

*The*  
**FIELD ARTILLERY**  
*Journal*



IN THIS ISSUE:

*The Prize-Winning Essay*

MARCH-APRIL, 1940

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## IN THIS ISSUE

THE prize essay contest this year was won by Lieut. Bernard Thielen, FA, a portrait and brief biography of whom is given in FORWARD OBSERVATIONS.

COLONEL CONRAD H. LANZA'S study of the economic phases of modern war is particularly timely, for obvious reasons, and it brings out facts and deductions currently receiving considerable attention in foreign periodicals. Col. Lanza, who for several years has been voted the most popular FIELD ARTILLERY JOURNAL author, has recently returned from General Staff duty in Oahu and is now stationed in New Hampshire.

MAJOR ALAN L. CAMPBELL, Field Artillery representative at the Ordnance Proving Ground, Aberdeen, Maryland, furnishes the first authentic description of our new command car and wheeled prime movers.

W. A. S. DOUGLAS, who describes the British division, is an editorial and feature writer for the *Washington Times-Herald*. He recently has returned from the European war zone, where he acted as correspondent for his newspaper and the magazine *News-Week*. He holds the unique distinction of having won a commission from the ranks in the regular armies of both Great Britain and the United States, and has seen active service in four wars.

NO SMALL number of JOURNAL authors write under pen names. Among these are the authors of "Two Ends of the Trajectory," "Antitank Mounting for 75-mm. Gun," and "Sic Transit Alidade." These gentlemen prefer to remain what a very young friend of ours calls "ominous."

COLONEL EDMUND H. LEVY, whose work has appeared in the JOURNAL before, has had an interesting military career extending back to 1915, when he enlisted in the Washington Artillery, Louisiana National Guard. He was commissioned in 1917 and served through the war in Battery E 19th FA. He reports that during his tour in France he enjoyed "good shooting and good wine, here and there." Colonel Levy is a graduate of the Field Artillery School, 1925, the C and GSS. 1926, and at present commands the 345th FA. His civilian occupation is Assistant Chief Patrol Inspector, Immigration and Naturalization Service, Border Patrol, U. S. Department of Labor.

Lieut. Col. A. V. Arnold, FA, former Director of the Gunnery Department, FA School, furnished the photos and text for "A Thought on Sensing."

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# The Field Artillery Journal

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**OUR NEWEST WEAPON!**

*The 105-mm. Howitzer M2A1 on the new 105-mm. Howitzer Carriage M2, a high-speed, split-trail carriage. The weight of the weapon in traveling position is 4300 pounds. It is fired directly from the wheels.*



# Faster Fire Direction for Light Artillery

The leisurely pace suggested by the quotation to the right leaves today's artilleryman, dizzy over *Blitzkrieg* from Poland and rush orders on maneuvers, with a question about the adequacy of "the outlined procedure" for all situations. Listen to the thin and querulous voices which will rise this very night from the chill swamps near Benning, from the mesquite of Texas, or from the misty fir forests on the shores of Puget Sound:

BATTALION COMMANDER: The attack jumps off in forty minutes. The infantry wants fire in those woods and along that stream bed. They think the enemy's got machine guns here and here and here and here. Get an overlay to the batteries.

S-3: No, sergeant, you can't use that template on a photomap overlay. The scale is different.

SERGEANT MAJOR: You guys have got seven minutes to make fourteen copies of this here overlay. And don't forget the grid lines like you did last time.

LIAISON OFFICER: My transportation's shoving off. How about an overlay?

BATTERY COMMANDER: Where the hell's that damn overlay?

MESSENGER (with overlay): Where the hell's B Battery CP?

INFANTRY COMMANDER: Where the hell. . . .?

The first quotation at the head of this article stresses the need for various methods of fire direction. Yet the text from which that quotation is taken mentions just two means of assigning targets on a firing chart—only one of them generally practicable—(1) the familiar concentration overlay and (2) coordinates. While appreciating the excellent merits of the time-tested overlay system, and realizing that a proposed additional method need not presume to supplant it, let us examine some of the overlay's disadvantages.

Preparation of an overlay consumes time, and reproduction—a trying business at best—eats additional minutes when they cannot be spared. As a result battery commanders are hard pressed, in a rapidly developed situation, to compute data before H-30. Furthermore, liaison officers going off to join the infantry—or cavalry—are too often unable to procure an overlay

Since the varying situations arising in combat may entail the interruption or failure of any one scheme of fire direction, the director of fire should be prepared at all times to use any of or all the means known, or that can be improvised, to insure a positive and continuous control over the fire of his units. *To depend exclusively on any one scheme or method is a serious error in judgment.*\*—Field Artillery Book 224 (1938), p. 108.

Fire direction . . . implies an ability to maneuver the fire in such a manner as to render maximum fire support during the rapidly changing situations found on a modern battlefield.—*Ibid.*, p. 109.

The outlined procedure presupposes that several hours are available for the preparation of the fires in an attack or defense, after the decision and general plan of the division commander have been announced . . . —*Ibid.*, p. 177.

\*The typographical emphasis is mine.

## The 1940 Prize Essay By Lieutenant Bernard Thielen, FA

attack or a defense requires one of two things: the prescience of a Napoleon, or a sickening plethora of goose eggs which must be "figured" by some sleepy junior officer with the taste of last night's cigarettes in his mouth. Yet another weakness of the overlay concerns the difficulty in obtaining good basic data from it when time is short or conditions unfavorable. Bad light, wrinkled and warped paper, cold fingers, and blood-shot eyes are among the enemies of speed and accuracy in reading protractor and linear-measuring device. A related obstacle lies in the scale variations of photomaps used as firing charts; correction factors must be applied to the usual standard-scale instruments. A final serious limitation is this: The liaison officers with the front-line troops—the artillery officers in closest touch with the urgent needs of supported units—find it very difficult to indicate vital fires unless they are in a position to perform the adjustment themselves. Observation, needless to say, is too often impossible.

Objections to the general use of coordinates for target designation are summarized in the textbook already referred to (p. 153):

"When targets have been accurately located (sound ranging, air photo, map, or survey), the assignment of missions by coordinates is, in theory, the best method. In practice, however, errors are apt to be made and time is consumed at the battalion and battery in plotting. A supplementary overlay with

before departure. Another obvious but important drawback, especially in fast-moving warfare, is the fact that the overlay must be transported physically through dark of night or hostile fire. Messengers lost or killed deliver no overlays. All the resources of radio and wire are useless in conveying this essential scrap of tracing paper from point of origin to destination. A further disadvantage—and a serious one—is lack of tactical flexibility; a major change in the tactical situation indicates a new overlay and a repetition of the whole time-consuming process. Foreseeing the front-line troops' demands for fire throughout the progress of an

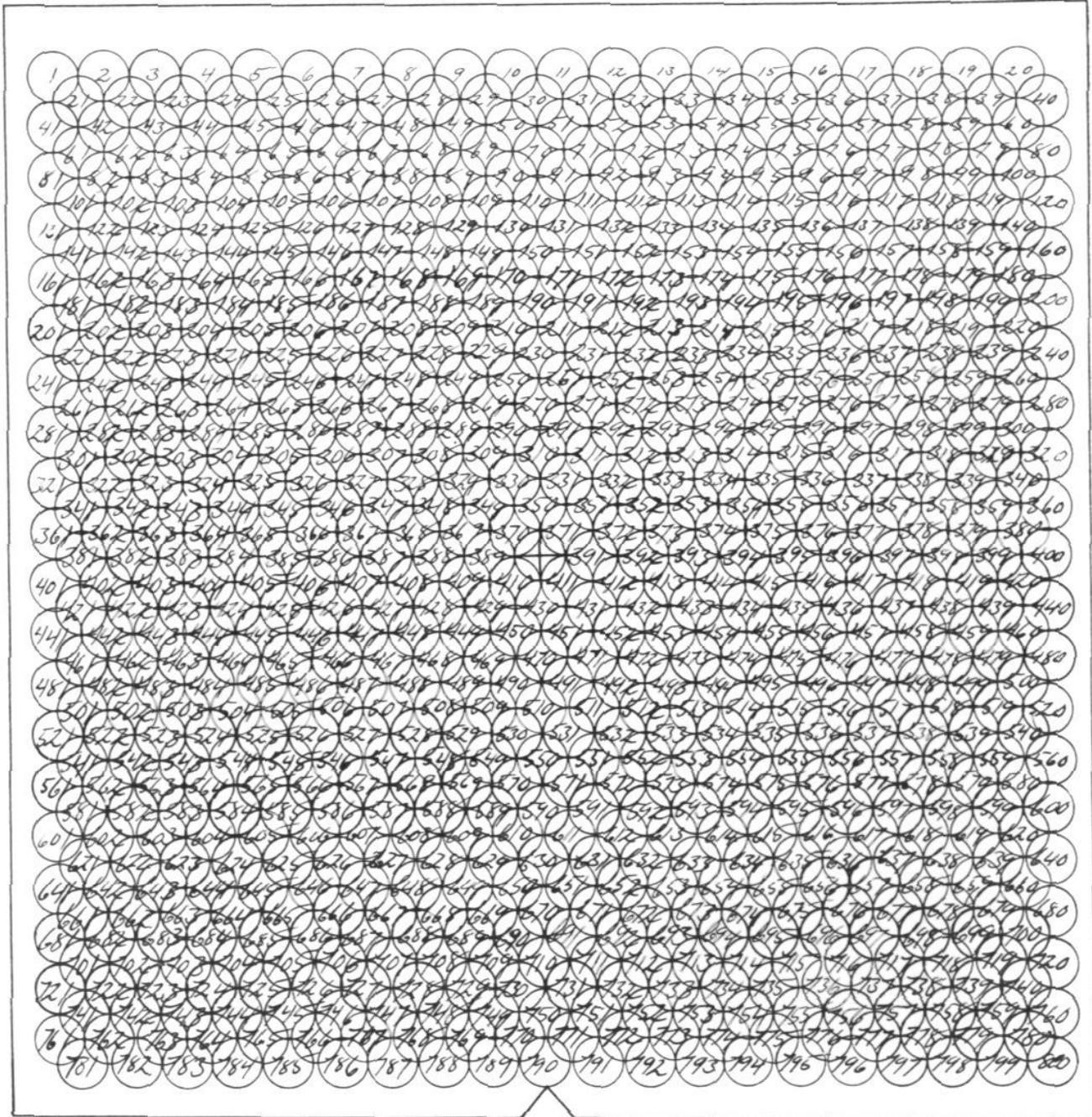


Figure 1

targets shown thereon, in addition to the coordinates, will avoid gross errors and serve as a useful check."

The method of fire direction for prearranged fires to be described in this article has disadvantages no less conspicuous than those of the older methods, but such disadvantages lie in a different direction. We have here an alternate means, supplemental to the existing system, to be used only when its characteristics are better adapted to the situation than are those of the conventional overlay. These characteristics of the suggested system—and they should be carried in mind throughout the following discussion—are (1)

speed, (2) tactical flexibility (but *not* technical flexibility), and (3) elimination of scale and protractor reading.

Consider the strange-looking device shown in Figure 1. It is a square of tracing paper containing 800 numbered circles, each representing a 200-yard standard area. It resembles nothing so much as the overlay turned out by a super-zealous S-3 who wants to lay down a concentration on every pineapple plant in Oahu, but analysis reveals that the circles are arranged in a more purposeful geometric pattern. The cross in the center represents the base point, and an imaginary line between this cross and the notch at the bottom of the square represents the base

line. This pattern may be constructed well in advance of the time needed, to any scale corresponding to the firing chart to be used.

For purposes of target assignment the director of fire or the liaison officer tacks the pattern on his map or firing chart, placing the center cross over the plotted base point, and the top of the pattern toward grid north (parallel to the east-west grid lines). Let us call this orientation *Position I*. Any target or terrain feature on the chart will appear within one or more of the numbered circles on the pattern. Obviously the appropriate concentration (s) can now be identified by pattern number, over any existing means of communication, to any person having a duplicate pattern oriented in *Position I*. Details will be discussed later.

