent to the 80th Field Artillery Battalion: "NEUTRALIZE PHOTO M18-R70, JIG YOKE 8867, FROM 10:10 TO 10:15, IN PREPARATION FOR ATTACK OF 1st INFANTRY. MAXIMUM RATE, 1 C APART." The S-3 prescribes 1 C APART in order to cover the target in depth. since each battalion fires on a different part of the target.

Example 4.—An air observer, observing for the 80th Field Artillery Battalion, reports a target: "PHOTO M18-R70, INTER ZED 41. TROOP AND VEHICLE ASSEMBLY. WILL ADJUST. REQUEST ALL POSSIBLE ADDITIONAL FIRE." The battalion commander, after examining the plot of the target, issues his direction for fire, as follows: "USE BATTALION. 1 C APART. 8 VOLLEYS." He then sends following request to the division artillery commander: "80th FIELD ARTILLERY BATTALION NOW ADJUSTING ON TROOP AND VEHICLE ASSEMBLY IN VICINITY OF PHOTO M18-R70, INTER ZED 41, REQUEST ALL POSSIBLE ADDITIONAL

FIRE. COORDINATES WILL BE FURNISHED YOU IN A FEW MINUTES." The battalion commander includes in his request the approximate location of the target so the division artillery commander can determine what other battalions can fire in that area. The division artillery commander decides to place the 53d Field Artillery Battalion on the target. The two direct support battalions are busy and are not available. Following warning order is sent to the 53d Field Artillery Battalion: "TROOP AND VEHICLE ASSEMBLY. COORDINATES WILL BE SENT TO YOU IN A FEW MINUTES. FIRE AT ONCE, FIFTEEN VOLLEYS. ATTACK IN DEPTH. STAND BY." The 80th Field Artillery Battalion is notified that the 53d Field Artillery Battalion will fire on the mission. Staff officers in the two battalion fire-direction centers and in the division artillery command post stay on the phone (stand by). As soon as the 80th Field Artillery Battalion completes the adjustment that battalion starts its fire for effect, plots the adjusted data, reads the coordinates, and the staff officer in the fire-direction center reports to division artillery: "PHOTO M18-R70, INTER YOKE 5098." The division artillery staff officer immediately relays these coordinates to the 53d Field Artillery Battalion.

DIVISION ARTILLERY FIRE-DIRECTION TECHNIQUE—WITHOUT SURVEY

It may be necessary to mass the division artillery fires before survey can be completed. This is particularly applicable when no maps or photos are available, since a grid-sheet survey is slow. When maps or photos are available the surveys can generally be completed before it is necessary to mass the fires of the division artillery.

The common control is established by firing. This involves the coordination of the battalion observed-fire charts by an additional registration per battalion on a common point (division artillery check point).

The division artillery commander selects the division artillery check point (check point, not base point) and assigns it arbitrary coordinates and altitude. It is best to select a grid intersection as the arbitrary coordinates, and to assign the altitude in yards. The division artillery check point should be near the center of the target area, should be easily identifiable, and unmistakable. The division artillery commander, or a staff officer, usually the survey officer, identifies the division artillery check point to the battalions.

Each battalion establishes an observed-fire chart. Figure 2 shows the chart established by the 1st Field Artillery Battalion (105-mm. How.). This battalion occupied positions before the division artillery check point, with its coordinates and altitude, was designated. Each battery registered on the battalion base point with Shell, HE, Charge 6. The battalion commander assigned an arbitrary altitude of 500 yards to the battalion base point. Each battery commander on the completion of his registration reported to the battalion fire-direction center the adjusted compass, adjusted base angle, adjusted quadrant elevation, and site. From these data the battalion fire-direction center plotted the observed-fire chart, using the improved type prescribed in Paragraph 470, *Field Artillery Book 161, Gunnery, 1941 Edition*.

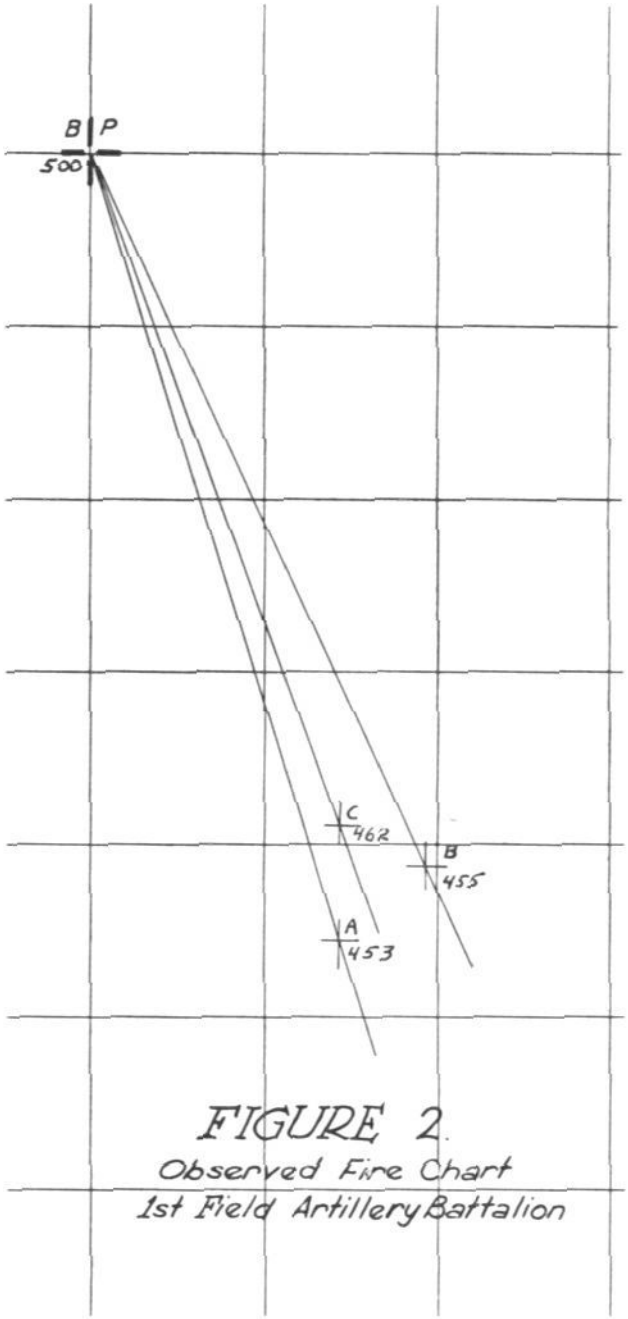


FIGURE 2.
Observed Fire Chart
1st Field Artillery Battalion

Each battalion coordinates its observed-fire chart into the division artillery arbitrary horizontal and vertical control by having one of its batteries, preferably the center battery, register on the division artillery check point. Figure 3 shows the coordination of the observed-fire chart of the 1st Field Artillery Battalion into the arbitrary control designated by the 6th Division artillery

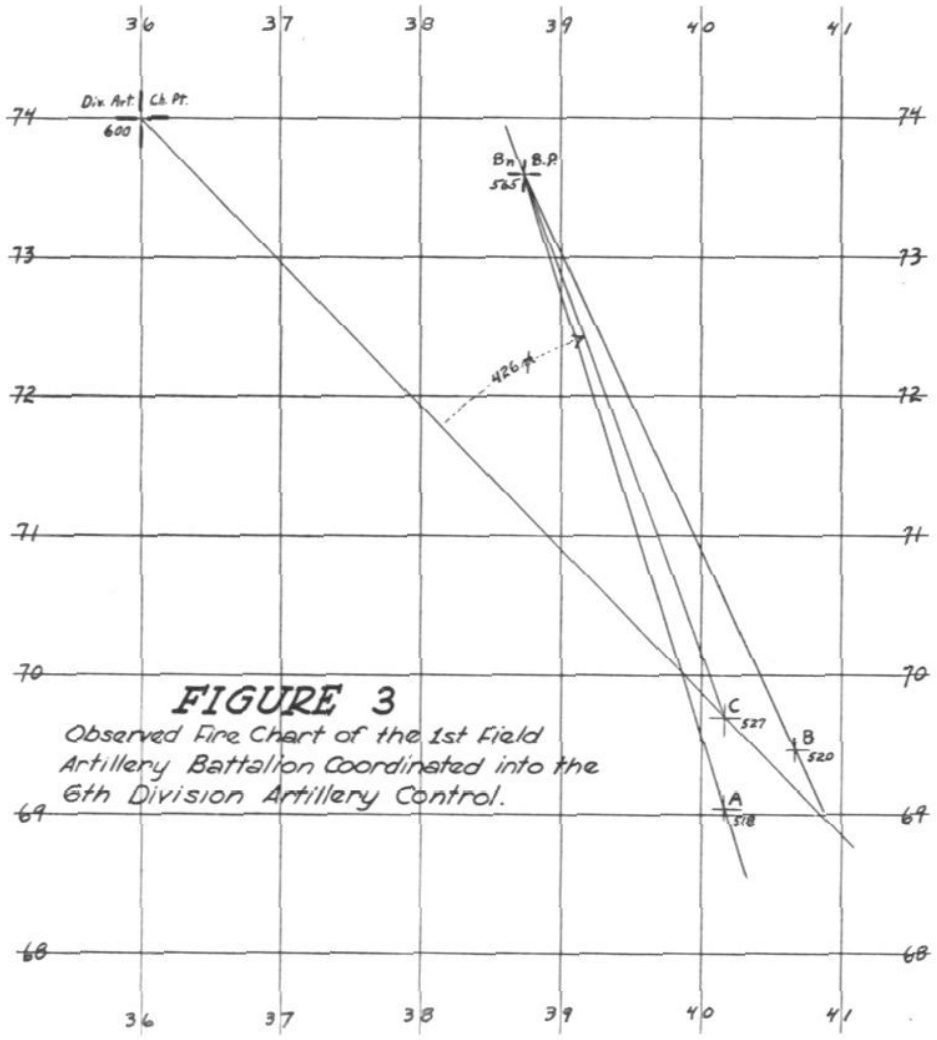


FIGURE 3
Observed Fire Chart of the 1st Field Artillery Battalion Coordinated into the 6th Division Artillery Control.

commander. The division artillery commander assigned the following control to the division artillery check point: coordinates 36.00-74.00; altitude 600 yards. Battery C, the center battery, register on the division artillery check point with Shell, HE, Charge 6 (same ammunition and charge used in registering on the battalion base point). The battery commander reports the following elements of adjusted data to the battalion fire-direction center: Adjusted compass, adjusted deflection, adjusted quadrant elevation, and site. The back-azimuth ray from the division artillery check point to C Battery is drawn and C Battery is plotted using the range corresponding to the adjusted elevation. The angle between the back-azimuth ray and the C Battery base line is the adjusted deflection, applied in the opposite direction. The adjusted deflection reported by the battery commander of C Battery is base deflection left 426; the C Battery base line is drawn to the right of the back-azimuth ray at an angle of 426 mils. With C Battery plotted and its base line drawn, the data for plotting the battalion base point, the other batteries, and the plotted positions of concentrations already fired are taken from the battalion observed-fire chart. If the battalion observed-fire chart has been drawn on tracing paper it can be thumbtacked in its proper position over the chart on which is plotted the division artillery check point, the back-azimuth ray, the registering battery, and its base line. The division artillery commander establishes vertical control by assigning an altitude to the division artillery check point, 600 yards in our example. Starting from the division artillery check point, and using site and distance computations (mil relationship), the altitude of the batteries and battalion base point are determined and entered on the chart. Reference: Paragraph 473, *Field Artillery Book 161, Gunnery, 1941 Edition*.

The examples shown in Figures 2 and 3 are typical of a battalion which has established its observed-fire chart before the division artillery control is designated. When the division artillery control is known before the battalion fire-direction center constructs the observed fire chart, the plotting in the fire-direction center should be started from the division artillery check point. In this case time is saved if the center battery is the first to register on the battalion base point; while the other two batteries are registering on the battalion base point the center battery can register on the division artillery check point.

All ranges used in plotting the battalion observed-fire charts, and their coordination into the division artillery arbitrary control, correspond to the adjusted elevations, which are the adjusted quadrant elevations with sites stripped. The battalions will usually be at different altitudes, and if sites are not stripped serious errors will result.

When the battalion observed-fire chart has been coordinated into the division artillery arbitrary control, the battalion observed-fire chart (unless it is on tracing paper and has been thumbtacked on the division artillery control) should be destroyed and the observed-fire chart with the division artillery arbitrary control used for all subsequent missions.

All observers in each battalion, including battery commanders, have the division artillery check point and the battalion base point identified to them, with the altitude of each. When the altitude of the battalion base point is changed to conform to the division artillery vertical control, the observers are notified of the new altitude of the base point. In reporting targets observers include the estimated altitude. With one or two known altitudes in the target area an observer can estimate the altitude within 10 yards; with a little training he can estimate within 5 yards.

The fires of the division artillery can be massed only when the location of the target is determined by the adjustment of a battery. Targets cannot be selected from a study of the chart. The battalion's use of the chart is limited to the charge used during the registrations; to get the maximum fire possibilities use a high charge. The battalion observed-fire charts are coordinated better (and therefore are more accurate) when battalions of like caliber use the same charge rather than when battalions use different charges. In some situations it will be possible for the division artillery commander to designate the charge to be used by the light battalions (and medium battalions if more than one); on other situations each battalion commander selects his own charge. The general rule is: Use the highest practicable charge. Battalion observed-fire charts and division artillery coordination of them are temporary expedients until survey has been completed. They will often be necessary, however, particularly when no maps or photos are available.

The division artillery chart is merely the fire possibilities of the battalions plotted from the reports of the battalions. See Figure 4.

Survey is started as soon as possible. The division artillery survey control is based on the arbitrary control established by the division artillery commander for the observed-fire charts, using the division artillery check point as Point B. As soon as a battalion completes its survey the surveyed chart replaces the observed-fire chart. If the division artillery survey control is based on a different control than that designated by the division artillery commander for the observed-fire charts, the transfer from observed-fire charts to surveyed charts must be done at the same time by all battalions.

Examples of Division Artillery Fire-Direction Technique Without Survey

The battalions of the 6th Division Artillery are used in the examples below. The organization for combat is the same as in the examples for surveyed positions.

Example 1.—The 6th Division, with the mission of seizing and securing the rail facilities at DUNCAN, is attacking the enemy forces holding DUNCAN. No maps or photos, other than automobile road maps, are available. Pending the completion of grid sheet surveys the battalions are using observed-fire charts, which have been coordinated into the division artillery arbitrary horizontal and vertical control. Each observer knows the locations and altitudes of the division artillery check point and his battalion base point. The advance of the 1st Infantry has been stopped by enemy forces in a strong point. Liaison Officer No. 1 of the 1st Field Artillery Battalion reports to his fire-direction center: "BASE POINT IS 400 LEFT, 800 OVER, ALTITUDE 550. STRONG POINT. WILL ADJUST. REQUEST ALL POSSIBLE ADDITIONAL FIRE." The battalion commander, after examining the plot of the target, issues to S-3 his direction for fire, as follows: "USE BATTALION, 15 VOLLEYS." He then sends the following request to the division artillery commander: "1st FIELD ARTILLERY BATTALION NOW ADJUSTING ON STRONG POINT IN VICINITY OF 39.4-73.1, REQUEST ALL POSSIBLE ADDITIONAL FIRE, COORDINATES AND ALTITUDE WILL BE FURNISHED YOU IN A FEW MINUTES." The battalion commander includes in his request the approximate location of the target so that the division artillery commander can determine what other battalions can fire in that area. The division artillery commander plots the approximate location of the target on his chart, notes that the 80th Field Artillery Battalion is the only other battalion that can fire on the target, and decides to place this battalion on the target. Following warning order is sent to the 80th Field Artillery Battalion: "STRONG POINT. COORDINATES AND ALTITUDE WILL BE SENT TO YOU IN A FEW MINUTES. FIRE AT ONCE. EIGHT VOLLEYS. STAND BY." The 1st Field Artillery Battalion is notified that the 80th Field Artillery Battalion will fire on the mission. As soon as the 1st Field Artillery Battalion completes the adjustment that battalion starts its fire for effect, plots the adjusted data, reads the coordinates, and reports to division artillery: "COORDINATES 39.55-72.84. ALTITUDE 550." Division artillery immediately relays these coordinates and the altitude to the 80th Field Artillery Battalion.

Example 2.—The battery commander of Battery B, 51st Field Artillery Battalion, observes a counterattack forming. He has authority from his battalion commander to fire on targets he discovers. Realizing the importance of the target, he begins initial data to his battery with: "COUNTERATTACK. REQUEST ALL ADDITIONAL FIRE." The battery executive reports to the battalion fire-direction center by simplexed wire circuit: "BATTERY COMMANDER FIRING ON COUNTERATTACK. REQUEST ALL ADDITIONAL FIRE." As the initial data from the battery commander is received, the battery executive reports to the fire-direction center the following elements of it: Ammunition (including charge and fuze), deflection, site, and elevation. Computer B, in the fire-direction center, informs S-3 and determines the data for the initial plot.

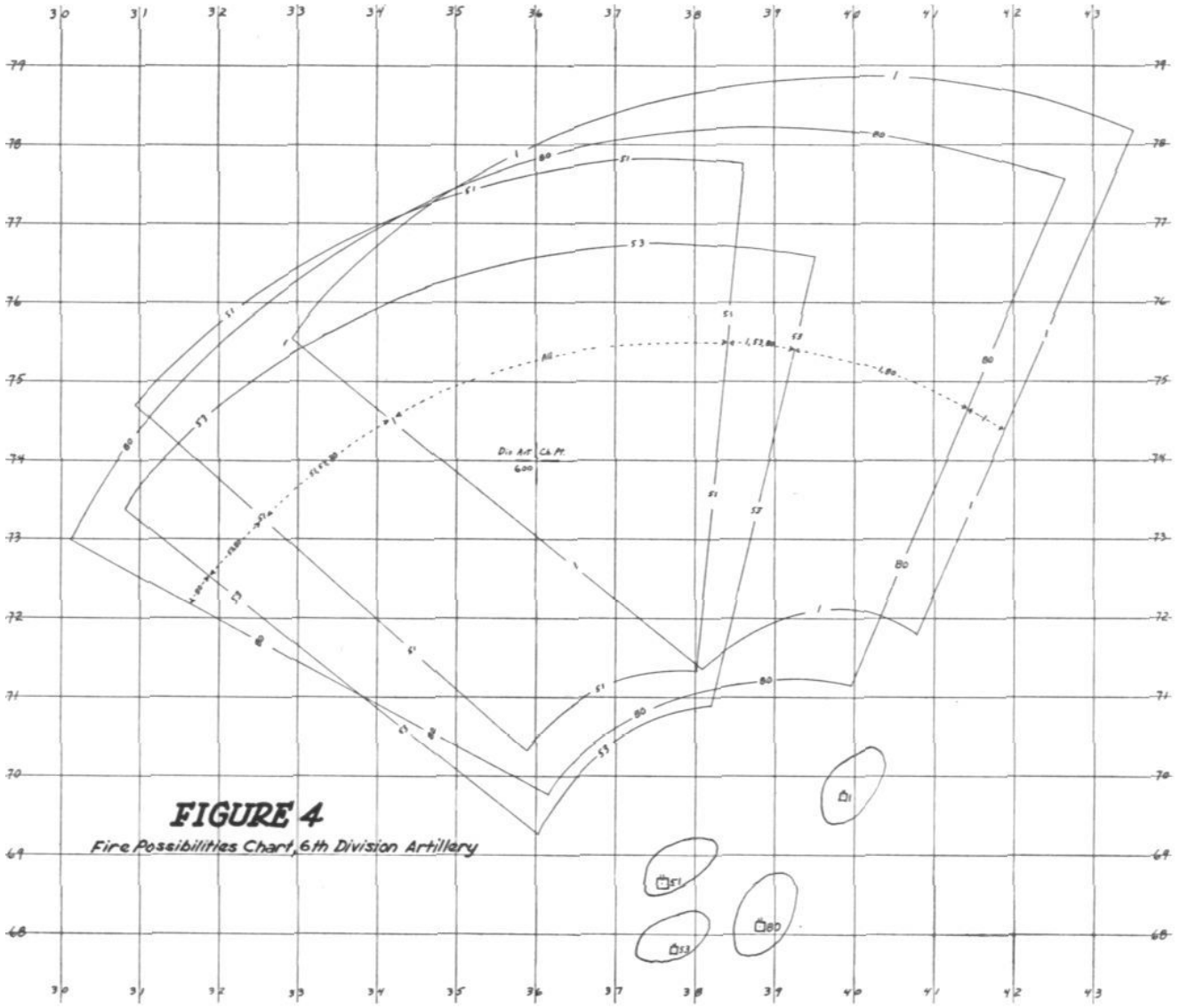


FIGURE 4

Fire Possibilities Chart, 6th Division Artillery

Data to lay the other batteries on this initial plot are computed. The battalion commander is present. He decides to use the battalion and to request additional fire from the division artillery commander. He gives his direction for fire: "USE BATTALION, MAXIMUM RATE FOR FIVE MINUTES, MAXIMUM SUSTAINED RATE UNTIL MISSION ACCOMPLISHED." He then sends following request to the division artillery commander: "51st FIELD ARTILLERY BATTALION NOW ADJUSTING ON COUNTERATTACK IN VICINITY OF 34.1-72.5. REQUEST ALL POSSIBLE ADDITIONAL FIRE. COORDINATES AND ALTITUDE WILL BE FURNISHED YOU IN A FEW MINUTES." The battalion commander knows the approximate coordinates from the initial plot of the target in his fire-direction center. The division artillery commander plots the approximate location of the target on his chart, and notes that the 53d and 80th Field Artillery Battalions can fire in that area. The counterattack threatens the left flank of the 2d Infantry, which is making the main effort of the division. The division artillery commander decides to place both battalions on the target. Following warning order is sent to the 53d and 80th Field Artillery Battalions: "COUNTERATTACK. COORDINATES AND ALTITUDE WILL BE SENT YOU IN A FEW MINUTES. MAXIMUM RATE UNTIL FURTHER ORDERS. STAND BY." The S-3 notifies the battalion commander of the 51st Field Artillery Battalion that the 53d and 80th Field Artillery Battalions will fire on the mission, and directs him to notify division artillery as soon as the mission has been accomplished. The battalion commander notifies the battery commander of Battery B of the additional fire that will be placed on the target on which he is adjusting, and orders him to observe the results and report when mission has been accomplished. As soon as the battery commander completes his adjustment he starts fire for effect and orders his executive: "REPORT ADJUSTED DATA

TO FIRE-DIRECTION CENTER." The battery executive reports to the fire-direction center the adjusted deflection and adjusted elevation (ammunition and site do not change). The fire-direction center applies the corrections to start the other two batteries firing for effect. (For detailed discussion of how the battalion masses its fires based on the adjustment of a battery commander see Paragraph 511 *e, FAB 161, Gunnery, 1941 Edition*.) The fire-direction center plots the adjusted data, reads the coordinates (the altitude has already been determined from the battery's report of site), and reports to division artillery: "COORDINATES 33.97-72.76. ALTITUDE 585." Division artillery relays the coordinates and altitude to the 53d and 80th Field Artillery Battalions. The fire-direction center of the 51st Field Artillery Battalion maintains close liaison with the battery commander of Battery B and with division artillery, and division artillery maintains close liaison with the 53d and 80th Field Artillery Battalions. When the battery commander of Battery B, 51st Field Artillery Battalion, reports "MISSION ACCOMPLISHED" to his fire-direction center, the fire-direction center notifies division artillery headquarters, which notifies the other two battalions.

THIS *OLD* FIRE-DIRECTION TECHNIQUE

By Technical Sergeant Richard Crecelius, 1st Bn, 139th FA.

Having read Captain Atkins' article on the new fire-direction technique in the December JOURNAL, I was prompted to set forth from an enlisted man's standpoint the method by which the 1st Bn, 139th FA, met the same situation Captain Atkins' battalion had to face.

In May our battalion S-3 returned from Fort Sill filled with the new idea of fire direction being taught there. He immediately organized an enlisted fire-direction team—HCO, VCO, and battery computers—from the headquarters battery operations section. He chose enlisted men because of a scarcity of officers and because it would leave the commissioned personnel free to perform their command and supervisory functions.

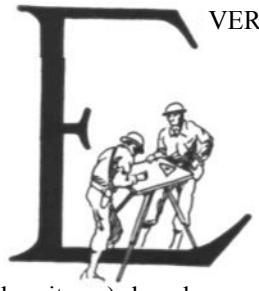
After two weeks' intensive training we were able to function as a team, and we took to the field to test our organization. It worked, and with a few adjustments and adaptations, such as having the computers operate their own phones, and mounting the whole thing in a truck, we used the system through the Louisiana maneuvers and several service tests during the Fall. The enlisted fire-direction team has fired many problems with excellent results.

It was our early and quickly fulfilled desire to have every man versed in both duties performed at fire-direction center—the computation of firing data using the graphical firing tables, and the operation of the vertical and horizontal control boards—so that the replacement problem would be simplified. Since that has been attained we now strive for speed and smoothness in operation, and the elimination of the confusion which is always present at the nerve-center of the battalion.

This so-called *new* fire-direction technique has been old stuff to us for many months, and I, for one, am glad to see that, in adapting it, the Field Artillery has realized the ability of its enlisted personnel by delegating to trained enlisted specialists that duty which formerly was the jealously-guarded job of officers only: preparation and conduct of fire.

FIRE DIRECTION DECENTRALIZED

By Captain J. J. Davis, FA.



EVERYONE these days is thinking in terms of fire direction, which is, of course, as it should be, since it becomes more and more apparent that massed fire is the most effective way in which a battalion of Field Artillery can speak.

The 80th FA Bn (155-mm. howitzers) has been no exception; we too have been doing much thinking along fire-direction lines. We bumped headlong into the same problems that were described in Captain Atkins' article in the December issue of the JOURNAL, and we solved them in an almost identical manner. Enlisted men were trained as computers and given headsets to eliminate telephone operators. The results were excellent, but certain other factors led us along the road to what we now call "Fire Direction Decentralized."

The enlisted men we trained as additional fire-direction personnel consisted of the battery instrument sections; instrument sergeants, instrument corporals, and instrument operators. Since the subject was right down their alley, they learned quickly and were keenly enthusiastic. The next step in the evolution of "Fire Direction Decentralized" came during maneuvers.

After we had been in Louisiana but a short time, it became painfully evident that those concentric contours representing OP's were strangely missing. We had grown used to them both in the texts and on the ground, but now they were gone. As a result of this catastrophe, we found our battery instrument sections with much time hanging heavily on their hands. Our battalion liaison sections and battery forward observers were soon grabbing all the glory.

In order to prevent the instrument sections from becoming completely demoralized we decided to utilize them for the relief of the regular Fire Direction personnel. This system worked fine, but suddenly one day the great idea was hatched; why not make four fire-direction centers instead of one? After all, the battalion fire-direction center was just as likely to become the unfortunate recipient of an enemy concentration as any other part of the battalion. These two thoughts immediately gave vent to much discussion. First of all, we checked the texts on fire direction, especially with regard to the part on decentralization. To say the least, that part was rather vague. It stated that the battalion commander should be able to decentralize at will, but what then? The consensus of opinion was that decentralization simply meant that massed fires were out of the picture, except for previously prepared concentrations. In other words, the knock-out blow of the battalion was gone.

Our idea of four fire-direction centers, one for battalion and one for each battery, now seemed better than ever. It soon became evident that the principal problem involved in the attainment of our goal was one of communications. Quite naturally our thoughts turned towards simplex since our battalion fire direction was then using that means of communication. Upon more than one occasion our simplex system had been unsatisfactory, due chiefly to very annoying cross talk. This fact eventually brought forth the idea of using direct lines of battalion fire direction and simplexed lines for "Decentralized Fire Direction." Figures 1 and 2 show the wire system finally arrived at. This system has several advantages and only one disadvantage.

ADVANTAGES

(1) The initial lines laid by battalion are direct lines to the three gun positions.

(2) These lines remain direct lines and are used for battalion fire direction.

(3) If any or all of the direct lines go out, the battalion fire direction can still function utilizing the simplex phone at the fire-direction center.

(4) If the battalion fire-direction center is knocked out and the battalion switchboard remains in, as it should if properly installed, any one of the batteries can take over the function of battalion fire direction.

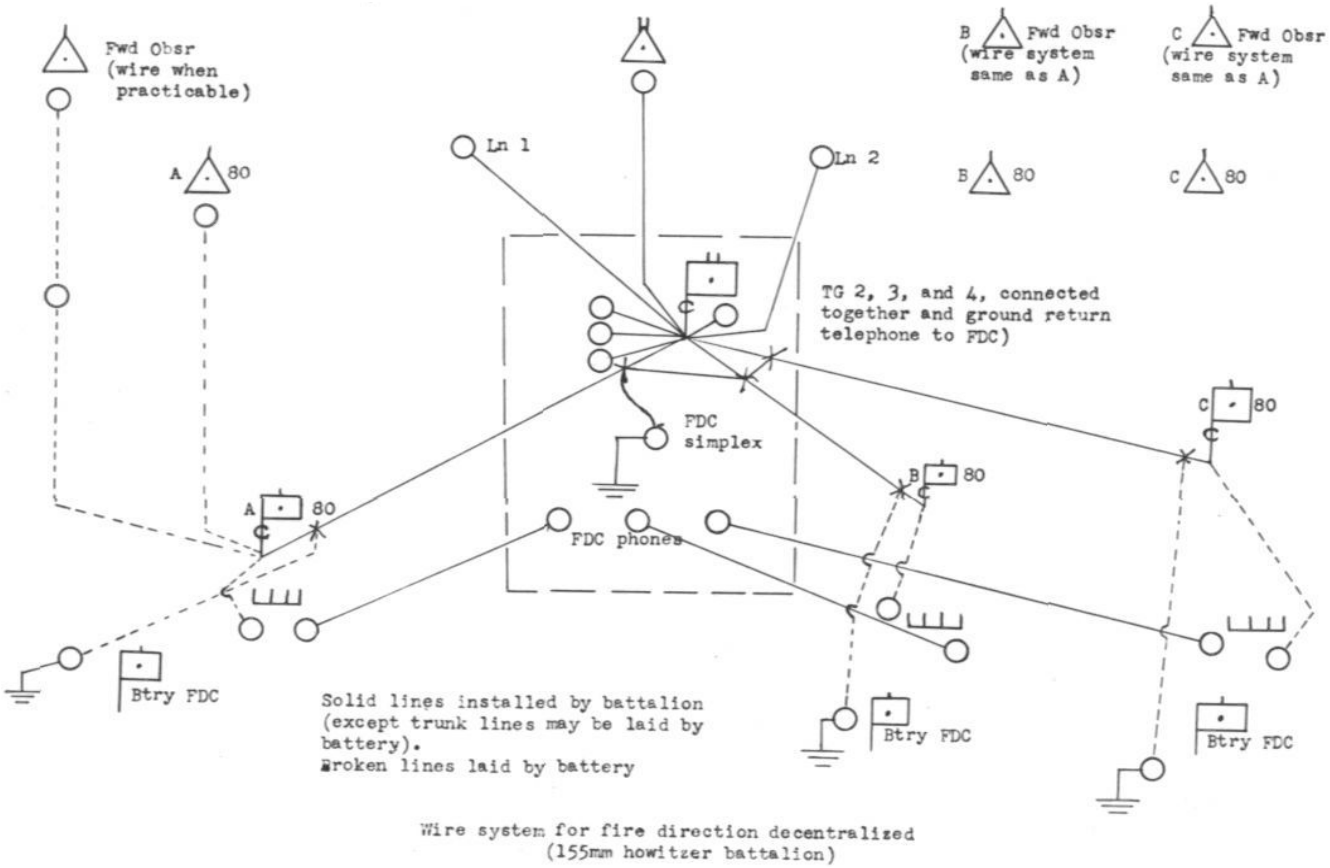
DISADVANTAGE

Requires laying of one direct line to each battery in addition to one normal line through the switchboards.

Note: Communication Officer can, at times, well utilize extra wire truck in each battery by having batteries lay one line to battalion.