Now we shall see a striking feature of the pattern system from the battery commander's point of view. Upon receiving a series of pattern numbers, his pattern being in *Position I*, he plots the center of each concentration, either by pricking through the pattern to his firing chart or by putting another sheet of tracing paper on top of the pattern and plotting by inspection. Next he rotates the pattern (and only the pattern) about the base point as a center until the base line on the pattern coincides with the base line of his battery as plotted on the chart. This is *Position II*. Each previously-plotted concentration center will now appear in a new pattern circle. Entering a printed booklet, which has a double-spread devoted to each gun-base point range from 2000 to 9000 yards at 20-yard intervals, the battery commander will find opposite each *Position II* pattern number the base-deflection shift to the right edge of the circle and the map range to the center. No record need be made of the *Position II* pattern number; shifts and ranges are entered on the work sheet as they are read from the tables. Computation is completed from these basic data in the usual way.

That is the *standard pattern system* in naked outline. Let us now discuss some of the details of procedure. In the course of discussion some of the objections to the system will be found to be more apparent than real; other very definite disadvantages are inherent in the system and can be overlooked only under the plea of necessity for speed, tactical flexibility, and ease of computation.

The most serious objection that can be raised against the standard pattern system is departure from rigorous accuracy of location. Accuracy is sacrificed in both positions: in *Position I* a concentration must be selected whose center is not, in general, the center of the target; in *Position II* the center of impact is further displaced, with the risk of cumulative effect. There are, however, several expedients by means of which possible errors can be brought within allowable limits. First let us assume a special case in *Position I* wherein the target center is discovered to lie on or near the point of tangency of any two adjacent circles—for example, near the point of tangency of No. 326 and No. 327. This condition can be indicated by a symbol, say the letter T, preceding the

pattern numbers of both concentrations; thus instead of designating either Concentration 326 or 327 we can designate T326-327. Through this expedient a condition of maximum inaccuracy becomes the most accurate location we have—designation of a point. If the same condition is discovered by the battery commander in *Position II* it is desirable to sketch or visualize a circle about the point of tangency and modify the tabular data applying to an adjacent concentration by means of the mil relation for deflection and an easily-estimated increment for range or by interpolation. Let us next consider the other special case of high potential error in *Position I*, wherein the target center falls on or near the common chord of two intersecting circles. Here again the director of fire is in a dilemma; selection of either circle will introduce the probability of large error. Again we have recourse to a "split" designation, preceded this time by the letter Q—for example, Q418-438. Should this same condition exist in *Position II* the battery commander proceeds as in the case of tangency. Having eliminated the cases involving large possible error (and they will occur infrequently, considering the nature of 75-mm. targets in tactical fires), let us discuss the general error. It can be shown by a process too tedious for inclusion here that the total probable error in displacement of the concentration center from the target center after the pattern has been revolved to *Position II* is about 30 yards in range and of course the same amount in deflection. Taking two probable errors as a reasonable allowance, we have in each element of basic data a 60-yard expected error which can be attributed to the pattern system. The error in range can be compensated for by using the range safety factors prescribed for map data corrected—100 yards at each limit. The deflection error is more serious; theoretically it threatens a possible loss of about 30% of the fire effect. To eliminate this loss it may be considered desirable under some circumstances to introduce a deflection safety factor of 25% of the width in mils of a 200-yard front. In other words, the net result of these increased safety factors would be to require preparation of fire as though the concentration were a concentric 300-yard standard area with the usual 50-yard safety factors. It will probably be found, however, that the sum of error to be expected under service conditions from causes independent of the fire-direction method will far exceed our vectorial 42 yards, particularly in the rapidly moving situations to which the standard pattern system is adaptable. Among the independent errors to be expected are distortion in photomaps (tilt, relief, shrinkage, and the like), inexact location of targets on the ground (targets are seldom clearly visible), errors in survey, materiel and personnel errors, plotting limitations, and especially errors in determination of site (this vexing problem is far from solved on photomaps). It would seem therefore that insistence on high precision of location by fire-direction methods is not ordinarily justified. Furthermore, the typical targets for 75-mm. materiel in prearranged fires are almost invariably composed of somewhat

widely dispersed elements, and fire in the vicinity of the estimated target center is seldom without effect. As in the case of a 155-mm. GPF firing along a main supply road, dispersion often operates advantageously when targets are neither fixed, accurately located, nor of little depth. By way of summarizing this rather long and involved paragraph it can be repeated that certain inaccuracies are inherent in the standard pattern system, and although these errors can be minimized to well within allowable limits they indicate use of some other method when conservation of ammunition or a high degree of accuracy is essential.\* In this respect the standard pattern system bears a relationship to the conventional overlay similar to the relationship between bracket and precision methods in observed fire.

Another charge that can be leveled against the standard pattern system is lack of technical flexibility. In unmodified operation of the system, designation of fires is confined to 200-yard standard areas. It must be remembered, however, that small necessity exists for unobserved 100-yard concentrations in the early stages of a rapidly developing situation. If the concentrations can be observed it is a simple matter for the observer to narrow the sheaf and shift it to the most effective spot. Also it is possible by special symbols to identify any one of the five divisions into which the four encroaching circles divide a given circle—a useful refinement in describing check concentrations. Concentrations larger than 200 yards must be obtained by designating two or more interlocking or tangent circles or by a 300-yard concentration symbol. Normal and emergency barrages, if accurately located, may have to be identified by two sets of grid coordinates representing the two extremities of the line. (It will be recalled that such barrages have no depth for purposes of computation although they are conventionally represented by rectangles.) Limiting lines and similar information can be described with sufficient accuracy by reference to successive pattern numbers. It must again be emphasized, however, that if technical flexibility is of primary importance, as in a prepared position defense, the standard pattern system is less suitable than the conventional overlay.

"Circles of confusion," a term familiar to amateur camera experts, probably describes an artilleryman's first reaction to the standard pattern. This difficulty need not concern us, however, as a simple experiment will prove. The properties of the human eye are such that examination of a point within a circle causes that particular circle to become much more apparent than any encroaching or tangent circle. Close inspection of any pattern number in Figure 1 will cause all

irrelevant circles to fade out of focus.

The method of target designation requires some further explanation. In order to simplify coordination of fires by higher headquarters it is considered desirable to retain the usual block system of numbering concentrations, using pattern numbers merely for identification. To provide a "break" between the concentration number and the pattern number the letter S is suggested for normal use, to be replaced by T or Q under conditions of tangency or common chords as described previously. Special set-ups in Position I<sup>†</sup> may be indicated by a prearranged change in the break symbol. Target altitudes must often be furnished to the batteries; in such cases the altitude will follow the pattern number, separated by the break symbol A. Here are two examples of target designations and their verbal translations:

101 S 243	Concentration No. 101. Located in Pattern Circle 243, from the standard Position I set-up.
22 T 310-311 A 510	Concentration No. 22. Center located near the point of tangency of Pattern Circles 310 and 311. Altitude, 510 feet. (Standard set-up assumed.)

Although these designations look long and complex, a lot of them can actually be transmitted without error in a very few minutes, and it should also be remembered that a battery will fire only about six such concentrations in an hour. Furthermore, the concentrations can be designated piecemeal as they are obtained—a tremendous advantage to the harassed battery commander in computing his data. In this connection it may be added that the use of the neat little TG 5 telegraph set simplex to gun-battery lines would develop to the fullest extent the remarkable potentialities of the standard pattern system.

Transmission of time schedules by electrical means of communication may be questioned, but such procedure seems to be entirely practicable. The usual graphical time schedule should be prepared by the director of fire. All the advantages claimed for a graphical time schedule apply only to the fire-direction center; for that reason the schedule should be retained there. Useless reproduction should be eliminated. Appropriate extracts can be transmitted to the batteries in a very few words: H-20 to H-15, No. 201, 112 rounds. This information can be entered directly on the command sheet by the battery commander. Improved tactical flexibility and increased control by the director of fire are evident; so is the advantage of informing batteries of fire priorities as soon as they are determined. Training doctrine emphasizes the time saved in establishing priority concurrently with the selection of targets, and the outlined procedure passes the fruit of this practice on to the batteries.

\*A somewhat different means of target designation, more accurate than the method discussed above, was considered, but discarded as approaching gadgetry. This original method is here outlined as a possible basis for further development. Operations are divided into two phases; Phase I involves the use of a distance-calibrated arm projecting from a mil-calibrated circle pivoted at the base point. Concentration centers are designated by giving a distance and a direction with the base point as a fixed origin (polar coordinates). Phase II, computation of data, utilizes the standard pattern described above, and is identical to the procedure already mentioned.

†If the charts are ungridded, for example, it may be necessary to set up Position I by the use of the base point and one other known point; or if the gun positions are known well in advance it may sometimes be desirable for the director of fire to designate targets from the Position II set-up for each battery.



Mechanical preparation of the pattern merits a few words. It would probably be worth while to print copies on a 1:20000 scale for issue, or to engrave the pattern on celluloid, since this scale is frequently used on fire-control data sheets, grid sheets, and (should they even be mentioned in good society?) fire-control maps. But one excellence of the standard pattern system lies in its adaptability to the varying scales of the increasingly-used photomaps. As soon as a photomap is provided for fire-control purposes, battalion or higher headquarters should hectograph 40 to 50 copies of the pattern, prepared to a scale corresponding to that of the photomap. This step should be taken regardless of whether immediate use for the standard pattern system is foreseen—and copies should be issued with the photomap to all concerned. Preparation of the master pattern is not difficult if a draftsman's bow pen is available. The writer, a mediocre draftsman, completed Figure 1 in a little over an hour. In emergency an abbreviated pattern can be improvised.

The table from which the battery commander extracts his basic data for deflection and range should be discussed briefly. The work involved in the preparation of such a table is tremendous—800 concentrations figured for range and for deflection at each of forty-three base-point ranges—but once compiled and printed the table will be a joy forever, since it is of course independent of variations in the scale of firing charts. Without going into detail it may be remarked that these tables, used in conjunction with the Position II set-up, could often be used to advantage in the rapid preparation of observed fires, especially when fire is conducted by air-ground methods. No one should cavil at work done in leisure time to expedite fire in time of pressure. Computation is based on these formulas:

$$Rn = \sqrt{a^2 + b^2}, \text{ and } Df = \arctan \frac{a}{b} \pm \arcsin \left( \text{or, practically, } \arctan \frac{100}{Rn} \right) \ddagger$$

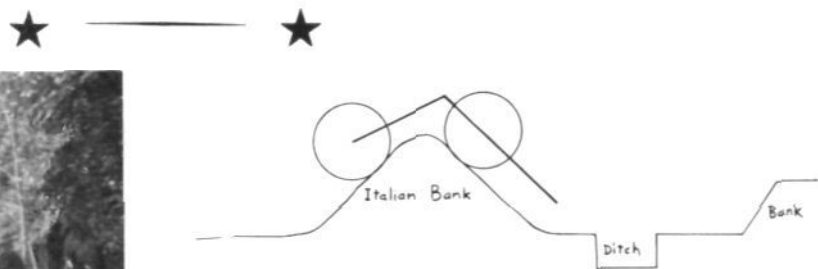
In these formulas  $a$  equals the perpendicular distance from the base line to the center of any pattern circle, and  $b$  equals the distance along the base line from such point of perpendicularity, to the base piece. Values of  $a$  and  $b$  are functions of the pattern and pattern set-up. Obviously they do not depend on the scale of the pattern, and they should be determined by inspection—not by measurement. A slide-rule, a table of natural functions expressed in mils (the Field Artillery School has published one) and a table of squares and square roots are the tools required. The data when printed should be incorporated with the 75-mm. firing tables to insure availability.

Such is the standard pattern system for fire direction of light artillery. This article has been largely concerned with a somewhat rigorous examination of its defects, but let us not forget its virtues. Primarily it provides an urgently needed alternate means for accomplishing the field artillery mission—a means which is weak where the older methods are strong, but strong where they are weak. Speed and tactical flexibility are ends worth seeking, particularly in motorized warfare, and perhaps our search will carry us far beyond the limits of the system here propounded. Yet even a stumbling step in the right direction is progress.

‡For all concentrations except those lying close to the guns in range and at the same time distant from the base point in deflection the formula can be modified by computing the shift to the right-hand intersection of the circumference of the pattern circle with a diameter perpendicular to the base line. In this general case the variation from theoretical accuracy is insignificant, and the formula for deflection becomes simply  $\arctan (\pm 100)/b$ .



Photograph of excellent driving over a difficult obstacle by students of the Advanced Class in Horsemanship driving a remount team during the fifth week of a modified six week course. The obstacle consists of an Italian bank, ditch and bank, profile of which is sketched in the next column.



Interesting features of the picture:

1. Lead and swing drivers looking to the rear.
2. Wheel driver watching the carriage in order to determine when to bring his pair back into the breeching.
3. Swing and wheel pairs in draft pulling the caisson up the initial slope (caisson not in picture).
4. Lead pair out of draft ready to climb up the bank at the extreme right edge of the picture.
5. All pairs abreast.

NOTE: Picture not posed.

# *The British Army Division of Today*

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**Recent visitor to the war zone describes organization and armament of modern British division, and training of the artillery.**

---



*Even powerful tanks develop mechanical trouble. This "flat" is repaired by British Royal Tank Corps members, under the watchful eyes of neighborhood children. Wide World Photo.*

By W. A. S. Douglas

## ORGANIZATION AND ARMAMENT

Talking of the size of armies, England has, since Cromwellian days, done the mental addition in forms of divisions. There is a little variation, of course, because the division differs in size in different armies—but not nearly as much, today, as it did up to the beginning of the end of the first World War. The division yard stick, right now, comes nearest to the truth because combatants of today—and of tomorrow—are fairly equal on standard of armament.

Another fashion of taking measure—and this covers many of the folks who are necessary to put a man in the front trench as well as the unfortunate in the front trench himself—is by ration strength. It is somewhat fallacious, but it is the quartermaster-general's yardstick—and he passes it along.

It is not entirely safe to estimate by numbers of army corps because an army corps may be made up of two or more divisions and may vary greatly in composition from time to time. The division-figuring is pretty accurate but then again one must remember that in the modern army there are at least two sorts of divisions: normal (infantry) divisions and divisions composed of armored fighting vehicles.

The cavalry division has gone since armistice day but has been replaced by the armored division as far as mobility is concerned—this latter coming nearer to the mounted forces of medieval days than it does to the Uhlans and Dragoons of 1914—for in the former times the horsemen bore the brunt of the battle, as will the mechanics of today just as soon as this weird war opens up and warms up.

But the armored division is still in its infancy and very far from uniform; therefore, when using the division measure in seeking to compute the strength of the enemy, it is maybe better to figure the mechanics separately. Variation in the size of normal divisions in the armies of different nations is not of much importance as

this is generally accounted for by the fact that units which in some armies form a permanent part of the division are in others retained under the command of higher organizations—to be distributed to divisions as occasion requires.

Thus the fact that on paper a German division of today shows a considerably higher numerical strength than does a British division does not materially falsify a calculation based on the number of divisions. As we all of us know, the normal division is the largest organization whose commander exercises direct executive control over the tactical conduct of troops in battle, and it is the smallest formation composed of all arms necessary for independent action. It is equivalent to what neighborhood youngsters fondly term "the mob" or "the gang," for the units which constitute it do not change unless slaughtered out of recognition; the esprit de corps of a division is its proudest and most tremendous asset.

The main function of an army corps commander is to coordinate the action of the divisions under his command. An army corps, as long as practicable, is composed of specific divisions and it is important that the corps commander should know his divisions intimately—but strategic necessity very frequently compels the transfer of divisions from one corps to the other and the transfer of commanders.

Army corps headquarters generally retains direct control over weapons such as heavy and medium artillery whose range covers, both in depth and width, a greater area than that which concerns the division commander. On the other hand there are corps and army units intended to reinforce divisions for particular operations and to go into action under division control on such occasions. The modern normal division is in point of numbers considerably smaller than in 1914 though modern weapons confer upon it immensely greater fire power.

In the final stages of the first world war, chiefly owing to exhaustion of man power, divisions in British, French, and German armies were greatly reduced in strength, particularly as regarded the infantry components. The Australian, South African, Canadian, Indian and New Zealand divisions, however, were able to retain their original setups due to good feeding into the gaps from the man power at home. The American divisions, from their first arrival, were much larger bodies of men than were those of any of the other armies. Indeed, when they went into hot action in 1918, American divisions were in infantry strength the equal of two British or German divisions.

After the first world war, continental European armies retained the final war divisional organization brought about by man-shortage. The British army, however, went back to the pre-1917-1918 standard and it is only over the last eighteen months that the strength of divisions has been brought down to the continental standard. The

cutting process has also been followed in the armies of the Dominions. It was realized at long last that, with the increasing number of weapons and vehicles, modern divisions at war strength, along the old line, would be too ponderous and bulky to be handled conveniently or to get proper benefit from the greatly increased potential mobility conferred by mechanization upon the soldier of 1940.

Today the British division on the western front is composed as follows:

Three infantry brigades, each of three battalions; which means nine battalions as compared with the twelve of the Retreat from Mons and First Marne.

Each battalion has four rifle companies, each of three platoons, with the marvellous Bren gun as the principal weapon; grenades, rifles and antitank guns are also, of course, carried.

In addition each battalion has a headquarters company which includes specialized platoons of mortars and antiaircraft weapons, a platoon of pioneers and a platoon of Bren gun armored carriers. These carriers are not, as you might suppose, light tanks, but enable the gun to be pushed forward rapidly in fire-swept areas.

Divisional artillery consists of three regiments of 25-pounder (3.45-inch) gun-howitzers. A regiment has two batteries of three troops of four guns; thus there are twenty-four guns per regiment and a total of seventy-two for the division. It should be noted that the "battery" corresponds to the American battalion and the "troop" to the American battery. The 25-pounder has a range of about 12,000 yards, and is mounted on a modernized carriage with an open box trail. It is built for high-speed traction, having pneumatic tires and automobile-type wheels and bearings. All artillery weapons larger than the 25-pounder are to be found only in corps or army; but it is no secret that the British Expeditionary Force in France is very liberally supplied with field artillery. A recent article in a British magazine mentions the clever and advanced methods of concealing guns at the front.

British field artillery is all motorized, the tractive device being a cross-country tractor of special military design (see illustration on page 365 of the FIELD ARTILLERY JOURNAL for July-August, 1939).

In addition to the artillery mentioned in the foregoing, the British division contains a regiment of forty-eight 40-mm. antitank guns. These are manned by artillerymen, and are in addition to the infantry antitank weapons.

Divisional troops include a mechanized cavalry regiment, engineers, signals and army service corps (quartermaster corps) units. The total personnel of the division is slightly over 12,000, all ranks, and there are no horses. Sufficient vehicles are available in the divisional establishment to carry about half the infantry personnel at one time.

Those who knew the English division in the last war

will note that the machine gun battalion, medium artillery and pioneers are no longer part of the divisional establishments. These—and certain other important units—are army corps troops under the new setup and can be attached to divisions temporarily when required.

One important result of mechanizing all artillery and transport is that when personnel is moved by road or rail its transport can keep pace with the move, whereas, in the last war, when a division moved by bus column or tactical train, its guns and transport very frequently were not able to rejoin the infantry for several days.

It can be seen that in fire-power and mobility the British division of today has made immense strides since 1914 and that today's soldier must be very highly trained in order to master so elaborate a machine. The fact, too, that there are fewer men to operate it implies rightly that there is no place in it for untrained officers or men. It is understandable that the war office insists that no officer or man goes to France till he has completed and creditably passed an intensive course of training.

#### ARTILLERY TRAINING CENTER

Once again Salisbury Plain, that great stretch of chalky flats and green hillocks over which England trains its little regular army in peacetime and its millions of impressed men and volunteers during wartime, is alive with the babel of the numerous tongues which stem from the syntax of Geoffrey Chaucer.

Here, I remember, in the first World War, tents and huts covered the land from the great barracks of Tidworth from one end to that strange stone temple of a dead and gone religion, Stonehenge, at the other.

Here, in a hollow between two ridges of hillocks, a famous volunteer artillery regiment is being used as a training center for gunner officers-to-be. The candidates have been selected from the ranks of the new infantry

battalions forming on the barracks squares of training centers; the youths were first jerked there by the conscription act and they run the gamut of society, as Kipling put it, from duke's son to cook's son.

In this artillery training center they have something new to old soldiers, termed "model exercises." The classes gather round a huge relief map on which the fields and roads of the terrain over which there is presumed to be war are painted on thin fabric with tiny trees, farms, villages, soldiers, and trenches, glued on; the whole business is spread over wire, and all the hollows, hills, rivers, and streams are as plain as the nose on your face.

An officer-to-be takes over as battery commander—always under the eye of a grizzled, beribboned artillery instructor of the regular army. But the senior does no interfering at the moment; all comes from the other young candidates.

The youthful commander gives his orders and makes his dispositions on the pretty relief map. Then his classmates set about, rightly or wrongly, to tear down his tactics.

I asked one cadet with a fine sense of humor how he liked all this artillery business.

"I think it is particularly excellent for me," he replied. "You see, I had just started in my father's stock-broking business when the army pulled me in. The old man has specialized in munitions and armament stocks for years. But, bless his soul, he couldn't tell a French 75 from an Ashantee war Lee-Metford. When this bloody business is over I'll be a specialist; be able to give the customers the real lowdown, as you folks call it."

"But this," I said, "is one of those wars to end all wars."

"Oh, yeah," he answered. "See how well I talk the American language? Learned it in the picture business. I'm not worried about this being the last war. There will be wars and wars and more wars."





# New Field Artillery Transportation

By Major A. L. Campbell, FA.

## A Preview of our Newest Automotive Equipment

By the latter part of May there will have been issued to the various units of the Field Artillery of the Regular Army new transportation for command, mobility and maintenance purposes. A little later the National Guard field artillery units will receive identical equipment. Thus, for the first time in our history of motor transportation there will be uniformity of equipment throughout like field artillery tactical units and a real opportunity to gather data as to its efficiency under widely varied conditions.

The purpose of this article is to paint some background to this fleet, describe its principal features, and outline some simple facts upon which, it is felt, successful operation depends.

In January, 1939, a board of officers met at Holabird Quartermaster Depot to review the motor needs of the Field Artillery and to reduce the number of "required" types of motor vehicles. This list of "required" types for the Army had grown like Mr. Finney's turnip until the demand was such that procurement might have been impossible in an emergency; the multiplicity of spare parts required would have probably immobilized the whole.

The General Staff, Quartermaster Corps, Ordnance, and Field Artillery were represented. General Danford addressed the board, and, stressing its value, insisted that, as for the Field Artillery, it was important to buy suitable

vehicles even though quantity might need to be reduced.

Three important basic facts were brought out: *First*—Full use must be made of standard commercial units. Specifications must require the least practicable deviation from standard manufacturing practices. *Second*—The policy that maximum use must be made of the commercial 1½-ton chassis. *Third*—The Field Artillery needs are approximately one-half of the P.M.P. motor-truck requirement.

The problem was attacked with an open mind on all sides, free exchange of opinion and experience was given, and a better understanding of the different needs followed. The results were constructive and showed up later in the year when the big motor-vehicle procurement program was initiated.