PRINCIPLE OF DECENTRALIZATION

The principle of "Fire Direction Decentralized" is that any battery can function as a battalion fire-direction center. It sounds complicated but it really isn't. All that is required is that battalion keep the batteries abreast of the situation so that they may duplicate the firing chart of the battalion. The battery fire-direction center consists of a plane table set up under cover, in the vicinity of the guns. It is the rendezvous of that part of the instrument section not at the OP. If the elusive OP is available, two members of the instrument section man it, the rest are at the battery fire-direction center. At the fire-direction center they get a complete picture



Wire system for fire direction decentralized
(155mm howitzer battalion)

Figure 1

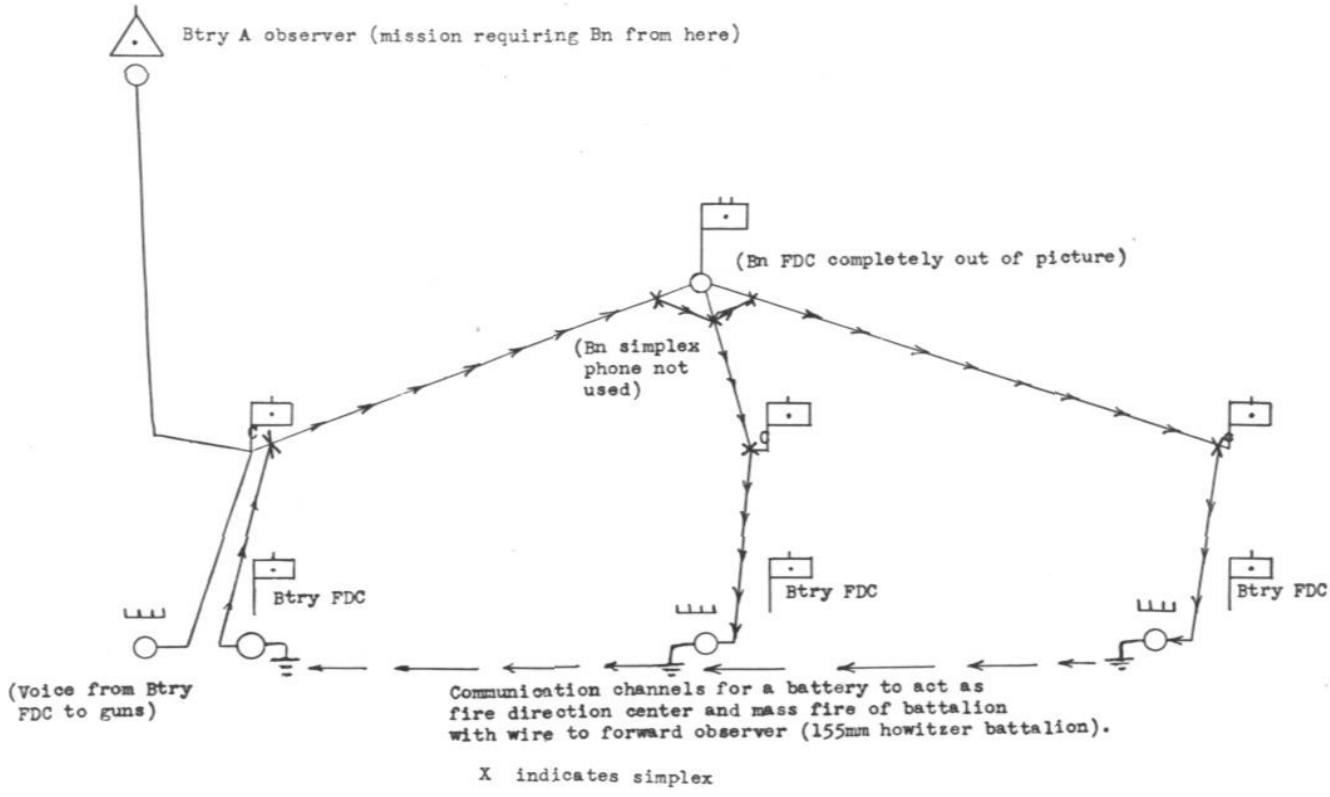


Figure 2

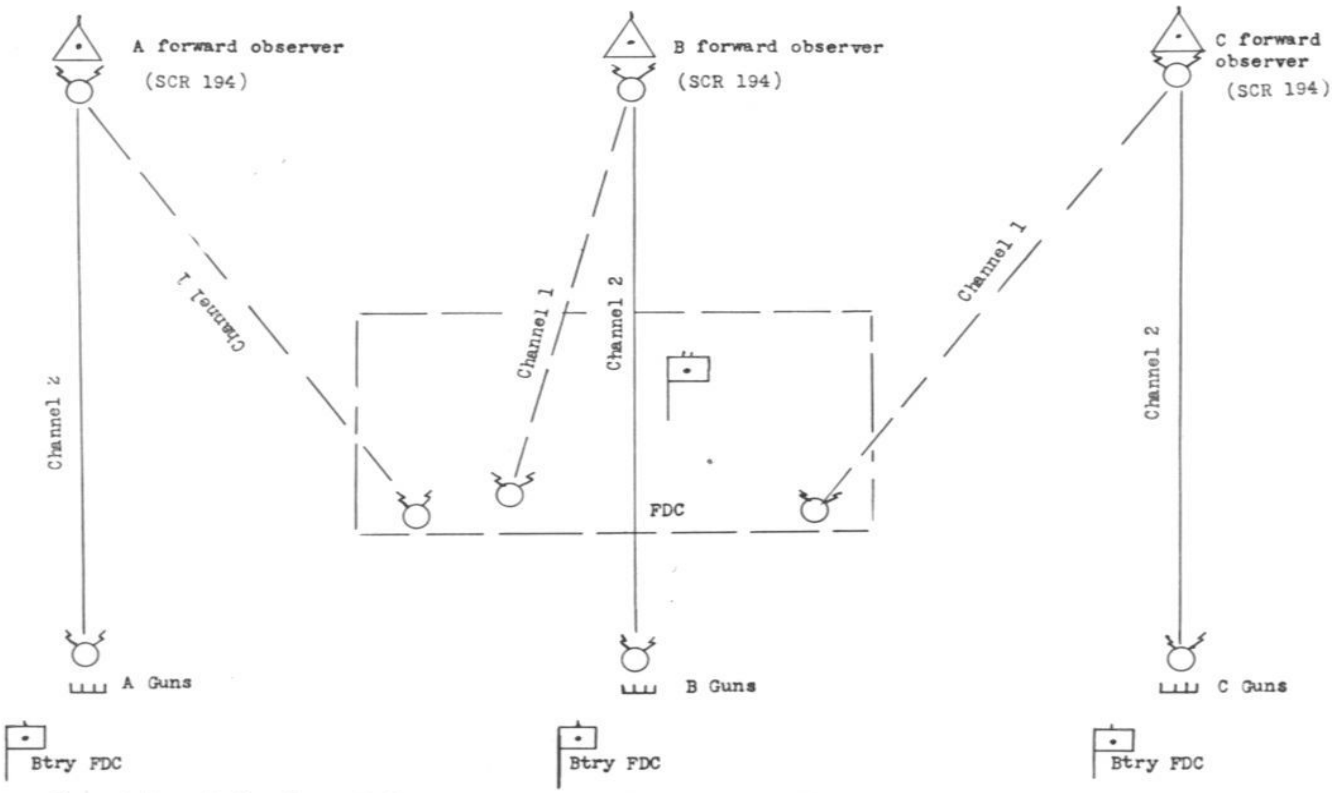


Figure 3

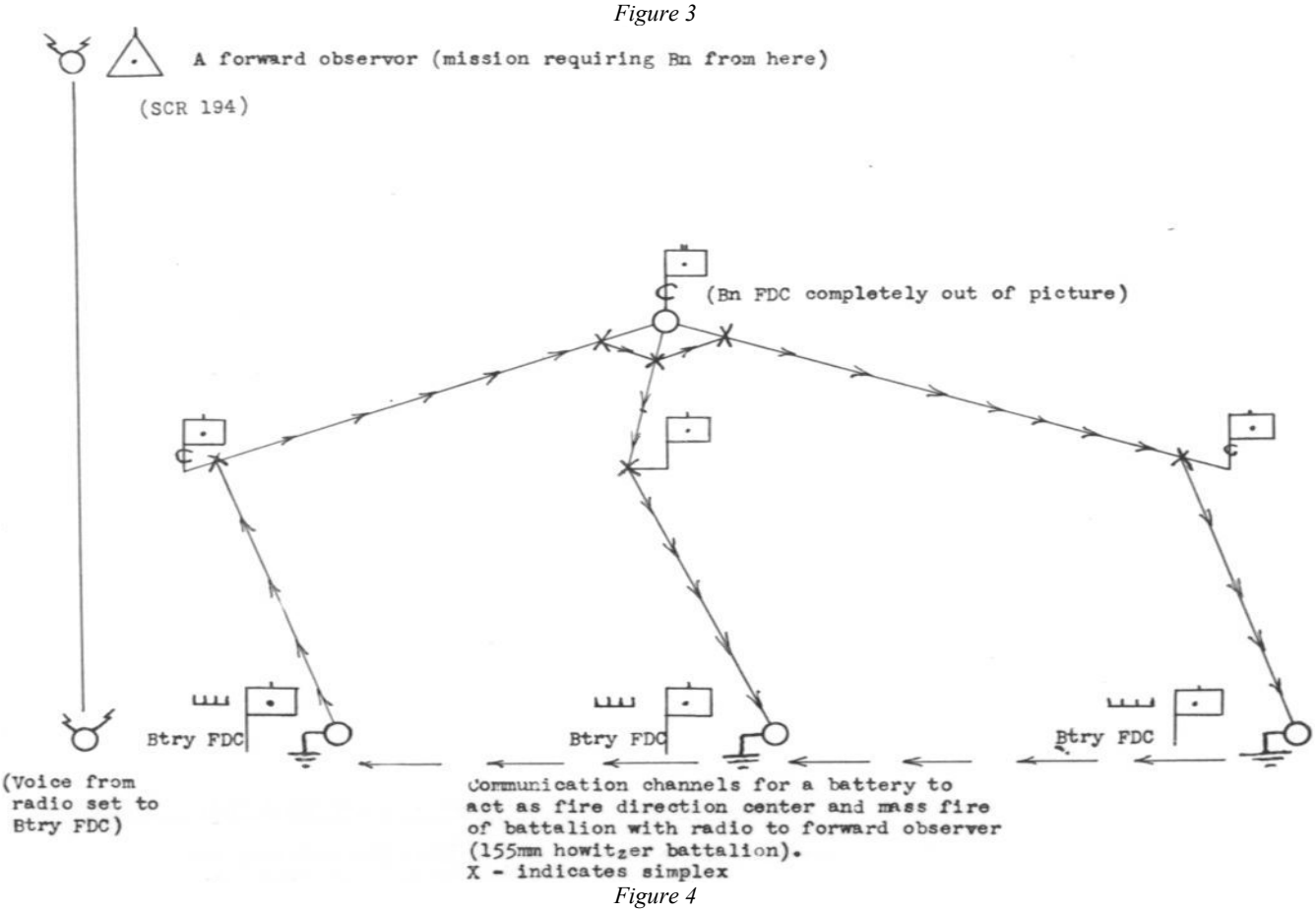


Figure 4

of what the battalion has done and what it plans to do. If and when the battery takes over the functions of battalion fire direction, the battery commander, executive, or reconnaissance officer takes over the duties of S-3. If the battalion FDC has been knocked out, available FDC personnel from battalion can be used to supplement that battery exercising control.

RADIO NETS

The radio set-up as used in the 80th FA Bn is normal for a 155-mm. howitzer battalion. Figures 3 and 4 show the nets as used in the 80th FA. Under our present SOI, each firing battery is allotted two channels for the SCR 194. Upon occupation of position, the battery forward observer (RO) directs his base-set at the guns to set up on channel 2 and listen. He takes his forward observer operator and base operator for battalion fire direction and reports to the battalion fire-direction center. There he receives detailed instructions as to base point, check concentrations, template points, etc. He is also told that if, after ten minutes' effort he can not establish communication with his base operator at the fire direction on channel 1, he will calibrate to channel 2 and try to establish communication with his set at the guns. This procedure is repeated until he has communication with one or the other of his base sets. He is then prepared to mass the fire of the battalion through either the battalion fire-direction center or through his battery fire direction center.

EXAMPLE

Situation: All batteries have duplicate firing charts of battalion FDC. Battery A forward observer has not succeeded in establishing radio with battalion FDC, but has contacted his base set at the guns on channel 2. He spots large enemy reserves and reports the following to his base set:

Base point 500 RR 300 SS

Enemy reserves, request battalion, will adjust.

Assume that battalion FDC is still functioning and that the forward observer merely had communication difficulties. The officer in charge of Battery A FDC reports target to battalion and is told to mass fire of battalion on the target, using 5 volleys. The following procedure is used:

(1) Battery A FDC to forward observer: Concentration 410 Adjust Battalion Affirm.
(2) Necessary data is taken from chart to adjust Affirm Battery and is called out to guns.
(3) Simplex telephone operator turns crank on his telephone, and Baker and Cast Batteries immediately answer. Batteries are told to stand by for fire mission.
(4) Forward observer is told battery has fired and adjustment proceeds in the normal manner.
(5) Range, charge, and base deflection shift is taken from chart for Baker and Cast Batteries and given to them over simplex channel. Personnel at battery FDC's of Baker and Cast Batteries act as computers and cause guns to be laid ready to fire for effect.
(6) Affirm Battery completes adjustment; deflection and elevation corrections are telephoned to Baker and Cast Batteries and battalion is fired for effect by Affirm Battery FDC.
(7) Concentration number is given Baker and Cast Batteries and also to battalion FDC.

CONCLUSIONS

We have tested our system of fire direction decentralized by using it to mass fires (using 37-mm. shell). The results have been excellent. Enumerated below are what we believe to be some of its outstanding advantages:

(1) It puts the battery and battery commander back into the big picture.
(2) There is no better way to train fire-direction personnel.
(3) It is highly flexible.
(4) It is entirely possible that it may be the means of massing the fire of the battalion in combat when the battalion fire-direction center is knocked out.
(5) Four fire-direction centers are available instead of one.

EVALUATION

Here's something you always can do. If you don't like it, "Raise Hell." If you do, say nothing and I am sure you will make a big hit wherever you go. The average person is filled with ego, and you won't nourish his self esteem with a spirit of criticism.

Let's just think this over together.

In these days of headlines: "65,000 Reserve officers now on Active duty," "Leaders among Selectees to be officers," "General Marshall asks for regulation change to permit release of incompetent regular Army officers with same simplicity as govern release of National Guard and reserve officers who do not qualify," "Five hundred Majors promoted to temporary grade of Lieut. Colonel."

In one thing at least we are again equal, our sources of information. We receive nothing that we can really tie to, for news releases are somewhat garbled by the time they reach us and we too, certainly realize that our leaders cannot broadcast their plans. Even if it were possible I, for one, would not at this time elect to be in on their plan until it approaches the time for action. The responsibility of knowing is often very great. Here is a case where truly, "ignorance is bliss."

But in our, shall we say, present blind condition, we can well spend time evaluating our information and each one come to his own conclusion, to the end that we do not commit that unpardonable military error of being surprised. —COL. WILLIAM N. DAY.

FIRE DIRECTION WITHOUT MAPS

By Lieutenant-Colonel H. C. Demuth, FA.

CAVALRY sometimes deploys and attacks directly from route column. This makes the action very fast and gives the artilleryman the minimum of time to organize his fires. This minimum of time, depending on the maneuver, is usually insufficient to set up the observed fire chart, make the necessary registrations, and get a concentration down in front of the attack. The artillery commander is, therefore, reduced to pointing out the target to his battery commanders and allowing them to adjust individually. This latter method is generally unsatisfactory.

No methods mentioned in FAB 161 Edition of 1936 or 1941 give the requisite speed in the case of where there are no maps or no aeroplane on the spot; yet to hold up the cavalry attack until the artillery can get the observed-fire chart operating may cause our cavalry to lose the initiative. To attack without artillery support may be disastrous.

Keeping in mind that speed is essential, the SCR 194 set makes it possible for the artillery battalion commander to, one might say, call signals; and along that line some code name should designate each system of fire direction that may be used and be sufficient to put it into effect in any situation. In the situation envisaged, the battalion commander of artillery is justified in occupying a battalion position geographically somewhat smaller than is usually occupied by a battalion of light artillery. In the case where this speed is essential, such a position can usually be found. Batteries will probably be about 300 yards apart at the maximum and nearly on a line. In close country this speed will rarely be required.

The following operating personnel should be provided:

S-3 (or staff officer) to control the whole thing and pass initial commands to flank batteries.

Two computers (staff officers) previously designated to compute, one for each flank battery.

Two line guards, mounted, each carrying 350 yards of light wire.

Two telephone operators, each with a telephone for battalion end of circuits. Batteries attach own telephones.

Battalion commander and battery commander of center battery at OP with battalion commander's SCR 194 set.

Battalion commander's base set, SCR 194, with battalion executive.

Battalion commander at OP states the code word to put the system into effect over SCR 194, and the battalion executive, receiving it over the base SCR 194 set, repeats it to the personnel named above. When trails are dropped, the above personnel, including the base SCR 194, all move up to the center battery. Each line guard lays his circuits from the executive's post of the center battery to the executive's post of his flank battery. In the meantime, the battalion commander has pointed out the target to the BC of the center battery, who lays with compass and adjusts, his commands being transmitted to his battery via the SCR 194 sets mentioned above. S-3, relaying the commands to the flank batteries, causes them to follow all commands of the center battery. By the time the center battery has completed adjustment, the flank batteries are only out in deflection by the amount of their displacement on the ground. Each computer has sent the site* for his battery and has estimated the difference in range between his battery and the center battery. He has also estimated the distance from the directing piece (O) of the center battery to the corresponding piece (G) of his battery and determined the obliquity factor. When the center battery announces its adjusted range, he calculates $OG/R \times QT$ (where QT is the obliquity factor) and commands the shift. He commands zone ..... R ± dR and the flank battery is laid to fire.

This method is very fast. Allowing 5 minutes for the one adjustment and 2 minutes to shift the flank batteries, since there is no plotting, a battalion should be able to concentrate its fire in a total of 7 minutes (or even less) from the time the first round is fired. This is one-third the time required for the method laid down in Book 161, and meets the speed necessary for support of cavalry. Bearing in mind the fact that R as used is that found by the center battery, anyone who can figure an initial compass problem can compute for the flank batteries and the result obtained closely approximates that shown on page 131, FA Book 161, Edition of 1941.

*A simple site problem. He knows site of center battery and uses approximate R of center battery.

HORSE ARTILLERY IN SUPPORT OF CAVALRY

FIRE-DIRECTION TRAINING IN GERMAN ARTILLERY BATTALION

FOREWORD: This article, written by a German lieutenant colonel of field artillery, was published in the July, 1941, issue of the *Artilleristische Rundschau*. The author has apparently had experience in commanding and training an artillery battalion. The article is of interest for the reason that it gives an indication of German fire-direction methods, concerning which information has been scarce.

As the battalion is the firing unit in the field artillery, and modern warfare requires the concentration of the fire from all the guns of an entire battalion and, in many instances, of an entire regiment in the shortest possible time, it is essential that the entire battalion be thoroughly trained in the proper fire-direction procedure. In order to accomplish this it is necessary that battalions frequently have fire-direction exercises.

The purposes of these exercises are:

First, to obtain and increase proficiency in battery fires under battalion command.

Second, to practice concentrating the fire of the battalion on targets of opportunity.

Third, to train all the batteries of a battalion to fire successively or to train only one battery to adjust and transmit data to the other batteries.

Fourth, to train battery commanders to make their own decision in accordance with their personal observations, the infantry fire requests and the firing orders of higher authority.

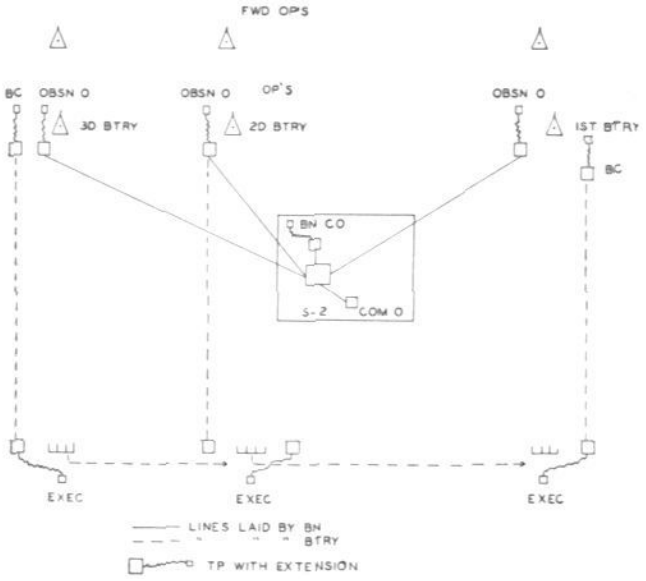
Fifth, to train battery intelligence reconnaissance and observation personnel and to impress them with the necessity of reporting to higher headquarters every observation, no matter how unimportant it may seem.

Medium Artillery in Open Warfare

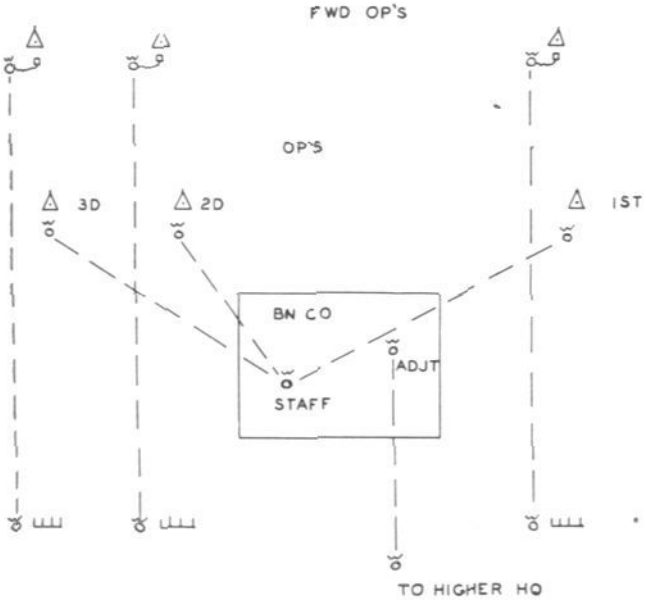
German 105-mm. gun firing on the Russian front during the summer campaign of 1941. Things of interest in this photo:

(1) The method of camouflage does not conform to our ideas as to what is proper. But it may be all right, at that, Note how much of the reflecting surfaces on the gun and carriage are concealed by the net or by brush. This camouflage may be meant to minimize chances of visual detection from the air rather than to provide photographic security. From a height, this whole layout may blend in with the clump of trees. Note the absence of disturbed earth. (2) German shelter tents are colored, or spotted, to provide some camouflage. (3) A good field of fire for shooting at tanks extends well to the front.

In order that a battalion may mass its fire in the shortest possible time, it must have a well-organized and fast-working signal communication net. The communication personnel must work with the greatest rapidity and accuracy. Speed is essential in this modern warfare and for that reason every delay in giving commands must be eliminated. Fire commands should be given only from one officer to another, both from the battalion to the battery observation post and from the battery observation post to the gun position. By means of a portable telephone and parallel switching equipment, the battery commander personally transmits the firing commands directly to the executive at the gun position, who is also equipped with a portable telephone and telephone switching equipment. The intermediate telephones listen in on the messages but remain quiet. The portable telephone set is a chest set. From the chart it can be seen that the battery observation officer [U.S. RO] is in direct connection with the battalion CP. The battalion adjutant [U.S. S3] gives firing orders directly, only to the battery observation officer or the battery commander. This method assures the quickest transmission of orders from the battalion to the batteries and the immediate conversion of these orders into fire commands to the firing battery through the observation officer and battery commander.



Schematic diagram of the battalion wire net. The lateral lines indicated between batteries are laid (from left to right) only in defensive or stabilized situations.



Schematic diagram of radio net.

In case the battery commander when firing from a map or at night is at the gun position, the observation officer operates the lines from the battery observation post to the gun position and to the battalion CP. He may be assisted in this by the instrument sergeant or instrument operator.

Computations *for map firing* should be made at the gun position by the battery commander rather than at the observation post. The observation post is used for observed fire, for which computations are unnecessary as the firing data calculated by the instrument sergeant or instrument operator is sufficient. Map firing on the other hand requires many computations. Hence, if the telephone line to the observation post has been broken, necessitating fire by map, then if computations are made at the observation post, the battery is forced to remain silent. When firing from the map at night the battery commander should be at the gun position and the computation group and its equipment must be moved there, in case it was at the observation post during the day.

Organization for a Fire-Direction Exercise.

The following groups are sufficient to conduct a fire-direction exercise: battalion staff with the battalion communications and survey sections, battery officers and gun crews, battery detail and forward observers with their equipment. The entire communication facilities are used, including parallel switching equipment.

The battalion commander is both commander and instructor. As battalion commander he has a staff. He, with his S3, is stationed at command post I and gives the fire orders to the batteries. The intelligence and signal officer is at command post II. In addition to his activities as communications officer, he receives information concerning the enemy and has charge of the situation maps.

As instructor, the battalion commander has an instructor's staff, including assistants and messengers. This staff has the following tasks: First, to represent infantry unit headquarters (battalion and company), which send their requests for fire support to the forward observers by messengers and if the occasion presents itself, to the artillery main positions. The requests are written on slips of paper so they can be checked later. Second, to

represent higher headquarters (artillery regiments and division artillery commander), which give orders to the battalion for fire and concentrations. Third, to compile the result of the fire-direction exercise, especially to ascertain whether the infantry requests and the orders of the higher headquarters have resulted in proper measures and fire commands in the battery.

The instructor's assistants should be intelligent noncommissioned officers. They are assigned to battery observation posts, forward observer and gun positions and record all firing commands and send them to the instructor's staff by messengers. From these the instructor's staff determines whether the fire orders were delivered properly to the battery officer, whether the calculations were accurate, and whether the firing commands were transmitted quickly enough. This staff also checks the fire commands which are transmitted to the guns by the battery officers, especially when firing by map.

Conduct of Exercise.

The instructor gives a basic tactical situation to the batteries, the battalion staff and the instructor's staff. In addition, the instructor's staff is given a general outline of the entire exercise, with a few combat situations. At appropriate times during the course of the exercise, the instructor's staff gives the orders of the higher headquarters and the infantry requests for fire to the battalion staff, the battery observation post or the forward observers.

With the help of the above mentioned facilities, the exercise then runs by itself. The instructor's staff representing the higher headquarters brings the battalion into action from "above," in accordance with the logical development of the situation. This staff, acting as infantry headquarters, also brings the battalion into action from "below" by means of messages from the forward observers or the battery observation post observers.

A time record must be kept of events occurring at the different observation posts, gun positions and at the battalion command post. Every effort must be made to decrease the time required to execute the different tasks.

Fire-direction exercises must be held at the very beginning of the training period and should be repeated at regular intervals. The first of these exercises should be utilized in training in use of the signal net to insure cooperation and teamwork among the operating groups. This can be done by placing groups in separate nearby buildings. The instructor and battalion staff with their equipment in one building, one gun position, observation post and forward observer for each battery. This arrangement is especially recommended for inclement weather. Later exercises are held outside where more stress is placed on combat conditions. During these exercises, *the enemy should be represented by troops*. Explosive charges and other facilities, which should simulate the logical action of the enemy as the assumed situation develops, should be used. [This effort for realism is characteristic of all German training.] Battery personnel should be stimulated and trained in the obligation to report all observations. The best reconnaissance information is obtained by the higher command through the reconnaissance activities of the artillery observation posts. The artillery is allotted the best observation points. Thus, observations from artillery personnel often form the most important basis for the decisions made by the higher command.

If the training period lasts three to four months, two exercises should be held during each of the first three months. In any event, one such exercise should be held each week during the last month of the unit training period. At least ten fire-direction exercises should be held by each artillery battalion during the four-months training period.

COMMENTS

This article gives the first indication of the German system of fire direction. It resembles the method taught at our FA School about 1927. It is simpler than our present system, and not so highly centralized. It is built on the assumption that the majority of fires will be observed fires. It does not have the refinement of methods as laid down in our fire-direction system for massing of fires. The communication system within the battalion does not provide for rapid transmission of target locations from forward observers to the fire-direction center and of fire orders from the fire-direction center to the gun positions.

In addition to emphasis upon adequate signal communication, the author emphasizes the importance of observation as a factor in massing artillery fires. It is a fundamental principle in German combat to expend every effort to seize the best available observation for artillery use and to deny the same to the enemy.

The portable telephones and parallel switching equipment as used by the Germans appear to make telephone operators out of their officers. Their purpose seems to be to give greater speed and accuracy in target designations and fire commands.

British medium howitzers in action in front of Tobruk. (*Acme Photo*.)

Lieutenant-Colonel David Larr's Diary of a Trip to

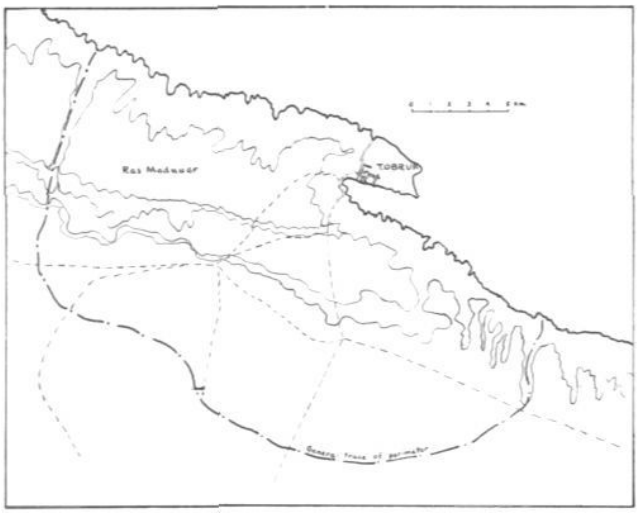
TOBRUK

13 August, 1941. After a night in the Windsor Palace Hotel at Alexandria, during which I had been awakened only once by the antiaircraft blazing away at the nightly raiders, it was like an Oppenheim story to approach the guarded gates of the naval base in the mist and darkness just before dawn. With true story-book technique, — examinations, whisperings, and dubious looks, I was finally dumped on a dock some 50 yards from a destroyer which was obviously loading for a trip. The taxi driver tossed my gear at the feet of a glowering Australian sentry and faded into the mist. After more questionings and more suspicion, I finally managed to get my bedding roll and musette bag on to the deck of the destroyer and started to see if I could find anyone who would tell me whether I had arrived at the proper place. More mystery, more searching glances at my American insignia, and I was conducted into the presence of a tall, blue-eyed, pleasant-faced chap who was a decided relief from all I had encountered heretofore. He turned out to be the skipper of this minor item in His Majesty's Navy, and immediately sent me down to the ward room where I was made to feel very much at home.

After a hearty and welcome breakfast, I went back on deck to watch the ship get under way. We were apparently being accompanied by two other destroyers. The vessel on which I had been billeted was a flotilla leader of half again the tonnage of the average modern destroyer. She was a beautiful ship, completed just after the outbreak of the war and possessed of peace-time fittings and comforts. Despite her classification of a destroyer she had an armament which in reality placed her in the light cruiser class. Far from the spotless and polished fixtures which one expects to see in peace-time, she was rusty here and there, covered with oil and muck, and only the mechanisms of the guns were bright. On the deck, stowed in every conceivable cranny and lashed to everything which looked strong enough to keep it from rolling overboard, were boxes of equipment, cases of canned rations, ammunition—mostly for antiaircraft and 25-pounders—and the personal equipment of two platoons of Australian infantry. There being no room below deck, the Australians were hanging on wherever they could find a resting place. There were six Australian officers and three British officers who quickly made themselves comfortable in the ward room and whose personal gear and equipment formed a small mountain, of which the greatest part seemed to pertain to the three British officers. There were apparently no regulations against living in comfort and people going to Tobruk prepared for any eventuality and an indefinite stay. (Later I discovered the wisdom of this.)

After we passed through the anti-submarine net at the mouth of the harbor and got into the open sea, we started to turn up 30 knots or better. I found quickly that this ship bucked and rolled just as much as any other destroyer anywhere in the world and she was especially wet as she was rather top-heavy with all the deck load which had been piled upon her.

After making the acquaintance of the ship's officers, I was taken on a tour of the engine room and the fire-control installations by the officers concerned and given the works in the manner traditional to all good navies. After the engine room, in which I quickly noticed that the engineer during the long, drawn-out explanations of turbines and boilers stood under the cool draft of the blower from the deck above while I continued to melt under 120 degrees of muggy steam, I was taken up into the director tower by the gunnery officer. (A more perfect pneumonia procedure could hardly be devised.) It was extremely interesting, as the same installation handled both antiaircraft and main battery.



Sketch of Tobruk area, showing the perimeter and edges of the multiple escarpment. Roads are indicated by broken lines.

However, my thirst for technical knowledge rapidly ebbed. We were swinging an arc of at least 25 feet in the heavy sea. I returned to the bridge and manfully attempted to look nonchalant while conversing with the skipper, but it was just no use. Finally nature took over. A polite attempt to excuse myself and go below was greeted by my new-found friend with, "Signalman, the bucket." A G.I. bucket was magically produced by a disgusted looking signalman who plunked it squarely on the deck practically at the skipper's feet. Being be yond all caring, down I went in the traditional fear that I probably wasn't going to die. The crowning blow shortly thereafter, while I was in my most ignominious posture, was an overheard line from the operator of the signal searchlight in the after part of the bridge who remarked to his chum, "Lum'me, 'e even fyces to'ard Mecca." By this time I had recovered sufficiently to berate the speaker with all the invective I could muster, and to pray that I could get him on a horse some day. This seemed to restore an era of general good feeling all around the bridge, and we got along beautifully thereafter.

Throughout the day the flotilla tore along at slightly better than 30 knots, making the prescribed zigs and zags, while all hands stared aloft for enemy aircraft. This ship had a bonus system in effect which seemed to sharpen the eyes of the watchers, even though their skins depended upon the early detection of any plane which might come into view. The crew had chipped into a pool, and five pounds were given to the one who first spotted enemy aircraft which later actually attacked the ship either by dive or high-level bombing. I was told this system had worked like a charm except during the Crete "show" where they had had 41 attacks in one morning and the ACC counting system collapsed, to the financial salvation of the engine room force and others below deck.

Late in the afternoon as we were about opposite Barrani, the cry "Fighters!" from the starboard beam brought everyone to his feet like a shot. After several moments of tense silence, they were identified as the "umbrella" sent out to cover us during the last hours of daylight.

Shortly before midnight the ship slowed down to a mere crawl, and a few flashes of light and dull glows began to appear in the murk ahead. Later, as we drifted along, rolling slightly in the choppy sea, there was received a certain signal which indicated that we were near our destination, and after a tense half hour or so we eased through the gap in the mine field and the submarine net into the harbor of Tobruk.

14 August. Our three vessels came through the gap one by one, and far from its being a haven of rest, the skipper was then presented with the problem of navigating to a rendezvous with a lighter through a tiny harbor which was said to contain more than 50 wrecks, to say nothing of miscellaneous acoustic, magnetic and ordinary contact mines dropped by Axis airplanes.

As we coasted towards the anchorage, the decks reminded one of an ant's nest which has just been aroused—Australian infantry stumbling over each other and all manner of gear as they congregated by the rail; officers wrestling with kit which would take no less than three men to carry if it were all moved at once; the crew casting off lines and lashings and preparing to unload the deck. The only illumination was the soft glow of the starlight and an occasional gun flash from above a dimly-seen ridge which seemed to constitute the sky-line. We soon realized that there was an air raid in progress. Antiaircraft guns were bickering on the hill above the harbor and occasionally there was a sudden group of bursts over head. We could clearly hear the drone of the hostile planes.

Just as the "hook" went down there was a terrific glow in the sky to the west, which lighted up the scene sufficiently to read fine print. The brightness held for a few breathless instants and then came a series of dull thuds and crumps which told us that an important hit had been made. The glow of the ensuing fire, which came from beyond the shadowy crest, gave quite a satisfactory illumination for the disembarkation. The lighter pulled alongside and the crew, working like madmen, started to throw the cargo overboard into it. Their efforts were in no wise slackened by three sticks of bombs which hit in rapid succession near the water front on the side of the harbor about one-half mile away. The bombers seemed to pass out to seaward, followed by a forlorn trail of antiaircraft bursts. About this time the realization came suddenly that no searchlights had been in operation throughout the firing.