Figure 1 outlines the scheme for procurement.

Prior to issuing the bids another conference was held at which representatives of the Quartermaster Corps and other Arms and Services and the Automotive Industry were present. The specifications were discussed and several constructive changes made. At this conference the Field Artillery made a stand for a specification which required an alternate bid on an engine next larger in size than standard commercial practice for the 1½-ton chassis. It was felt that the usual engine developed insufficient torque to give the needed

STANDARDIZED GENERAL-PURPOSE MOTOR VEHICLE CHASSIS FOR WAR PROCUREMENT

	GROUP I*		GROUP II	GROUP III
	1½-ton (4×2) (4×4)**	2½-ton (6×4) (6×6)**	4-ton (4×4) (6×6)**	5-7½-ton (6×6)
SERVICE REQUIREMENTS SET-UP IN MILITARY CHARACTERISTICS				
Command	Cargo	Cargo	Cargo	Cargo
Pickup	Dump	Prime mover	Prime mover	Prime mover
Panel delivery	Prime mover	Dump	Wrecking	Wrecking
Reconnaissance	Reconnaissance	Tank		Field servicing
Prime mover, anti-tank gun	Tractor-truck	Wrecking		
Weapons carrier	Light repair	Searchlight		
Combat ammunition carrier	Panel delivery			
	Telephone maintenance			
	Constr. earth boring			
	Constr. winch			
	Ambulance—field			

\*Engines, clutches, and transmissions to be interchangeable insofar as practicable throughout group. 2½-ton chassis to be identical with 1½-ton chassis except for additional bogie units provided. Makes in group to be limited to mass-production manufacturers.

\*\*Front drive to be secured by modification of (4×2) or (6×4) chassis. Front-drive vehicles of group to be limited initially to prime movers, weapons, and combat ammunition carriers. Standard vehicles, all-wheel-drive types; substitute standard, rear-wheel-drive types.

Figure 1

	Dodge ½-ton	Dodge 1½-ton	GMC 2½-ton	Autocar 4-ton	Indiana 4-ton
<b>Weight:</b>					
Front axle.....	2450	4500	4760	6750	7050
Rear axle.....	2900	6200	10750	16790	16200
Gross.....	5350	10700	15510	23540	23250
<b>Tires:</b>					
Size.....	7.50-16	7.00-20	7.00-20	9.00-20	9.00-20
Load radius, inches.....	14.9	16.8	16.8	18.8	18.8
Ground area at tire diameter penetration—square inches.....	190	195	195	300	300
Ground pressure—pounds per square inch:					
Front.....	6.45	11.54	12.2	11.25	11.75
Rear.....	7.63	7.94	6.89	6.99	6.75
Wheel base—inches.....	116	143	142	156	160
Angle of approach.....	45°	25½°	27°	37½°	36°
Angle of departure.....	30°	31°	30°	53°	40°
<b>Engine:</b>					
Operating—RPM.....	3000	3000	2900	2400	2800
Maximum torque at RPM.....	154 at 1300	188 at 1200	200 at 1000	320 at 800	285 at 1200
<b>Axles, weight capacity:</b>					
Front.....	3000	5000	5000	8000	8000
Rear.....	4500	9000	8400	11000	11000
Clearance.....	9½	9½	9	11¼	11¼
Ratio.....	4.89	6.6	6.6	8.44	9.33
<b>Gradeability:</b>					
Low gear without tow.....	60%	83%	86%	71.2%	87%
High gear with tow.....	6.6%	3.6%	3.56%	3%	3%
<b>Transfer case:</b>					
Speeds.....	1	1×1	1.155×1	1×1	1×1
Ratio.....	1×1	1.87×1	2.6×1	2.05×1	2.05×1
Maximum input torque.....	1325	1460	1460	3250	3250
<b>Transmission:</b>					
Ratios:					
First.....	6.40	6.40	6.06	5.78	7.00
Second.....	3.09	3.09	3.5	3.52	3.97
Third.....	1.69	1.69	1.8	1.83	1.90
Fourth.....	Direct	Direct	Direct	Direct	Direct
Overdrive.....	No	No	.799	.72	.788
Reverse.....	7.82	7.82	6	7.23	7
Maximum input torque.....	175	188	205	350	305

Figure 2

mobility. So sure was the Field Artillery of its stand that some representatives felt we should withdraw from the standardization program in order to get the essential mobility. In the final outcome this larger size engine increased the cost less than \$20.00 per vehicle and resulted in the adoption of a unit which promises to give us our minimum characteristics.

Figure 2 lists some of the technical characteristics of the new vehicles.

Let us consider the 1½-ton prime mover. In this vehicle 42% of the weight is on the front axle and 58% on the rear. Some officers feel that for best traction and flotation, the weight should be evenly divided between the axles. Some believe that the tire size should be increased. Such increase would help the flotation situation but would decrease the grade ability of the vehicle unless at the same time different axle or transmission ratios were used. Also larger tire size would reduce the clearances under the fenders, reduce the turning radius of the vehicle, and make more difficult the application of traction devices. In general, such increase would tend to result in too much deviation from standard practice.

The front-mounted winch reduces the angle of approach below that desired but the advantage of this winch mounting, as will be shown later, outweighs the reduction in angle of approach.

The axles are designed to carry the imposed loads. While

outwardly they do not appear much different from those on our present vehicles, refinements of design and workmanship result in a sturdier unit.

The clutch, propeller shafts, transmission, transfer case, universal joints and live axles are all of such size as to transmit adequately the maximum torque which will be applied.

Many officers feel that a 6×6 prime mover would be more successful with light artillery than a 4×4.

In an attempt to answer this question, fifteen (15) six-wheel drive trucks have been purchased. They are listed as 2½-ton trucks but, under the standardization program, are developed around the 1½-ton chassis.

A comparison of the data on the 1½-ton and 2½-ton units shows for the 2½-ton truck a slightly greater tire load per square inch at the front axle and a slightly lesser load per square inch at the rear axles.

Main Transmission	Transfer Case			
	High		Low	
	1½	2½	1½	2½
Fourth.....	6.6	7.64	12.34	17.3
Third.....	11.15	14.5	20.85	32.6
Second.....	20.39	26.78	38.13	60.0
First.....	42.24	41.4	78.99	93
Overdrive.....	.....	6.1	.....	13.8
Reverse.....	51.61	45.9	96.51	101.8

Figure 3

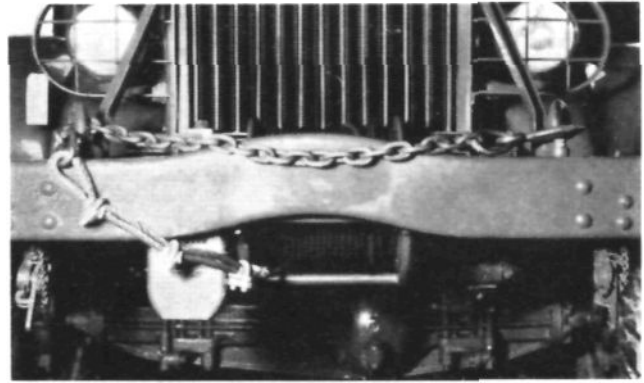
Figure 3 lists the comparative overall gear ratios. The two trucks will each be capable of a top speed of approximately 45 miles per hour but the 2½-ton truck will probably be able to make a higher average road speed because the engine develops more torque and the spread of gear ratios is more favorable. The rolling resistance is greater with three axles than two but on highways this should be more than compensated for by the greater torque of the engine in the 2½-ton truck. On the other hand, with the 1½-ton truck we have about 57 lbs. of truck per foot-pound of torque, while with the 2½-ton truck the ratio is 77.5 lbs. of truck per foot-pound of torque. The test should prove interesting and instructive.

The ½-ton chassis is of interest. The first column of Figure 1 shows the various uses of this chassis. We will use it with the command car body for command and reconnaissance purposes. Examination of the data on this truck discloses a flotation generally inferior to any vehicle listed (attention is invited to the fact that in soft going we use dual tires on the front wheels of prime movers). The ratio of weight to foot-pounds of torque is 35 to 1, much better than those already considered. Also part of the load—personnel—can be readily removed and assist as motive power. The top speed available is 56 miles per hour while the speed in lowest gear at the RPM of maximum torque is about 3.5 miles per hour.

The four-ton vehicles are to be used as prime movers for the 155-mm. howitzer. There is little to choose between the flotation of the two. The transfer case and propeller shafts are identical. The axles are the same except for gear ratio. Clutches and transmissions are adequate for the torque transmitted.

The Autocar engine has 447 cubic inch displacement and develops 106 horsepower at 2400 RPM. The White engine in the Indiana has a displacement of 362 cubic inches and develops its 109 horsepower at 2800 RPM. The Autocar engine develops a greater torque, 320, than the Indiana, 285. The White engine in the Indiana is a higher-speed engine than the Autocar. The difference in engine speeds accounts for the difference in gear ratios. Sixty-nine of the Indiana and eight of the Autocar will be issued to the medium units of the Field Artillery.

All the vehicles discussed are capable of all-wheel drive. When traction is good the front axle drive can be declutched. The front axle driving ends are of the constant-velocity type, designed to operate at a cramping angle of 30%. Better service will be obtained if the angle is further limited. If the steering stops are set so as to permit the full 30 turn, then when the vehicle is driven into a curve the surge on the outside spring can cause a momentary operation greater than 30%. This has been the chief cause of front-end steering troubles. It should be checked carefully.



*Four-ton Autocar showing winch*

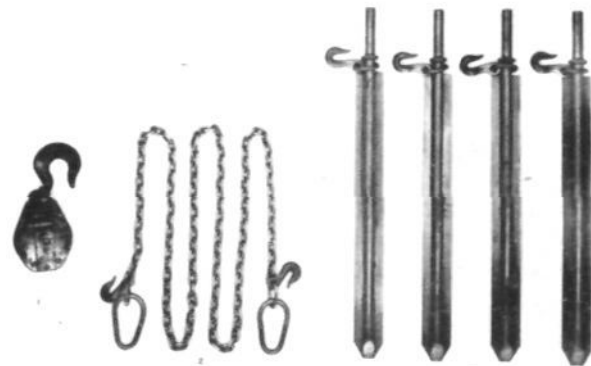
With this purchase of prime movers the Field Artillery is being furnished a front-mounted winch. It is hoped that this unit will make it possible to dispense with the battalion commander's pool of tractors; traction devices may possibly be eliminated also.

The greatest tractive effort which can be exerted by a motor vehicle is generally considered to be 60% of its gross weight. Under unfavorable conditions of traction this pull will be reduced—perhaps becoming zero.

On the 1½-ton and 2½-ton trucks the winch is capable of exerting a pull of 10,000 lbs. On the 4-ton trucks the pull is 15,000 lbs. This pull only occurs on the first layer of cable; as the drum fills up the pull is reduced. The ability of the winches is much greater than the figures mentioned. The limit is determined by a shear pin placed in the winch power train. Extra shear pins will be provided.

The limits were set due to the reluctance of the vehicle manufacturers to install the winches. They feel that, if the full capability of the winch were to be used, particularly if the winch were improperly used, serious damage would result to the vehicle. The manufacturer is required to guarantee the vehicle for one year or 4000 miles, whichever occurs first.

Should experience show that a greater pull is desirable and safe it can be had by change in the material of the



*Auxiliary winch equipment for 1½-ton and 2½-ton trucks (4-ton equipment differs only in size)*



1 1/2-ton 4 × 4 Dodge Prime Mover

shear pin. Both the winch mechanism and cable permit a greater load.

On the end of the cable is a four-foot length of chain. To use the winch the cable is pulled off to the front and the chain hooked around a tree or bush. The hook of the chain should never be put over the cable as this will create a sharp bend in the cable and a source of weakness.