The lighter was rapidly filling with a heterogeneous collection of boxes, barrels, cases of canned goods, and bits of kit and personal equipment which were tossed indiscriminately over the side of our destroyer. As the

crew and details from the Australian infantry worked like madmen to clear the deck, there was hardly a word—just a shuffle of feet, the sound of quick-caught breath, and the thud (or occasional splash) as the cases went over the side. My bedding roll flew over the rail, propelled by a pair of brawny Australian arms. It hit on the stern of the lighter, and after a precarious moment tumbled inside (thank God!) to be hit squarely in the midrif with a case of 25-pounder ammunition. My heart sank as I thought of the two bottles of precious Scotch which were in the roll.

Finally the decks were cleared and at a quiet word, the troops leaped over the rail helter skelter on top of the heaps of boxes and cases in the lighter. An ancient, one-lunged tug strained and struggled, and we slowly chuffed away from the side of the destroyer. At this moment an increasing hum told that the bombers were returning. The lighter had no more than cast off its line than the destroyer went into a purposeful reverse and headed toward the gap in the anti-submarine net at a speed which was well-nigh madness in the half-light. The fire was still burning over the hill to the west, accompanied by the occasional crump of an explosion of great or small degree. Now and then a light rocketed up somewhere around the horizon, or a gun flash punctuated the picture from below the sky-line to the south. The bombers came roaring in and bestowed several sticks of bombs on the destroyer anchorage less than five minutes after the last of those gray shadows had departed in the direction of the gap in the mine field.

We arrived at the quay, and the dull light of the fire began to die down just as the moon shed some light as it rose beyond the harbor mouth. A detail of stevedores pitched in to unload the lighter just as frantically as it had been loaded. The bombers swung back towards us after wandering around for a while out to the west. The officers formed a forlorn group peering among the crew down into the lighter, trying to pick out pieces of personal equipment from the heaps of cases of rations and ammunition. Now and then mangled remnants came into sight; meantime the enemy droned overhead. Just as I spied my bedding roll and leaped with a glad cry to retrieve it, someone yelled "Down!" There was a succession of terrific crashes in the buildings opposite the quay. The air was filled with swirling things, and frantically clasping what I think was a case of canned goods to my bosom, I fairly burrowed into that cargo as bricks, dust, and heaven knows what all bounced about.

This bedlam had no sooner died down, giving place to recollections of horrible stories of delayed fuzes, when there was a most terrific thump about 300 yards away in the middle of the harbor. I got a quick picture of a huge white column of water rising, rising—interspersed with black objects. And after it came down with a thundering crash, someone nonchalantly observed that "Th' mail barge must've got hit by a big 'un." It certainly "must've!"

After a time some degree of coordination began to be achieved on the dock and baggage came to light. I was about to enter the truck which was waiting for some Ordnance friends whom I had met in Cairo, when a peremptory young officer arrived shouting my name. He appeared to be in something of an ill-humor as he had apparently been seeking me for quite some time. I was unceremoniously loaded into the back end of a truck already filled with shadowy figures, and my bedding roll (colloquially known as a "flea bag") unceremoniously was tossed in after me. The truck bumped away up the ramp from the harbor, threading its way between the bomb craters which seemed to pock the entire roadway, and moved off to the west. By this time—around three o'clock—things had quieted down. I learned that the big fire had come from an old Italian ammunition dump which had apparently received a direct hit from a stick of bombs and had gone up in a tremendous blaze.

After about a half hour's grinding over what appeared to be an endless pile of bricks and flagstones, we pitched down a short slope and bumped to a stop in a valley which, in the moonlight, reminded me of some of the pictures from my childhood memories of ancient Biblical burying grounds. Equipment was tossed out on the ground, and a wave of the hand from my curt young officer indicated what appeared to be a rocky ledge, accompanied by the information that breakfast could be obtained between 6:30 and 7:00 at some place in a vaguely defined direction. Being too tired to know or care, I set about unrolling my bed and was not many minutes in discovering this billet supported the most tremendous and voracious population of fleas ever encountered.

Shortly after daybreak it was revealed that my guide and mentor of the night before was the liaison officer in charge of newspaper correspondents. He had a bill of lading for six correspondents and had only been able to discover five on the quay the preceding night. Learning of an additional foreigner he had come to the logical conclusion that I must be the sixth. It took some argument to convince him that his assumption was in error. I had not the slightest desire to go on a personally conducted tour to the billets of an Indian Cavalry Regiment in the area along the seacoast that morning. After some sales resistance, transportation to Division Headquarters was finally produced.

The fortress of Tobruk at this time was anything but the classic idea of a besieged town. As will be seen from the map, the terrain was, in general, divided into three levels by the low escarpments which traversed the area roughly from east to west through the central portion of the defended area. In general, the British defensive positions followed the old Italian perimeter. They enclosed a roughly semi-circular segment of naked desert at a radius of about 15,000 yds. from what had once been a small white-washed town. In most cases the Italian perimeter works were actually employed as a

basis for the forward defense. In addition, there were other organized perimeters in rear of the first, with a series of final defensive areas above the harbor. The outer perimeter was at this time some 27 miles long. The Germans had reached it at the southwest corner on May 2, and occupied a low rise in the ground called Ras Maduuar which overlooked approximately a fourth of the terrain inside the Italian defenses.

The ground inside the outer perimeter contiguous to its southern portion and above the southern or second escarpment, as well as that near the eastern end, was extremely flat with visibility largely limited by light conditions only. Here one encountered the rather unusual condition of observation from wooden towers, where you sat 'twixt earth and sky and watched your opposite number some 2,000 yards away, doing the same thing. It apparently wasn't "cricket" to shoot up the other chap's observation post except in dire emergency, as he would naturally reciprocate and it was a long way to any cover once you abandoned the tiny dugout at the foot of your tower. It was OK, though, to pitch a round or so over in the morning to check your "K" for the day and remind him you still had him "taped." He would reciprocate promptly.

Most light artillery positions had little more than sight defilade. There were some "troops" (batteries) with battle positions squarely on top of the second (southern) escarpment in full view of enemy observation posts for miles around and one could not help wondering whether they were really undetected or were left there so they wouldn't go away and hide themselves somewhere else.

Scattered about below the first escarpment and in the wadis which cut the coastal cliff in a continuous series from east to western ends of the perimeter, were located the base installations, hospitals, shops, supply dumps, etc. The harbor, being a vital area, was the site of heavy antiaircraft and seacoast defenses.

Troops were billeted generally all over the area with extreme dispersion—living in hovels, holes in the ground, holes in the escarpment, or just out in the open, in a condition of dirt and grime unsurpassed anywhere in the world that I know of. The climate of Tobruk never varied—it was always abominable. As soon as the dew left the ground in the morning, the northwest wind picked up quantities of dust raised by traffic in the base area along the coast. By ten o'clock a full-sized "kham-seen" (dust storm) would be blowing, with visibility anything from 150 to 400 yards. This thinned out on top of the second escarpment near the forward defensive lines and one was presented with the delightful alternative of existence in a perpetual exposure to acute silicosis or to "lead poisoning." It was always hot during the day and always cold at night. As mentioned before, the fleas in Tobruk were everywhere—the biggest, fattest, and hungriest I have ever seen. Their change from an Italian to a British diet simply seemed to have whetted their appetites.

The garrison at this time consisted of Australian infantry, British and Australian artillery, British antiaircraft, and mixed antitank and armored units all under command of an Australian general. Nothing except the infantry seemed to have either its designed equipment or its table of organization strength; this largely due to the circumstances under which the garrison was formed. It was made up of troops who had captured the fortress during the campaign of December, 1940-January, 1941, plus others who had taken refuge in it during the retreat from Cyrenaica in April, 1941. They had whatever they had brought with them in the way of equipment, plus a very considerable amount of armament captured from the Italians when the place was taken. Troops were using what they could get hold of, in the condition in which they found it, and the results were a tribute to the ingenuity and adaptability of the men. Units of artillery were equipped with everything from Italian 65's through British 25-pounders and 6-inch guns to Italian 150-mm. howitzers. Antiaircraft guns were as variegated in their character, but fortunately for the garrison a considerable number of Breda 20-mm. machine guns had been captured, with ample stores of ammunition. These formed the backbone of the light antiaircraft defense and had proved their worth by shooting down a majority of the planes destroyed during the constant bombing attacks to which the garrison was subjected. At this time the fortress had been under siege approximately five months, and the physical condition of the troops was not so good. However, when one considers the conditions under which they lived, both as to climate, rations, and foul, brackish water, their stamina was little short of amazing. Their morale was satisfactory when one considered the conditions under which they lived and worked. (Author's note: Practically the entire garrison was replaced by fresh troops early in the fall of 1941.)

The motor equipment was in a condition of decrepitude beyond belief. The fact that it ran at all was prima facie evidence that the Ordnance officer of the fortress must have staffed his maintenance shops with magicians. Vehicles seldom had any equipment or fittings not necessary to their locomotion or the transportation of cargo, and usually showed bomb scars and bullet holes.

As we topped a rise on my trip to fortress headquarters and looked across a flat expanse of dry dirt, my driver cheerily remarked with a wave of his hand, "There she is!" Through the yellow clouds of dust I couldn't see anything but the usual dispersion of small tents, tarpaulins, sand bags, billets, multitudes of wrecked vehicles, etc., which one met any place. He laughed and told me that I was looking at the headquarters contained in a number of sizable structures. As we approached, I suddenly realized that he was correct. The camouflage was as unusual as it was effective.

The sentry at the traffic control post diverted all traffic some distance from the destination. The driver threw my flea bag into the ditch and swirled away in a cloud

of dust. Trustfully consigning my worldly possessions to the sentry, who observed that he was due to be relieved in 10 minutes, and trudging up a slight incline I finaly found the Brigadier, R.A., Chief of Artillery, Tobruk Fortress. His office was a tiny place, cluttered with people and gear and supplies. Everything including the people was covered with literally inches of dust, which drifted in almost as fast as it was shovelled out. Our conversation was punctuated by an occasional bang or whirr of flying steel from the ammunition dump which had been bombed the night before and was still burning just beyond his sandbag wall.

About ten o'clock, having retrieved my gear from a new and dubious sentry, I was driven to a little concrete house under one of the escarpments which proved to be the office and billet of the counter-battery officer of Tobruk. He was a lively and intelligent young captain who apparently carried his responsibilities easily. The place was crowded, to say the least, but they told me I could sleep on the front porch, whose virtues they extolled with the remark that it had six-inch concrete walls on top and two sides. The dump of material just across the road on the two open sides contained several hundred tons of 500-lb. airplane bombs, so it didn't make any difference whether I had concrete walls on those sides or not. Besides there weren't any fleas on the porch and I could direct callers who blundered in at night to the proper room and they (the counter-battery staff) wouldn't all be awakened to sort them out.

After a luncheon (so-called) of bully beef, hard bread and whisky flavored with salt water (or vice versa), Captain F took me off for an inspection of his counter-battery installation.

This operated as a part of the Office of the Chief of Artillery. Unfortunately for the results achieved, the counter-battery officer did not have under his immediate control more than one troop (battery)—these being heavy guns specifically allotted to counter-battery fire against the so-called "harbor gun" with which the Italians shot up the entrance to Tobruk harbor from positions east of the perimeter. The counter-battery office received its information from the flash spotting CP, the sound ranging CP, and the headquarters of three sectors—west, south, and east. These sectors headquarters were in reality the counter-battery officers of three regimental headquarters under which the artillery allotted to their respective sectors was functioning in groups.

We left the counterbattery office to visit the sectors from right to left. It was about three in the afternoon when a locally produced dust storm was at its murkiest. As we rolled westward on the Derna Road, Captain F and his driver took turns at the map and speedometer trying to locate the wadi off left, in which the headquarters of the group were reputed to be. Finally, having gone much too far but with some doubt as to the accuracy of the odometer, we headed south across the plain, winding in and out among the billets towards a wadi which appeared to be inhabited by something which looked impressive. These wadis cut into the low escarpment in continuous succession, and all were full of shacks and holes which were "home." Inquiry secured the information that our group headquarters was probably further west. So we drove on, still following our map which was as bare as the palm of the hand in so far as terrain features in this particular area were concerned.

Suddenly a perfectly ordered 4-gun volley struck about 200 yards ahead of our ancient station wagon. We stopped. Another struck 200 yards in rear. Inasmuch as we seemed to be in the center of a bracket, "Abandon ship!" was immediate and simultaneous.

Some time later, when there was enough additional dust from the shelling to form a rather good screen, the enthusiasm of that particular Wop observer seemed to be satisfied and "withdrawal" was effected at the price of only two front spring leaves and a few new holes in the sides. Later it developed the navigation had been slightly in error and the headquarters were a half-mile back.

The colonel commanding this particular group of two field regiments was a tall gray-haired officer who had at one time been the champion pig sticker of India. We learned a lot about pig sticking, and also a lot about map firing on captured Wop maps of dubious scale with worn-out equipment using salvaged ammunition of more than dubious quality. However, the colonel had the hottest sector in the perimeter and was apparently keeping Jerry's head down in handsome fashion, so some of the technique (which seemed a bit unusual) had to be accorded the accolade of success where it really counted.

After transacting some routine business, we visited the center sector headquarters which was the regimental headquarters of a very famous regular army R.H.A. Regiment. These troops had trained for some years to support an armored division with attendant scorn for anything other than eat-'em-alive methods. The fortunes of war had suddenly tossed them into a job requiring all the more abstruse techniques incident to an extreme degree of stabilization, and they had been at it for five months. The mental readjustment had apparently been terrific, and their methods were still somewhat more offhand than those on the west. They would not use wire instead of radio apparently because the Australians in their particular front were in the habit of stealing the wire for tent ropes.

As the light faded, we arrived at the east group headquarters, also that of an R.H.A. Regiment, and just in time for the evening hate bestowed upon known installations by both sides. A few moments before, a 150-mm. HE had come down with practically a ninety-degree angle of fall and landed in the bottom of the wadi squarely in the mouth of a dugout inhabited by six signalers of the headquarters. It was a poor time for calling.

(*To be concluded*)

EFFECT OF ARTILLERY FIRE

A large group of German tanks rushed a British battalion of 25-pounders near Sidi Omar on November 25. The guns were partly dug in, and were protected by a mine field. The battalion commander held his fire until the enemy were within 800 yards. Then he "let them have it," using high explosive. Here is the result. Ten German tanks destroyed, the rest dispersed in flight. Note the turret of one tank, which was completely destroyed by a 25-pdr. HE shell.

Remains of a truck struck by HE shell. Note the vehicle recognition flags on the British armored car. These two official British photos of the fighting in Libya, released for publication, and many others, show conclusively the terrific effect of artillery fire against vehicles of all kinds, either armored or unarmored. As Hoffman Nickerson points out, the GUN *has come into its own.*

COMMENTS ON THE WAR

SEESAW IN LIBYA

The November, 1941, issue of THE FIELD ARTILLERY JOURNAL carried an article which discussed the campaigns in Libya of 1940-41. It described Wavell's advance to El Agheila, Rommel's counteroffensive and the retreat of the British back into Egypt, and the action at Solum in June. At its conclusion the article suggested that renewed action might be expected in the near future. This remark was soon verified, for on November 18 the British began a new westward push into Libya. Although the details are still far from clear, and the campaign has by no means been completed, it seems worthwhile to briefly review the events to date.

During the summer and fall of 1941 the British made extensive but well-concealed preparations for an offensive which subsequently was launched in November. The preparations were under the direction of General Sir Claude Auchinleck. Great quantities of material, and especially tanks and planes, were obtained from the United States. The task force designated was the Eighth Army. The latter had been formed from a part of the old Army of the Nile (the remainder was sent to Syria under Sir Henry Maitland Wilson). Large reinforcements were collected from all over the Empire, and Lieutenant General Sir Alan Gordon Cunningham was assigned as commander of the Eighth Army. He had been knighted only the previous May for his success in Somaliland and Ethiopia. His brother. Admiral Sir Arthur Browne Cunningham, directed the fleet which was to support the land forces, while Air Vice Marshal Arthur Coningham commanded the air forces.

In the extent of its preparations and the elaborate detail of its planning the proposed offensive resembled the carefully mounted Great War operations. It was necessary, therefore, to take extreme precautions to preserve secrecy. It was known that Rommel's troops had worked months in developing a fortified area from Solum south through Halfaya Pass to Sidi Omar. The previous campaign had shown that in order to secure final victory—capture of Tripoli and the complete conquest of Libya—Rommel's forces would have to be surrounded and destroyed in Cyrenaica. The year before the Italians had reformed behind El Agheila, a strong point barring the way to Tripoli which could not readily be by-passed because of the marshes by which it is flanked. Safe at this point, the Italians had awaited the German reinforcements, and the ultimate result had been the failure of the British campaign.

Prime Minister Churchill put the British goal quite plainly: "The object of the British and Empire offensive is not so much the occupation of this or that locality but the destruction of the armed, and primarily the armored, forces of the enemy." To achieve this, it appears from the newspaper accounts that in its essentials the British plan called for an attack along the line of Rommel's entrenchments accompanied by a wide turning movement south of Sidi Omar, to be carried out by armored troops. Once Rommel's line was by-passed, the armored forces apparently were to head northwest for a junction with the British garrison at Tobruk. When this movement was completed, Rommel's army would be encircled, and its westward retreat blocked.

By the night of November 17, the British troops were in position, and the attack began at dawn on the 18th. A heavy rain had turned the desert dust to mud, and the weather was unusually cold. In spite of this, the turning movement made good progress in the first days. Following Churchill's announcement of the opening of the campaign, in the words of the New York *Times*, "widespread jubilation was evident throughout Britain."

It soon became evident, however, that Rommel had not been taken completely unawares. His armored forces were quickly concentrated and used to meet the British envelopment. By November 21, a great tank battle had developed around Rezegh, south of Tobruk. In general, the battle moved from southeast to northwest, and at times groups of tanks would move parallel to each other, firing continuously, much as a ship-against-ship action proceeds at sea. The fighting was very confused; many of the British units had become separated in the course of their wide turning movement, and by concentrating his forces Rommel was able to destroy some of the British units in detail. For prolonged and bitter fighting, this tank battle has had few equals in the war. By the 24th it was apparent that, temporarily at least, Rommel was going to be able to hold his own, and thus keep open a line of retreat to the west. However, a shortage of gasoline prevented him from undertaking any extensive counteroffensive. The same day Auchinleck arrived at headquarters at the front.

On November 25, the British 31,000 ton battleship *Barham* was sunk off Solum, with an estimated loss of about five hundred lives. It was reported that she had been torpedoed by a submarine while shelling the coast. The next day Auchinleck relieved Cunningham, and replaced him in command of the Eighth Army by Lieutenant General Neil Methuen Ritchie. Of the Middle

East commander Churchill later remarked: "During nearly the whole time Auchinleck has been at battle headquarters, and I have no hesitation in saying that for good or ill it is Auchinleck's battle." Of this first phase of the battle, Churchill said: "The Libyan offensive did not take the course the authors expected . . . there have been some unpleasant surprises and some awkward things have happened"; and he added, "our losses in tanks were a good deal heavier than we expected."

The tank battle around Rezegh was continued with increased severity, but the British were unable to completely close the gap.

November 26, Rommel pounced on a South African brigade southwest of Rezegh, and sent raiding parties south of Sidi Omar into Egypt. Prisoners taken this day included Harold Denny of the New York *Times*, Godfrey Anderson of the Associated Press, and Major Michael Buckley, Jr., FA, an American observer. Four days later the British captured their first German general officer while he was making a reconnaissance near Rezegh. The latter was General von Ravenstein, the commander of the 21st Panzer Division (there were two German armored divisions in Libya: the 15th and the 21st). The same day the British sent a raiding party to the Gulf of Sidra, south of Bengazi.

On December 2, the British fell back south to Bir-el-Gobi to reform. Rommel's troops thereupon began their withdrawal to the west. Rommel had succeeded in evading the trap which had been set for him.

For the British there now remained two tasks: to follow up and attempt to intercept Rommel, and to mop up the strong points he had left in their rear. December 10, Tobruk was finally relieved, and Gambut was taken. The British pushed on, their progress hampered by sandstorms. Many German planes were wrecked on the ground, reportedly because of a shortage of gasoline. Rommel's troops conducted a delaying action, and on Christmas day the British occupied Bengazi. Heavy rains returned, and on December 27, the New York *Times* reported that "there was a growing belief among London observers that Germany and Italy were rushing heavy reinforcements to Tripoli."

January 2, South African troops captured Bardia. Six days later Rommel evacuated Agedabia, and fell back in the direction of El Agheila; by the 13th he was reported to have taken his stand at that point. January 17, Halfaya Pass surrendered to the British.

On January 22, Rommel's counterattack began. The next day he retook Agedabia, just fifteen days after he had evacuated it. By the 26th he had pushed forward to the northeast to Msus, from which point he could threaten either Mekili to the east or Bengazi to the west. On January 29, the Germans announced that they had retaken Bengazi, and the same day the German radio reported that Rommel had been made a field marshal for his victory. Considerable supplies of gasoline were captured by Rommel, which relieved him of his most pressing difficulties on this count.

On January 27, Prime Minister Churchill summed up the campaign to that date: "This battle would have been lost on November 24 if General Auchinleck had not intervened, changed the command and ordered the ruthless pressure of the attack to be maintained without regard to the consequences. But for this robust decision, we should have been forced back on our original line . . . Cyrenaica is regained; it has still to be held . . . in this battle we have lost in killed, wounded and captured about 18,000 officers and men, of which the greater part are British. We have 36,500 prisoners in our possession. I cannot tell what is waiting for us at the present moment in Cyrenaica. We have a very daring and skillful opponent against us—and I may say—a great general." And that is about where the operations stood at the end of January.

DARWIN, AUSTRALIA

EDITOR'S NOTE: *The Japanese thrust toward Australia has brought this part of the world into prominence. The* JOURNAL *wishes to acquaint its readers with the general features of this and other geographic points of interest. Darwin is selected because it is one of the principal ports of Australia and has been discussed considerably in the press recently*.

Early in June last year Vice Admiral Sir Geoffrey Layton, commander-in-chief of the British naval forces in the Far East, made a broadcast from Singapore in which he discussed the defense setup in that region. Singapore, of course, was the key point of the system, and Sir Geoffrey coupled it in importance with two supplementary bases: Hongkong to the north and Darwin to the south. Hongkong is now lost, and Singapore is under such heavy attack at present that its effectiveness as a base is, of necessity, somewhat limited. The importance of Darwin therefore is increased to a very great extent, yet of all the points brought into prominence by the new turn of the war, Darwin is perhaps the least known.

Until recently Darwin was a sleepy little tropical frontier town, about which even the Australians themselves had little knowledge—and less interest. It is the chief town of North Australia, a territory which is administered by the Federal Australian government at Canberra. The area of the Northern Territory is 523,620 square miles, yet at the census of 1933 there were in this vast region only 3,306 white inhabitants. With the addition of about fifteen hundred orientals and half-castes, this comprised the population of the Territory, exclusive of aboriginals. The latter numbered somewhat less than eighteen thousand, and were mostly confined on fifteen large aboriginal reserves, which appear to be similar to our Indian reservations. The aboriginals do not. however,

seem to have accepted civilization to the extent of the American Indian, for less than thirty-five hundred of them were employed, and the Australian year book states that "large numbers of the aboriginals in the Territory are still outside the influence of Europeans."

Along the northern coast of the Territory, wherein is located Darwin, the low flat coastal plain is occasionally broken by sandstone cliffs, but the elevation seldom exceeds 100 feet above sea level. The shore itself is composed of sandy beaches and mud flats, covered with a thick growth of mangrove. The coast line of the Territory is more than 1,000 miles long, and contains numerous bays and inlets. Most of the rivers in the Territory run from the south to the north, emptying into the Indian Ocean, and some of them are navigable for considerable distances inland. The vegetation of the coastal plain is tropical in nature, as is the bird and animal life which inhabits it.

South from the coast the land rises gradually. From a monetary standpoint the Territory is very poor. There is no agriculture, and the only noteworthy income producing occupation in the hinterland is cattle raising. The cattle district is centered around the Katherine River, two hundred miles south of Darwin.

Darwin was first settled in the 1870's, but prior to the present war it could never have been called a thriving town.[1] During the Great War it derived some prosperity from meat packing. In 1938 the population was estimated at 1,300 whites, 600 orientals (mostly Chinese), and 300 half-castes, plus a few aboriginals, nearly all of whom were dependent for a living upon the expenditures of the Federal government. There was also some mother-of-pearl shell fishing out of Darwin, althought it was considerably hampered by Japanese competition. Describing the town in 1938, an officer wrote, "the commercial buildings are mean, the streets dusty and the gardens poor."

South from Darwin a state owned railroad runs some 316 miles to Daly Waters on Birdum Creek. The Federal government plans to build a transcontinental railroad from Darwin on the north to Port Augusta on the south.[2] North from Port Augusta the railroad reaches as far as Alice Springs in Central Australia. Between Alice Springs and Daly Waters there is a stretch of more than five hundred miles, fringed by deserts, swamps and mountains. The northern and southern railroad extensions were completed in 1929, whereupon the depression intervened and construction stopped. But in 1940 an all-weather road was opened between Alice Springs and Daly Waters which connected the two railheads.

Before the war there was a monthly boat service to Brisbane, Sydney, Melbourne, and the populous southeast. Except for beef, all foodstuffs had to be brought in over this route, as well as all building materials, merchandise, etc. Now, however, that a road has been built connecting the railheads at Daly Waters and Alice Springs the difficulties of supplying the base at Darwin have been lessened. In 1934 Darwin became the Australian port of entry for the overseas air service. Darwin is connected by air with Brisbane, Adelaide and Perth at the other extremes of the continent. The roads out of Darwin are not good, and in the hinterland they often become mere tracks.

A glance at a map is sufficient to indicate how admirably Darwin is situated with regard to the East Indies. The harbor opens on to Clarence Strait, which separates Bathurst and Melville Islands from the mainland. In 1925 a report was submitted recommending that Darwin be developed as a base. It was not, however, until September, 1932, that a detachment was landed, and work on fortifications begun. It was next to impossible to train the aboriginals, and, other labor being both scarce and high priced, most of the work was done by military personnel. A year later a permanent garrison was installed at Darwin.

The rainy season runs from November to April, during which time an average of 50 inches of rain falls. The temperature averages about 90°, with a humidity of 80%, which makes it quite unpleasant. The prevailing wind is a northwest monsoon, and much of the rain falls in fierce storms. Occasionally there are cyclones and slight earth tremors. During the dry season from May to October the climate is far more agreeable. However, the water supply is insufficient in the dry season.

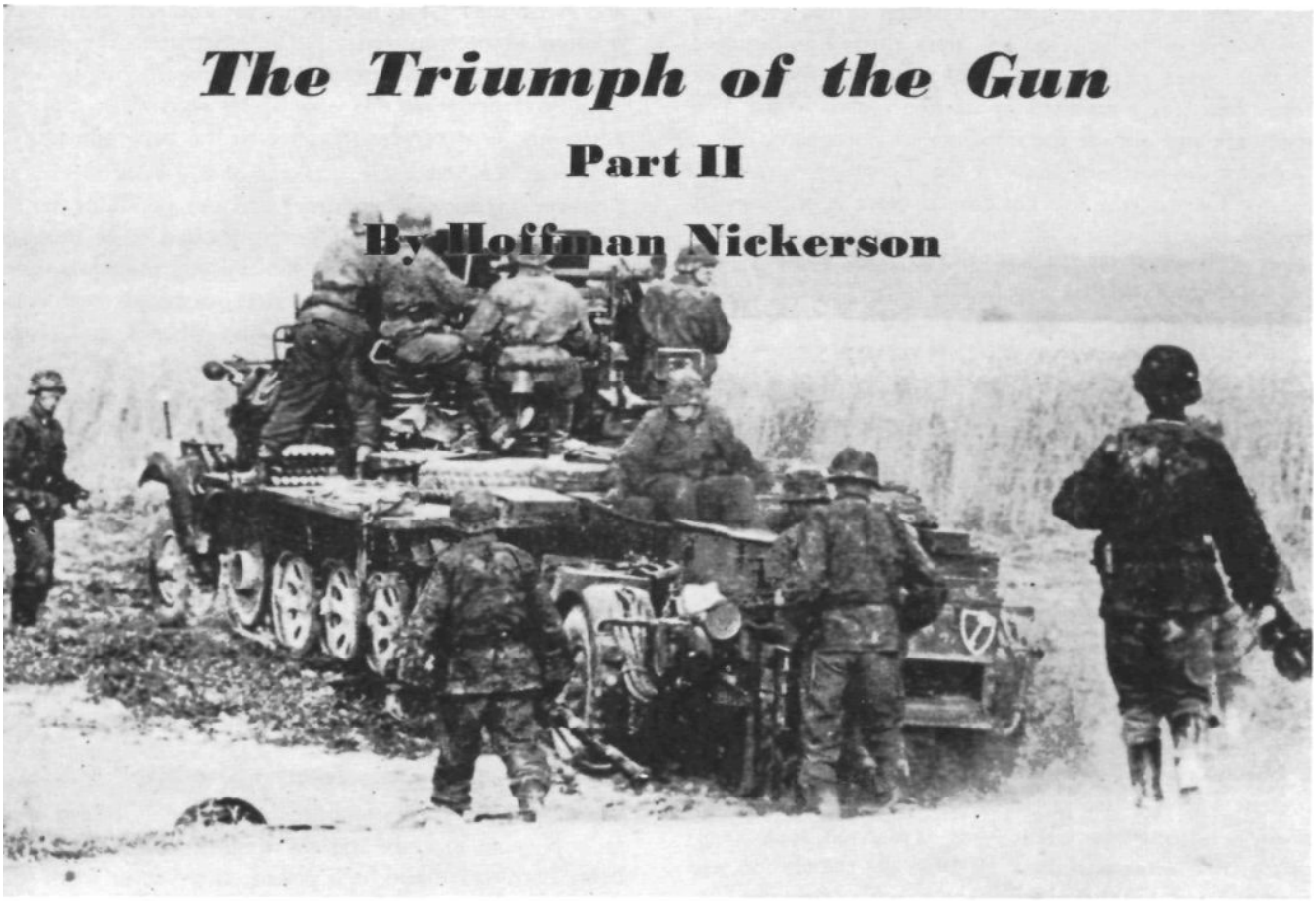
Living is largely confined to spacious, heavily screened and shuttered verandas. Partition walls are stopped short of the ceiling to facilitate air circulation. Mosquitos and sandflies are a persistent nuisance, and termites are a real menace. Health is usually good. Dengue (a tropical fever) is limited, and other tropical diseases are seldom found. There is good hunting and fishing out of Darwin. In short, before the war Darwin was a typical frontier garrison town, to which the war has doubtless brought many changes and improvements.

[1]This article is based upon pre-war sources, and no doubt a very considerable war boom has developed in Darwin.

[2]Rail connections from the east coast terminate at Port Augusta, which is also the terminus of the state owned transcontinental railroad to Perth on the west coast.

It's not the size of the dog in the fight that counts, it's the size of the fight in the dog. The size of the fight in you depends upon your mastery of self. Self mastery is a matter of discipline. In fact, discipline is the basis of all military training. It not only is essential, but it lessens the burden for each one, and too little do we realize the important part it plays in the making of an organized society.

—COL. WILLIAM N. DAY.



German self-propelled gun in action on the Russian front. Note the trailer. (*Acme*)

The first part of this paper on the plane-tank transformation of tactics noted that past transformations have normally resulted from some new means of increasing mobility, protection, striking power, moral effect, or more than one of these. It defined true infantry as foot-soldiers armed with weapons each of which can be carried and operated by a single man, and showed how the triumph of team weapons, i.e., guns, with their greater range and power, had become definite in 1914-18, but that at the same time the difficulty of moving them by human or animal muscle power within the zone of fire had resulted in a negative, ultra-defensive form of war. After a discussion of tanks and planes as mobile gun-mounts, it concluded with a theoretical survey showing that superiority in the air and in armored divisions might well compensate for a considerable inferiority in the older arms.

We now estimate how far the campaigns of the present war, up to the time of writing early in January, '42, support this theoretical conclusion.

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If the weakness of theoretical discussion is a tendency toward generalizations insufficiently supported by facts, the weakness of historical analogy is that every particular campaign is influenced by special circumstances irrelevant to general principles. Two special circumstances unconnected with the plane-tank team have furthered the German success in the present war to the date of writing. First, German superiority in infantry-artillery training; second, what may be politely called "political surprise" in the shape of attacks without a declaration of war, often attacks upon neutrals. Obviously other peoples can in time learn, and perhaps improve upon German military technique. They also could decide to attack without warning if they think themselves threatened — in the unsettled American West, men who thought themselves slower on the draw than possible opponents took pains to begin shooting first.

To date, the present war is like a play of which the third act is still unfinished. The first act was in Poland, followed by an interlude in Norway; the second act in France, Holland and Belgium, followed by interludes in Libya, Yugoslavia, mainland Greece and Crete. The third act now going forward in Russia is as yet imperfectly known.

The Poles are warlike people, conscript since 1920, comparatively poor and handicapped both by considerable non-Polish minorities, German, White-Russian, and Jewish, and by frontiers difficult to defend. In August, 1939, their active army was the fourth or fifth

strongest in Europe, comprising thirty infantry-artillery divisions, twelve horse cavalry brigades, about ten mechanized battalions and about fifteen hundred planes, most of the tanks and planes being somewhat old-fashioned. The soldiers and company officers were well trained, the higher command* more doubtful. The latter had misinterpreted the lessons of the Spanish Civil War, underestimating both tanks and planes.

The Germans, in spite of their great Prussian military tradition, had not been conscript from 1919 to '35. Their hastily expanded active army numbered about forty-two infantry-artillery and nine armored divisions. In August, 1939, between ninety and a hundred reserve divisions were organized, of which perhaps forty would be available within the first month. On September first, leaving only from twenty to twenty-five divisions in their western fortifications facing the French, about sixty stood in line in the east against the Poles. Further, the Germans possessed great air superiority, about seven thousand fighting planes, of which they proposed to use about two thousand against their eastern enemies, while the latter possessed only about five hundred, most of which were of older models.