In using the cable care must be exercised to prevent kinks, and the pull must be applied as a steady load, *not* with a jerk. Do not permit the cable to be used for towing because inevitably it will be subjected to jerks which will surely break it. Use tow chains for towing.

In case a tree or bush is not available an anchor can be fixed by driving the stakes, furnished with all winch trucks, into the ground. The number required will depend upon the nature of the ground.

In applying the pull of the winch, care must be exercised that the pull is not downward. The data in Figure 1 shows that the front axle of the 1 1/2-ton truck, for example, has a load capacity of 5000 lbs. The weight on the axle is 4500 lbs. It would, therefore, not be difficult to overload the axle.

Examination of the photograph will show that the cable runs on to the drum from below. A guide is provided to prevent the cable from jumping off the drum but care must also be exercised to prevent it. A roller is provided under the front bumper and between the guides so that the cable will not wear grooves in the bumper. The bearings of this roller should receive some care.

With each winch truck will be issued four anchor stakes, a snatch block, and a tow chain.

A manual covering the use of the winch equipment is being prepared at Fort Sill. It will be published as a Quartermaster Technical Bulletin and will be available for issue when the trucks are delivered.

In general, it should be remembered:  
 Always pull steadily to the front.  
 Permit no kinks in the cable.

If the cable winds on unevenly take it off at the first opportunity and wind it back on under tension. (The pull of two men is sufficient.)

Do not use the winch so that a downward pull is exerted.

So we have our new fleet: For the Army, 13,000 trucks, 2 1/2-ton and less, of two makes, and three chassis types.

In general the units are better than those we have had. The torque delivered by the engine in the 1 1/2-ton truck is better than any we have had in this size. The winch equipment should be a decided improvement. The Field Artillery has gone along with the Standardization Program. The field artillery combat trains and all arms and services are being equipped with similar vehicles. From the broad point of view maintenance should be simplified. From the Field Artillery point of view the question is, do we have the mobility we *need* within the Program?

There is one other feature, common to all the trucks, which can be of real practical value: To the dash of each truck will be attached plates which will inform the driver on certain important points in connection with the operation of the vehicle.

Figure 4 illustrates some of these data. The 4-ton vehicles have a tachometer on the dash. If the vehicle is driven so that, irrespective of the gear selected, the engine is never operated above the safe maximum RPM better operation will result. The 1/2-ton, 1 1/2-ton and 2 1/2-ton vehicles do not have the tachometer. Instead, a speed caution plate is installed. With properly trained drivers this plate should be as effective as the tachometer.

The purpose of this caution plate is to indicate what maximum road speeds in the various gearshift combinations will result in safe *engine* speeds. Violation of the speeds indicated not only will void the manufacturer's guarantees but will indicate lack of skillful use of the equipment furnished. Let us consider the 1 1/2-ton truck.

Figure 3 shows the various overall gear ratios available (includes the gear reduction in the axles).

The overall gear ratio is the ratio of the number of



turns of the engine to one turn of the vehicle wheel. In fourth gear, transfer case in high, the engine turns over 6.6 times to each revolution of the wheels. In first gear, transfer case in low, the engine turns over 78.99 times while the wheel turns once. Thus the gear ratios enable the engine to develop its power and apply it to the wheel at some preselected rate. The operator selects a gear depending upon road conditions.

What artilleryman has not, at some time, taken a pole and used it to pry up a gun or truck? The longer the pole the easier it is to lift the gun. The gears in the transmission, transfer case, and axles are levers—continuously acting levers. The higher the gear-ratio number the longer the "pole" and the easier it is to lift the load, that is, turn the wheels. Levers or gears multiply the force or torque applied.

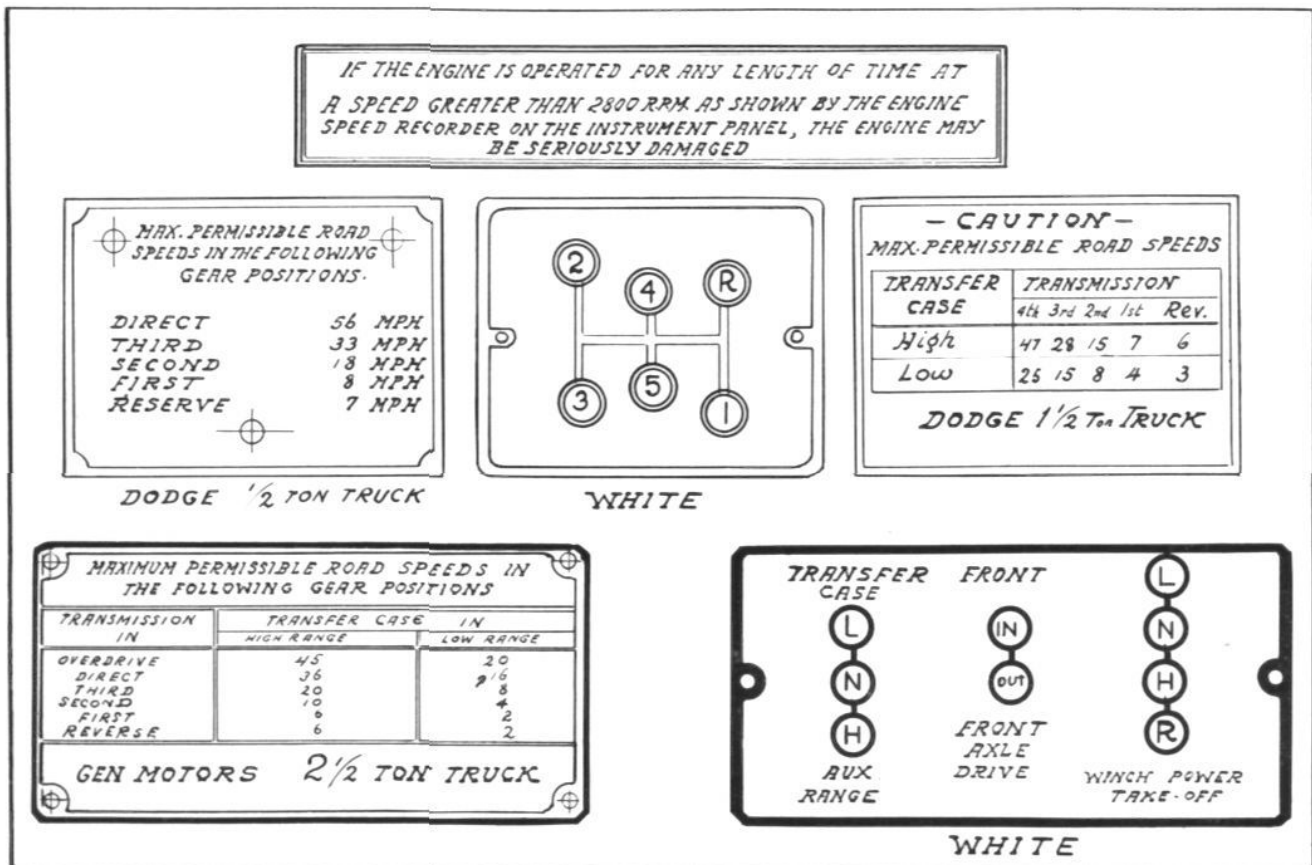
Study of the data shows a prime mover possessing two operating possibilities. We have a gear range for good roads, giving us vehicle speeds from about 2 miles per hour up to 45 miles per hour and a cross-country gear range giving speeds from about 1 mile per hour up to 24 miles per hour. We might call these the Strategic Range and the Tactical Range. The vehicle can operate with a column of marching infantry either on the highway at 2½ miles per hour or across country at 1½ miles per hour. The engine speed in either case will be near the speed of maximum torque.

With the transfer case in high range the prime mover and gun can negotiate a 3½% grade in 4th gear; an 11% grade in 3d gear; a 20% grade in 2d gear; and a 41% grade in low. These figures indicate a fine ability for any road.

In 4th gear at an engine speed of 1200 RPM—the speed of maximum torque—the vehicle will be travelling about 18 miles per hour. Figure 4 shows that a road speed of 28 miles per hour in 3d gear is within the engine capability. Therefore, drivers should be taught to shift from 4th to 3d gear when the road conditions pull the speed of the vehicle down to about 22 miles per hour. This practice will tend to make for better motor performance and a higher average road speed. Similarly, gears should be shifted from 3d to 2d when the road speed drops to about 10 miles per hour.

This type of gear shifting requires training and practice. The operator must understand the relation between road speed, gear speed and engine speed. It is accomplished by the following sequence: declutch, shift to neutral, engage clutch and speed motor, declutch, shift to lower gear position, engage clutch. It sounds complicated but can be taught and is a part of skillful driving. Clashing gears indicate unskillful execution.

If this vehicle is operated under such conditions of continuous operation on the highway as to maintain an engine speed of about 2500 RPM, the unit should give





*Pilot model of command car. The production vehicles (Dodge) embody certain modifications and improvements*

a long, satisfactory performance. An engine speed of 2500 RPM will reduce the maximum speeds indicated on the dash plate by one-sixth.

Consideration of the data given and their explanation will show that a fine piece of equipment is being placed in the hands of our light field artillery. It is up to us to display our resourcefulness in learning to use it skillfully. A truck or its driver cannot see a shell hole or a tree stump in the

dark and avoid it, as can a horse. A battery cannot be placed in position with the nonchalance of a lady being driven to the opera. The answer is reconnaissance, reconnaissance and more reconnaissance—much of it on foot "at a gallop." Everyone, especially drivers and mechanics, must be taught the simple fundamental characteristics outlined here, and be drilled in their skillful application.

### WHY ARTILLERY FIRE "NEUTRALIZES"

*The following is an extract from a letter written in February, to a brother in America, by a Finnish infantry lieutenant serving on the Karelian isthmus.—EDITOR.*

Now I know what an artillery barrage is like and if my knowledge ever gets any better, the world will be a difficult place to exist in. Friend Klim Voroshilov has certainly done his best to appease the "Father of Nations" and to slacken his thirst for blood. He has tried and tried again and is continuing to try to break our resistance, but the Russians have been thrown back with bloody heads time and time again. Thousands of them lie bleeding in silent, immobile shapes on these sparkling February snow fields. They share the fate of the other thousands who in former times have invited the carrion birds and wolves of our forests to a feast.

If it were not for that frightful, tearing artillery fire with its rending explosions one would almost have felt pity for the gray Russian masses who in their long overcoats waded up to their thighs in soft snow against the death-spitting mouths of our machine guns.

I am not ashamed to confess that artillery fire to me, as well as to most of the others, is simply revolting. I have not yet suffered from "artillery sickness," although I feel that I could press my hands on my ears and cry out in pain. The explosion of 6-inch shells on the average of every fourth second during nine continuous hours, the incessant detonations, screaming splinters, and blinding bursts of flame create in our bodies unspeakable terror, which can be overcome only by exercising one's entire psychic courage. It is killing to try to be an example to one's men; to joke, suck calmly on one's pipe, while every nerve is as taut as a violin string. We know that if one should for a second give up one's self-control, the hands would begin to shake, the head to nod, and the eyes to flinch, which has happened to several of my men. It is terrible to try to make such a man carry on his duty by encouragement and threats, but so far I have succeeded, and every time prompt action has been required the men have been ready.

If the Russians had been subjected to a fraction of the drum fire that has poured over us during the last twenty-four hours, the entire Seventh Army of the U.S.S.R. would have been in wild, panicky flight toward their steppes. The superiority of materiel and masses is so overwhelming that it is inconceivable how we can stand it, but we do.

# The First Chief of Field Artillery

## FOREIGN MISSIONS

Early in my incumbency as Chief of Field Artillery I got in touch with the Foreign Missions in Washington. A brief experience, however, was sufficient to show that there were only two with whom I would have to deal, as far as field artillery matters were concerned. These were the British and French Missions.

The head of the British Mission was Major General Sir John Headlam. It has never been my good fortune to be associated with a finer man. Both the British and American nations are to be congratulated upon his selection for the task he performed. An excellent "gunner" in every sense of the word, a polished gentleman and a man of tact, with a wealth of knowledge and experience, he construed his work here in America to be that of a friend under obligations to be as helpful as he could. He had been an officer of the Royal Artillery Regiment for many years, had served with this regiment in France, had been Chief of Artillery of the British forces on the famous retreat from Mons, and later Chief of Artillery of the British First Army, and all this knowledge and experience he placed freely at my disposal. On my side, I kept him in touch with what we were doing and proposed to do, consulted him freely, and invited suggestions and criticisms. The British, having gone through an experience similar to ours in having to train a large new army, and their national characteristics being similar to our own, he had an excellent grasp of our problems and a sympathetic understanding. We established at this time a warm friendship which will endure as long as we live.

The head of the French Mission was Colonel G. R. C. F. X. Reille. He was the senior of the four French officers who had come to Fort Sill the previous summer, when I was reestablishing the School of Fire. We, accordingly,

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## Extracts from the World War Memoirs of MAJOR GENERAL WILLIAM J. SNOW

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were already well acquainted when we again met in Washington. But, as neither of us could speak the other's language, there could not exist that frank, informal, conversational exchange of views between us which is so essential to a close understanding. In the early days at Sill the four French officers were useful to me. They did what I asked them to do.

When I became Chief, I found that the French had between seventy and eighty of their officers in the United States, one or more at every field artillery camp, in

addition to those on duty with the Mission in Washington. I also found that several of our field artillery brigade commanders, who were not field artillery officers themselves, leaned tremendously on the French officers, even in a few cases to the extent of practically allowing the latter to dictate the training schedules. This was all wrong, of course. In several communications I tried to show that all responsibility lay with the

brigade commander, and that he had no power to divest himself of it. This was in conflict with the views of the French Mission, who seemed to think that a large measure of responsibility for the American field artillery was theirs. As one of many illustrations of this view I may mention that when the French officers reported to Colonel Gruber for duty at his Sill Firing Center, the senior of these officers stated that he had practically commanded the field artillery brigade of the 89th Division at Camp Funston and now expected to be appointed Assistant Commandant at Colonel Gruber's Center. He was politely but firmly disillusioned and told that, under my policy, all foreign officers were to be merely advisers and not commanders in either word or fact. The situation was aggravated by the fact that nearly all of these French officers, including the head of the Mission, had been but a relatively short time in the service,

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## PART II FORMULATION OF A GENERAL TRAINING SCHEME

Part I described the chaotic condition of the Field Artillery confronting Gen. Snow when he was appointed Chief of Field Artillery early in 1918, and told how he organized his office and set to work to remedy the deficiencies.

were not well grounded in field artillery, had left France during the height of stabilized warfare, and consequently knew almost no field artillery except the trench phase.

These facts, coupled with the different mental attitudes of the Latin and American races, prevented the French from understanding our problem, in marked contrast to the British. But, even worse in their misunderstanding or lack of understanding of our problems, and with their wrongly assumed sense of responsibility for us, they continually interfered with my instructions to Brigade School and Firing Center Commanders. Upon one occasion, a French officer arrived at the School of Fire and had hardly gotten there (having been sent by the French Mission without my knowledge or consent) when he presented to the Commandant a plan for completely reorganizing the school, emasculating the doctrine I was trying to inculcate and substituting a wholly unsound one. As soon as the Commandant informed me of the presence there of what he described as "an ignorant Frenchman," I had the latter recalled to Washington. This interference finally reached the point where these French officers became a positive handicap to the progress of the Field Artillery in the United States, and in August (1918) I went to the Chief of Staff and asked him to take these men off my back by getting every one of them out of the United States. He agreed to call them all in to Washington, where their influence could be minimized. But of course this had to be done diplomatically, with the result that not all of them had been gotten away from troops when the Armistice came and settled our problem. They left the School of Fire on October 2d.

Only indirectly connected with the larger aspects of this lack of understanding of our problems by the French, but as illustrating the different methods of American procedure, an amusing incident occurs to me. We had, by working through President Wilson, secured the loan of some French 75's, and I was very anxious to get these to the Sill School as promptly as possible. One of the stipulations in lending us these guns was that they should be under charge of some French officers and noncommissioned officers. The guns were coming from France, and the French Mission had collected here in Washington the personnel to take charge of them.<sup>1</sup> I agreed to let Colonel Reille know of their arrival, saying that they were expected on, say, Monday.

Then, I regret to say, in the press of work, I forgot all about the Colonel. Sure enough, on Tuesday he came in the office, said that he assumed the ship had docked Monday, the guns would be taken off Tuesday, that he would then take his party to New York City (where the ship docked), load them on a train on Wednesday and start for Sill on Thursday. I apologized to him for not having kept him informed. Then I told him that the guns were loaded on the ship the last thing in France, they were taken off the first thing in New York, they were immediately put on a special

train waiting for them, that the train then started for Fort Sill, and at the time we were speaking it was several hundred miles on its way. In true Gallic style, he jumped up and down and waved his arms, saying over and over: "It cannot be! It cannot be!" It took considerable effort on my part to convince him that this illustration of American hustle was actually true.

It was no easy task even to get sound field artillery doctrine *taught* in this country, much less absorbed. The French Artillery Mission, with its numerous officers scattered among all the field artillery brigades when I became Chief, fought it openly and under cover. Some few regular army field artillery officers, in France, had succumbed to the "newly-discovered" trench-warfare, map-firing, ultra-refinement ideas, and wrote to friends in this country saying our teaching was obsolete, and sent back French literature to prove it. The War College here, not having time to digest the immense amount of printed matter it received from France, merely translated it and distributed it throughout the service. Almost all of it was wrong, or untimely.

Fortunately for me, General Pershing had sent a cablegram protesting against this very character of instruction over here, and saying that it had been given at the expense of the most elementary and absolutely necessary training, and that brigades arriving in France were handicapped by this very instruction they had gotten in the United States.

I, accordingly, supplemented my previous instructions to brigade commanders by quoting parts of General Pershing's cablegram. I also cabled Major ———, who undoubtedly with the best of intentions was the principal offender in France, directing him to send all literature direct to me and forbidding him to send it direct to his numerous friends here. I then went to General March and prevailed upon him to direct the Army War College to distribute no field artillery literature without first securing my approval.

All these actions helped, but the evil was not entirely eradicated until the graduates of the School of Fire at Sill began to return to their regiments and teach what they had just learned. And, of course, with the establishment of the four principal activities under the General Training Scheme, sound teaching drowned out the unsound. The principal resistance to my teachings, after this, came from the French officers on duty with brigades, and these officers never quit.

Sill had three regiments of field artillery for use in the School firing. They were the only really trained regiments in this country. The School could not function without them. It was always my intention to send them to France as soon as I could replace them. This was to be their reward for the wonderful work they were doing. But at the time of which I am now speaking, their relief would have broken up the School. Accordingly, the French Mission, realizing this and having

<sup>1</sup>20 officers, 20 noncommissioned officers, and 60 privates, all French.



*FRUSTRATION*

*Demonstration in driving and draft at Camp Lewis during World War*

failed in their attempts to move me personally, got the French Ambassador to see President Wilson and ask him to order these three Sill regiments to France. Fortunately, President Wilson saw the absurdity of thinking that three American regiments could have any appreciable effect on the Western Front and declined to interfere, and, of course, I explained to Secretary Baker what was back of the Ambassador's request, killing off the American field artillery doctrine.

I may add that, in addition to their effort to hamstring our teaching of "open warfare" in the field artillery here, the French Artillery Mission never let up in its efforts to feed our troops into their army as replacements. This proposition took all sorts of forms, the most specious being for each battery in the United States to send one gun detachment to France for service with a French field artillery regiment, thus acquiring proficiency before the arrival of the balance of the brigade. This was but one of many schemes proposed by the French. But the question of preventing the formation of an American Army, and the use of our troops as replacements has been so well and ably covered in General Pershing's book that it is unnecessary for me to say more about it. In his book he records the English as being just as strong as the French in this regard. Here in the United States this was not the case in the Field Artillery. The British Artillery Mission never broached the subject to me from the beginning to the end of the war. On the contrary, General Headlam was most helpful to me in

every way, even to the extent of getting for me, from the French Mission, information about guns, consumption of ammunition, and the like, which I needed and which the French Mission would not give me.

NEED FOR TRAINING PROGRAM

By the time the replies to my questionnaire<sup>2</sup> were received and I had partly digested them, I had a number of regular field artillery officers on duty in my office. I had, of course, from the day of my appointment as Chief, contemplated bringing such officers on to Washington to assist in the work of the office, but I delayed until I could get a grasp of the situation myself, form some idea as to the kind and amount of work to be done, organize the office tentatively, and so be in a position intelligently to lay out tasks for them when they should arrive. There was such a shortage of trained field artillery officers in our Army that I did not want to take away from the troops a single officer more than was necessary, and the particular officers upon whom I had my eye were doing splendid work where they were. I knew they could not be replaced. They were men who had served with me at different times, whose ability I knew, and who were outstanding field artillerymen.

These officers, and the dates upon which they reported to me, were:

Lieut. Col. George R. Allin ..... March 18, 1918

<sup>2</sup>Covering the state of training of the different field artillery units. See FIELD ARTILLERY JOURNAL, Jan.-Feb., 1940, pp. 8-9.

Lieut. Col. R. M. Danford..... March 16, 1918  
 Lieut. Col. E. L. Gruber..... March 23, 1918  
 Lieut. Col. E. P. King, Jr..... March 23, 1918

I cannot pass this point without pausing for a moment to pay tribute to this remarkable group of officers. They proved themselves, in the large work I gave them, to be men of vision, breadth, and understanding. They were tireless workers, and fully alive to their greatly increased responsibilities. No task was too big for them and no detail so small as to be overlooked. Their work was characterized by energy, efficiency, zeal, loyalty, and ability.

At this point I may state that I had been Chief of Field Artillery for over a month. There were not enough hours in the day to do the things that pressed upon me. This period of several weeks as Chief had also enabled me, by incessant efforts, to get a fairly detailed knowledge of conditions affecting the Field Artillery in the United States, and a general but comprehensive view of the arm's needs in France. As to the United States, I had gotten some data as to the personnel, as to the state of training, as to the amount of equipment available for training, as to the probable rate of production of new materiel, as to rate of shipment of brigades abroad, as to the prospect of organizing new brigades, and so on. As to General Pershing's needs, I had learned of the system of training in France, of agreements with the French to provide equipment to a certain date, of his needs in general, and of the part he wanted us to play in the United States. The requirements, both here and abroad, as weighed against existing assets, showed a dark picture. The only bright star in the whole Field Artillery firmament was the School of Fire at Fort Sill, which I had established and had enlarged to one hundred times its previous capacity (and I had been reprimanded by the then Chief of Staff for my insistence). And even this school I now saw must be doubled in its capacity.

I turned over to the group of officers, above referred to, the questionnaire replies I had received, and certain papers from the Army War College; and then, after giving my views to the group and enumerating the specific activities I wanted to establish, in general terms told them to work out a plan of salvation. And this they did.

Before taking up this general training plan in detail I think we should spend just a moment to see what the Field Artillery then consisted of. And just now I am speaking only of the Field Artillery in the United States, for while that in Europe, of course, also came under the Chief, yet it was being far more ably looked after by General Ernest Hinds, the Chief of Artillery, A.E.F. (and that position could not possibly have been more ably filled), than could have been done from the United States. It may not be technically correct to refer to General Hinds as Chief of Artillery, American Expeditionary Forces, at this date. Our army in France was even slower than in the United States to recognize the necessity of such a position. A Chief of Artillery, A.E.F., was provided for in orders from General Pershing's Headquarters dated February 16, 1918. The duties

of the office were prescribed in orders from the same source dated April 29, 1918, but not issued until May 24, 1918. Under this order, General Hinds assumed office three days later and continued as Chief until the A.E.F. broke up after the war. He had, however, prior to this formal appointment, been practically acting in that capacity. His appointment was preeminently that of the right man to the right place. Later, when I had my first breathing spell, I got more closely in touch with General Hinds, established a regular courier service with him, and my office was enabled to be of much assistance to him from then to the end of the war.