As if the foregoing German superiorities were not enough, the geography of the Polish borders makes them difficult to defend. The western frontier bulges forward in a great arc, uncovered by any natural obstacle except the Carpathian Mountains in the far south. It is outflanked by Germany's little ally Slovakia in the south and by East Prussia on the north. The one serious obstacle to movement from west to east or from northwest to southeast is the river line formed by the San, the Middle Vistula, and the Narew rivers. From west to east the Middle Vistula is about a hundred and seventy miles from the German border and has to the west of it much of the most nationally homogeneous part of the country.

Thus even if the fighting had been confined to the older arm, one would have expected the Poles to be defeated by a great double envelopment on the familiar Cannae pattern.

What is astonishing is the rapidity with which the German plane-tank team, vigorously supported by their infantry-artillery teams, accomplished the result. In two days after the beginning of a typically treacherous German attack practically the whole Polish Air Force was out of action. Within eight days the main body of the Polish ground army was hopelessly compromised. The first great German mechanized thrust of some eighty miles in forty-eight hours from the southwest northeastward to the outskirts of Warsaw had isolated the strong center group of the defenders. In just over a month from the beginning of hostilities the entire Polish army, numbering nearly a million, had surrendered. Without the Soviet attack from the east, remnants might have spun out an irregular resistance but this would have had little strategic significance.

This phenomenal speed can hardly be over-emphasized. We have seen that the Polish higher command was not of the best; their willingness to engage most of their active divisions near the German frontier argues either conceit or some promise of direct support by their western Allies; which promise, if made, was not kept. We have also seen that the total numbers of the losers were inferior in the proportion of one to two, that in mechanized numbers the Germans were overwhelmingly superior, and that Western Poland is difficult to defend. Even so, the lightning German victory over this fifth, or perhaps fourth, strongest army in Europe is startling.

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From the first major German campaign in Poland, we turn to the April, 1940, interlude in Norway—an unmilitary country whose armed forces were negligible and whose sparse population of about two and a half millions numbers only about seven-eighths of that of the borough of Brooklyn. Norwegian armed forces had hardly fired an angry shot within historic memory. On the other hand, most of the country is rugged and mountainous with an arctic or sub-arctic climate, and the coast, extending through thirteen degrees of latitude, lay open to the superior Allied navies.

Early in April, 1940, the British violated Norwegian neutrality by laying mines in certain Norwegian territorial waters, but apparently took no measures to counter a possible German reaction. The Germans acted promptly. They first occupied almost without resistance the peaceable and unoffending little state of Denmark. Next a small German force landed from planes on the airport of Oslo, the Norwegian capital, first took the airport and then overawed rather than occupied the city. At the same time other small German detachments, suddenly appearing from the holds of what appeared to be peaceful German merchant ships lying in Norwegian harbors, seized the four other principal harbor towns. These preliminary operations gave them the armories and assembly points of five of the six as yet unmobilized Norwegian divisions. Oslo was next occupied by a larger German force coming chiefly by sea and party by air. Some of the German troops spoke Norwegian from having enjoyed the hospitality of the country as children when their own country was blockaded during the last war; one rumor is that these men were told that they were going to rescue the Norwegians from a British invasion. The result of the German stroke was to paralyze all Norway, and British attempts to intervene were successful only temporarily and in the far north.

How much the Norwegian resistance was hampered by traitors who sent false orders, etc., is uncertain. It seems, however, that there was no vigorous and general attempt

*A distinguished Polish officer informs us that for a number of years past in Poland, as well as in France, high commanders (as selected) tended more toward the "good fellow," well-educated, polished type of individual, rather than the hard and efficient field soldier who formerly characterized the staff and command of the Polish Army.—Editor.

at defense. With all desire to be just to the Norwegians, one can hardly explain the high proportion of officers to enlisted men captured by the Germans, except by assuming that most of the Norwegian conscripts when ordered to turn out did not do so. A recent article in the U. S. Naval Institute Proceedings says that few of the Norwegian naval vessels fought. Nor does there seem to have been much effort to impede the enemy by the demolition of bridges, tunnels, etc.—which would have been effective in the mountainous terrain. Thus no matter how much one may sympathize with this little and weak people in their hour of trial, and also honor their King and other gallant individuals, nevertheless the original, tiny German invading parties could hardly have succeeded had the people in general really fought like the heroic Poles.

As in Poland, German tanks and especially planes played the star parts. We have seen that the original attack on Oslo was made by troops first landed from the air and then reenforced from the air. German air attack or the threat of it kept British surface ships out of the Skaggerack and greatly hindered their action in the other combat areas except at Narvik in the far north. German air supremacy linked up and permitted the reenforcement of the originally tiny invading detachments in Central Norway. German tanks, rushing from the Oslo area about two hundred and thirty-five miles along the mountain valleys to the neighborhood of Trondheim, delivered the decisive thrust against the Franco-British landing parties there. In short, as the Polish campaign had shown the power of plane-tank supremacy rapidly to crush a brave but ill-commanded and comparatively ill-armed opponent, so in Norway planes kept hostile fleets out of narrow waters and both planes and tanks overcame great geographical difficulties.

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We now turn to the great German offensive in the West which may be divided into three phases: the Dutch, which began on May 10 and ended with the surrender of Holland on May 14; the Franco-Belgian, which also began on May 10 and ended with the final Anglo-French evacuation of Dunkirk on June 4; and the final French phase from June 5 to the French surrender on June 22. The first two phases are distinguishable because the rapidly successful attack upon the Dutch hardly affected the almost equally rapid movement of events further south.

The controlling geographical factor in both the Dutch and the Franco-Belgian phases is the small size of the two theaters. Very roughly, Belgium and Holland together form an irregular triangle of which the two longer sides facing the North Sea and Germany respectively are not much over two hundred and fifty miles long as the crow flies—a distance about the same as that from New York either to Portsmouth, New Hampshire, or from Philadelphia to Pittsburgh. The base of this triangle, i.e., the Franco-Belgian border, is less than two hundred miles in a straight line and therefore less than the distance from New York either to Boston or to Washington. Holland itself constitutes a smaller triangle in the point of the larger one, and the direct line from Germany to the sea along the Belgian-Dutch border is only about a hundred miles—not much over that from New York to New Haven or to Philadelphia by air.

The lightning effect of treacherous attack plus air and tank supremacy in so small a theater as Holland greatly exceeded that shown in either Poland or Norway. Parachute attacks distracted the defenders and with the help of Fifth Column traitors seized the critical bridges over the strong Dutch waterlines in the southwest of the country, the corner furthest from Germany. When a German armored column approached the bridges the Dutch surrendered.

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The critical part of the Franco-Belgian phase went as rapidly as the invasion of Holland. On the first day, May 10, the strong Belgian fortifications were breached at Fort Eben Emael, which consisted chiefly of subterranean galleries designed to resist prolonged shelling of the 1914-18 type. Its active resistance was paralyzed by parachutists who landed on its almost undefended top. On May 13 the main German effort across the Ardennes, the armored divisions with their superior weapon power brushing aside the Belgian Chasseurs Ardennais and the French Cavalry like dust, reached the Meuse near the ill-omened city of Sedan nearly eighty miles from their starting point. Meanwhile the enormously superior numbers of the German Air Force were hindering the movement of Allied reserves, and had in some cases shaken the morale of portions of the French front line troops—more by the terrifying noise they made than by the few casualties they inflicted. At the same time, from the second day of the invasion the ground and air invaders had set in motion a vast wave of refugees who clogged the roads necessary to the Allied forces. The French Ninth Army along the Meuse southwest of the Ardennes consisted chiefly of reservists. It was commanded by Corap, who has been described as an intelligent but morally timid man, unsoldierly looking, and so fat that he could hardly lift himself into an automobile. The German communique of May 15, only the sixth day of the operation, announced the crossing of the Meuse and the breaking of the "Little Maginot Line" at Sedan as well as another crossing of the Meuse "on a broad front" in Belgium between Namur and Givet, i.e., about forty-odd miles northwest of Sedan.

This action was to prove a watershed or decisive point for the campaign. The French High Command may not at once have realized the seriousness of the German penetration of their center. In 1914-18 and especially in '18 the depth of a penetration had never equalled its width; if the "shoulders" on each side held, then the frontal advance had always been stopped. In any event,

a second misfortune quickly followed the first when Corap's successor, the gallant General Giraud, one of the best soldiers in the French Army, was taken prisoner in a tank with which he was fighting. What had been Corap's army virtually disappeared. No sooner had the breach in the French center been made than the Germans threw into it the bulk of their mechanized forces. On May 17, the eighth day of the offensive, they were close to Laon, nearly a hundred and twenty miles from their starting point, and Gamelin, the French commander-in-chief, advised the French government that if the invaders turned south he would not guarantee Paris later than that evening. Instead the mechanized columns turned west. On May 21, they reached tidewater at Abbeville on the Somme, over two hundred miles as the crow flies from the German border. No strong points in rear of the original Allied fortified lines had been prepared for defense, and the detachments in the Allied rear were unable to check the headlong German advance.

Ammunition being transferred from ammunition tender to armored assault gun. Note thickness of armor on side of assault gun vehicle—about the same as for a light tank. (*Acme*)

By 1914-18 standards, the mere trace of the "front" during the last ten days of May was absurd. According to the point of view, a glance at the map showed either a farce or a nightmare. Instead of the flattish segment of a circle or at least the blunt triangle formed by the penetrations of the last war, the new salient which the Germans now thrust forward to the sea was like a bulb supported only by a stalk thinner than itself. By the precedents of twenty years ago, such a monstrosity should have been promptly pinched out, trapping its occupants. Instead, even when its stalk was narrowed by such counterattacks as the Allies were able to deliver, still the amazing bulb continued to swell like a fantastic plant in a movie.

The reasons for this fourth German lightning victory were: again "political surprise," overwhelming plane-tank superiority and a better command. The French War Office on November 10, 1940, put the May 10 German tanks at seven thousand two hundred as against two thousand French, a superiority of nearly four to one; the German pursuit planes at fifteen hundred against four hundred and twenty French, again nearly four to one; the German bombers at two thousand five hundred against one hundred French. In point of command, the Germans realized better than their opponents the strategic effect of the internal combustion engine, putting their main blow across the Ardennes despite the local lack of good railroads. Their choice recalls the famous saying of that notable Seventeenth Century intriguer, the Cardinal de Retz: "That which seems hazardous but really is not, is nearly always wise."

The successful crossing of the Meuse and the local dissolution of the French was achieved exclusively by planes and armored divisions. Unopposed German dive-bombers, although they caused few casualties, shook French morale; and German tanks broke such French reserves as could be rushed to the scene.

Just at the end of the Franco-Belgian phase, however, another abrupt change of fortune characteristic of air power permitted the escape of the astonishingly high proportion of seventy-five per cent of the Franco-British personnel trapped by the German rush to the sea. If the shape of the German salient had seemed fantastic, the position of the Franco-British elements north of it seemed hopeless. Their one chance of escape was through the port of Dunkirk. By air Dunkirk is about a hundred and seventy miles from the nearest German soil, and for the time being the Belgian airfields had been systematically disabled. Accordingly the German pursuit planes could no longer cover their bombers, now trying to prevent the Allied embarkation, against the Allied pursuit planes; while the strong British pursuit squadrons, most of which had been held in the Island, could now operate over Dunkirk from bases not much over forty miles away in England.

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The final French phase need not long detain us. Ninety thousand of the best French troops together with nine of the original ten British divisions, although safely evacuated through Dunkirk, could not be immediately re-equipped. For the moment Weygand, the new French commander-in-chief, had only forty-three divisions of infantry, three of cavalry and three of armored troops between the west end of the Maginot Line and the sea. He organized a new system of defense in depth, but his chief hope was that the Germans would be too weakened to

attack for some time. Instead they struck hard and promptly on June 5, leading with their right as before. On the 9th they aimed their main blow, again as before, against the French center which now stood behind the Aisne. By the evening of the 10th, after what the Germans called the hardest fighting of the war, a famous Brandenburg corps had gained a small bridgehead south of the river near Chateau Porcien. From this the last of the great German mechanized thrusts was launched, headed southeast toward Switzerland. By June 10 the Panzer troops were at Châlons-sur-Marne forty miles forward. Organized French resistance to them now ceased, and they rushed forward, reaching the Swiss border—a hundred and eighty miles from Chateau Porcien—on June 17, and thus cutting off the Maginot Line with its garrisons and what was left of their supporting troops.

Already by June 12 the French forces west of the Maginot Line had been reduced from forty-nine to twenty-four divisions, and these were worn out with fatiguing retreats, constant fighting, and loss of sleep.

A single point as to the condition of the German mechanized units just before the French Armistice deserves comment. The comparatively short time within which a mechanized unit can maintain intense action had been foreseen. In 1934 it had been noted by the present writer in Chapter XVI, "Tanks, Planes and Limited War," of a book entitled "Can We Limit War?" The point is not unlike the brief battle endurance of horsemen before the infantry rifle made mounted charges impossible. Belloc's "Waterloo" calls the French cavalry charges there "A form of energy whose high potential upon the battlefield corresponds to a very rapid exhaustion." Hence, despite the crumbling of French resistance in June, 1940, some commentators expected the German mechanized advance to slow down from internal difficulties. An inconspicuous Associated Press article from Geneva on June 20—two days before the French Armistice—reprinted in the New York Sun on the same day, suggests that these expectations, although disappointed, were not without foundation. The headlines were: "Report Nazi tanks hard hit by wear. Swiss hear repair problem . . . is serious." The article said in part: "Refugees . . . said they saw scores of worn-out German tanks, armored cars and motorcycles abandoned along the main highway because of mechanical breakdowns after long dashes." Later experience in Russia was to emphasize the conclusion that the plane-tank team is like a snake which can strike quickly within a limited radius but must then coil up again before it can repeat the blow.

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Both the British capture of Cyrenaica in the early months of '41 and the Axis reconquest of the same territory in the spring of that year were primarily plane-tank operations. The all-around British defense of Tobruk recalls the considerable part often played by the highly fortified points known as castles in Medieval campaigns whose decisive "tank forces" were armored horsemen.

The critical phase of the Balkan campaign of April, 1941, was over even more quickly than that of any of its predecessors. Strategically the weak point of the Yugoslavian, Greek and English coalition was the mountainous neck about a hundred miles wide between the Italian positions in Albania and the western border of German-occupied Bulgaria. Through this neck ran the Vardar Valley, the one avenue of communication between Yugoslavia and Greece. In two days German armored units, striking as usual under cover of air supremacy, and advancing westward from Bulgaria over the mountainous terrain more than sixty miles as the crow flies, had cut the Vardar line. This stroke turned the flank of the Anglo-Greek positions around Salonika and assured a junction with the Italians in Albania, thus practically ending the campaign.

The German conquest of Crete does not concern us because no tank-plane team participated. The British had a few tanks but no planes, the Germans no tanks.

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In dealing with the Russian campaign, we plunge into the unknown. With few if any neutrals present on either side, and with even the Allied Missions and military attachés allowed to see *nothing*, it is war in the dark. Sometimes the statements of the two sides contradict each other, more often they do not even refer to the hostile claims. We are therefore confined to one-sided statements and to a general knowledge of the movement and position of the strangely shaped "fronts" upon the map.

The map, together with our other crumbs of knowledge, does tell us something. The distances are enormously greater than those of previous theaters of mechanized war. At its greatest, 1939 Poland was less than four hundred miles from north to south and less than five hundred from east to west, France less than five hundred from north to south and less than four hundred from east to west. But it is more than nine hundred miles northward from Odessa to Petersburg-Leningrad and nearly another six hundred and fifty from that city to Petsamo. From the Polish town of Lemberg-Lwow, held by the Soviets at the beginning of the campaign, eastward to Rostov is more than seven hundred miles; and from the longitude of Rostov, which is practically that of Moscow, east again to the Urals is nearly another thousand.

The effect of distance in permitting almost indefinite retreat by the defenders needs no emphasis. It is particularly important in postponing a mechanized decision because planes and tanks depend upon elaborately equipped bases. The effort of advancing those bases so that the mechanized "snake" may coil up and strike again is considerable and makes for long pauses.

In preparing for the vast Russian theater, the Germans made two significant changes. To give some of their

armored divisions greater cruising radius, they lightened or "stripped" them, making them capable of operating independently over longer periods. They also provided a number of guns on self-propelled mounts which they called "Sturm-Kanonen," i.e., assault artillery.

Once more the "spearheads" or better the "marching wings" of each phase of the German offensive were the plane-tank teams. While their method of striking now on one and now on another sector of the long Russian front recalls Foch's strategy in the autumn of 1918, each great stroke aimed to surround a number of Russian divisions by double envelopment, cutting the surrounded units off from support as in Poland and in the first phase in France. To give only two capital Russian instances, the Minsk operation in the early summer and the Kiev operation in the autumn were obviously plane-tank affairs, the Air Force and the armored divisions performing the critical act of throwing a net around the enveloped Russians, motorized divisions strengthening the net, the foot divisions participating only in the kill. Allowing for the difference in scale, each net, facing both inwards and outwards, recalls the lines of contravallation and circumvallation in the old sieges, the former covering the besiegers against sallies by the besieged, the latter against relieving forces.

Beyond this our knowledge fades into darkness. How much the Russian defense has depended upon old-fashioned artillery and infantry stubbornness, how much on plane-tank counterattack, we do not know. Nor can we estimate closely the all-important rates of loss and replacement of men and materiel on either side. Only two things seem certain: First, those of the mechanized German envelopments which succeeded were, by their nature, less bloody than similar 1914-18 operations would have been. In the critical stage the victor risks fewer men, while the vanquished, however brave, often surrender wholesale. Second, the Russian statements of high German losses during the German advance cannot be accurate, since the one accurate way of knowing your enemy's losses is to drive him from the battlefield and then to count your prisoners together with the corpses and materiel which he has left behind. This the retreating Russians could seldom do.

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Late in 1941 the British reconquest of Cyrenaica was still another local decision gained chiefly by the plane-tank team. On the other hand, the rapid exhaustion of actively engaged mechanized forces and the correspondingly abrupt ebb tides of mechanized action were vividly shown. A United Press despatch from Cairo dated November 28 and printed in the New York Times next day reads in part: "Military spokesmen here . . . said it was now"—only thirty-six days after the beginning of the operation—"a battle of infantry and artillery forces, with tank support, rather than a tank battle supported by infantry. Both sides had lost heavily in tank forces in terrific clashes . . . ."

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The record speaks for itself. The gun has triumphed. Wherever planes and tanks are present and can act, these mobile gun platforms are now the soul of offensive action, and guns are the only active defense against them. In land warfare the dominance of the gun, seen in naval war as early as the defeat of the Spanish Armada in 1588, seems certain to remain while civilization retains the scientific knowledge and wealth needed to build planes and tanks in numbers. Henceforward the true infantryman armed with his one-man weapons can consider only one tactical question, i.e.: what is the irreducible minimum of infantry action? Probably this minimum will remain large. Terrain, climate, poverty, and other special circumstances obviously limit plane-tank action. But under normal conditions the gun will continue to triumph.

Historically the importance of the change can hardly be overestimated. We must go back for centuries to find its equal. Not since the "knight and castle" wars of the Middle Ages has its like been seen. The search for historical analogies which will throw some light upon the astonishing present may yet send officers and students of war back to the scanty, monkish records of Medieval campaigns.

In this hurried moment, however, we may congratulate ourselves upon the vigor with which our high command is building our antitank and antiaircraft artillery, still more our Air Corps, and most of all our armored divisions. Whether or not our Chiefs have ever heard the phrase "The triumph of the Gun," their action shows that they fully understand that triumph. Moreover, to our planes and tanks are flocking officers and young men who are among our best. Soon, when those planes and tanks shall have been combined into effective, smoothly working teams, we shall indeed have reason to thank God and take courage.

There is no doubt that your thought is a contagious factor of influence for good or for bad. Let one man in a group of brave people be stricken with fear, and if he can express his feelings, he will impart to each of the rest, in different degrees it may be, the uneasiness he experiences. It is the same with laughter.

—W. N. D.

ANTITANK GUNNERY ★

Training aid to develop the 37-mm. gunner's manipulative skill and coordination

By Lieutenant-Colonel Paul B. Bell, FA

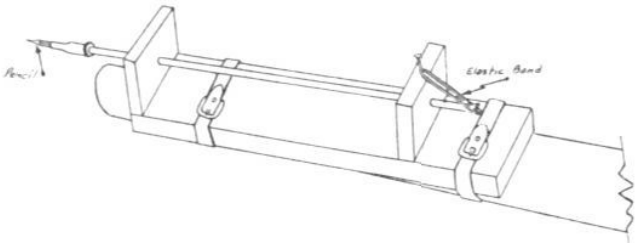


Figure 1.—Recording device attached to gun tube.

The 37-mm. antitank gunner is a very important man; he not only fires the gun but he also controls the traverse and elevation. He must track by using a circular movement with the right arm, a twisting wrist movement with the left arm, and fire by applying pressure with the heel of the left hand. Hence he must have perfect coordination and lots of manipulative skill. We have recommended tracking and more tracking, but how did we know that the gunner was on the target with the proper lead and elevation? Yes, we have requested photographic guns, and have fired on the 1,000-inch range, and on moving targets, but always the same alibi, "not enough practice," so we devised the following course of instruction with the help of some gadgets that can be made by any unit.

Our course of instructions consists of:

First acquainting the men with the nomenclature, controls, and ballistics of the gun.

Second, we put the guns in firing position in the gun park, with tubes and axles level, and place a vertical plywood panel in front of the gun, clearing the tube by about two inches. To the tube we strap a gadget as shown in Figure 1, made from a piece of 1″ × 4″ × 18″, a couple of wooden blocks 1″ × 2″ × 4″, a piece of welding rod or tubing with an empty .30 cal. cartridge on one end to hold the pencil and a slot in the other end to hold the rubber band. The rubber band forces the pencil to protrude beyond the 1″ × 4″ and tube, and touches the panel. On the panel we place two mimeographed sheets (Figure 2), the target in line with the sight and the scoring sheet in line with the pencil. Starting in the upper left hand corner of the square target, we track the line, progressing to the right and down, the pencil recording, on the score sheet, the gunner's every movement. The student then progresses from the square to the triangle, the wavy line, the circle and the figure eight. Scores are secured by checking the number of times the pencil line leaves the 100% track, as shown by the enclosed score sheet.

A very interesting problem appeared in making these scoring sheets. We found that the off-center position of the sight made our pencil draw shapes different from that of the target. Finally we worked out the necessary corrections, and corrected the target in order to use regular scoring sheets. These scoring sheets give us a record of progress and have helped materially in training our

Gunner aims at this target

Score is recorded here by the moving pencil attached to gun tube

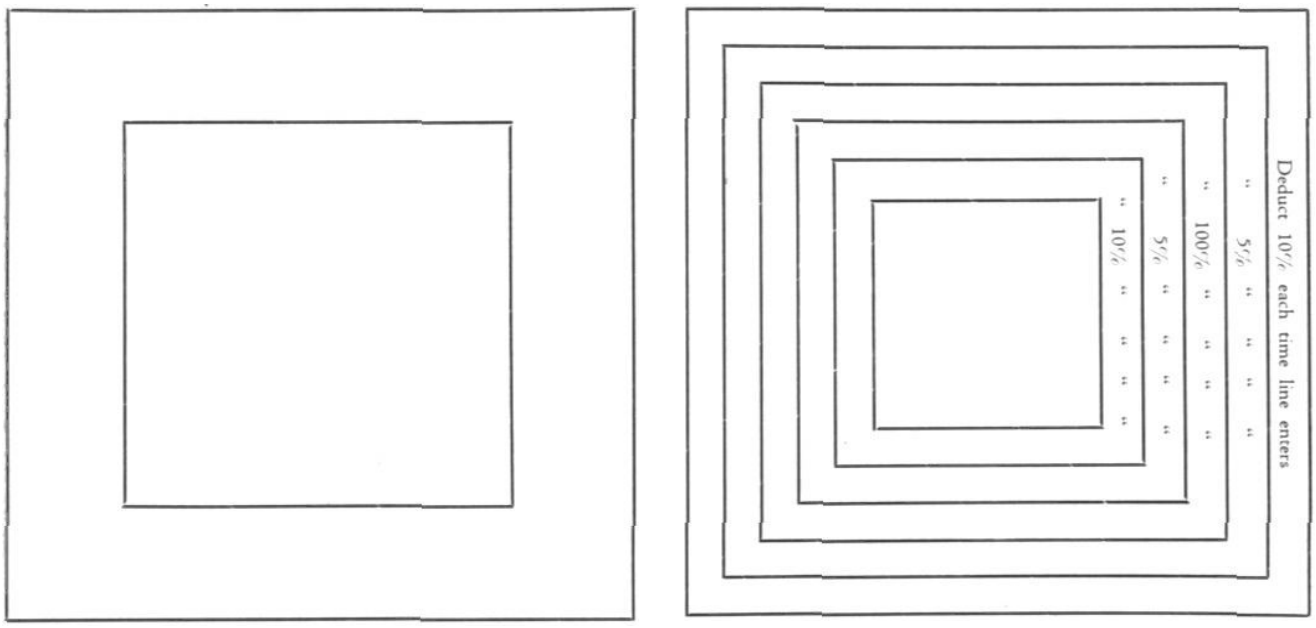


Figure 2.—Target and score sheet, using square. From this the candidate progresses to targets shaped, respectively, as triangles, wavy lines, ovals, circles, and figure eights.

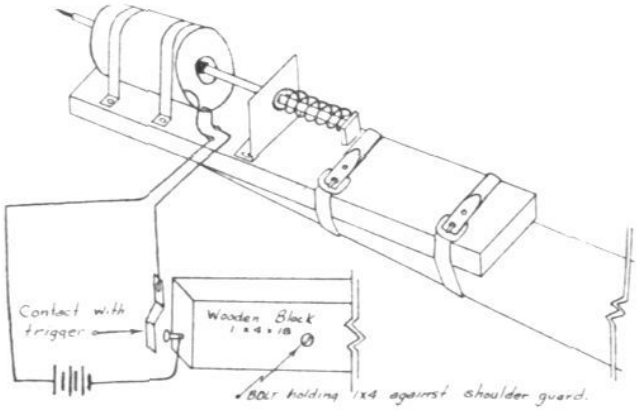


Figure 3.—Recording device for developing speed.

men. These tracking exercises were made regardless of speed, but at their completion we were ready to develop speed. This took another gadget (as shown by Figure 3), which consists of solenoid and piston, activated by a six-volt car battery and controlled by a gun plunger. We now start again over similar targets, consisting of dots or tank silhouettes. Firing at each silhouette, the needle attached to the plunger strikes inside, if possible, or near the bull's eye on the record sheet. This, when timed, helps increase the speed of manipulation and includes the third correlated movement—that of the heel of the left hand. This gave us another set of records on each gunner.

Our third course uses oblique terrain photos on which we have superimposed tank silhouettes, mimeographing a score sheet with bull's eye for each tank.

We hope in the future to secure moving pictures of tanks approaching and retreating, and place an electric spot light in the tube controlled by the plunger, to be used as a final phase of our training before we start our regular 1,000-inch range and moving - target service practice.

SWISS METHOD

EDITOR'S NOTE: In *Revue Militaire Suisse*, April, 1941, there is an article by Capt. Nicollin which describes a method of antitank gunnery training similar to that developed by Col. Bell in the preceding study. Pertinent extracts from this article follow.

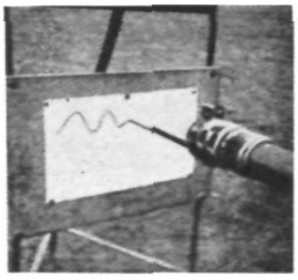
SIMPLE POINTING EXERCISES

The purpose of these exercises is to teach the subject to handle all controls, handwheels, etc., smoothly and automatically while at the same time not taking his eye from the sight. The instructor places his fist in front of the tube. Then he moves it in different directions. The gunner follows with his eye and moves the tube in the directions indicated. Next, he is required to execute changes on order rather than by visual tracking. Finally he is required to repeat this last exercise blindfolded.

[Comment: The value of this seems to be that a gunner may find it necessary to track a target, by command, which he cannot see—in other words to execute a species of indirect fire on a moving target. Situations may arise frequently in combat where this will occur. Dust and smoke of muzzle blast may obscure the target for the gunner, but not for a chief of section near by.]

EXERCISES WITH THE "BARREL-WRITER"

These exercises are begun as soon as the gunner can manipulate the hand-wheels correctly.



The gunner at first follows simple lines, then, later, complicated ones. The time factor must not be considered at this stage.

The gunner at first will simply try to reproduce the figure on the target. Later, however, he must do these same exercises as rapidly as possible.

The man may also, and just as effectively, be made to follow the lines in nature: a chain of mountains, the lines of a roof, etc. He may even be made to write his own name.

A gunner functioning correctly—manipulating, that is, the two hand-wheels simultaneously—will obtain lines that are continuous and regular. A man pointing badly, on the other hand, will produce jags.

This method makes it possible to show the man his mistakes and explain them clearly. The chief of section will, from week to week, compare the results obtained.

POINTING AGAINST MOBILE TARGETS

(a) *The aiming point*. This part of the instruction is carried out with the aid of a celluloid plate on which is represented the sight, the *sighting piece*, and a piece of cardboard on which are represented tanks seen from various distances and moving in all possible directions.

The first thing to be made clear to the gunner is what is meant by the *deflection correction*. Now, at the command "Tank to the left, range 800, correct for size of target!" the gunner must place his sighting piece on the sketch exactly as if he were aiming with the sight.

The deflection correction must be ordered in terms of size of target, not in mils. It will depend, naturally, on the speed with which the target moves and its direction of movement with reference to the line of fire.

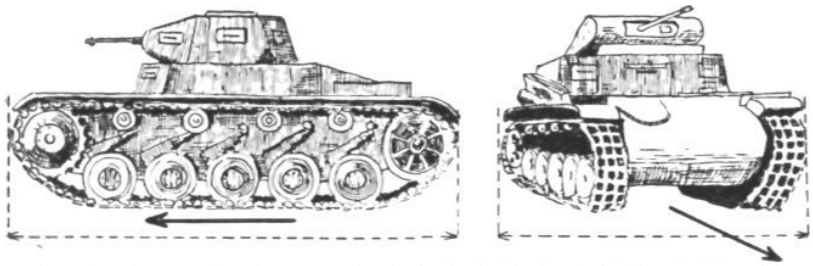
In practice, the following rule may be adopted: Against a tank moving perpendicularly to the direction of fire, the correction angle will be one-half of the number representing in kilometers per hour the speed of the tank.

Examples:

Speed of tank: 10 km. p.h. Correction: 5
Speed of tank: 30 km. p.h. Correction: 15

If the target is moving obliquely with reference to the direction of fire, the deflection correction must be less. It is zero when the tank presents itself directly in front.

In the same way, the size of the target diminishes in the measure that its direction of movement march approaches the direction of fire. This diminution will coincide in practice with the diminution necessary in the correction angle.



The notion of *size* (*width*) *of target* must be absolutely clear in the mind of the gunner. Explain to him why it generally suffices, at short distances, to aim at the front part of the tank, while at greater distances, 800 meters for example, it is necessary to correct for several sizes of target.

Here we have the same tank (six meters in length) seen from a distance of first, 300 m. next, 900 m. Speed of the tank: 20 km. p.h. Correction: 10.

Fig. 1: width of target 20. Therefore it suffices to aim at the front part of the tank.

Fig. 2: width of target 7. The correction will now be one and a half times the size of the target.

(b) *The corrections*. Here we are up against the delicate part of the instruction. It is very strange to note how the gunners generally fail to make bold corrections.

Let it be noted that the correction must be effected instantaneously and that the second shot must be fired very quickly. Otherwise, it is very probable that the tank will have changed speed and direction, thus annulling the effect of the correction. The chief of section will employ the same means as before. He will indicate on the sketch the point at which a given shot has struck. The gunner will thereupon apply his sighting piece to it immediately, rectifying the aiming point that he had previously.

Pointing With the Pointing Apparatus

The same exercises are now performed with the pointing apparatus. These exercises will have no value unless they are rigidly checked.

The instructor, his eye at an auxiliary sight, will check on whether the gunner executes rapidly and correctly the orders he receives.

The tanks being numbered, the order will run as follows: "18, tank to the left, 300, a half size!"

The man rapidly points at the designated target and orders "Fire!" The target is thereupon changed.

For the corrections, proceed in the same fashion. Indicate where the shots strike, check whether the man rectifies his aim at once.

Once the gunner is able to execute the pointing and the corrections without errors and without hesitation, the instructor will pass on to the business of aiming at mobile targets. These exercises must again be performed under the strictest control, a thing that will be possible, thanks to the second gun sight. The simplest system is to have a cardboard tank advance in front of a screen or partition. Change its speed, change its direction, and mark on a board where the shots strike.

Pointing Exercises With a Panoramic Sketch

The gunner now works (with the instructor still checking him) facing a landscape drawn on a small board. There must be grooves cut into the board. These grooves are designed to make it possible to have tanks appear at various distances in the terrain thus pictured, and to have them move about in various directions. Forests and villages are cut out and affixed in front of the panorama. It will thus be possible for the tanks to disappear behind or emerge from the various covers.

This exercise makes it possible to instruct both the gun commander and the gunner. We have now arrived at the last stage of instruction before passing on to firing.

Estimating Distances and Speed

Paralleling this instruction, the gunner must be trained in gauging distances and speed. A gunner should be able to judge distances up to 1,000 m, and he should be able to estimate the speed of a vehicle to within five kilometers per hour.

Once this program of instruction has been executed, firing with subcaliber can be begun at the range. Then will come firing on mobile targets, with tracer ammunition and armor-piercing shells.

Grooved panoramic sketch

Pointing exercises with panorama

SURVEY PLANS AND PROCEDURE

By Lieutenant Colonel E. B. Gjelsteen, FA.

Part II—Conclusion—Division Artillery Control

GENERALLY division artillery control of survey has two purposes:

(1) To coordinate the surveys of the battalions so the fires of the division artillery may be massed.

(2) To facilitate the surveys of the battalions.

There are four elements of division artillery survey control:

(1) Scale.
(2) Horizontal control.
(3) Vertical control.
(4) Direction.