When we entered the World War, the total strength of the Field Artillery was but 275 officers and 5,253 enlisted men of over one year's service. (Compare this with the strength of 22,393 officers and 429,760 enlisted men on November 11, 1918.) At the outbreak of the war, the nine regular regiments were expanded to twenty-one, and about 400 noncommissioned officers were sent to training camps as instructors. Eight Regular Army cavalry regiments were converted into field artillery. Seventeen brigades, or over fifty-one regiments, of National Army field artillery were organized. The same amount of National Guard field artillery was authorized to come into the Federal service. But the National Guard did not have this amount of field artillery, consequently almost all the National Guard cavalry units and some infantry units were converted into field artillery by the stroke of a pen. So also were some coast artillery units, some signal corps units, and other units of the National Guard. And even after all the conversions were made, seventeen National Guard brigades were still only about half-strength in officers and men, and the balance had to come from the Regular and National Armies. I am not writing this in criticism of the National Guard, but rather to call attention to the supposition of the War Department that the Guard was a "force in being" when called into the Federal Service and therefore could quickly be gotten ready for overseas service ahead of the National Army.<sup>3</sup>

<sup>3</sup>If we consider as a trained field artilleryman any officer or man who served with this arm on the Mexican border (and that is a very doubtful standard of training), then the National Guard had 541 officers and 12,975 trained men. These numbers constituted but 18% of the field artillery of the National Guard. The other 82% of the 17 field artillery brigades organized in the summer of 1917 came from various sources, as the following table shows:

Description	Officers		Men	
	Average %		Average %	
National Guard Field Artillery officers and men with previous training by reason of service during Mexican Border Mobilization.....	541	18	12,975	18
Converted National Guard units, officers and men with training in branches <i>other</i> than artillery, by reason of service during Mexican Border Mobilization.....	530	18	12,182	17
"War Volunteers," officers and men <i>without</i> previous military training.....	895	31	34,391	47
Increments from other sources, officers principally from Regular Army and Reserve Corps and men from National Army.....	957	33	12,378	18
Totals.....	2,923	100	71,926	100





*A "Bryan" howitzer—made from a length of wooden sewer-pipe mounted on wagon wheels.*

It was, therefore, put in tent camps and given a generous share of the small amount of available field artillery equipment for training; the erroneous basic assumption remained to plague the Chief of Field Artillery during the entire war. Of the 275 regular field artillery officers, previously referred to, nearly 100 had gone abroad by the time the Chief was appointed. And, if I add that only about a third of the field artillery brigades were commanded by field artillery officers, you have the picture of the mass of untrained field artillery in existence and the paucity of trained regulars to pull it out of its chaos.

Having now glanced at the personnel, we ought to spend a moment in looking at the materiel with which these brigades were training. There was, of course, a shortage of guns,—there was still a shortage when the Armistice was signed. What guns we had were not equitably distributed. About one half of the guns were with the National Guard, which constituted about one third of the number of regiments in training; about one fourth with the Regulars, comprising about one eighth of the regiments in training; about one fourth with the National Army, comprising about one half of the regiments in training. Of course I promptly redistributed this heterogeneous collection of guns, including 8 Russian ones I located at a Proving Ground, so as to give every regiment something to work with besides the pathetic wooden guns they had made, some with a great

*(Footnote continued)*

This table merits a few minutes' study. It shows 18% of officers and men as "trained." There is no doubt (as was conclusively proven by later experience in organizing new brigades at Firing Centers under the direct control of the Chief of Field Artillery) that a really trained nucleus of 18% of both officers and enlisted men could very quickly train the other 82% of enlisted men. But in the matter of officers, 18% of trained officers cannot simultaneously train 82% of untrained officers and an equal percentage of untrained enlisted men, and accomplish real results in any reasonable length of time. Herein lay the fallacy of the War Department's supposition that the National Guard Field Artillery was a force "in being" at the outbreak of the War. It was not! And, if to this inadequate number of trained officers, we consider the inadequacy of equipment and other facilities for utilization in training, and then add the absence of a directing head (there being no Chief of Field Artillery), it is apparent why it took over a year to make a presentable showing in the National Guard Field Artillery, and why some brigades, which came into the service at the outbreak of the war, never got into action during the entire war.

deal of ingenuity in laying devices. These wooden affairs were variously designated by the enlisted men as "Liberty guns" and "Bryan howitzers." Fire-control equipment, such as prismatic compasses, B.C. telescopes, aiming circles, range finders, and the like, was even more scarce, I did what I could to correct this shortage by directing Colonel Gruber to get on the train and go to Philadelphia, New York, and Buffalo, and buy anything in the commercial line he could find that would help us out.

#### FORMULATION OF TRAINING SCHEME

I want now to take up the scheme for training evolved in the newly created Office of the Chief of Field Artillery, and later to discuss the matter of ordnance and equipment in more detail, simply stating, at this point, that there was not a day up to signing of the Armistice when I did not have to work on guns.

The training scheme is too lengthy to be quoted in full here, so only an extract is given. It was submitted to the Chief of Staff on March 27th. In general, it set forth an elastic policy, adaptable to further developments, while fitting the immediate situation:

#### EXTRACT

"A summary of the recommendations, contained herein, is as follows, and the reasons for these recommendations appear in the body of this paper:

"a. That an Artillery Replacement Camp be established at Camp Jackson, South Carolina, detailed arrangements for its establishment to be made by the Chief of Field Artillery.

"b. That a training camp for candidate officers be prepared at Camp Doniphan, Fort Sill, Oklahoma, and opened about July 1, 1918, and that the present plan of training candidates for Field Artillery commissions in Divisional Training Camps be abandoned.

"c. That the School of Fire, at Fort Sill, Oklahoma, be immediately enlarged to a weekly intake of two hundred officers; that, in this enlargement, as much advantage as practicable be taken of existing buildings at Camp Doniphan.

"d. That one brigade training center be established at Camp Jackson, South Carolina, and another at Camp McClellan, Anniston, Alabama; that steps be taken to establish two additional ones as early as possible; that the 81st Division, less the 156th Field Artillery Brigade, be moved from Camp Jackson to Camp Gordon, Atlanta, Georgia (where there is an existing cantonment and consequently no additional construction necessary), and that the 29th Division, at Camp McClellan, be moved to another part of the reservation so as to clear the artillery range.

"e. That, to these artillery centers, brigades be sent complete with both officers and enlisted men for final training prior to their overseas movement.

"f. That the present training camp commanders be directed to recommend for commission, not to exceed 50% of the candidates in the R.O.T.C. on April 15, 1918, and that the remainder be returned to their organizations.

"g. That the graduates of the two Field Artillery training units of the Officers' Training Corps (Yale and Virginia Military Institute), now organized under the provisions of G.O. 49, W.D., 1916, be commissioned and sent to the replacement camp."

The four cardinal points in the scheme for training are:

"a. The concentration of all recruits for Field Artillery, both for replacements in France and for the formation of new

field artillery brigades in the United States, in one artillery replacement camp. In this camp, the men are to receive their preliminary training and be passed through successive stages of training in replacement units.

"*b.* The concentration of all candidate officers of Field Artillery in the United States at one training camp. In this training camp, the candidates are to receive their first training, especially directed toward qualifying them to become officers. Only those who come up to an established standard are to be recommended for commission.

"*c.* The enlargement of the School of Fire to an intake of two hundred officers per week. This is necessary in view of the great need to pass as many field artillery officers through this school as possible before they are sent overseas.

"*d.* The establishment of firing centers for Field Artillery at which the brigades will be given their finishing instructions before going overseas.

"(Note 1): A fifth, but temporary step, is the detail of Inspector Instructors, under the Chief of Field Artillery, to visit brigades as his representatives, and assist in laying out programs in speeding up training.

"(Note 2): An incidental step is the training in both officers and enlisted men connected with motorized regiments; also the training of officers and enlisted men in materiel. Neither of these schools is discussed in this paper, as arrangements are now under way with the Ordnance Department for the early establishment of schools for these purposes.

"(Note 3): Another feature is the continuation of the present school for aerial artillery observers under charge of the Signal Corps, the capacity of which, under recent arrangements, will shortly be enlarged. There are, in addition, various schools within divisions, such as horseshoers, farriers, wireless, telephony, etc., which it is not intended to disturb."

A statement of the reasons for each of the proposed features in the plan was included, together with other matter bearing on the subject.

As time was of the utmost importance and I begrudged every day's delay in securing approval of this scheme, I detailed Major Channing to accompany it personally through the tortuous channels of War Department committees, answering questions about it, giving explanations where needed, bringing to my personal attention obstacles which I alone could remove, and otherwise expediting the paper. A reading of the memoranda filed with the scheme by the different sections of the General Staff discloses a total lack of enthusiasm (to put it mildly) for my plan, and these memoranda were all written after I had done all I could personally to remove objections and to convert these sections to my way of thinking. However, I was fairly successful in clearing the way in all cases except two. One of these was the War Plans Division, and I quote the objection of the Acting Director of this important division of the General Staff:

"(1) With reference to the Officers' Schools, it would seem that, if the present policy of divisional schools in this country and the final schools in France established by General Pershing is to be adhered to, the necessity for the training school for officers, as recommended by General Snow, does not exist.

"(2) With reference to training replacements, the existing policy contemplates the elementary instruction in training camps

in this country, and then completion of the training of men for replacement in the replacement divisions in France.

"The depot brigades were originally meant to be the place where replacements should be given their elementary training. Tables of Organization for Training Battalions were provided for Field Artillery replacements, as well as for Infantry. The construction at these depot brigades (one at each National Army Cantonment) will provide accommodations for an average of 12,000 men each. It would seem advisable to make use of a part of these accommodations for training replacements for Field Artillery. Set aside in two or three or more of these depot brigades enough space to train all field artillery replacements. The cantonments containing these depot brigades could be selected in different parts of the country, and with reference to suitability for training and accessibility. In this way, much transportation would be saved, and the number of men at each training depot would be large enough (say 10,000) to obviate the objections made by General Snow with reference to lack of economy in personnel and materiel.

"(3) With reference to the firing centers, theoretically for the best results, there should be one at each cantonment. As indicated above, it is not believed that these are necessary for the training of replacements. They would be used for completing the training of brigades, already organized in this country and these to be organized in the future. The present policy contemplates that this phase of training shall be done in France. If this is to be insisted upon, in addition to similar training here, then the advisability of establishing such centers may be questioned, because of transportation and time involved, assuming that all brigades must be sent to one or two centers. The question of equipment should be considered also; for, if the training is to be completed in training centers here, it should be done with the equipment that will be used in France. It is believed that these questions, of whether the final training is to be done in this country, and if so, whether the proper equipment will be available, should be settled before the scheme is adopted.

"(4) My recommendations are along the lines above indicated.

(Signed) D. W. KETCHAM,

Col., Gen. Staff,

Actg. Director, W.P.D., A.A.C. of S."

Fairness compels me to state that the members of the War Plans Division had prepared a generally favorable memorandum on my plan, but Colonel Ketcham, the head of the Section, refused to sign it and substituted his own ideas as just set forth. To anyone familiar with conditions as they actually existed at that time, the views set forth by Colonel Ketcham amounted, in substance, to a disapproval of my whole scheme, and to continuing in force the plan which had so badly broken down, which had led to chaos in the Field Artillery, and which was daily getting worse.