SCALE

When the scale of a map or photo is known it is noted on the map or photo. This is the case with maps *made* from ground survey, or mosaics or maps *controlled* by ground survey. In the case of air photos (single verticals and uncontrolled mosaics) the approximate scale only is known. When such a photo is to be the firing chart its scale must be determined. This can best be done by the division artillery topographic platoon. It obtains the photos at the same time as or earlier than the battalions, and can determine the scale incidental to its other survey operations. Furthermore, the determination of scale by the division artillery topographic platoon effects an economy of effort; if the determination of scale is left to the battalions, each of the four battalion survey parties would have to determine it. In determining the scale it is best to base the computation on as long a distance as possible. This reduces to a minimum the errors of scaling the photo distance and errors due to distortion. It is better to use a long distance, whose length on the ground is determined by a short base computation, than to use a short distance whose ground measurement is determined by the more accurate method of taping. Before scaling the photo distance, the two points used in the determination of scale must be corrected to the datum plane (see *Vertical Control*, below).

HORIZONTAL CONTROL

Horizontal control is obtained by giving the battalion survey parties the coordinates of a point in the *position* area, termed Point A, and the coordinates of a point in the *target* area, termed Point B. These two points must also be identified on the ground to the battalions. When a map or photo is available, Point A is determined by inspection and short traverse, Point B by inspection, when possible. Often a short or long base intersection is necessary to determine the approximate location of Point B, the exact location being determined by inspection. With Point B so determined, the distortion of the map between the target and position area is removed. When Point B cannot be located on the map or photo by inspection, the direction has been established entirely from the position area, and the distortion between the target and position areas is not removed. When no maps or photos are available. Points A and B are located with reference to corps artillery control points. When corps artillery survey control is not available, the coordinates of Point A are assumed, direction is determined with a declinated aiming circle, and Point B is located by short-base intersection. One Point A for all the battalions is preferable. If the battalions are spread too wide, more than one Point A may be used. There should be but one Point B. Only those battalions having a common Point B have their surveys coordinated. The best survey control exists between battalions using common Points A and B. After locating Points A and B the division artillery topographic platoon locates other control points; the more points located the easier and quicker can the battalion surveys be performed.

SELECTION OF POINTS A AND B

Point A must be accessible, and Point B must be visible from it. The desirable features of Point A are:

(1) Near center of the position areas of the battalions using the point.
(2) Most of the target area visible from it.
(3) Line of sight to battalion position areas.
(4) Ease of location on the chart.
(5) Concealment for personnel and vehicles.
(6) Taping ground for establishment of short base.

The desirable features of Point B are:

(1) Ease of location on the chart.
(2) Near center line of division artillery target area.
(3) As distant as chart permits.
(4) Easily identifiable; unmistakable.
(5) Visible from numerous points in the position area.

VERTICAL CONTROL

Vertical control must be established only on uncontoured maps or photos, and for a grid sheet survey. On a contoured map the vertical control already exists.

When the contour interval is large, fifty feet or more, the vertical control on the map is supplemented by determining the altitudes of points used for horizontal control. On uncontoured maps or photos and grid sheets vertical control is established by determining the altitude of control points by vertical angle and distance computation, using the mil relationship. The computations are started from a known altitude furnished by corps or assumed by the division artillery survey officer. An assumed altitude should be as near the actual altitude as possible. Vertical control is established at the same time as horizontal control, the vertical angles being read when the instrument is laid on points for measurement of horizontal angles. Vertical control is established by division artillery rather than left to the battalions so that the division artillery metro section and the battalions are using the same vertical control. When the wide-angle photo is the firing chart the vertical control includes the designation of a datum plane, to which all points are corrected for distortion due to relief. The division artillery survey officer should designate the average altitude of the target area as the datum plane. All points are corrected to this datum plane. The datum plane is set by division artillery, rather than left to the battalions, in order that the coordinates of a target determined by one survey group may be applicable to all.

DIRECTION

A map or controlled mosaic, on which is superimposed the military grid, has direction on it. This is true, likewise, when survey is performed on a grid sheet, since control points are determined by rectangular coordinates and two points automatically determine the direction. When direction is assumed, it is measured with an aiming circle. When a map or photo does not have an oriented grid on it, as is usually the case with a wide angle photo, the division artillery survey officer measures with an aiming circle the azimuth of a line, and designates this as the direction on which metro computations are to be based. The line chosen should be a well defined line, such as a long straight stretch of road, although the line AB, or any other line, may be used.

CONTROL NECESSARY FOR VARIOUS TYPES OF MAPS

Contoured Map, Controlled by Ground Survey.

a. Scale 1/30,000 or greater.—Select and determine the coordinates of Points A and B. Since the grid is true, the direction is automatically established by Points A and B. Vertical control already exists. If the contour interval is fifty feet or more, determine the altitudes of Points A and B. There is no distortion; therefore, no datum plane.

b. Scale smaller than 1/30,000 but greater than 1/100,000 (*such as Geological Survey Map, 1/62,500, with twenty-foot contour interval*).—Determine the coordinates of two widespread control points by measuring their coordinates directly from the map. Coordinates can be measured with an accuracy of ten yards. Points between such control points will have proportionately smaller errors. The horizontal control is determined with reference to these two control points. Take the vertical control from the contours. If the map is not gridded assume coordinates of a longitude and latitude intersection, and draw grids on all maps used by the division artillery.

Uncontoured Map, Controlled by Ground Survey

Same as above except for vertical control, which is the same as below.

Grid Sheet (*No maps or photos available*)

The scale is always 1/20,000, since our grid sheets are gridded to this scale. Points A and B are located horizontally with reference to control points furnished by the corps field artillery observation battalion. If no corps control exists, the coordinates of Point A and a direction are assumed, and Point B is determined by short-base intersection. Altitudes of these control points are determined with reference to the altitudes furnished by corps or the altitude assumed by the division artillery survey officer. There is no distortion; therefore, no datum plane. Points A and B automatically furnish the direction.

Air Photo

Scale is determined by comparing a photo distance with a ground distance, the ground distance being determined by short base intersection. Point A is determined by inspection and short traverse. Point B is determined by inspection; the approximate location must usually be determined by short base intersection. Both Points A and B are corrected to the datum plane. Vertical control is established by assuming the altitude of Point A or Point B, and determining altitudes of other control points with reference to this assumed altitude. The average altitude of the target area is chosen as the datum plane. Direction is established by measuring with an aiming circle the azimuth of a line, preferably a long straight road.

DIVISION OF LABOR BETWEEN DIVISION ARTILLERY AND THE BATTALIONS

There is no definite line of demarcation between division artillery survey and battalion survey. After the division artillery topographic platoon has established survey control it continues its survey operation so as to assist the battalions. This assistance should take the form of locating points in the target area, rather than in the position area, for the following reasons:

(1) A point in the target area will generally be useful to a greater number of battalions than a point in the position area.

(2) In establishing its Point B the division artillery topographic platoon has usually established a base that

can be used for locating other points in the target area.

(3) The target area is known before the battalion position areas are known. Furthermore the exact location of the battalion position areas may not be known to the division artillery topographic platoon.

(4) Survey control is facilitated better by control established by a group of points in the target area than it is by a group of points in the position area.

(5) A battalion may not be able to perform any survey before dark. The battalion can perform the position area survey and the connection survey after dark, but no survey can be performed in the target area. The battalion in this case must depend for target area survey data on data furnished by the division artillery topographic platoon.

For the above reasons it is best for the division artillery topographic platoon, after survey control has been established, to give priority to the survey of the target area.

LIAISON

Liaison between the division artillery survey officer and the battalion survey officers is a difficult problem. The division artillery survey officer must get his survey control to the battalions, or the battalion survey officers (or their representatives) must report to the division artillery survey officer (or his representative) at a designated place. The latter is probably the most practicable solution, since the survey control must be pointed out on the ground.

If the battalions will not be committed to action during the survey period the survey officers can maintain liaison and exchange survey data by radio.

PERSONNEL AND METHODS

The Field Artillery School is preparing recommendations for the inclusion in tables of organization of a topographic platoon in the division artillery headquarters battery. The personnel and transportation will be approximately as follows:

Platoon headquarters, consisting of:
- 2 officers (the senior is survey officer)
- 1 survey chief (technical sergeant)
- 2 trucks, ¼-ton, with drivers.

Two topographic sections, *each* consisting of:
- 1 survey sergeant (staff sergeant)
- 1 corporal
- 6 privates
- 1 truck, ¼-ton, with driver
- 2 trucks, ½-ton, with drivers.

One drafting section.

One reproduction section.

Two radio sets and operators for the use of the survey personnel are included in the communications platoon.

Division artillery survey personnel will usually work as two survey teams, each topographic section being a team. If necessary, however, the personnel can be further subdivided to form more survey teams.

In performing its survey work the division artillery topographic platoon should compute, rather than plot. Division artillery survey is for the purpose of control, and since the battalions will base their surveys on this control it should be accurate.

Division artillery survey control should be established before the battalion survey parties begin their surveys. To accomplish this the division artillery survey personnel must work well forward; they must be with the most advanced elements of the division or other troops covering the advance of the division. As soon as the area of the division employment is known, the division artillery survey officer must start establishing survey control.

If one march group of the division is covering the advance of the rest of the division the division artillery survey personnel must be with it; not with the artillery of that march group, but forward with the infantry.

DIVISION ARTILLERY ORDER FOR SURVEY

In his orders to his survey officer the division artillery commander should include the following:

(1) Charts to be used.

(2) Situation:
   - *a*. Zone of action or sector of the division.
   - *b*. Time when battalion reconnaissance elements will arrive in their areas.

(3) Division artillery check point, with assumed horizontal and vertical control, if observed fire charts are to be used initially.

(4) Approximate location of battalion position areas.

The above is a check list, not an arrangement of the division artillery commander's order for survey control. This order will usually be issued in fragmentary form and will usually be given to the survey officer by the division artillery S-3. Most of the order consists of information of probable target area, probable battalion position areas, and the time element. Based on the division artillery commander's order and a ground reconnaissance the survey officer chooses his control points and establishes survey control for the battalions. During an advance the survey officer would probably receive no orders for survey control, other than being ordered to accompany the leading elements of the division or covering troops. In this case the survey officer bases his control on the action as it develops in the leading elements.

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WAR IN THE BALKANS

Assault gun, part of German armored unit in Greece. (*Dever from Black Star*)

By Col. Conrad H. Lanza, FA.

CONQUEST OF GREECE

On 18 April, 1941, Greece was confronted with a critical situation. The Yugoslavian Army had surrendered the evening before. This would certainly release strong German forces to assist those already attacking Greece. The main Greek army was in Epirus. Its right and center had had its line of communications cut by the enemy's seizure of Kalabaka. Deprived of rations, supplies and ammunition it was no longer in position to resist the two Italian armies which were closely following the Greek withdrawal.

The British Army, intact, was preparing a new line of resistance extending from the Thermopylae Pass south to the Gulf of Corinth. This line had not yet been reached by the enemy, and the British hoped it would hold. This, however, would not save the Greek army in Epirus, which was now completely separated.

During the day bad news came from the field. The British rear guard, making a stand a short distance north of Larissa, failed to realize how close the enemy were. They took considerable time in reconnoitering and occupying a position. They had just about completed solving this problem when German tanks attacked both flanks. A strong artillery preparation against the front of the position was quickly succeeded by another tank attack. The position, so carefully occupied, was abandoned almost immediately and the British fell back, leaving 12 armored cars for the German Panzer division.

Road obstacles installed by British engineers do not appear to have greatly delayed the Germans. They detoured them, picking up stragglers who furnished also good identifications. The Germans pushed right on into Larissa, taking more prisoners.

Larissa was a well-stocked supply depot, but the engineers had used so much explosive in the road demolishing job that there was none left with which to destroy the depot. The Germans found at this place food supplies which they very badly needed—a veritable god-send to them.

The Greek Government, sitting at Athens and hearing of these events, was not sure that the British could stop the Germans. As a precaution, two destroyers were ordered to stand by, ready to take away the high government officials. The new location was not decided; probably it would be one of the Greek islands in the Aegean Sea. There was much discussion as to whether to go or not. The meeting broke up about 4:30 PM.

The Greek Premier went home. He received some more bad news. The army in Epirus was falling back and had evacuated the remaining part of Albania. They had had to abandon considerable material, on account of lack of transportation. The Premier, M. Korizis, did not know what to do. He was worn out. Had been at his desk day after day, and night after night, since the war started. He could see no solution to the problem

which his country faced. About 5:00 PM he killed himself.

As soon as the suicide of the Premier was known, King George assumed command. He decided to be his own Premier, appointed M. Kostas Kotsias as Vice Premier and Executive. Kotsias was a popular member of Parliament—a big fellow and extremely jolly. But he had been pro-German, so his appointment gave the impression that surrender was contemplated. The C-in-C, General Alexander Papagos, announced that he was leaving for the front of his Albanian army. He also was supposed to be in favor of surrender, so his leaving was promptly assumed to be for the purpose of negotiating an armistice. This in spite of the fact that it was commonly reported that the King, only a few days before, had said that he would shoot anybody who even suggested a surrender.

It was now decided that above all it was necessary to quiet the people. The radio was used to give the general advice to remain calm; to continue on with the usual business, and to avoid refugee problems by staying wherever they were. A communiqué was issued stating that the situation was serious, due to the enormously superior enemy forces. Ten hostile divisions had attacked the single Allied division around Mt. Olympus. Tremendous losses had been inflicted upon the enemy, as against very moderate losses for the Allies.

Since the enemy was receiving a perfectly overwhelming mass of supplies and of replacements over the mountain passes from Bulgaria, no matter what losses he might suffer they would be made good, both in personnel and materiel. On the other hand, the Greeks were receiving very few supplies and replacements, and the British none of either. Consequently, notwithstanding their superior fighting ability and relatively small losses, the Allies were naturally becoming weaker daily.

After attending to the boosting of public morale, M. Kotsias now had to consider what was to be done. Kotsias had been strongly opposed to the war. However, when war came he believed that every loyal citizen should support the government and that the war must be continued to the end. Now he so advised King George. In view of the fact that the majority of the generals were against this opinion, he further advised his sovereign to form a new Cabinet, composed of those generals and admirals who were willing to continue.

19 April

The Italian Ninth and Eleventh Armies attacked all along the line. They cleaned the last remaining elements of Greeks away from the Albanian frontier. The Italians used 450 unopposed planes to attack the retreating Greeks, mercilessly bombing and machine gunning troops and destroying roads and bridges.

German reports state that Greek units, out of rations and retreating in face of the Italians, began this day to dissolve. East of the Pindus Mountains, stragglers and entire units surrendered to the Germans without a struggle.

General Pitsikas, commanding the Greek corps in East Epirus, felt that it was useless to continue the war. He had lost his line of communications and lacked food. There was no more ammunition to be had other than what was with the troops. He sent a message to Athens suggesting surrender and requesting approval of his recommendation.

The Greek government received the message and once more proceeded to argue at length as to what had best be done. They received the regular British communiqué, dated at 2:25 PM, which read:

> "Heavy attacks by armored units and by infantry have been repulsed, and many prisoners taken. Enemy casualties are severe. Austrian prisoners show especially low morale, and complain of the violence of our air attacks . . . our front has nowhere been penetrated, and our flanks nowhere turned. Heroic Greek cooperation on our left is playing a valuable part."

This sounded pretty good. The Government wired General Pitsikas that his recommendation on opening negotiations for a surrender was disapproved.

The British had peaceably occupied their chosen line of resistance. They had had all day to prepare it for defense. The main contact with the enemy occurred at Larissa. Some Australian troops who had been stationed near Servia, north of Mt. Olympus, had found it necessary to retreat across country by reason of the German advance on both their right and left. The country was very rough and the going difficult. More important, there was no food to be found, and the supplies in the hands of the men became exhausted. According to their own accounts, during the last day their ration consisted mostly of melted snow. Consequently, as they approached Larissa, they were quite hungry.

The Australians did not know that Germans were in Larissa. They knew that it was the designated supply base. They entered the town from the north side and saw no Germans. Unsuspicious, they sent the mess sergeant to locate the commissary and draw rations. The remainder of the detachment rested with visions of a nice supper and rest for the ensuing evening. The mess sergeant found the commissary all right, but instead of rations he received machine-gun bullets. Believing that this was a hostile patrol only, the Australians proceeded to attack. They needed those rations.

The noise of the firing caused other Germans to close in from all sides, and soon the Australians realized that they were surrounded. They met this situation bravely. They decided to fight their way out. They attacked towards the south exit of the town. Not all made it, but a substantial part got through and reached open terrain beyond Larissa. They resumed the march and continued to eat melted snow. Eventually they reached the new British lines.

In rear of the German forces, Bulgarian troops moved into east Thrace, relieving Germans. This was in accordance

with the agreement of 17 November, 1940, between Hitler and King Boris, to the effect that the benevolent neutrality of Bulgaria would be rewarded with that part of Thrace east of the Vardar.

King George decided to appoint a new cabinet composed of generals and admirals who were in favor of continuing the war. He detailed General Alexander Mazarakis as Premier, and instructed him to take charge of guiding the destinies of the state. This general had been the Greek military expert in 1918 and 1919, and in that capacity took part in the negotiations at Versailles. He had a good reputation. Notwithstanding the measures taken and the communiqués issued, the general opinion in Athens was that the Greek Army was going to surrender, and that thereafter the state itself would be dissolved.

20 APRIL

The British completed the occupation of the Thermopylae position, which extended southwest from that pass to the Gulf of Corinth at a point south of Amphissa. Both ends of this line were strongly held. The interval was wooded and mountainous and was assumed to be impracticable for military operations. Consequently it was only patrolled. There was no important enemy contact.

The Italian armies from Albania continued their attacks on the retreating Greeks. Their vastly superior air force continued to harass ground movements. They did considerable damage by bombing the one remaining Greek base at Mesolongion, which habitually supplied the Greek left.

The Greek General Pitsikas, claiming that he had received no reply to his wire to Athens regarding surrender, assumed that he was authorized to do so. He sent a flag over to the German lines, suggesting negotiations with a view to an armistice and the surrender of those Greek forces in north Greece which were under his command. Late in the day the German reply was received. It directed General Pitsikas to make an official application to the Commanding General, Italian Armies of Albania, for armistice and surrender.

King George's new cabinet were unable to carry out the mission the King had entrusted to them. They resigned. Confronted with this crisis, the King appointed M. Manuel Tsouderos as the new Prime Minister, with authority to proceed along any line that he considered wise and practicable. The King withdrew his decision to be his own Prime Minister made two days before.

21 APRIL

Tsouderos announced that there would be no surrender. All talk and rumors to the contrary were completely without authority, he said, and pure nonsense. Notwithstanding these brave words, issued for public consumption, the Greek Government was cognizant of the futility of further resistance. The Premier sent a confidential letter to British GHQ, reading in part:

The Greek Government, while expressing to the British Government . . . their gratitude for the aid they have extended, are obliged to state [that] the Greek army has now reached a state of exhaustion, and moreover, finds itself completely deprived of certain resources indispensable to the pursuit of the war, for example, munitions, motor vehicles and planes.

This state of things makes it impossible for the Greeks to continue the struggle with any chance of success, and deprives them of all hope of being able to lend some assistance to their valiant ally.

Consequently the Royal Government is obliged to state that further sacrifice of the British Expeditionary Force would be vain, and that its withdrawal in time seems to be rendered necessary.

The Greek Government then issued an official communiqué explaining to the people that the Army was withdrawing in an orderly manner, and according to plan. The enemy followed very slowly, partly because of bad roads but mostly because of the rough handling received whenever contact was made with Greek or British troops.

British GHQ seems to have anticipated the suggestion for withdrawal. They were ready. The Royal Navy was informed that Greece was to be evacuated as quickly as possible, and request was made that transports for embarkation be furnished expeditiously.

The Germans made no attack during the day. Reports arrived that the enemy was closing in, and that strong hostile forces were marching through or near Arta and Agrinion. Other forces were located at Lamia (exc.) and Volos (inc.). It was assumed that the enemy were arranging for an attack of both flanks of the British line. Details were sent out to make demolitions along probable lines of approach.

According to German reports the British started their evacuation this very evening. The Luftwaffe claimed that in the vicinity of Khalkis it sank 5 transports and damaged 6 others.

22 APRIL

German troops occupied Lamia after a minor engagement. The New Zealand Brigade in this area withdrew to the Thermopylae Pass, which was to be held to cover the withdrawal of the troops to embarkation points.

The German Air Force concentrated on raiding harbors, to impede embarkation of British troops. Piraeus, Salamis and Megara were specially attacked. The Germans claimed to have sunk 7 ships and damaged 12 others, all supposed to be transports. Bombings also covered islands in the Aegean Sea and Suda Bay in Crete. According to Greek reports, the enemy air attacks caused only one casualty; damage to ships was acknowledged to have been considerable, but details were not given.

In the evening General Tsolakoglu, commanding the Greek Armies on the Albanian front, sent a flag of truce over to the lines of the Italian Ninth Army. Tsolakoglu appears to have been advised by General Pitsikas, on his right, that an application for an armistice would not be received by the Germans but must be submitted to their

Italian ally. Tsolakoglu, as commander of all Greek forces left in the field, now formally requested a cessation of hostilities. His letter was acknowledged the same evening and he was requested to report in person in the morning, with a view of proceeding to Salonika immediately, where a capitulation would be signed.

23 APRIL

In accordance with the agreement of the preceding day, General Tsolakoglu passed through the Axis lines and around midday arrived at Salonika. Here he met Generals Jodl and Ferrero, respectively designated by the German and Italian High Commands as commissioners to arrange for the surrender of the Greeks. The three generals concluded and signed Articles of Capitulation at 6:00 PM, which provided that, effective at once, the unconditional surrender of the Greek Armies was tendered and accepted. Other articles were customary, except for two. These provided that Greece would guard against destruction of all ships then in her ports.

Late that evening the Greek Government at Athens issued a statement that the surrender was unauthorized and that it had been made without their knowledge or consent. However, there was nothing they could do about it. Realizing that the end had about arrived, the King, the Crown-Prince, and the Cabinet moved to Crete.

The Italian Ninth and Eleventh Armies continued, up to 6:00 PM, to advance against Greek resistance. The fighting was not serious. On both sides the men had heard of the prospective surrender, and saw no use in incurring fresh losses. Italian reports show that since 1 April their total casualties in Albania had been approximately 6,000. Greek reports as to this campaign have not yet been found.

British GHQ knew early of the Greek intent to surrender. It was evident that if Greece was to be evacuated by the Expeditionary Force, embarkation of the troops would have to be expedited. The latest available returns showed that there were around 40,000 men to be embarked. Even assuming that all materiel were abandoned, the problem still was not an easy one.

The best port had been Piraeus. Due to the great explosion of the munitions ship on the opening day of the war, this was no longer usable. Salamis and Megara, not far from Athens, would have been suitable places. However, on the previous night the Germans had severely bombed these ports, sinking some small transports there. It was obvious that the enemy was watching these ports, and it was believed that it would be too dangerous to try to use them any more. It was best to employ ports which were not quite so good and which had not yet attracted hostile attention.

German motorized troops crossing a river in Greece. (*Acme*)

It was decided to select Raphti, a small port east of Athens and fairly close to the front; and Navplion, more distant and south of Argos, on the Argolikos Gulf. Neither of these ports had yet been bombed. The first was suitable for troops withdrawing from the vicinity of Thermopylae Pass sector, the second for troops coming from the left of the line on the Gulf of Corinth. The Royal Navy was notified. Transports were not to approach harbors until after nightfall. Initial orders for embarkation of troops were issued.

The British were not disturbed by any enemy attacks

on this day. The German Air Force was, however, very active. According to their own claims they scoured the seas around Greece, sank 5 ships and damaged 10 others, including an escorting destroyer.

24 April

At 5:00 AM a German force landed from transports on Lemnos Island. The small Greek garrison resisted, but the fighting was all over by 9:00 AM. The Germans at once started work on establishing an airdrome, as a further step to their control of the Aegean Sea.

The main German force on the mainland had had time to reorganize. It was ready for further operations. A sharp attack, supported by tanks, was made against the British lines at Thermopylae Pass. Met by a strong artillery fire delivered by six batteries, it was quickly stopped. Perhaps it had not been intended to do more than attract British attention, for while this fight was going on other German troops from a mountain division climbed over the supposedly impassable mountain on the British left and turned that flank.

The British do not appear to have made any serious effort to stop this turning movement. It seems to have been a complete surprise to them. They abandoned the Pass Now came the German Air Force, which dive-bombed and machine-gunned the main road and the paths. The German artillery savagely shelled the retiring troops. The six British batteries fired constantly to protect their comrades. They gave up the idea of bringing up the tractors, for fear that they might be disabled on the way up and block the only road. So only after all had had an opportunity to get a start, the gunners too left, leaving their pieces on the field. They had held the enemy off long enough to enable the infantry to break off the action.

Now another British artillery battalion, further to the rear, took up the task of keeping the enemy's pursuit away. This battalion was well camouflaged in an olive grove. The advancing German tanks failed to see them until they opened fire. Eight of the German tanks were hit, destroyed or left burning on the field. The pursuit was stopped again.

Once more the German mountain troops got busy. They made another turning movement, and came up on the flanks of the olive grove. The artillery battalion had no supporting troops and had no local protection. The German attack was swift. All three batteries were taken before the guns could be turned around to face the new direction of danger.

British resistance now collapsed, and the Pass of Thermopylae fell into the hands of the enemy. Through the sacrifice of nine batteries of artillery, the foot troops had had time to get away. The British infantry casualties were reported as about 400. The artillery casualties have not been ascertained.

The British line of resistance now found itself in a very threatened position. The utmost haste must be employed if the Expeditionary Force was to make good its withdrawal from Greece. Notwithstanding previous decisions, it was decided that Megara would have to be used as a port of embarkation, in addition to Raphti and Navplion.

After issuing orders to this effect, British GHQ closed their CP and flew off to Crete. About 200 German prisoners were embarked and shipped to Egypt. The Greek Navy sailed for the same destination.

German planes appeared to be everywhere. They bombed everything afloat in Greek waters, including small craft. They claim to have sunk one ship and to have damaged 3 others, all believed to be transports. They discovered Allied troops in and about Argos and rightly judged that they were en route to Navplion. They bombed Argos and set it on fire shortly before dark. They flew over Navplion harbor, found a ship waiting there, and set it on fire also.

Navplion is a little port, closed in by high, dark and gloomy cliffs. The British cruiser *Phoebe* arrived to embark troops. Disregarding the danger of remaining in such a confined space, the *Phoebe* stood by and embarked as many British troops as her space permitted. The troops abandoned all property. There was not time to destroy any considerable quantity of it.

25 April

During this night of the 24/25 April, the embarkation of British troops proceeded at a rapid rate. According to British reports up to noon of the 25th, 13,500 troops had been embarked. This left over 26,000 more yet to be evacuated.

The movement of troops to the selected ports was hastened. Withdrawal from the front was protected by rear guards. The enemy was advancing through Thermopylae Pass and by a road over the mountains via Delphi. Bridges were demolished on both roads and twelve road blocks were constructed in the 45 miles from Delphi to Athens.

The country was a succession of ridges and valleys, consequently there was no lack of good defensive positions for the rear guards. One after another the road blocks and destroyed bridges were defended. The enemy was forced to bring up his artillery. Aided by artillery and dive bombers, the enemy tanks and armored cars would find a detour around the obstacles, and the rear guard would be compelled to fall back a few miles to the next place.

The advance of the hostile ground forces was very slow. Not so with their air forces. The latter flew over the rear guards and found the main columns. They dropped bombs not on the road but about 5 meters outside. The bombs were sufficiently powerful to overthrow trucks carrying 30 to 40 men. They caused considerable casualties and delayed many of the troops.

To avoid the delays caused by the numerous rear guard actions, the Germans on the eastern flank crossed

over to Euboea Island. They met no opposition at all, and continued south, recrossing to the mainland in the vicinity of Khalkis. Nobody in the British forces had anticipated such a movement. All rear guard positions north of Khalkis were quickly evacuated and the Germans moved into this area.

On the Delphi-Athens road a German Panzer division at the end of the day arrived at Thebes.

The German Air Force reported a continuance of its raids on shipping and claimed to have sunk some small transports and to have damaged 4 large ones. They attacked small boats of every kind in order to delay or prevent the taking off of troops from beaches.

26 April

The Greek C-in-C, General Papagos, not having any troops left to command, was placed upon the retired list, at his own request. There was now nothing left of the Greek army on the mainland.

The east column of British troops marched through Athens. The people understood what was passing, and that their allies were about to sail away. They did what they could to show their appreciation of the British effort on their behalf. This column proceeded on to Raphti for embarkation. The west British column marched via the isthmus of Corinth in order to embark at Navplion.

The German Air Force was very active over Greek waters and harbors, attacking anything afloat. Against the ground forces they concentrated their efforts towards stopping the retreating west column.

Very early in the morning German planes attacked the area south of the city of Corinth, just beyond the isthmus. There was little opposition, and shortly afterwards parachutists were dropped. According to available reports they sustained no losses in landing. They were able to pick up arms, motorcycles and other equipment which had been dropped separately and to organize themselves into two detachments.

The first detachment, mounted on motorcycles and liberally provided with machine guns and automatic rifles, went at once to the isthmus and blocked it. There being no artillery support, bombers watched the situation and assisted the ground forces by attacking approaching British troops. The British retreat was stopped.

The second German detachment proceeded to a small air field nearby. They occupied and cleared it within a very short time. Then came the German transport planes with air-borne troops, which were sent immediately to assist the first detachment blocking the isthmus. The air-borne troops had heavy infantry weapons and, together with the parachutists, they permanently closed the isthmus to the British.

Quite a number of British were thus cut off. They made no special effort to break the enemy block at the isthmus. Instead, with the cooperation of the Navy, the embarkation point was changed to Megara. Speed in embarking was stressed and the troops were instructed to abandon their equipment.

On the German right, the Adolf Hitler Regiment reached without opposition Navpaktos on the Gulf of Patras. It found a considerable number of small boats. Wasting no time, the regiment crossed the Gulf. On landing they started right off in a southerly direction into the Peloponnesus.

The British embarkations were rushed as soon as night came on; 4,200 men from the east column were embarked at Raphti and 8,000 men from both columns at Megara. About 4,000 more men from the west column, who had cleared the isthmus of Corinth before it was blocked, were embarked at Navplion.

The latter operation was the only one where serious difficulties were encountered. Four transports had been sent by the Navy to Navplion. After the transports arrived, but before they had begun to receive passengers, the German Air Force appeared and commenced a terrific bombing attack. All transports were hit, and three out of the four were set on fire and subsequently sank. When the attack ended, there was just the one ship left. It proceeded to embark every passenger on shore. Apparently these were around 4,000 in number. Notwithstanding that great haste was used and that every bit of equipment was left on shore, it took most of the night to load this crowd. Absolutely jammed and packed, the ship moved out before daylight.

Now came another attack by the Luftwaffe. Again they hit the unlucky ship, causing a great number of casualties, setting it on fire, and leaving it in a sinking condition. The transport became unmanageable. It was so badly wounded that it was run close to shore, to afford the personnel the maximum chance of escape. Here it sank.

Daylight was coming. With the dawn came two British destroyers, the *Diamond* and the *Wryneck*. The *Diamond* came up first and rescued about 600 survivors swimming and floating on wreckage in the bay. While these rescues were in progress enemy planes returned and continually bombed and machine-gunned the destroyers and the men struggling in the water. Stukas arrived and sank the *Diamond*. The *Wryneck* bravely came up and picked up about 100 men. A bomb struck it squarely, and down it went also.

Nobody knows the total number of casualties in this gruesome night embarkation at Navplion. They were heavy. Some men of course managed to regain the shore and were later included in the prisoners taken by the Germans.

The Germans claim that on this night they destroyed 11 ships, including 2 transports, and damaged 2 other ships. This is exclusive of a destroyer and 19 other ships claimed to have been attacked and damaged off Crete.

27 April

There were no British troops left north of the isthmus of Corinth.

The German Panzer division entered Athens. As at Belgrade a detail of MPs on motorcycles preceded the main body. Arriving about 8:30 AM, they posted appropriate road signs in German at the proper places. One hour later the Germans paraded in. The Military Governor formally surrendered the city.

There were no military engagements this day, other than the disastrous sequel to the embarkation at Navplion. Not all British troops at this port had been embarked. Since it seemed improbable that this port could again be used, the British forces, together with some Yugoslav detachments which had joined them, started for another port. Initially the march was directed towards Kalamata, which appeared to be the most suitable available place left.

It was assumed that the enemy was in rear towards the isthmus of Corinth. It was not known that the German Adolf Hitler Regiment was moving down the west side of the Peloponnesus.

The Adolf Hitler Regiment, now all over the Gulf of Patras, went rapidly on to the south. They learned that a British naval force was landing a beach party at Kalamata, from which they correctly decided that the British still in Greece intended to escape via this port. They pushed on with the mission of seizing the port before the British arrived there.

The two hostile columns, both marching on Kalamata, did not contact one another this day.

28 April

The first German supply trains to reach the front arrived at Athens.

During the three weeks' campaign, only ammunition appears to have reached the German front from the rear echelons. What we would call Class I supplies were obtained off the country and from captured enemy stores. Not much food was found locally. Had it not been for certain windfalls it might have gone hard with the Germans. Particularly at Salonika and at Larissa substantial quantities of rations had been captured. Even with this lucky help, it had been necessary to place the combat troops on a reduced ration. In many cases the troops, due to the rapidity of the campaign, had had no opportunity to cook what limited food was available to them. They had had to eat canned vegetables, potatoes and meat, raw, for they had no kitchens with them, and fires were prohibited. Weapons and ammunition they had, but everything else was sacrificed to obtain mobility.

There had been no relief of divisions in line. There were divisions in rear, originally intended to take their place in turn at the front. But the front had moved so very quickly that the rear divisions were never used.

When these fighting divisions arrived in Athens, the men plainly showed the result of the hardships they had gone through. They were underweight and suffering from malnutrition. A large number were afflicted with insomnia. When the kitchens came up and regular meals were served, many soldiers could not keep this food on their stomachs. Rest was needed. It took about three weeks to restore the physical condition of these German troops.

* * * * *

During the afternoon, the Adolf Hitler Regiment reached and occupied Kalamata. The British beach party, having learned of the approach of this hostile force, withdrew to their ships, which had remained offshore in the hope that they might nevertheless be able to rescue their countrymen.

The British column continued, unknowing, towards Kalamata. They numbered, including Yugoslavians, about 10,000 men. Although they carefully watched to their rear for possible pursuing German forces, they noted none. They do not appear to have realized that they might be headed off at Kalamata. When night came, as there was only a short remaining distance to go, it was decided that after a rest the march would be continued. They expected to arrive at Kalamata at about 1:00 AM in the morning.

29 April

The British column arrived on the outskirts of Kalamata soon after midnight. The enemy was found to be in possession of the port, between the British and the naval transportation which was to have taken them away.

The British outnumbered the Germans, but they did not know this. The British commander at daylight made an estimate of the situation. The enemy was in front of him, holding the only possible port of embarkation. Germans were in rear, and could be expected to appear at any time in overwhelming strength. He had no air force, whereas the enemy had a large and efficient air force. He was out of supplies, had no base, little ammunition, little artillery. He could see no way to escape from Greece, and no object in trying to maintain himself in Greece, even if this were possible. After negotiations with the German commander in Kalamata, he surrendered his command.

The British Expeditionary Force in Greece thus came to an end—9,860 British officers and other ranks were counted in the surrender. There were men from all three divisions — from New Zealand, from Australia and from England. There were about 1,000 Jewish troops from Palestine, 550 Arabs from Egypt, and sizable detachments from Cyprus, Malta, India, etc. Not included in the above figures were 1,187 Yugoslavians, the remainder of and the last of the unsurrendered forces of that unfortunate nation. Many motor vehicles, artillery, weapons, and supplies fell into the hands of the Germans.

British destroyers stood by all day off Kalamata to pick up troops. After night they closed in towards the shore, and 33 British officers and 179 men were rescued.

30 April

German and Italian troops, now freed from any further fighting on the mainland, proceeded to occupy

islands in the Aegean Sea. All were to be taken for use as airfields and naval bases. A start was made this day with the occupation of Cephalonia and Zante.

Italian motor torpedo boats, which were very fast, arrived in the Aegean. They attacked an escorted convoy and torpedoed a cruiser and a destroyer, without loss to themselves. The German Air Force bombed 3 ships in Suda Bay in Crete. In view of this situation, the British Naval C-in-C decided that further naval operations around Greece and in the Aegean were not warranted. After consultation with the military authorities he announced that after this night the British Navy would withdraw from the Greek coast.

Thus ended the Greek campaign.

* * * * *

British GHQ announced that they had evacuated about 45,000 men from Greece, not counting a large number of refugees. They claimed that their casualties had amounted to around 3,000 men in all.

There are no available figures as to the Greek losses.

The British loss seems to have been nearly entirely accounted for by the surrender at Kalamata. The booty taken by the Germans amounted to over 500,000 rifles, about 1,000 guns of various calibers and a very large number of machine guns, quantities of ammunition, and stores of all kinds. About 1,100 British motor vehicles, including many badly damaged ones, were also taken.

The German casualties, as reported by themselves, are not in general separated between the campaigns against Yugoslavia and Greece. For the two together they are stated to have been in all:

	Officers	*Men*
Killed (ground forces)	57	1,042
(air forces)	10	42
Wounded (ground forces)	181	3,571
(air forces)		
Missing (ground forces)	13	372
(air forces)	36	104
Total	297	5,131

German parachutists who landed near Corinth Canal made use of some abandoned English trucks. (*Dever from Black Star*)

For the joint Yugoslav-Greek campaign, the German Army had provided 32 divisions. These were engaged with the enemy as follows:

	Divisions
In line for over 6 days	11
In line for 6 days or less	10
In line, total	21
In army reserve, available but not used	11
Grand total	32
Of the divisions that were in line, there were	
Panzer divisions	6
Motorized divisions (inc. 2 ½ divs.)	4
Infantry divisions	11
Total divisions	21

The number of prisoners reported by the Germans was given as approximately:

	Officers	*Men*
Greeks	8,000	210,000
British	500	9,500

These seem like a very small number. Some individual losses appear to be more remarkable. The 2nd Panzer Division, which fought against the British after breaking through the Yugoslavians, reports for the entire campaign a loss of but 66 killed and 147 wounded. The Mountain Division, also employed against the British, reports 97 killed and 160 wounded. The only independent observation on German losses is by American correspondents, who counted the graves of German dead near Corinth and near Salonika. In both cases they checked approximately with the reported German lists of casualties. The German reports may be accurate.

Against the British the Germans employed 3 divisions (2 Panzer and 1 Mountain [Alpine] division), plus the Adolf Hitler Infantry Regiment.

Two more German divisions were in Greece and were used against 1 Greek division east of Salonika, plus the fortress troops, which were equivalent to another division; and against the corps of 3 Greek divisions, on the left of the British under General Pitsikas.

Altogether in east Greece there were 5 German divisions, plus 1 infantry regiment, against 3 British and the equivalent of 5 Greek divisions.

In west Greece—the Albanian front—the Italians appear to have had 20 divisions, as against about 18 Greek divisions.

All in all, although exact figures are not yet known, there was nearly the same force on each side.

COMMENTS

Some explanation is required as to the reasons for the surprisingly rapid success of the Germans in the Yugoslav-Greek campaign.

1. The Germans attacked on 6 April, about 5 weeks earlier than the Allies had thought possible. They caught the Yugoslavians completely unprepared. What happened has been described.

This was a prime cause for the loss of this Balkan war—failure to allow for the time element.

2. Another error was the complacency of the Yugoslavia High Command as to the security afforded by their difficult terrain. The Germans conquered the terrain, and the defense thereupon collapsed.

3. The Greek fortifications against Bulgaria held off the Germans for four days, and then were cut in only one pass. The defense of this pass was purely defensive. The division in rear was not used, and no attempt was made to counter enemy gains. The pass was so narrow that the Germans could find use for only one battalion. If strong counterattacks had been delivered, the outcome might have been different.

4. The defense of the south Bulgar border was turned, and thereafter made useless, by the German advance west into Yugoslavia and south down the Vardar valley. This happened so rapidly that no defense was made. The one Greek division to the east in rear of their defensive line was now cut off from the British, who were the nearest friendly forces, and forced to surrender. With hardly any fighting, the Germans thereby gained all of East Macedonia, and eliminated the equivalent of 2 Greek divisions.

5. The drive of the Germans to Nis(h) and Skoplje separated the Greeks and British from the Yugoslavians.

6. The British line west of the Vardar had been intended to resist a German advance—provided that it came from East Macedonia. It was not prepared to resist an attack from the north. When the enemy did appear in that direction, the British found their left turned and abandoned their lines to a new but unprepared line to the south.

The Germans now made their main attack towards Kalabaka, on the boundary between the British and General Pitsika's corps. Once more the Germans had split their opponents into separate compartments by attacking along boundary lines.

This German success turned the British left, and led to another withdrawal on their part. They selected a line—Thermopylae—which might have protected Athens. It would have done so could the line have been defended. Had it been prepared in advance with modern fortifications, it might, with the sea open behind it, have held indefinitely. But nothing was ready. Everything had to be improvised.

Not only had the loss of Kalabaka forced the British backwards, but it also lost to the Greeks their advance depot and their line of communications to the right and center of the main Greek army on the Albanian frontier. The left of this army was supplied from Mesolongion on the Gulf of Patras. This latter depot was working under difficulties. It received its supplies usually from Athens. Since the destruction of the port of Piraeus, on the opening day of the war, supplies issued were not being replaced. Besides, due to the absence of roads, only limited pack transportation was available to ship anything to the center and right over high mountains. It therefore became impracticable to supply the main Greek army, and its offensive ability practically disappeared.

It is probably true that the Germans had better equipment. They were, on the other hand, handicapped by a lack of supplies, and depended largely upon what they could capture. A vigorous counter-offensive from the opening day of the war might have prevented the Germans from capturing very much and given an entirely different direction to the ensuing campaign. The Allies had as many divisions available as the Germans used, but they were never used together.

8. According to American correspondents who interviewed British prisoners of war after their surrender, the general opinion of the British was that they had been hopelessly outnumbered, and that therefore further resistance was useless. It is now known that this was incorrect. The opinion may have been brought about by enemy propaganda.

9. All British officers and men agree that a prime cause of their disaster was lack of air support. They were particularly impressed by the German Air Force and its very prompt and intelligent cooperation with the ground troops. There had been nothing like this on the Allied side. The British and Greek Air Forces had been distinctly inferior in strength. More important, they operated independently of the ground troops, frequently disappearing at critical hours en route to bomb enemy rear areas, which so far as the ground troops were concerned was time and ammunition thrown away. They believed that the Air Force should have stayed near the ground troops, and should have directly aided them through their battles. At the defense of the various passes, the ground troops had been constantly bombed and machine gunned by enemy planes, who were obviously in close liaison with the attackers; but there was never any allied plane to help the defenders.

The desire of the ground troops, and especially of the infantry, to have close support from other arms has long been recognized. The artillery of all armies provides for

such direct support, while not neglecting more distant targets. Our own FSR clearly recognizes that the primary mission of the artillery is to get the infantry forward, or prevent it from going backwards. Were the artillery to devote its entire effort to action against long-range objectives, the infantry would have a legitimate cause of complaint.

The same situation applies to the Air Force. If the ground troops lose a campaign, as those of the Allies unfortunately did in the Balkans, it is no consolation that certain enemy rear areas were materially damaged or destroyed.

Fortunately this principle has, partly as a result of this campaign, now been generally accepted. All arms must work together. And it is best that they do so under a single commander, with authority over all armed forces in the same theater of operations regardless as to whether they come from the army, the navy or air forces. All have the same mission—the defeat of the enemy. And if there be more than one ally, there should nevertheless be but one commander, to direct one united whole to secure VICTORY.

[*This concludes Col. Lanza's series on the Balkan campaign*.]

S-4 PROBLEM

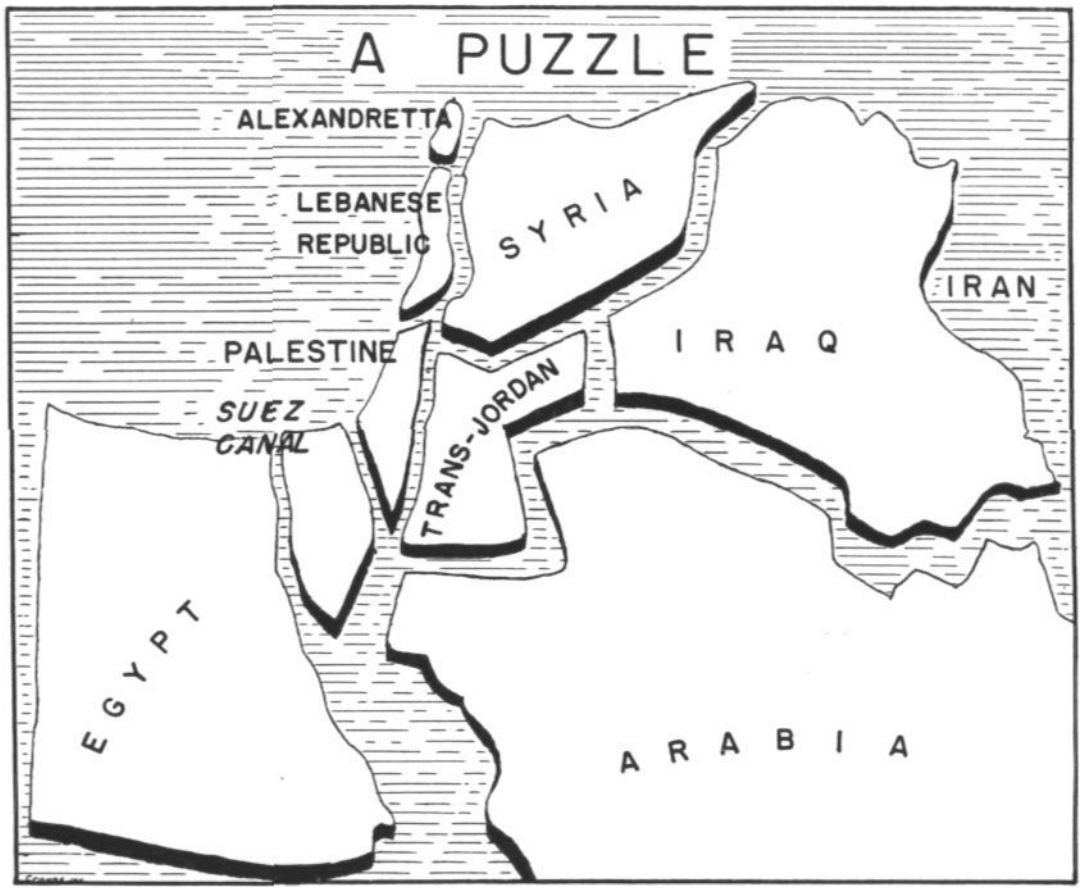
By Lieutenant-Colonel John H. Sampson, Jr., FA.

A good carpenter always knows where his tools are and knows the condition they are in. A good S-4 should likewise know his tools and the condition they are in. This problem is designed to familiarize the artilleryman with the S-4's normally available equipment.

1. In the 105-mm. howitzer battalion, how many rounds of ammunition are carried in:
   a. One firing battery executive's truck?
   b. One firing battery prime mover?
   c. One firing battery fifth-section vehicle?
   d. One ammunition train vehicle on good roads?
   e. Where do you look to secure the above information?
2. *a*.How many vehicles are there in the battalion ammunition train?
   b. If an equal distribution of these vehicles is made for hauling ammunition to each battery, how many of these vehicles should haul ammunition for each howitzer battery?
   c. How many trucks are available for the battalion supply section?
   d. Where do you look to secure this information?
3. How long (time) does it take to:
   a. Unload the battalion ammunition train?
   b. Load the battalion ammunition train?
   c. Where do you look to secure this information?
4. Assuming that roads are good, how fast in miles per hour can the battalion ammunition train travel:
   a. During daylight?
   b. During night with lights?
   c. During night without lights?
   d. Where do you look to secure this information?
5. When are ammunition reports submitted?
6. In the 105-mm. howitzer battalion how many tons of ammunition are carried when all ammunition-carrying vehicles are carrying their normal ammunition loads over good roads?
7. Define the unit of fire.
8. How many tons of ammunition are there in one unit of fire for the 105-mm. howitzer battalion?
9. Name the five methods of procuring supplies of all classes in the field during combat.
10. How is small-arms ammunition obtained by the field artillery?

NOTE: Use as text references: Conference Course Training Bulletin No. 2 (FAS T-1); FM 101-10; FM 6-20; and FM 6-130.

(*Solutions are on page* 246)



PALESTINE AT THE CROSS ROADS

Palestine is not a very imposing place: A rim-rocked ridge which starts in the sands of the Sinai Desert and is flanked by the coastal plains and the Jordan River valley—Dead Sea depression. Not much to fight over; yet it has a long record of warfare, running back to the Semitic tribesmen in the dawn of history.

It is populated by Arabs, Jews, and British officials. The Arabs hate the Jews; the Jews dislike the Arabs; and both want to rid themselves of the British. To keep the political pot boiling, the Arabs throw dead pigs into the Jewish synagogues, and the Jews throw dead dogs into the Arab mosques, while the British officials cast oil on the troubled waters. To protect themselves the Arabs flee to the desert, and the Jews build magnificent yellow brick citadels as refuges.

"Tommy" Tompkins and I entered the Promised Land on foot at Kantara in the middle of the night, followed by shouting porters and a swarthy tyrant who represented Cook's Wagon Lit. We groped our way down the long, unlighted station platform. After a tedious wait we climbed aboard a car marked with enormous brass letters, "International Wagon Lit," which, in spite of its showy exterior, was a rather seedy affair.

The railroad follows the shoreline from Kantara on the Suez Canal to Gaza—the route of the invading and returning armies throughout the centuries. During the World War the British Army also used it, as they drove the Turks northward and pulled behind themselves the railroad and the pipe line from the Sweetwater Canal.

During the night we crossed the western edge of the Sinai Desert, which, like many other parts of Palestine before the Mohammedan invasion, was a prosperous and fertile country filled with grain fields, vineyards and orchards. When the hap-hazard Bedouin appeared, the ancient civilization and prosperity disappeared in a very short time. In probably less than a century he had a country to his own taste—a howling, waterless wilderness, in the midst of which he sat, miserably complaining of his plight.

The Bedouin and his goats moved on into the Nile

By Lieutenant Colonel Riley F. Ennis, GSC

Another first-hand description of one of the theaters of war, written by a U. S. military observer recently returned from the Middle East.

Valley and to the coast of North Africa, where the tiny hooves of his animals destroyed the binding grass, and his master cut down the trees. Together they became the great scourge of the Middle East.

Gaza, much fought over during the World War, approximately marks the northern edge of the desert. An "all British" canal has been proposed to run from Gaza to Akaba, a little fishing village at the head of the Gulf of Akaba. To the north of Gaza, the desert slowly and sullenly gives way to grain fields and orchards.

Though Greece had just been evacuated, and the Middle East was waiting with bated breath for the next German thrust, life was moving on in Palestine much as it had since time immemorial. The black tents of the nomads dotted the barley fields. Sheep, donkeys and camels grazed on the freshly cut fields. Whole families, as in Biblical times, crawled along on their hands and knees, cutting the grain. Donkeys, no larger than burros, carried enormous loads, and large men seated on their rumps. You wondered how the poor creatures could survive.

Lydda, where one transfers to the branch line running to Jerusalem, is in the center of the orange groves. The fruit had not been harvested, because little could be exported; and even the British Army in Egypt was denied the fine citrus fruits of Palestine, for the King of Egypt is one of the big orange barons of the Middle East.

When England took over Palestine after the World War, it was a most neglected Turkish Province, ravaged by campaigns and plundered by the retreating Turkish troops. When in 1917 the *Declaration Making Palestine the National Home for the Jewish People* was published, Mr. Balfour opened the tap from which flowed millions of philanthropic Jewish money. It is impossible to take sides in the bear-pit racial bickering between the Jews and the Arabs in Palestine. Your sympathy may veer toward the slow-witted Arabs, who are in the majority, because the sharp weapon of gold has made the Jews the top dogs. Or it may swing to the Jews, whose industry and thrift have made Palestine the modern, clean, and attractive pearl of the sordid Middle East. They have surrounded the historic but filthy walled city of Jerusalem, which Allenby conquered, with the modern city of fine yellow brick and stuccoed homes, apartments, and business buildings.

It is rather ironical that the Y.M.C.A., a gift of an American millionaire, with its high tower flanked by a magnificent chapel and an auditorium, should be the most prominent and most beautiful building in Jerusalem. Across the street is the King David Hotel, one of the most famous hostelries in the Middle East, which makes the Cairo hotels look like shabby, second-rate summer resort establishments.

Lieutenant General Henry Maitland Wilson—"Jumbo" to every officer in the British Army—was in command. The hero of Greece and of the Libyan Desert Campaign of a year ago, he exemplifies the cool, practical, commonsense type of British General. He is the perfect type to put into execution the plans of a genius like Sir Archibald Wavell. As "Jumbo" looked over the top of his black half-lens glasses on a late afternoon in the latter part of May, "Tommy" and I knew that he was behind a "damned-if-you-do, damned-if-you-don't" eight ball, for the pot was beginning to boil in Syria. And while he talked, frankly and bluntly, of the lessons to be drawn from the campaign in Greece, our thoughts, I am afraid, were centered on the question of what was going to happen in Syria. But being a good soldier, "Jumbo" never dropped a hint.

The troubles which flanked him seemed to rest well on his broad shoulders: In Turkey, Franz Von Papen, the old conspirator, was using all his wiles to try and pry open the door to Turkey. The troops of Iraq's Raschid Ali were leisurely dropping artillery shells from a barren, flat-topped hill into the great British air field at Habayna in Iraq along the Euphrates River. The Transjordan pro-British Emir Abdullah was reported shot and badly wounded by his son, just as it was rumored that he was about to move into Iraq to help the British. In Saudi Arabia the wily Ibn Saud was waiting for the cat to jump. In Syria the pro-Vichy and pro-De Gaulle forces were jockeying for positions. The Nazis were occupying Aleppo, Palmyra and Damascus air fields. And although we did not know it at the time, the British were deciding on the damned-for-doing course.

Since power and action are might in the Arab world, "Jumbo" Wilson was preparing to play a thin hand. If successful, he would add mightily to the British "face" in the Middle East, would boost the De Gaullist stock, and perhaps put some spine into wobbling Turkey. The capture of Syria would also prevent the further encirclement of Turkey, would guard the Iraq oil fields, and prevent a super-colossal grand-slam by the Nazis in the form of a campaign from Syria against the Suez Canal.

The British Headquarters in Jerusalem was beginning, for the first time, to feel the true effect of the war. Many of the officers' wives were at Suez en route to South Africa. A friend, a major in a Royal Tank Regiment, refused to deport his wife. As a result, he was ordered from a comfortable berth as an instructor in the Staff College at Haifa to the western desert, where, ironically,

in June he distinguished himself and was later sent back to England on an excellent assignment.

The headquarters in Jerusalem was an orderly and helpful establishment, which reflected the personalities of its commander and the chief of staff. We had easy access to the officers who could assist us; an alert young Canadian captain took care of our every whim. To our astonishment a car was placed at our disposal. All of this was so different from Cairo, where we had been lost in the labyrinth of the offices of a highly departmental headquarters. Here, in time, one became acquainted with a few officers, who through friendship, could be most helpful. But in the meantime one cooled his heels for weeks.

In Jerusalem, after only a few days' preparation, we were on our way to the critical Syrian border, beyond which the French had massed some 45,000 well-trained troops and approximately 100 tanks. En route to Haifa, our first stop, we visited the headquarters of a weapons school quartered in the great white buildings of a former German school which had been Allenby's headquarters in 1918. Also we saw a remount depot, where we marveled at the meticulous care with which grain was crushed and mixed with chopped roughage for feed. The British Army has always distinguished itself in the care of its animals. However, many things must give way to the new order in a changing world; and so Palestine was witnessing the mechanization of the last horse cavalry division in the British Army.

Haifa owes part of its importance to the facts that it is at the end of the Iraq Petroleum Company's pipe line, has a modern refinery, and a new harbor, which was built by the British some years ago, in spite of protests by both Jews and the Arabs, who for once agreed upon something, but did not agree upon the alternate location. The older part of Haifa, clean and orderly, lies along the coastal plain, while the new and modern section of the city is located on a high plateau overlooking the old city and the harbor.

In Haifa we first felt the influence of Mr. Spinney, formerly a sergeant in the British Army in Palestine during the World War, canteen steward, minister's son, and a talented musician. Today he is a merchant prince of the Middle East, partly because he is a good business man and partly because the Jews do not trust the Arabs, nor the Arabs the Jews, and both trust the British, although they have no love for them. We ate in Mr. Spinney's cafe, bought supplies in his department store, drank his soda, and looked at his great wholesale establishment. Somehow you never seemed to get away from Mr. Spinney's influence. You leave the Middle East feeling that he is the only up-and-coming merchant in that section of the world.

The British Staff College of the Middle East at Haifa is perhaps one of the most realistic military educational institutions in the world—for in it the battle experiences of a theater are being taught to the officers who will assist in carrying on the future campaigns of the same theater of operations. It is unfortunate that arrangements cannot be made to send a great number of our officers to the school.

In spite of black-outs and an occasional air raid warning, the night life of Haifa continues at a sprightly pace. The star of the leading night club is Rachel, who sings a jingly little tune all her own, the theme of which is "a little bit of Arabic, a little bit of Yiddish, a little bit of Irish—my Palestinian Rose . . ." And this aptly describes Rachel.

From Haifa we moved along the coastal plain to the Syrian border. Taggert's Wall, a high barbed wire fence, was built a number of years ago along the Syrian-Palestinian border to keep smugglers and bands of partisan Arabs out of Palestine. Today the "wall" has become a liability, for it must be carefully guarded to prevent the Arabs from stealing the iron posts which they can sell for a few shillings apiece.

During the World War Allenby on his advance into Syria moved columns along the coastal plains and across the plains of Esdrelon, and thence up the Jordan Corridor and the Transjordan Desert, by Irbid and Der'a on Damascus. As in the World War, these routes offered the avenues of advance for Nazi forces southward and for British forces into Syria.

The great military objective in Palestine is the coastal plain which leads to the Suez Canal, and the political objective is the Holy City.

As Allenby's name will always be connected with history in Palestine, so will that of T. C. Lawrence be always connected with Transjordan—a buffer state, a kind of Near-East Manchukuo, which was erected to form a wedge between Jewish Palestine and the surrounding Arab states.

In the general distribution of states after World War I, the three sons of King Husein, former Sherif of Mecca, great co-worker of Lawrence, each was made the ruler of a state. Ali was given Saudi Arabia, Feisal was given Iraq, and Abdullah was given Transjordan.

The Hejaz Railroad, built by the Germans before the World War, runs through Transjordan from the north to the south and forms the backbone of the country. The most important stations on the railroad are Mafrax, the depot of the Iraq Petroleum Company Pipe Line, Zerka, Amman, the capital, and Ma'an. Below Ma'an the railroad has not been repaired since its destruction by Lawrence. East of the railroad is unrelieved desert and there is no cultivation; very few springs and wells exist.

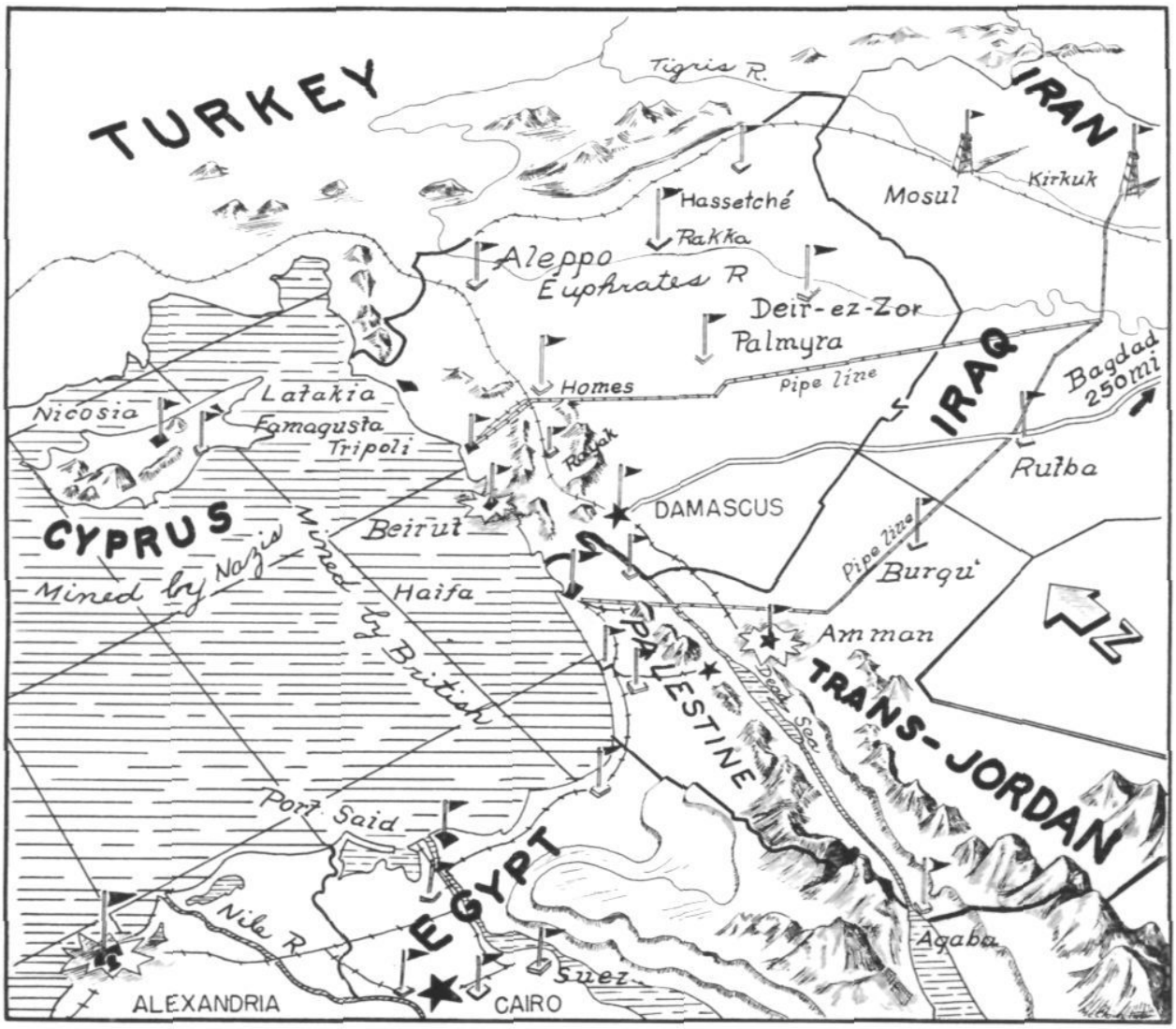
In the summer when the desert is parched and barren, the Bedouins live on the cultivated lands west of the railroad where there is ample water. About October, when the first rain begins to fall, they move eastward, grazing their sheep and goats. As spring approaches they slowly graze back to civilization.

The Bedu has a charming manner, but is not overburdened with brains. He abhors discipline; so the loneliness

and monotony of the desert does not bother him. However, he is rapidly losing his individuality, for the invasion of the motor car, airplane, and construction projects, like the Iraq Petroleum Company's pipe line, have brought him in contact with the outside world. The pipe line brings oil from the Kirkuk Field in Iraq to the Mediterranean, a distance of over 1,200 miles. Although only two years were required for its construction, it took close to ten years to pacify the stretch of country it covers, before work could be started in 1931. The Bedouins mistrusted it as a giant snake. Their pacification was left to Major J. B. Glubb, an English officer, who is regarded in the Near East as a successor to Colonel Lawrence. Where Lawrence had to win over the fighting Bedouins with gold and arms in a war, the two most powerful bribes in the desert, Glubb had to pacify them and take away the weapons which they had received from Lawrence.

Blubb's methods were excellent. He left behind his English officer's uniform and appeared among the Bedouins in their simple picturesque garb. When he visited the great stone fort of the Desert Legion behind the H-5 Pumping Station on the pipe line, he never dropped in for an evening's visit or meal with his English cousins, but always stayed with his Bedouin officers. The Arabs now go to him with their petty troubles and for advice. And only occasionally has the pipe line been dug up, shot up, and the oil set afire.

We left Haifa with two taxicabs. Ours was driven by a little Arab from Jerusalem. That of our guide, a British major, was driven by a Rumanian-Jewish refugee, who, when we laughingly suggested that he take us to Habayna, the scene of the fighting in Iraq and which we were trying to reach, flatly refused. Our taxi had poor tires and an engine which overheated badly. In climbing out of the Jordan Valley to the plains of Transjordan we had to frequently and patiently wait while the engine cooled. Our first stop was at Mafrax on the Hejaz Railroad. A large truck train was refueling at the station and the whole place was enveloped in a great cloud of dust. After a bottle of hot beer and refueling, we pushed on.



The first night we stopped at H-5, a pumping station on the pipe line. The manager, a little Yorkshireman, who had lived for year in Rhode Island, was an old-time oil construction man. He had been in Mexico, Central and South America, and had been a foreman during the construction days of the Iraq pipe line. Most of the skilled construction personnel, especially the welders, had been hard-bitten American oil men. Many had stayed on in operating jobs, but soon they got itching feet and wandered on to other sections of the world. The Britishers, having the faculty of adapting themselves to remote sections of the world, do much better on the administrative and operating jobs.

At the gate of the pumping station we were challenged by a picturesque Desert Legion guard, who carried a nasty looking silver-plated dagger and a long rifle. The pumping stations are carefully planned and well-built establishments. At each there is a great stone fort with two cement-roof block houses on opposite corners. The inside of the wall is lined with shops, a hospital, water pumping station, and all the things necessary to make the establishment self-sustaining. There is even a soda bottling plant, which makes life so much more bearable for the Britisher on the desert, and, of course, a Spinney store.

H-5 lies in the lava bed, a great barrier to animal and water transportation, almost 100 miles in width, which stretches from the country of Jebel-el-Druz in Syria several hundred miles southward in the desert. It is a solid field of broken boulders ranging from twelve to eighteen inches in diameter, lying close together on the surface of the ground, as if at one time they had been scattered by a gigantic volcano. Most of the water for H-5 is piped from an oasis forty or fifty miles to the south. This oasis was inhabited by a Bedouin tribe hostile to the British; so the British, being practical diplomats, imported an equal number of their most bitter enemies, and thus established a balance of power.

H-4, about eighty miles east of H-5, had been the headquarters of the British column moving to the relief of Habyana. When we arrived, the commanding general was en route to Habyana, and my old Gunner friend, Colonel Halifax, was in command. Halifax's regiment was scattered from Crete to Habyana; and he was almost in the exact center. Being a good soldier, he was greatly concerned over the fact that he, as a commander of a large stretch of a line of communication, was living in comfortable bachelor quarters while that part of his regiment which was with him was living on the desert.

I had become well acquainted with all the officers of his regiment while on shipboard en route to Egypt, so my stay at H-4 was like old home week. The regiment was rapidly becoming seasoned "desert rats," and the men were discovering how to make themselves comfortable under most adverse conditions. Truck covers with bows were used for headquarters and tents. The gasoline field ranges having proven too troublesome in the dust storms, the organizations had improvised excellent field ranges out of five-gallon gasoline tins. They filled them about 2/3 full of a paste of gasoline, mud and water, which made an excellent fuel.

We never caught up with the Kingcol—the name given to the slender motorized and mechanized column which made a strategic sweep that influenced two minor campaigns. It did relatively little fighting, but moving for two months without a stop through the most cruel desert country, it whipped out of Egypt and along the pipe line to lift the siege at Habyana. Having liquidated the ill-timed Iraq Rebellion of Raschid Ali, it turned westward into Syria and took part in that campaign. It advanced past Palmyra and was threatening the rear of the French forces, retiring northward from Damascus, when General Dentz asked for an armistice.

While we were in Transjordan, Colonel Collette and many of his anti-Vichy Circassians crossed the border and joined the Allies. Colonel Collette was a colorful character in the French Army, whose role in Syria was similar to that of Glubb and Lawrence. He was a cruel and harsh disciplinarian, but with his Circassians he did much to maintain internal order in Syria. His English wife no doubt influenced him to join the British. His men were descendants of Russians who had been moved from Caucasus into Syria by the Turkish government some eighty years ago. The noncommissioned officers and many of the enlisted men were so loyal to Colonel Collette that they would follow him anywhere and in any cause. In the Syrian campaign the followers of Colonel Collette became engaged in an action with that part of the regiment that had remained loyal to Vichy.

Transjordan abounds with many places of historical interest. In ancient times important caravan routes, with their fortified stations, criss-crossed the country, and it was once a part of the Roman Empire. On our way back to Jerusalem, we made a short detour to the ruins of an abandoned Assyrian Christian village, built between 200 and 300 A.D., lying several miles north of the road, between pumping station H-5 and Mafrax. Gaunt and desolate it stood on a slight rise of ground in a vast expanse of waterless, barren desert. All the buildings were of stone laid without mortar. In the center was a large stone fortress with a wall some 20 to 25 feet in height. The only door was a large stone slab, swung on stone hinges. As in a frontier fortress on our western frontier, homes lined the inside of the wall. In one corner was a church. Its arched stone roof, built without mortar, was supported by stone pillars and beams. The high symmetrical tower was inscribed with many Greek inscriptions, which apparently were Biblical quotations. Considering that no mortar was used in the structure, it was in a remarkable state of preservation.

As we left the fort several Arab boys offered to sell us a half dozen eggs. We gave them a couple of shillings, but did not take the eggs. Their father appeared

and invited us to his tent for coffee. The family consisted of two men, an older and a younger woman, a grown boy, and several half-grown children. Their typical black Arab tent was divided into two parts; and we all sat down cross-legged on a Persian rug. Chickens wandered into the tent, the donkeys and their Arab horse with a young colt came in to look us over and make us feel at home. The Arab horses are gentle, for they live with the families.

One of the men with sparkling eyes, fine features, and a pleasant smile, brought out a bowl, mallet, and some coffee beans, and proceeded with rhythmic motion to grind the beans. Through our Arab driver, who acted as an interpreter, we asked him several questions, which apparently embarrassed him and caused him to leave for a few minutes.

The men and the older boy, dressed in typical Arab garb, wore vicious looking knives with silver sheaths and handles. They proudly showed us their old French long-barreled rifle, their flint and steel to light fires, and other simple accessories of life.

They had to make a two-day camel trip for supplies across the desert; all in all, their mode of life was much the same as that of those people who had built the village. They had a small grain field in a wadi (valley), but, like other Bedouins, their life was closely bound to their goats, for they eat their flesh, drink their milk, make black tents from their hair, and trade superfluous goats for salt, matches, coffee and cheap cotton material. No one wants to buy their camels, so they are becoming liabilities.

There are a few rough roads crossing the Jordan River Valley south of the macadam road which skirts the southern end of the Sea of Galilee and the Dead Sea. As the Jordan River approaches the Dead Sea, its valley becomes a barren mud flat. A few trails cross the area south of the Dead Sea. There has been talk of building a good road or railroad south to Akaba, at the head of the Gulf of Akaba. The development of a port at Akaba and a line of communication by way of the Dead Sea Depression, some 1,300 feet below sea level, to Jerusalem, would relieve the rail facilities leading to Egypt and the Egyptian port of a great part of the burden of supplying Palestine.

During our last few days in Palestine there was every evidence that preparations were being made for the defense of the northern border, or for an advance into Syria. Troops were being moved into the Jordan Valley and into the Mafrax-Ibrid area. A report was received that the French were reinforcing Der'a. Like newspaper correspondents we were "on the spot." I wanted to get to the western desert, yet I did not want to miss a show in Syria or Palestine. "Tommy" Tompkins asked General Wilson for his advice in the matter. The result was a gentle hint that something might happen within a week. It did—and history plagiarized itself, for "Jumbo" Wilson used the routes of advance of Allenby's Army.

R.O.T.C. MEDAL WINNERS

The following additional R.O.T.C. cadets were awarded the U. S. Field Artillery Association medal in 1941, given each year to that member of the advanced course considered outstanding in soldierly characteristics, and in academic, athletic, and cultural phases of university activity. The FIELD ARTILLEERY JOURNAL extends its heartiest congratulations to these young men, and wishes them every success in their future career.

1. Cadet Second Lieutenant John W. Southworth; Oregon State College; Scabbard and Blade, Sigma Phi Epsilon; rifle team.
2. Cadet Colonel Wendell McMeans Smoot, Jr., Salt Lake City, Utah; University of Utah; Scabbard and Blade, Sigma Chi; track.
3. Cadet Lieutenant Colonel F. J. Wood, Riverside, Illinois; Purdue University; mechanical engineering; Scabbard and Blade, Sigma Phi Epsilon, Tau Beta Pi, Pi Tau Sigma.
4. Cadet Captain Timothy G. Higgins; University of Nebraska; political science; Scabbard and Blade, Phi Sigma Iota.
5. Cadet Captain James T. Carleton; University of Santa Clara; electrical engineering; Saber Society, Engineering Society.

WITH THE OTHER ARMS AND SERVICES

***Editor's note*: From time to time the FIELD ARTILLERY JOURNAL publishes an article designed to acquaint field artillerymen, especially our newer members, with the other arms and services. This, the seventh of this series, has been prepared specially for us by the Associate Editor of the *Quartermaster Review*.**

VII—THE QUARTERMASTER CORPS

By Catherine Redmond

Plates courtesy "The Quartermaster Review"

Before there was a United States of America there was a Quartermaster Corps established and empowered to supply the Continental Army in its historic fight against taxation without representation, against injustice and tyrannical oppression. More than a year before the Declaration of Independence was signed, on June 16, 1775, the Quartermaster Department was established by the Continental Congress with the following resolution: "That there shall be one Quartermaster General for the grand army and one deputy under him for the separate army." Later that same day preliminary steps were taken to create a national army and General George Washington accepted military leadership of the forces "raised and to be raised in defense of American Liberty."

Brash and foolhardy as those raw Colonials might have seemed in undertaking a contest with the world's greatest power, they possessed a saving strain of practicality in that they faced forthwith the fact that an Army's first and all-important need is a service of supply. To that end the Quartermaster Corps of the United States was created and has since developed until today it is classified as the nation's biggest business organization, with an expenditure for the fiscal year 1940 - 1941 of $3,237,612,270—an average of $8,909,367 a day.

Courtesy Baltimore News-Post

Left to right: Mr. John L. Rogers, Major General Edward Martin and Major General E. B. Gregory, the Quartermaster General, review convoy at Point of Rocks.

To feed, clothe, shelter and transport the nation's fighting man is the mammoth daily task which confronts the Quartermaster Corps and which must be discharged regardless of circumstances. At the head of this organization is the Quartermaster General who, with the chiefs of his executive and operating divisions, must possess a knowledge of almost every phase of business coupled with experience, sound judgment and a thorough understanding of military requirements. It is the Quartermaster General's responsibility to provide for the nation's armed forces, whether they number two hundred or two million, and also to keep inviolate the trust imposed upon him by the government which puts into his hands the expenditure of such vast sums of public funds.

From the moment of its inception the Quartermaster Corps has repeatedly faced obstacles which at the time appeared insurmountable. It had, first, to supply and equip the Colonial Army with nothing to start on; it had only a few days' notice to prepare for the war of 1812; starved of appropriations in 1846. the Mexican War challenged its resourcefulness; with a skeleton staff and nonexistent funds, it entered the Civil War, and similar situations existed at the time of the Spanish - American War, the Boxer Rebellion, the Mexican Punitive Expedition and World War I. The situation

Shoeing the Army is the Quartermaster Corps' job.

in 1940 was no better than previously: in yet another emergency the Quartermaster Corps was called upon without warning to expand its organization to supply the largest and most completely equipped Army our nation has ever mobilized in peace time. Without funds one day, it was expected to spend billions the next; overnight, its planning had to encompass shelter and supplies for a potential army of nearly two million men in contrast to the then army of approximately 200,000.

Only an extremely efficient organization could have taken on such a task as that imposed upon the Quartermaster Corps in 1940 and to date it has proved itself capable of handling the job. Nerve center of the organization is the Office of the Quartermaster General in Washington from which all activity emanates or is directed. This office, which currently employs some 6,100 civilians and is administered by approximately 500 officers, is broken down into 12 divisions which in turn are divided into branches.

Before December, 1941, when army construction activities were transferred to the Corps of Engineers, the Quartermaster Corps was charged with the important task of providing shelter for our Army. This responsibility included the erection of all army buildings, installation of utilities and subsequent maintenance and repair; it was one of the heaviest burdens shouldered by the Quartermaster Corps and was handled with dispatch and efficiency until the Secretary of War saw fit to recommend that Congress authorize its transfer to the Engineer Corps. In the 14 months from October, 1940, to December, 1941, the Quartermaster Corps, through the Construction Division, directed one of the largest building programs in all history, providing shelter for more than a million and a half men and bringing into being virtual "Army Cities" over all the country. In Panama alone—where such grave difficulties as undependable labor and imported supplies were encountered—more than $84,000,000 was spent in construction work on the 45-mile Isthmus and the 3 complete cities of Ft. Gulick, Ft. Kobbe and Howard Field were built.

Since in future the Quartermaster Corps will not be called upon to handle army construction it is not necessary to elaborate upon the problems which the Corps faced at the beginning of the present emergency. However, in addition to its tremendous emergency building program, the Construction Division carried along its routine duties of Chief Plumber, Electrician, Carpenter and Gardener for the army. It also was charged with responsibility for providing adequate fire prevention at all army installations; this entailed careful supervision of the installations of electric wires as well as protection against lightning. Fire alarm systems and automatic sprinklers were installed, and fire fighting equipment provided to guarantee a maximum of safety to the billions of dollars Uncle Sam had invested in army property.

It is impossible to claim that one function of the Quartermaster Corps is more important than another, since all are vital. However, in any emergency the problem of transportation looms prominent and such is particularly true at this time when improved methods of transport have given birth to a new era of "blitz" warfare.

The Motor Transport Division of the Quartermaster Corps is charged with responsibility for the procurement and maintenance of all Army vehicles and upon it depends the degree of mobility of our troops. It must supply the soldier with whatever means of locomotion he demands and must also be continually working toward development of more efficient equipment. Here the Quartermaster Corps must collaborate with private industry in working out its designs and must rely upon the cooperation of individual motor manufacturers in the final production of vehicles.

Motor experts, in working out designs for army vehicles, must take into consideration the extraordinary usage to which these vehicles will be put. They will in all probability operate largely off the highway, in deep sand or in mud and water to the axle housing; they will be obliged to pull through ditches and take steep grades, to withstand rapid changes and reversals of acceleration; they will know a succession of drivers, some good, some fair, some poor; they cannot be counted on to choose a convenient time to break down but in all likelihood will require new spark plugs during a rainstorm in an open field. They must be built to stand the punishment they will have to take.

Most recent and widely publicized member of the family of army vehicles is the quarter-ton truck, or "Jeep," developed to replace the motorcycle with side-car so popular in the German army. The "Jeep" resembles a litle boy's plaything yet is a wizard of efficiency; it will carry two men, a machine gun and a load of ammunition; it is maneuverable, can be carried in a 1½-ton truck and is economical of operation. In addition to the "Jeep," the army requires a ½-ton, 4 by 4 truck; truck and truck-tractor, 1½-ton, 4 by 4 and the truck 2½-ton, 6 by 6; truck, 4-ton, 6 by 6; truck-tractor, 4-5 ton, 4 by 4; and the prime mover, 6-ton, 6 by 6. In addition there are administrative and other specially designed vehicles, including such recently developed equipment as the mobile laundry, sterilizer, commissary, shoe repair shop and bakery. For the sake of maneuverability, all-wheel drive vehicles are being provided for all tactical units of the army.

More important perhaps than the development and procurement of army vehicles is their maintenance, since a truck that won't run is valueless. The Motor Transport Division must provide trained drivers, skilled mechanics, an abundance of tools and spare parts; it must take responsibility for keeping our Army "rolling."

Since the unhappy experiences of the first World War when the Motor Transport Division had 216 different makes of vehicles to operate and maintain, the Army has moved steadily toward even greater standardization and interchangeability of parts, factors which will make for increased efficiency of our motor transport system.

It is the Quartermaster's task to provide, when necessary, rail transportation for troops and army materiel. Its Transportation Division works closely with the Association of American Railroads. The Commercial Traffic Branch controls and coordinates War Department traffic moving by commercial railways, steamship lines, motor lines, air lines and other means of commercial transportation; during the fiscal year 1940-1941 it provided routing for approximately 1,500,000 men by rail, 689 by steamship and 203 by air; it issued freight route orders for 176,691 carloads of freight and more than 100,000 carloads of construction materials for new camps; it purchased railroad equipment totaling $2,994,991.

The Army's transportation problem does not end with land operations but also includes responsibility for providing water transport for officers, troops, civilian personnel and supplies destined for our outlying possessions. This makes necessary a Water Transport Branch charged with the continual operation of a fleet of steamships, including some of the newest and largest in the country, as passenger and cargo vessels. This Branch of Quartermaster Corps activity has been in existence for over 40 years and in the last half of that period has netted the army budget an annual dividend of $1,800,000 or more. Such specialized activity requires the employment of naval architects and designers who are charged with planning new transports as well as with the plans for overhaul and conversion of commercial ships to army use. Today the Army, faced with the necessity of sending troops and supplies to distant leased bases and keeping to full war time strength our forces in Alaska, Hawaii, the Philippines and other insular possessions, has put heavy demands upon the Transport service but it has thus far been equal to the emergency.

Lumps of dough into loaves of bread; some experts can roll two of these 4½-lb. pieces at a time.

There is another phase of transportation with which the Quartermaster Corps is charged: the procurement and breeding of horses for army use. While the horse has retired from a prominent role in modern warfare he still has his uses and the Remount Division must see that horses and mules are available when needed. Careful and long-range planning is necessary here and it is significant that at the beginning of the emergency the Remount Division was the only army activity not only *on* but *ahead* of schedule. The Remount Service must buy and condition animals for army use, and, through conduct and supervision of the Army Breeding Plan it strives to develop a standard half-bred horse suited to the exigencies of warfare.

There are three remount Depots

—Front Royal, Va., Ft. Reno, Okla, and Ft. Robinson, Neb.—and seven geographical remount areas with a headquarters in each area. Over 700 army-owned stallions (95% thoroughbreds) are scattered over the country and are placed in the hands of breeders throughout the 48 states; it is estimated that approximately 12,000 horses are foaled each year as a result of this Plan and about 75% of horses purchased by the Army are the get of remount sires. In the fiscal year 1940-1941, 28,000 animals were procured and 6,000 more may be needed before the end of the current year.

Perhaps most important of the Quartermaster Corps' tasks, because it is most intimate and most necessary to morale, is that of Supply. Food, clothes, shoes, blankets, cot—all a soldier's daily creature comforts must be provided by the Quartermaster Corps and here failure would be disastrous.

Since such a supply task involves procurement of hundreds of separate items, some standardization is necessary. Therefore, under the Supply Division is the Standardization Branch which dates from 1919 when actual purchase of all items common to two or more arms of the service was centralized in the Quartermaster Corps. Prior to this time there was a wasteful overlapping of purchases; for example, three types of shovels were bought: one by the QMC, one by the Ordnance Department and one by the Corps of Engineers. Such duplication also resulted in much unnecessary work and led to compilation of a Federal Stock Catalogue for all departments of the Government. From this the Quartermaster Corps prepared a Quartermaster Corps Supplement to the F.S.S.C. which lists items stocked by the Corps and serves as standard guide for all Quartermaster supply agencies.

Before an item goes into the Supplement it must first stand a long series of tests and bear the approval of the various branches of the service which will use it; thus the introduction of new equipment into the Army is a long and tedious process. The Quartermaster General receives requests for developing or modifying equipment from various sources; Chiefs of the Branches and personnel at the Depots make suggestions; hundreds of recommendations pour in from private inventors and manufacturers looking for army business. All suggestions are referred to the Standardization Branch of the Quartermaster Corps for careful study and recommendation; when a suggestion is considered practical, it is referred to the QMC Technical Committee for final decision; if the decision is favorable the recommendation then goes to the Adjutant General for authorization by the Secretary of War. There follow service tests upon the outcome of which depends final adoption of the item for army use; when adopted it must be cleared for procurement by the Assistant Secretary of War, then classified and designated as an adopted standard by the Adjutant General. In the Standardization Branch specifications must be drawn up for the new item and funds allocated for its procurement.

Particularly is standardization important in the procurement of army clothing and equipage. Months of research and tests go into the change or adoption of any item of army wear. The Army is the country's largest

Another Quartermaster Corps development: Two views of mobile sterilization and bath units, showing soldiers using shower bath while their clothes go into wire compartment preparatory is sending it into sterilization chamber.

consumer of wool products, since approximately 199 pounds of raw wool are necessary to outfit a single soldier. Procurement, with scant advance notice, of sufficient quantities of woolen cloth for the manufacture of 1,500,000 uniforms was a problem in itself; blankets also had to be provided and lighter clothing for summer and tropical wear secured. For our troops in Alaska and Iceland extra heavy raiment was developed and secured.

Shoes—in dozens of different sizes—were procured by the million and here again requirements are exacting, since properly shod feet are necessary above all else to a soldier's well-being. Shoes and most clothing items are purchased by contract from civilian manufacturers but work is done under army supervision and must meet all specifications.

A Salvage and Surplus Property Branch comes under the Supply Division and is charged with salvaging and renovating existing equipment and making satisfactory disposition of surplus property. The successful operation of this branch cuts down all unnecessary waste and makes for a more efficient and less costly military organization.

The General Supplies Division is charged with the procurement of miscellaneous necessities for Army use. It must provide housekeeping equipment, must worry about everything from cots to pots and pans. One of this Division's most important developments in recent years has been the army field range, a stream-lined stainless steel, gasoline-fueled stove which can be mounted in a truck and can cook on the move. A great many of the items procured by the General Supplies Division—such as kitchen utensils, tableware, stoves, etc.—are made of materials on the critical list at present so that not only must the Division procure the items but first it must develop substitutes from which they will be manufactured.

Not only are shoes and clothing provided by the Supply Division but this service also insures their care by operating laundries and providing shoe repairs. Laundries are generally operated by civilian personnel; a minimum charge is made to the soldier for this service. Shoe repairs are made by letting contracts or by army procurement of equipment and training of military personnel to do the work; while the latter system involves an initial outlay of funds and expenditure of time, it has worked to advantage in many instances during the present emergency.

Last but by no means least of the Supply Division's tasks is that of Subsistence—supplying three meals a day, every day in the year, to an approximate million and a half men. To procure supplies, prepare and serve three mediocre meals daily to such a number would be an accomplishment in itself but the Subsistence Division even under emergency conditions has been able to carry forward the tradition that the American soldier is the best-fed in the world; the quality and quantity of food consumed by Uncle Sam's fighting man is above that of the average civilian and menus have been planned by nutrition experts to assure balanced and palatable diets.

Thinking with regard to Army as well as civilian feeding has changed since 1917. Then the Quartermaster's concern was chiefly in giving troops sufficient quantities of food, while today he knows that quantity is important but so also is selection, since inclusion of certain foods in the diet is vital to growth and health. The objective of subsistence experts is to provide a ration to keep the soldier healthy and happy, to cram this ration full of necessary calories (4,900 per man per day average) and vitamins and still keep it enjoyable and away from the monotonous. A far cry from today's ration was that of 1790, which made a daily allowance per man of the following: 1 lb. flour, ½ gill spirits, 1 lb. fresh or salt beef, ¾ lb. pork or bacon.

An innovation in this emergency has been the operation of market centers throughout the country. Thirty purchasing offices throughout the United States have been established to purchase fresh fruits and vegetables for Army use, thereby replacing the old system whereby each post bought to fill its individual needs. This system has proven advantageous in that it has made possible better distribution and has provided for maximum consumption of seasonal crops. Procurement officers buy staple supplies on a competitive bid basis for definite quantities; milk and dairy products are contracted for locally and fresh vegetables and fruits are procured through the nearest market center.

The Commanding Officer in each Corps Area has delegated responsibility for menu-making to one individual—usually the Commandant of the Bakers' and Cooks' School—who plans the month's menus and submits them to the Chief of the Subsistence Division for comment or correction. Here the menus are analyzed and approved by nutrition experts and thus some direct control can be exercised over the daily meals of approximately 1,500,000 men. Every effort is made to include the following in each daily ration: one egg, ½ pint fresh milk, 10 oz. beef or substitutive meat, 2 oz. butter, ½ lb. fresh vegetables, 2 oz. onion, 10 oz. potatoes, 2½ oz. canned vegetables, coffee, tea or cocoa, canned or fresh fruit and necessary condiments.

The Quartermaster Corps operates Bakers' and Cooks' schools where men are trained for the job of army cooking and, while a great shortage of trained personnel has existed during this time of rapid army expansion, those available have managed to carry on admirably and train assistants to aid them in their task. The operation of Army bakeries is but one phase of Quartermaster Corps activity about which reams could be written and daily, whether in garrison or on maneuvers, Army bakers are charged with turning out bread for troops.

Since May 1 the United States Army has been on the Field Ration which is specified for time of "war or emergency." This Type A field ration differs only in its conformity from the garrison ration where mess officers

can choose from a variety of items. Field Ration A limits choice but provides practically the same basic components. Type B ration substitutes canned or processed products for fresh ones; Type C ration is designated for emergency use (as on maneuvers) and comprises cans of "M" units (meat and vegetable stew) and "B" units (bread, coffee and sugar). Type D ration consists of 3 4-oz. bars of concentrated chocolate to be issued only in strict emergency when it is impracticable to furnish any other type of food.

The Type D, or "chocolate ration," has been developed within the past two years and is suitable for use in any climate, having been tested particularly for tropical use. Experts are at present working on a "blitz" ration for parachute troops. This "pemmican" (defined as a "unit food which meets all nutritional requirements by itself") must be palatable as well as nutritionally adequate to serve its full purpose. Recent grueling tests have proved its suitability for Army use. A representative formula contains rendered kidney knobs 9%, prime oleo oil 6%, seedless raisins 30%, cerelose 15%, peanuts 15%, shredded coconut 25%, salt and vanilla 1%. Total weight of a daily ration including "pemmican" is 28 oz.; this includes: *Meal 1*—special biscuit, 4 oz.; veal loaf, 3 oz.; malted milk tablets, 2 oz.; soluble coffee, 0.2 oz.; sugar, 0.4 oz. *Meal 2*—special biscuit, 4 oz.; ham preparation, 3 oz.; dextrose tablets, 1.3 oz., lemon powder, 0.2 oz:; sugar, 0.4 oz. *Meal 3*—special biscuit, 4 oz.; dry cervelat sausage, 4 oz.; bouillon paste, 0.3 oz.; "D" bar, 1.6 oz.

Also under supervision of the Subsistence Division are the commissaries operated at practically every Army post in the United States and its possessions. These are non-profit making and are run solely for the convenience of Army personnel; literally they put the Army in the grocery business and entail a tremendous amount of purchasing, bookkeeping, stock-accounting and other detail work.

A less pleasant but highly important duty of the Quartermaster Corps is the handling of soldier burials and establishment and maintenance of army cemeteries at home and abroad. Since frontier days, when post cemeteries were established adjacent to military posts and placed in charge of the Quartermaster at the station concerned, the Quartermaster Corps has administered post cemeteries though the foundation of the present Memorial Division was the result of General Orders No. 75, September 11, 1861, directing the Secretary of War to preserve accurate and permanent records of deceased soldiers and their burial places.

Duties of the Memorial Division are varied and voluminous. It is charged with care and maintenance of 87 national cemeteries and selection, appointment, transfer and promotion of their superintendents; it handles burial of those who die while on active duty with the United States Army, determines proper price of burial service (civilian undertakers are given contracts for army burials), procures and erects headstones (secured by bid on contract), settles claims for burial expenses of deceased regular army personnel and deceased members of the CCC, handles identification of World War dead found on field of battle and maintains records of those killed in action and buried in European cemeteries. In addition, the Memorial Division cares for and maintains certain National Military Parks and National monumments as well as 63 post cemeteries, 18 soldiers' plots and 5 Confederate burial plots.

Quartermaster Depots dot the country, serving as supply and distribution points. These depots are established with an eye to minimizing distribution difficulties and locations are selected close to military personnel centers, transportation facilities, commodity markets, and the source of supply. These are vast warehouses, many of them charged with the manufacture of army equipment; the Jeffersonville, Ind., Quartermaster Depot, for example, employs hundreds of civilians to turn out the huge quantities of clothing, individual equipment and leather goods (such as harness) it manufactures; and also "farms out" already cut garments to seamstresses in Jeffersonville, New Albany, Louisville and adjacent communities for completion at home. Millions of garments have been produced in this fashion, obviating the necessity for and expense of large government installations. A foundry at Jeffersonville melts down old brass buttons and converts them into shiny new buckles; here, also, in the Nation's "horse country," riding and new packsaddles have been developed and manufactured as well as other items of army equipment.

Direction and supervision of the work of these depots, most of them business organizations with operations running into millions of dollars annually, is the task of the Depot Division of the Quartermaster General's Office.

An extremely important Division of the Office of the Quartermaster General is that of Military Personnel and Training. Here the problems of regular and reserve officers, warrant officers and enlisted men are handled; promotions, transfers, changes of assignment—these and attendant "headaches" for thousands of individuals keep a large office constantly at work. Under this Division also is the Training Branch which directs the training of reserve officers and from time to time conducts classes for candidates for reserve commissions in the Corps. Concomitant with the work of the Military Personnel and Training Division is that of the Civilian Personnel Division, which handles similar problems pertaining to the vast army of civilian employees whose efforts are so essential to efficient functioning of the Corps' many and diversified activities. An Office Service Branch includes an Executive Officer to the Quartermaster General for Civilian Personnel Affairs and an Executive Officer to the Quartermaster General for CCC Affairs.

Of first importance to any organization is the funds for its operation. The Fiscal Division of the O.Q.M.G.

makes up the annual budget, defends its estimates before congressional appropriation committees and handles disbursement of funds once they are secured. In these days when army spending has jumped into the billions, such a task assumes enormous proportion and is a vital cog in the wheel of QMC activity.

The country's biggest business organization requires careful planning and control, tasks which the Quartermaster Corps charges to a Division bearing that name. Here war plans are formulated and a Requirements and Procurement Planning Branch considers the effect of army purchasing on the general market and consuming public. Procurement Control, Contracts and Claims, and Statistical Branches complete the activities of this Division.

A General Service Division encompasses such miscellaneous Branches as the following: General Administrative, Mail Expediting, Field Service, Public Relations, Intelligence and Congressional. The names serve to identify the duties of most of these Branches. Of the list, the Public Relations Branch perhaps marks the most interesting innovation in the activities of the Quartermaster Corps, since in no other period in our military history has the trend been toward giving publicity to Army procedure and developments. Today, however, the public is kept informed of our military progress. Its interest promises to prove so beneficial that banished forever may be the old school of thought which held to the theory that the Army should be as inconspicuous in the press as the lady of days gone by whose reputation was imperiled were her name mentioned in print more than three times in her life; upon the occasions of her birth, marriage and death. Today it's "the thing" to tell the public about the service and it depends in large part upon the Quartermaster Corps to make that story a proud one to relate—to see to it that the American Army is provided with all physical equipment to make it the most efficient fighting force in a war-torn world.

SOLUTIONS TO S-4 PROBLEM (See page 233)

1. *a*. 40 rounds.
b. 40 rounds.
c. 60 rounds in the truck, 40 rounds in the trailer.
d. 100 rounds in the truck, 40 rounds in the trailer.
e. The Field Artillery School Instruction Memorandum T-1 (issued as *Conference Course Training Bulletin No. 2*), T/C's for T/O's on pages 9 and 11.

2. *a*. 12 trucks, 2½-ton; 12 trailers, 1-ton.
b. One ammunition section of 4 trucks and 4 trailers. (See Instruction Memorandum referred to in 1, *e.*, above.
c. 2 trucks, 2½-ton; 2 trailers, 1-ton.
d. Transportation chart to accompany Tables of Organization 6-88 on page 9 of Field Artillery School Instruction Memorandum T-1.

3. *a*. 20 minutes.
b. 20 minutes.
c. Paragraph 101 c, page 180, FM 101-10.

4. *a*. 25 miles per hour.
b. 25 miles per hour.
c. 10 miles per hour.
d. Paragraph 38, page 82, FM 101-10.

5. Ammunition reports are periodic reports and are usually submitted daily when called for. (See paragraph 25, page 63, FM 6-130.) Ammunition reports are not to be considered as Morning or Sick Reports. They do not necessarily close out as of midnight each night. They may close out at any time and more than one may be called for during a twenty-four-hour period.

6. The total normal ammunition load for vehicles within the howitzer battery is 400 rounds. The total normal ammunition load for vehicles within the battalion ammunition train on good roads is 1,680 rounds. (See Instruction Memorandum T-1, referred to in 1, *e*, above.) Therefore, the total for the battalion is 3 × 400 plus 1,680 or 2,880 rounds. From Table I, page 5, FM 6-130, we find that the weight for each round is 50 pounds. Therefore, 2,880 × 50 or 144,000 pounds or 72 tons is the total weight.

7. A unit of fire for a designated organization or weapon is the quantity in rounds or tons of ammunition, bombs, grenades, and pyrotechnics which it may be expected to expend on the average in one day of combat. (See paragraph 1, page 4, FM 100-10.) For the field artillery the value is always taken in rounds per weapon.

The term unit of fire replaces the old "day of fire." The unit of fire is prescribed by the commander of the theater of operations. In a stabilized situation where the artillery is placed almost hub to hub and doing considerable firing the unit of fire may be relatively large. In highly mobile situations the unit of fire may be relatively small. Thus the unit of fire is not fixed. The theater commander may change its value. For average conditions the values given for the different weapons in Table, paragraph 92*a*, FM 101-10, are a satisfactory guide.

8. The unit of fire for the 105-mm. howitzer is 225 rounds per piece. (See Table, Paragraph 92*a*, page 174, FM 101-10.) There are 12 howitzers in the battalion. Therefore, the unit of fire for the battalion is 12 × 225 or 2,700 rounds. Each round weighs 50 pounds. (See question 6, above.) The total weight of one unit of fire for the battalion is then: 2,700 × 50 or 135,000 pounds or 67½ tons.

9. See paragraph 103, page 180, FM 101-10.
Automatically.
By daily telegram.
By requisition.
As the result of establishing a credit.
By local exploitation.

10. Small-arms ammunition is obtained for the field artillery by arrangement with the ordnance officer of the unit to which the artillery pertains. (See paragraph 212, page 176, FM 6-20.)

The Campaign of Flanders, 1940

By Captain Leo Framery

Part VII—Conclusion

As an end to the series of articles relating the various operations in which my battalion participated in May, 1940, I have outlined, in the following pages, some of the ideas and reflections these events could not fail to bring forth. The subject has been divided in five paragraphs, dealing with the problems confronting the field artillery officer. Some of these paragraphs could be greatly enlarged; No. 4, for instance, concerning the preparation and conduct of fire—I have endeavored to limit them with due consideration to the patience of the reader.

1. The Battalion on the March

One thing has to be remembered in any case: in present-day warfare, a battalion on the road, even moving under the protection of numerous friendly units and far from the foe, should ever be prepared to meet any emergency, should it be an air attack or a thrust of enemy tanks. This implies that:

(a) All arms, MG's or sub-MGs, as well as rifles, or the pieces themselves, be held constantly in readiness;

(b) The personnel in each vehicle should include a responsible chief, be it an officer, an NCO, or only a private, but a man of tried intelligence and alertness who can be relied upon to bring along his car where and when it is wanted. This man should, of course, be provided with enough information concerning the route to enable him to find his way alone should any incident separate him from the column.

(c) To maintain the efficiency of every unit, a system of relief should be worked out so part of the personnel may rest while the other is on watch; this applies to everybody including officers. I know officers of my battalion who did not sleep more than 10 or 12 hours in all during the three weeks of the Battle of Flanders; whatever one may say on this, it certainly was not conducive to mental alertness.

2. Selection of Battalion Emplacements

The subject of having eventually to fight off tank attacks thrown against artillery positions has become a major consideration in choosing gun emplacements. This gives more importance and usefulness to the natural obstacles that may be found on the area allotted to the battalion: banks, brooks, trees, ditches, holes, etc. It renders counterslope positions more attractive, as they generally provide extended views of the terrain in front of the guns; any enemy tank endeavoring to storm such emplacements is constrained to travel under direct fire for long periods.

Protection against observation from the air is, of course, more important than ever and consequently should not be overlooked when inspecting the possible emplacements.

These considerations do not preclude the fact that under compelling circumstances the guns may have to be stopped short and put in action wherever they happen to be.

3. Defense Against Direct Attacks

(a) *Tanks*.—Since I am considering only the case of mechanized units moving fast and often, it is to be assumed that the batteries will not be stationed long enough on any position to enable the gun crews to build obstacles. Consequently natural defenses will be used to the utmost. In each section as thorough a study as time allows should be made of the terrain immediately in front of the battery, using the range finder, if one is available, to determine distances, otherwise estimating them by the usual but much simplified process of a "base."[1]

(b) *Airplanes*.—It is obvious that the battalion is helpless against air attacks by high-flying bombers. What one may hope to achieve is some protection against hedge-hopping or low-altitude planes flying above the guns. Machine guns and sub-MGs are used for this purpose. They should be disposed at vantage points around the position. The MGs should be grouped by twos or threes to insure enough density of fire. Their locations are determined by the necessity of having an unobstructed vertical field of fire in all azimuths.

The cannoneers should be trained to dig rapidly slit trenches close by their battle stations, with due consideration to camouflage. It saves many lives while maintaining the efficiency of the batteries under fire.

4. Preparation and Conduct of Fire

The normal action of light divisional artillery is direct support; this, with the fast tempo which characterizes all operations in mechanized warfare, implies that all problems have to be worked out very rapidly without, of course, impairing accuracy. If the reader considers that in most cases the French battalion is fired as a twelve-gun battery, he will realize the high degree of training the personnel must reach to obtain the required smooth running and efficient team work, in spite of unfavorable circumstances.

But why, one may ask, insist on 12 gun fires instead of the old method involving only, in most cases, the usual four guns of one battery—each battery working out separately its own problems? Simply because experience

[1] G is a gun of the battery, T a tree in the foreground; the problem is to determine the distance GT. The aiming circle or any other sort of goniometer is placed at B on a line GX perpendicular to GT. This can be done quickly with the help of the gunner sighting through the gun sight. The distance GB, which is the "base," measured with a rope or a tape is, let us say, 30 yards. The angle TBG is measured with the aiming circle. Let us suppose, for example, that we find 1540 mils; it means that the parallax of the base, for T, is 1600-1540 or 60 mils—consequently the distance is 30/60 = ½ of a thousand yards, i.e., 500 yards.

has proven undoubtedly that a volley fired by the 12 guns of a field artillery battalion is more effective than an equivalent volley fired by a 4-piece battery. All the readers who have been under artillery fire will bear out this statement. Twelve guns can obviously fire three times faster than four, so there is much more "punch" in the battalion "broadside" than in the battery's. But, furthermore, whereas the trajectories of the battalion volley more or less cross each other on the target, a battery's trajectories are practically parallel. This is baffling for the personnel placed at the receiving end of the battalion trajectories: veterans know that one may, to some extent, by wisely using the irregularities of the ground, secure protection against shell fire coming from a given direction, but it is much more hazardous when one has to station oneself on the lee side of three different directions.

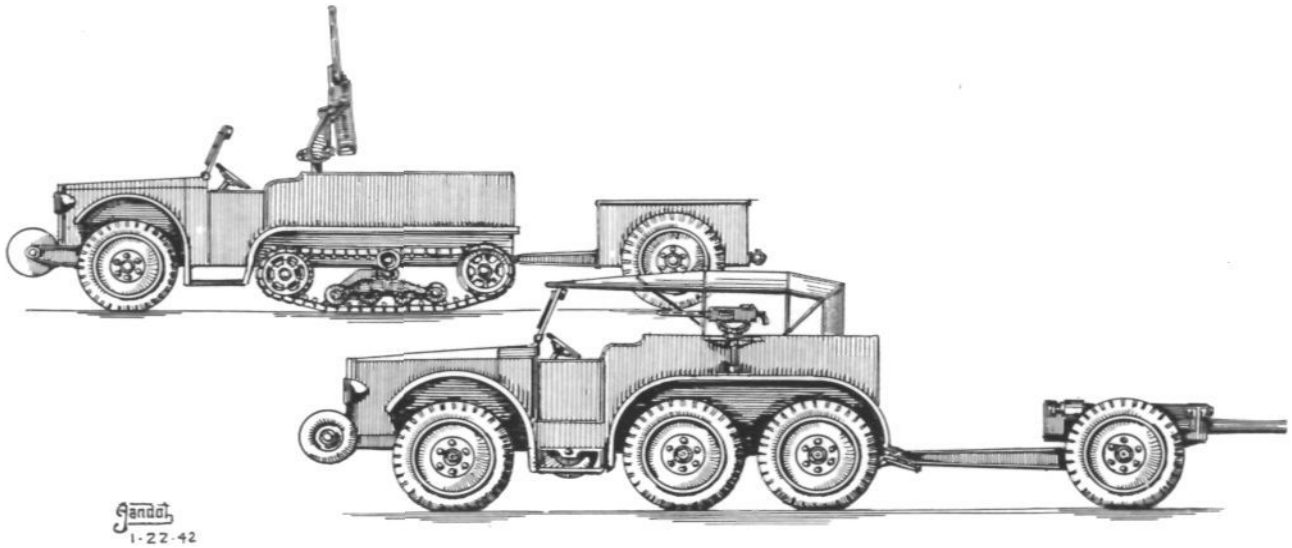
Assuming, therefore, on the strength of above premises, that battalion firing is to be used whenever possible in preference to battery firing, the problem is to speed up the determination of the basic data and corrections, by the fire-direction center, so it may be sent to the batteries shortly after the guns are in position.

Explaining fully how we achieved it in my battalion exceeds the scope of this article. However, I may list, as one of the prerequisites, that the surveying officer should start his operations early enough with the reconnaissance party so the FDC, when arriving with the batteries, may be supplied with essential topographical data. This includes the coordinates of the emplacements of the three base pieces, when an accurate gridded map is available; it may be only a diagram giving the polar coordinates of the base pieces, using as center the OP, and as direction origin, the basic deflection, when no reliable map exists. In latter case the polar coordinates, in the same system, of the successive objectives have to be determined and given to the FDC; the observer at the OP may easily obtain them, using an oriented telescope and a range finder.

Another preparation which speeds up considerably the battalion firing is the elaboration and dissemination to the batteries as early as possible of a provisional schedule of fire. This shows not only the targets which may have been listed in divisional artillery orders but also many other probable objectives determined after a close study of the map, or through information received from the OP or the supported units. These targets are numbered; for each one the schedule gives the coordinates and the basic data computed for the battalion base piece with, if possible, the area, the type and rate of fire, how and when to fire, etc. This enables the BC's, who have received from the FDC the diagrams of corrections (weather and planimetric), to prepare rapidly for their own sections data for each target.

When an order to fire is received, the objective will be, most of the time, one of the list; if not, it will be in the immediate vicinity of one of them and some simple corrections to data already computed will fit it.

To give an idea of the results obtained, I may state that it never took us more than 7 minutes to launch a concentration, taken from the time the order was received at Bn CP to the time the first shots went on their way. On May 14th our concentration on Perwez started less than five minutes after getting the order to fire in spite of the fact that the sections were preparing to hook up the pieces to the tractors when the order came (see FIELD ARTILLERY JOURNAL, October number, page 766). Our best time was three minutes and a half for a barrage on the village of Lecluse.



The author's conception of proper materiel for modern light artillery. (a) 75-mm. or 105-mm. gun or howitzer. (b) Prime mover (6×6) with two additional pairs of small dolly wheels for going over obstruction and ditches. (c) Or, half track with front wheels propelled, and roller in front of chassis. Either of these two types of prime mover should carry gun crew and ammuntion. (d) The section should include two prime movers, one drawing the gun, the other drawing the caisson, and each carrying at least one .30 cal. or .50 cal. MG.

5. THE MATERIEL

I have been asked many times whether, in my opinion, the materiel we had, namely, tractor-drawn 75-mm. guns and 105-mm. howitzers, had proven able to solve *all* the problems confronting *direct support* divisional artillery in mechanized divisions. The answer is decidedly no.

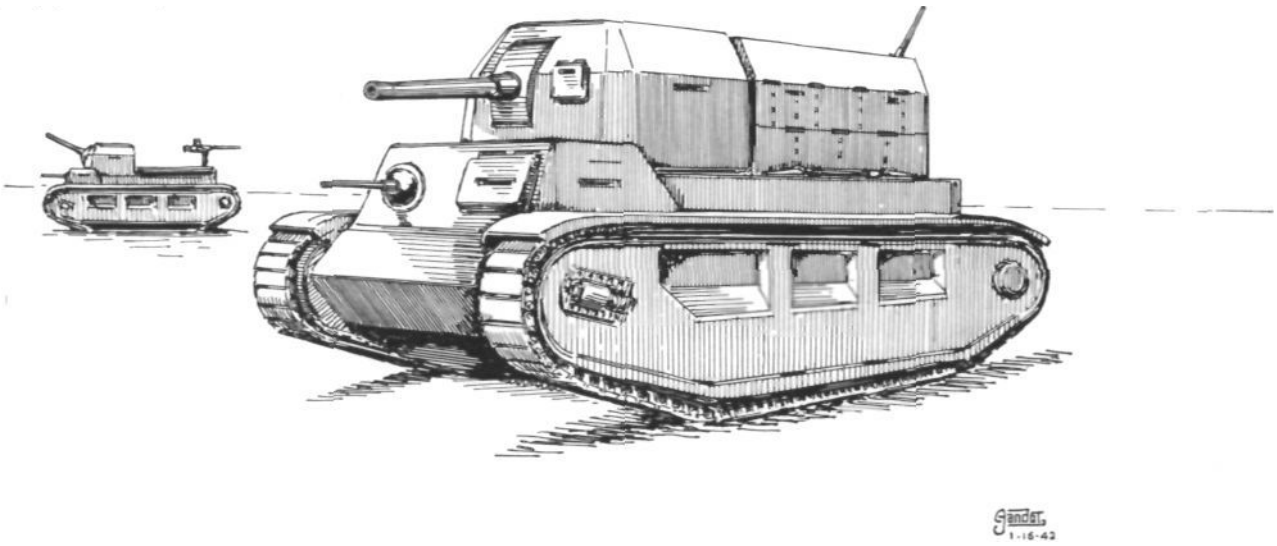
The movements, during the action, of tank squadrons, these most characteristic units of mechanized divisions, are obviously too swift and extend on too wide areas to enable the fighters to receive the help at all times of their tractor-drawn divisional artillery; putting the latter in action requires too much time even with the best trained and the best equipped batteries to expect it to follow, with its trajectories, the various episodes of a tank battle. Even armored OPs travelling on caterpillar tracks and communicating with the batteries by radio telephone solve only the easiest part of the problem. What is needed is a materiel designed in such a way that it has the possibility of following the tanks it supports in the ebbs of battle and be ever ready to fire. In short, it should enable the division CO to revert to the tactics of the cavalry divisions of old, where the horse artillery was trained to follow closely the regiments they supported and shoot its first round one minute after the command "Halt," even if it was signalled in the course of an all-out charge.

We felt direly the need for such a materiel during the campaign of Flanders in many places. I may cite, for instance, the action of our division in the Mormal Forest on May 18th (see FIELD ARTILLERY JOURNAL, November, page 890): it was exclusively a tank battle, with quick thrusts and withdrawals, marches and countermarches. It was fought in rather dense woods, precluding any possibility of observation. Our tank regiments, already sorely depleted by the severe battles of the previous days in Belgium, and hopelessly outnumbered, were decimated, while we, their divisional artillery and direct support, were standing by, useless, a few miles away. There is little doubt that if we had had then a materiel enabling us to accompany and support our tanks, the outcome would have been more favorable.

I cannot, in these lines, discuss fully what should be the specifications of this needed materiel, which moreover has already been studied and tentatively designed by all nations at war, but I will try to outline briefly some ideas on the subject. Obviously the piece should be mounted on a self-propelled platform, on treads, as are the tanks it is meant to accompany. It should afford adequate protection to the gun crew as well as to the prime mover; this implies, as the gun fires forward, an armor in front and on the sides, thick and hard enough to resist the impact of at least 37-mm. projectiles. The gun has to be a rifle to provide the high muzzle velocity needed for armor piercing. Its caliber must be at least 75-mm. but is limited, obviously, by the fact that the vehicle has to carry a sufficient provision of ammunition, some 70 or 75 rounds, and avoid being topheavy.

The armament should be completed by two heavy MGs, to deal with eventual attackers on foot, or discourage low-flying planes. The fact that such a machine moves forward to attack enemy tanks (in opposition to AT guns which ambush them) renders imperative that it be propelled by an engine powerful enough to provide a speed higher than that of its eventual prey; it has, thus a chance to outmaneuver them and fire first.

I may add that, to my knowledge, the French High Command had decided, before the war started, to include a battery of these self-propelled guns, called auto-cannons, in each battalion of divisional artillery of LMDS.



Armored self-propelled gun—as suggested by the author. Tracks lighter than tank's, skirted for protection. Center of gravity low. Engine in front between driver and machine gunner, both protected by hood; .50 cal. MG in front; 75-inch barbette-like mount allowing limited traverse and elevation up to 20°. About 50 or 75 shots carried in lateral racks on rear platform. Personnel protected by folding shields; .50 cal. MG on flexible mount at rear. Speed a little higher than companion tank.

Modification of Range-Deflection Fan

By James T. Carleton

EDITOR'S NOTE: *The author of this article was the winner of the United States Field Artillery Association's Medal (1941) at the University of Santa Clara. His photograph appears on page 239 of this issue. The pages of the* FIELD ARTILLERY JOURNAL *are always open to writers from the membership of the ROTC.*

Two of the principal firing factors are approximated by the following formulae:

$$S = \frac{1/10\ T}{R} \qquad (1)$$

$$d = \frac{1/10\ T}{r} \qquad (2)$$

If lines of constant values of d are plotted in polar coordinates on a range-deflection fan, the values of S and d can be read directly from the fan at the same time that T is measured.

Construction

The lines should be cut into the celluloid range-deflection fan in accordance to the formula (2), or the accompanying table. These lines should be filled in with an ink of a color which will contrast with the red lines of the board and the black lines of the fan. Blue is recommended.

Operation

After the target and the guns have been located on the plotting board, set the range-deflection fan as if to measure the target offset, being certain that the zero side of the fan is closest to the guns. (If the guns are to the left, the fan must be turned upside down.)

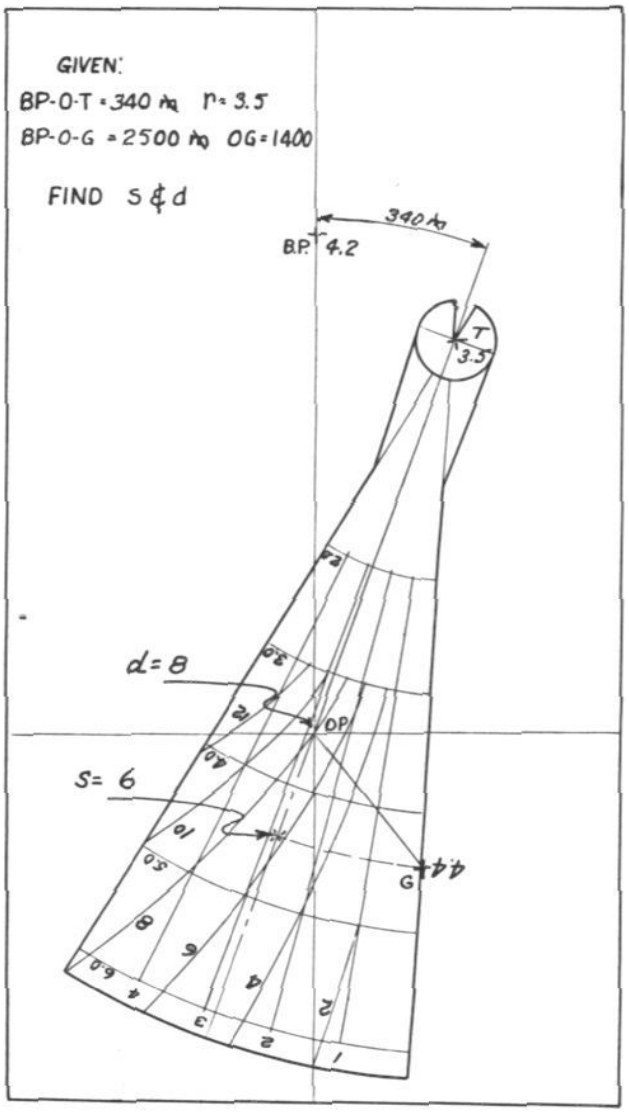
In accordance with formula (2) the value of d may be read directly off the fan at the point where the OP is. Similarly, S can be read on the line O-T at a range R.

TABLE

$d = 1/10\ Tr$

d

r	2	4	6	8	10	12
2500	.....	100	150	200	250	300
3000	.....	120	180	240	300	360
4000	.....	160	240	320	400	480
5000	100	200	300	400	500	.....
6000	120	240	360	480	.....	.....



If the data is to be plotted, the time involved in determining these factors is so short as to be considered insignificant.

We are continually receiving change-of-address cards and other communications, including entries of new subscriptions, *which have not been signed*, and quite a few are totally blank! None of these can be identified. If you have sent in a change of address or have sent us some other communication and have not received proper action thereon, it is quite possible that you failed to sign your card.

Not in the BOOK

EDITOR'S NOTE: *This feature is devoted to ideas sent in by our readers describing methods or devices which, though not specified by official literature, have proved useful in service.*

GROUND PLOTTING

A good soldier seldom thinks of casualties except in the abstract. He knows of course that they will come but he feels sure that he will not be hit and almost equally sure that none of his immediate group will suffer. Casualties mean only killed and wounded; he never thinks of the many other ways that his group may be depleted.

We were four corporals on the battalion detail. We had been well trained and we knew our jobs. We liked each other and worked together as a team, each man doing the thing he did best. We were honest and admitted without false modesty that we were the best damned detail in the whole Army. Had we been able to remain as a unit we might in a few months have lived up to our own estimation.

But many things can happen to wreck a good team. Few of them are thought of as casualties but their result is the same. A man detached to train new troops. An unusual job needing a good man, not anticipated in the drill regulations. Such jobs as care of a forward ammunition dump, to replace an important man on another detail or to take charge of a brigade or corps observation post. Sickness or accident. As personal guide to a pair of Brass Hats on a tour of the sector. To help out on a battery detail. Promotion to regimental or brigade headquarters. Detailed to assist intelligence officer. These and a number of other things can happen.

No Major ever allows his detail team to be completely ruined, and will fight to hold his men. But time generally leaves only one of the original number to train new men for the vacant posts.

The replacements generally come from the batteries. An inexperienced Major will naively ask one of his battery commanders for a "good man" for the battalion instrument detail. This gives the battery commander an opportunity to rid himself of a species of village idiot which he has been unable to use in any capacity. An *experienced* Major will ask for three men from each battery, five of whom will be returned after he has selected the best. This enables him to get a good farm hand who has had at least five years of schooling and who can add, subtract, multiply and divide. Such is the average replacement for which college and high school men were considered necessary in the beginning.

Two circumstances combined to make me the residual man on the detail. As a student architect, my drafting and sketching were rather above the average to be expected; and then there was the fact that I had been slightly wounded early in action. (Army superstition grants a once-wounded man a longer expectancy than one who has never been wounded.)

After a month or so on the front I found myself in charge of a detail composed of a farmer with an excellent back, a carpenter with a heart of gold, and an honor graduate in Liberal Arts from the University of Dublin, who considered mathematics beyond the pale of art, but who was magnificent in an abstract argument.

As the only thoroughly-trained man on the detail I realized my obligation to train these men as quickly as possible; and the static condition of the fighting at this time gave me ample time and opportunity to attempt it. I attempted to pass this knowledge on to them as it had been taught to me but the results were within the probable error of zero. My carpenter was my best prospect; he was a good carpenter and had a keen mind but his education had never reached beyond the simplest mathematics.

One day when I had spent some time trying to explain the value of a mil, he remarked, "It's like a rope ladder, ain't it?"

I asked him to explain what he meant. He picked up a piece of string, doubled it to form an acute angle and laid several twigs across it at intervals.

"These are all a mil wide," he said, "but those at the bottom are twice as big as the ones at the top. It's just like the steps in a rope ladder."

It occurred to me that his trouble lay in the strangeness of the terms used and not in his inability to grasp the principles involved. That night as I mulled over my difficulty it suddenly occurred to me that most of the problems to be solved might be converted into terms with which he was familiar. The next day I secured a six-foot carpenter's rule from the farrier sergeant and started out to do some experimenting "on my own."

By studying the map of the sector I discovered a point several hundred meters to the right of our positions, from which several church steeples behind the enemy lines could be seen. I took my carpenter and the range finder to this point and had him lay out two lines on the ground, one from our point to the guns and the other toward a steeple in the distance behind the German lines. I let him read the ranges to each of these points and then had him lay out these ranges at a scale of ⅛ inch to the meter, along the two lines laid on the ground. I let him connect the two points with a third line and had him measure it with the rule to get the range from gun to target and then set up the aiming circle on the gun prime point and read the angle from OP to target. I then explained to him that if the gun laid off the determined angle from the OP and fired the determined range it would theoretically hit the target. He grasped the idea immediately but again became confused when I put the same problem on the plotting board.

One thing that puzzled him a bit was that I did not get the same answer when I tried to put it on the board the same problem we had worked out on the ground. He wanted to know which was the right answer. This stopped me for a minute. Then I realized that the work on the board was at a scale of 1/10,000 and that that on the ground was at a scale of only about 1/300. Of course the larger-scale work had a much better chance for accuracy.

He next asked why I "messed around with all that drawing" when I could do it better and quicker on the ground. I could think of several answers, but none of them seemed very good to him. The only one I thought much of myself was that I did not want to start a riot.

My carpenter corporal said that plotting on the ground was just like laying out a house and that a carpenter's rule was a measure a body could understand. An eighth of an inch was something a fellow could see even if he had to call it a meter. The next time we moved I found a small store in a French village and bought several balls of yellow string, and the two of us started out to see how many problems we could work out with our new method.

My first reaction was that we would be limited in the number of positions in which we would have the space to lay out our problems and of course I knew it would be of little value

in forward OPs. But 5,000 meters at ⅛ scale would only requite about fifty-five feet and we had little need for distances this great with the old seventy-five guns.

We were in a rolling country that was fairly heavily wooded. The sector was an old one and a quiet one. We scouted the country thoroughly for points from which we could try various types of problems.

Mr. Chips had a phobia about the word *angle*. One day when I was showing him a dead-space problem he discovered that an angle of fall was the same thing as a roof pitch and could be expressed in the same manner once it was converted from mils into fractions. Fifteen or twenty years later the same idea occurred to someone else in the Army and the firing tables now express this "slope" as a fraction.

Site gave us some trouble until Mr. Chips decided that it was just a pitched roof, jacked up on one side. This may not sound so clear to an artilleryman but it makes good sense to a carpenter.

We still had trouble with mils. He could understand that a mil was a unit of measurement that varied in length with the diameter of the circle but it still worried him. One day he asked me why we could not figure out some way to measure mils with a carpenter's rule. It was a new idea but did not prove a very difficult one. I laid off a circle with a ten-foot five-inch radius and laid the rule along the arc of the circumference. We got back at the radius point and found we could read the rule easily. I put a needle in the radius peg and told him to read off the ⅛″ markers, that each of them would be a mil wide. That was the final step in the carpenter-rule method of ground plotting. As far as we were concerned, the Army could take back a couple of thousand dollars' worth of equipment—all we needed was a fifty-foot lot, two balls of string and a carpenter's rule, a battalion of artillery and a war.

At this point in our experiment the other two members of the detail became interested and began to contribute to the success of our venture. The farmer, who had a whittling background, wrecked the rabbit hutch of the Mayor of Copru to secure white pine from which he created a very gaudy bunch of stakes. These stakes had personality and were lettered in General Grant Gothic letters to represent their various functions. The one marked "Opie" was a masterpiece of the whittler's art.

The Irishman's contribution was to write a thesis on our theory of artillery control. Unfortunately he became involved in the possibilities of adapting the Druvidiian method of sheep-liver prophecy to the anticipation of enemy counterbattery fire, and never got beyond the preface.

Mr. Chips and his carpenter rule method of finding data passed on. His successor was an infant prodigy who could do cube root in his head. My Major, who owed me for a few smuggled dead-space problems during the period in which he had commanded a battery, shipped me off to Samur to save me from an inferiority complex.

Even though the Army has seen fit to adopt our method of expressing the angle of fall, though in our own minds at least we are convinced that ground plotting can be several times as accurate as the methods now used; and even in spite of the thousands of dollars that might be saved the taxpayers by the elimination of expensive instruments, we will not at this time advance the idea of abandoning our present methods of fire. But to those tried souls who have striven to make battalion details from battery castoffs, we recommend our approach to this problem. A carpenter's rule is the lowest common denominator of measuring instruments, and a string along the ground looks simpler to a simple mind than tiny carefully drawn lines on a checkered piece of paper bearing no resemblance to the landscape. Workmen's fingers do not adapt themselves to fine draftsmanship, and a dull pencil can be a fork in width.

We have thought of writing a text book on the subject, but on second thought, the idea is so simple that any good artilleryman will be able to work out the application of our methods to any of his problems and it would be unfair to deprive him of the joy of discovery.

If, however, you doubt our methods, send us your problem and if we fail to work it without the aid of any of the instruments now in use, we will mail you, post-paid, our private formulae for lemon extract fizz.

—By Corporal Crane.

CIGARETTE PAPER WILL DO!

In an effort to eliminate one more form from our files the following is submitted as a method of determining metro corrections.

Assume your battalion or battery has occupied a surveyed position; registration is prohibited; a metro message will be available shortly.

(For this discussion assume the materiel to be 155-mm. howitzers firing shell HE, fuze M46 and M47, Charge M2, white bag.)

Select metro check point (FAB 161, per 418). Let us assume Range 6000 and AZ 1500 and that we will use charge 5 initially. Altitude of battery 800 ft.

At the top of a blank piece of paper (Figure 1) enter Range and Azimuth.

Deflection being our first problem, we now write down the two elements which affect deflection (Figure 1): Wind Direction and Drift. Wind direction alone being no good to us, we write Direction of Fire directly below Wind Direction. Note that Direction of Fire is entered below Wind Direction.

Open firing tables to proper charge and range. Reading across the page opposite 6000, we enter on our work sheet (Figure 1) the things we need.

Column 1—6000
Column 2—We need this (opposite 6000) Figure 1
Column 3—Not needed
Column 4—Not needed
Column 5—We need this (bottom of page) Figure 1
Column 6—Not needed
Column 7—Not needed

6000 — El. 318 Az. 1500

Line No. 3

Wind dir. Drift R7

Dir. fire × .2 =

	V.S.	V.E.	+	—
Wt. Proj.	+2	—13		
P.T.	—16 f/s	+7.2		
A.T.		+3.6		
W-R		+5.7		
D		—9		

14 yd/m

Figure 1

Column 8—Not needed
Column 9—Not needed
Column 10—We need this (Under Range Figure 1)
Column 11—We need this (opposite Drift Figure 1)
Column 12—We need this (under Drift Figure 1)
Columns 13 and 14—Not needed
Column (15-16), 17, 18, 19 and 20—We need the data in each of these columns and since they all affect range we put them in column (Figure 1). (Note: variation from standard for powder temperature must be entered in f/s; this is determined from Table B.)

Now draw vertical lines for four columns for tabulation of variation from standards, unit effects and the results of cross-multiplying same which may be plus or minus (Figure 1).

Fill in the unit effects in the unit effect column (Figure 1).

By this time, information from the battery executive should be available. Assume that he reports powder temperature of 30° F., weight of projectile of six square.

Enter variation from standard for these two items.

All of the above may be accomplished before we receive the metro message.

Assume that the following metro message is received:

	MIF		MIF
	3	12	33
0	14	20	00
1	13	22	99
2	10	28	99
3	10	28	97
4	16	35	97
5	12	40	96

Put on work sheet only the part of the message you need (Fig. 2).

Correct Temperature and Density for difference in altitude of battery from MDP.

Determine chart direction.
Look up and tabulate wind components.
Multiply components by velocity of wind.
Determine wind effect on deflection and add to drift.
Draw circle around deflection correction.
Enter Variation from Standard for Air T°, W—R, and D.
Cross multiply Variation from Standards and Unit Effects.
Add columns and determine net effect in yards.
Divide by yd/m change, sign and circle correction.

6000 — El. 318 Az. 1500

	3	12	33	34
Line No. 3	10	28	97	98
	64			

Wind dir. 7400 Drift R7
Dir. fire 1500 R 13 mph × .2 = R3
Chart dir. 5900

R .47 × 28 = R 13 mph Effect R 10
— .88 × 28 = — 25 mph Correction L 10

	V.S.	U.E.	+	—
Wt Proj	+2	—13		26
P.T.°	—16 f/s	+7.2		115
A.T.°	—25	+3.6		90
W-R	—25	+5.7		143
			18	
D	—2	—9	+18	—374

14 yd/$\not{m}$

$$\text{Effect in mils} = \frac{-365 \text{ yd}}{14 \text{ yd}/\not{m}} = -25\ \not{m}$$

Correction = + 25 $\not{m}$
Corrected elev. = 318 + 25 = 243 $\not{m}$

Figure 2

Note: In the foregoing only one thing must be committed to memory, i.e., Wind Direction must be written above Direction of Fire, everything else is in a logical sequence using the range table as a guide.

—BY I. G.

BOOK REVIEWS

By H. S. F.

"*The worst of the defensive attitude is the difficulty, moral and physical, of passing effectively out of it into the offensive*."

—GENERAL SIR IAN HAMILTON

MR. CHURCHILL. By Philip Guedalla. Reynal and Hitchcock, New York, 1942. $3.00.

The author of this book ranks among the most distinguished of contemporary biographers. As is his custom, Mr. Guedalla concentrates upon a portrait of his subject rather than the factual record of his career. His style, too, is unchanged: polished, mildly ironic in tone, with frequent use of apt, anonymous quotations. And there is the same annoying lack of dates. But it may be questioned whether this is the proper method of treating a biography of Churchill. It worked very well, for example, in his life of Wellington, whose personality has been obscured by the passage of time; but at present our daily papers are filled with accounts of Churchill's personal traits and habits. It would seem that now a detailed, factual biography of Churchill would have been more useful.

Two-thirds of the book deals with Churchill's life up to the time of his loss of his seat in Parliament in 1922. Unfortunately, this story has already been well told in a number of volumes by Churchill himself, and it would have been better to have concentrated on the period following Churchill's return to political life. Actually, it is futile to attempt to sum up in one volume the life of a man who, like Churchill, has been continuously in the public eye for nearly a half century.

We learn, however, that in this later period Churchill was dominated by two ideas. At first he was mainly concerned with communist Russia. But in the exile of Trotsky and the rise of Stalin Churchill saw a decline in "evangelistic" communism. Russia, he felt, would be content to keep its communism at home. As a corollary to this belief, he saw in Russia a valuable ally against Germany—and an ally motivated by nationalistic aims rather than by a desire to spread communism to western Europe.

Coincident with Churchill's new feeling towards Russia was a growing alarm with regard to Germany. He was not an advocate of a "preventative" war at the beginning, however. German grievances should be redressed, and so that this should not appear to be a surrender, Britain should rearm at once. But this was not done; and as prediction after prediction came true, it was inevitable that Churchill should be taken into the cabinet at the outbreak of war. After Norway, he became prime minister almost as a matter of course. The story, of course, is far from finished; but this is a fair background sketch.

MISSION TO MOSCOW. By Joseph E. Davies, Simon and Schuster, New York, 1941. $3.00.

Mr. Davies was the United States ambassador to Russia for about a year and a half, from the end of 1936 to the middle of 1938. His book is made up almost entirely of original sources: official reports made to the State Department (which he received special permission to reprint), a diary, a journal, and personal letters. For this reason the book will be especially valuable for historical students and as a work of reference.

At the beginning of the book Mr. Davies states that he was a "capitalist" when he left for Russia, and that his beliefs were unchanged when he returned. However, he took up his duties with an open mind, prepared to take a sympathetic view of the efforts of a friendly nation, and in full accord with the words of Thomas Jefferson with which he prefaces his book: "We surely can

not deny to any nation that right whereon our own government is founded—that every one may govern itself according to its own will."

Although it is impossible to review in these pages the mass of political, economic and social material covered in the book, it may be said that Mr. Davies received a very favorable impression from his many inspections of the various fields of Russian activity. At the end of his mission he was granted the rare privilege of a personal interview with Stalin, about whom Mr. Davies afterwards wrote: "If you can picture a personality exactly opposite to what the most rabid anti-Stalinist anywhere could conceive, then you might picture this man. . . . A child would like to sit in his lap and a dog would sidle up to him." Finally, Mr. Davies felt that "communism holds no serious threat to the United States."

Concerning the Russian Army Mr. Davies likewise had the highest opinion: "The man power was invariably impressive. Their infantry was striking as they marched by the Kremlin reviewing stand in their thousands." It is interesting to note that Mr. Davies reported that the curriculum in the military schools devoted 60% of the time to military training, and 40% to the study of communism. He concluded that the army was loyal to Stalin and to communism, that the executions of the many generals and other officers in the purge—which occurred while Mr. Davies was in Moscow—had not seriously hurt the army, and that Russia was capable of sustaining a simultaneous attack by both Japan and Germany.

ARMY TALK. By Elbridge Colby. Princeton University Press. Princeton. N. J., 1942. $2.00.

Colonel Colby's name will be familiar to most readers of the service journals, who will recall his many studies of the American operations in the last war. He has very appropriately dedicated this new book to H. L. Mencken, who has done more than anyone else to advance the study of the American language.

It may be said at once that this is an excellent book. It bears no resemblance to the unsatisfactory catalogs of army slang which regularly appear Each word receives anything from a short paragraph to more than a page explaining how the word came into use, and giving its historical background. Both slang and regular military terms are included: you will discover how "eyewash" evolved, and how the words "lieutenant general" came to have their present meaning. At the same time this is no dull treatise; the definitions are given with intelligence and humor, as well as learning. Only in the present generation have Americans come to realize that their language is not English, but something which is new and distinct from the mother tongue. This book is a first rate compendium of the important military section of our speech.

THE FOURTH HORSEMAN. By J. H. Doherty, Lieutenant Colonel, Finance Department. Military Service Publishing Company, Harrisburg, Pa., December, 1941. $1.00.

Colonel Doherty (author of "Death! Then What?" which appeared in the September-October, 1935, FIELD ARTILLERY JOURNAL and which was reprinted in pamphlet form by popular demand) has prepared a valuable study on all the steps which an officer or other member of the military service should take to put his affairs in order before his death. It includes instructions for the family of the deceased on collection of various benefits due from insurance, pensions, etc.; tells who should be notified in case of death and what instruction should be given concerning burial. A valuable form is included which sets forth clearly, yet in detail, exactly what instructions should be left for the family in order that they may take care of the various matters which come up at the time of death. There are forms for wills, record of leave-taking, change of station, and numerous other statistics. There is also a form for record of military service which should be retained as a permanent file. The whole book, in fact, is prepared as a form so that it is necessary only to enter the data in the proper place.

MODERN WAR—ITS ECONOMIC AND SOCIAL ASPECTS. A BIBLIOGRAPHY. By Albert T. Lauterbach, in collaboration with Robert A. Kahn and Deborah A. Hubbard. Institute for Advanced Study, Princeton. N. J.

The increasing volume of literature dealing with war has made classification and analysis an absolute necessity if we are not to become hopelessly lost in the flood of new material. While this new bibliography places most emphasis on the economic and social phases of war, it contains many references to the purely military items. The publisher is prepared to furnish limited copies to interested persons.

A best seller—in its third reprinting!

HOW TO PRODUCE AN EFFICIENT FIRING BATTERY

BY MAJORS H. F. HANDY AND V. F. BURGER, FA

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