I may add that Ketcham's views appealed to the Chief of Staff no more than they did to me. One other objection I was unable to overcome. General McCain, The Adjutant General, objected to the Central Officers' Training Camp. Accordingly, the scheme, with this exception, was approved in full by the Chief of Staff on April 15th. And even this Central Officers' Training School was approved on May 18th. But this delay of over a month soon resulted in a shortage of officers that was never overcome. General McCain's belated agreement to my plan was due to General March's expediting the shipment of divisions overseas, thus creating an unforeseen

situation. The Divisional Officers' Schools were in fact component parts of the divisions for the time being, and the War Department expected that the schools would be completed in each division prior to its sailing for France. But by now setting forward the dates for sailing of these divisions, they would leave before the schools were completed, and the question arose of what to do with them. They must either accompany their divisions to France, or remain in this country. But when a division reached France, its job was fighting and not running an officers' school, so the schools could not well accompany their divisions overseas. On the other hand, since their instructors and many facilities would go with the division when it sailed, the schools if left behind were simply stranded and could not function. But the essential point to note is that my comprehensive scheme was thereupon approved in toto. But before taking up its application I again want to go back.

#### FIELD ARTILLERY SPECIALISTS

Field artillery brigades had as a rule originally been organized as components of the divisions. As drafts of men were received, a hurried effort was made to assign them according to their vocations. The specialist needs of the Field Artillery were neither recognized nor understood by the assigning powers, so that the only specialists we received were teamsters and horseshoers. Radio and telephone men went to the Signal Corps, draftsmen and engineers to the Engineer Corps, and so on. But the Field Artillery cannot function without a wide variety of specialists. Accordingly, in such brigades where its commander knew enough, schools were started to train these men, and as fast as any were even partially trained they were taken away and assigned to Engineers, Signal Corps, etc. This procedure, followed time after time in my brigade before I became Chief, kept me in a constant state of insubordinate complaint and made hopeless the outlook to train an efficient unit. One of my first acts as Chief, therefore, was to appear before the Committee on Classification of Personnel, in the War Department, and convince them that 62% of the field artillery personnel must be men of specialist vocational training. It came as a distinct surprise to them, but they accepted it and we then worked out a table showing the civilian occupations which corresponded approximately with the field artillery needs.

I was unable to think of any civilian occupation that corresponded to first sergeant. In discussing the subject, I made the remark that I had once served under an officer who described a good first sergeant "as the noblest handiwork of God." The Committee replied that they knew of no such position in civil life unless it was an official of the Church; but I declined him, so we left the first sergeant's "previous condition of servitude" a blank.

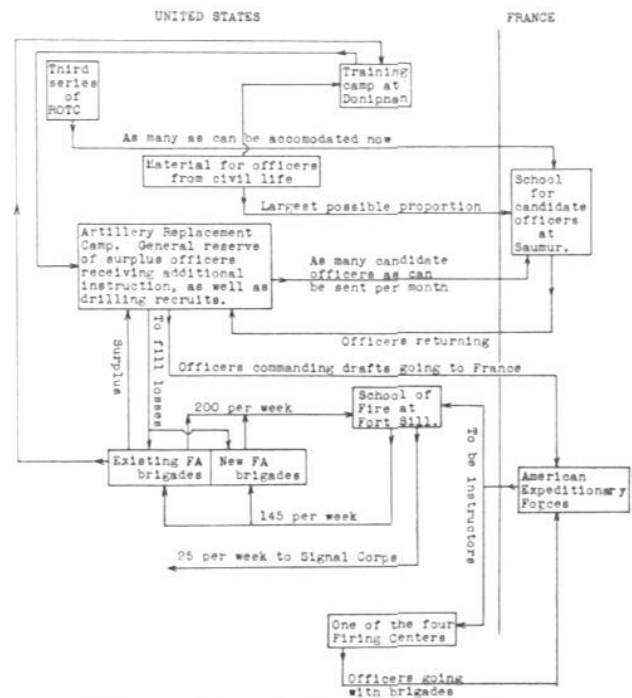
After the publication of these tables the Field Artillery got its quota of specialists from the draft. I promptly stopped

robbing the brigades, except for overseas field artillery replacements, and we began to make some progress.

But think of it! The table is dated eleven months to the day after we entered the war. Eleven months of valuable time gone before the authorities knew or recognized the needs of 62% of the arm, without which the whole 100% would be useless and impotent. *But there had been no one to state the case until a Chief was appointed.* This subject of specialists may be finished up by adding that the replacement depots, when established, took over the work of training these men, and the firing centers specialized on such men as were needed to coordinate the work of the brigade training. In addition, through the Committee on Education and Special Training, I obtained several thousand men from colleges and manufacturing plants, to whom we had to give additional training. Finally, on July 23, 1918, I furnished that committee with an estimate of the number of specialists (108,000) it was to furnish the Field Artillery prior to July 1, 1919. They agreed to do their best to get these men. This Committee's work was of considerable value, and is discussed more fully later.

#### FLOW OF OFFICERS AND ENLISTED MEN

In our General Training Scheme, we incorporated a diagram showing the flow of officers and enlisted men. This diagrammatic flow is shown herewith. These diagrams, which were prepared by Colonel<sup>4</sup> Sherman Miles during the formulation of our Training Scheme, served largely as a basis of that Scheme. Colonel Miles was a field artillery officer on duty as a member of the Army War College General Staff. He brought us the views of that institution and his help to us was very material



*Theoretical flow of officers to and from France, under proposed scheme.*

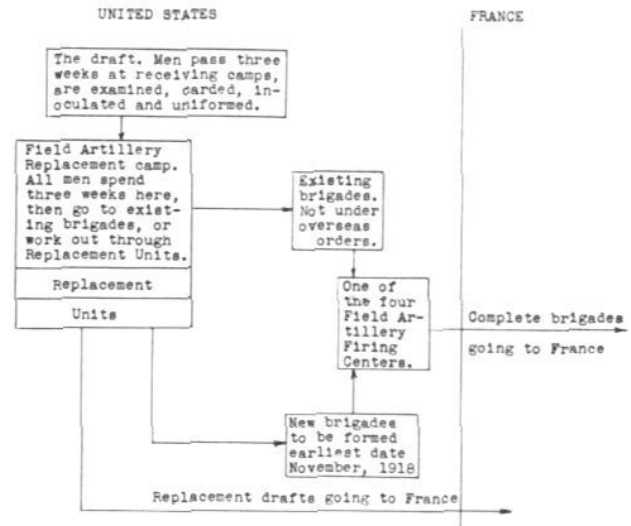
<sup>4</sup>Now Brigadier General, military attache in London.

during our preliminary work. He also assisted us otherwise, including obtaining the views of the Railroad Administration as to the rail facilities at different camps.

The diagrams are really not as complicated as they seem at first glance, and they are worth studying for a few moments. At the time they were made, they looked good to us in all respects. But, actually, things did not work out quite as contemplated. This was due to the fact that the ink was scarcely dry on them when the new Chief of Staff began to speed up the whole war machine to an extent wholly undreamed of before. That threw our training times, as shown on the diagram, out of joint and also necessitated other departures. Thus, the Officers' sheet shows Saumur, France, as the principal place where the raw material from the United States was to be converted into officers. The diagram shows that we were to send to Saumur the "largest possible proportion" of the material for officers from civil life, and as "many as can be accommodated now" from the third series of R.O.T.C., then in operation in the United States, and "as many candidate officers as can be sent per month" from the Replacement Camp. Our idea was that, as General Pershing had created the Saumur School, he had presumably instituted a course of instruction there entirely satisfactory to him and that, consequently, we would contribute the greatest aid to him by simply feeding raw material into this school, rather than by starting a separate school here in the United States, which might or might not be entirely coordinated with his school. We even went so far as to cable him before incorporating in our scheme any school at all in the United States. In his reply he designated the U. S. as the place for the school. This was a wise decision for, under the speeding up which General March shortly ordered, there was neither time nor shipping to send the raw material to France, have it there converted into officers, and then a part brought back to this country for the new brigades we were continuously organizing here. So our Central Officers' Training School (indicated on the diagram as "Training Camp at Doniphan" but later organized at Camp Knox, Kentucky) did the work for us here and also we were able to send a part of its product to supplement the output of the Saumur School. Or, in other words, instead of his sending us junior officers, we were to send them to him. The diagram also shows that, other than the Saumur graduates, the only officers to come back to the United States were those who were to become instructors in the School of Fire and at the Firing Centers. But, in practice, a regular flow of senior officers back to this country had to be instituted in order to officer the new brigades organized here.

If we now turn to the Enlisted Men's diagram, there are two things to note. The first is that in the Replacement Camp, three weeks is indicated as the possible length of training there. This is badly stated. It was never our intention to so limit the time. But we were faced with such a shortage of men at this time that we could not tell how long we could retain men at the Replacement Camp. Hence, we inserted the

figures "three weeks," but fully intending to work up to three months as soon as practicable. The second and much more important point to note in the Enlisted Men's diagram is that the organization of new brigades was contemplated to take place in November; and the insertion of this date was not



*Theoretical flow of enlisted men to France under proposed scheme.*

guesswork on our part. The date was given us by that Section of the War Department General Staff whose business it was to determine such dates. In addition, we checked it up as far as possible in other parts of the War Department. The determination of the right date when we would have to organize such units was of the utmost importance to us. When these new brigades were once started, a part of our inadequate supply of officers, materiel, and enlisted men must be placed in them. And the further off the date was, the greater the amount of our meager resources could be devoted to already existing brigades; and, also, of course, the more time we would have to train such brigades. In reality, we organized new brigades in July and by November had them not only organized, but also had them trained and even awaiting orders for overseas shipment.

However, the changes of times I have indicated in the scheme were really only details in its application and did not affect its underlying principles. The scheme itself was sound and it worked with ever increasing efficiency, as will be shown later. The real significance of these changes in times lay in the extent to which they show how much General March speeded up the conduct of the war. Instead of starting brigades in November, they were a finished article by that time. The truth of the matter is that he brought to the War Department a broader conception of the war than had existed up to that time, and he impressed upon everybody there a full appreciation of the gravity of the situation on the Western

Front with its consequent necessity of ever increasing speed on the part of the United States.

He had hardly assumed the position of Chief of Staff when talk of more speed and more troops was heard on every hand. Early in June the speed of shipment overseas had become so apparent that it became evident to me that we would soon have to organize the new brigades previously slated for November. I accordingly, during the first week of June, twice asked March for information on this subject, calling his attention to the fact that we had 31 infantry regiments of the regular army (sufficient for 8 divisions, less 1 regiment) and no field artillery at all for such divisions. He was fully aware of this fact and said he would let me know at the earliest possible date the result of a study he was having made.

The only disagreeable feature to me in this speeding up of the overseas movement was the embarrassment caused by the poor state of training of many of the field artillery brigades at the time of their departure from this country. It was my custom to send to the Chief of Artillery, A.E.F., a brief statement of the condition of each brigade and these reports were rather discouraging; but they were at least honest. But so much time had been frittered away, before the appointment of a Chief of Field Artillery, that the short time intervening between his appointment and the departure of brigades, coupled with our shortage of instructors and equipment, was inadequate to produce the desired results. Thus the condition of the brigades ordered overseas during the first month (May) under the speeding-up program was as follows:

— Brigade, — Division. "Reported by French Mission as being fairly well trained but filled with recruits."

— Brigade, — Division. "One regiment in fair shape, the other two not well instructed. One in particular had no equipment and so will have to receive complete training with its equipment abroad."

— Brigade, — Division. "Not prepared for overseas duty."

— Brigade, — Division. "Composed of two regular field artillery and one converted cavalry regiment. In a fair state of preparation."

— Brigade, — Division. "Not prepared for overseas duty. Received 41 officers from Replacement Depot just prior to its departure and still had many inefficient officers."

— Brigade, — Division. "Not prepared for overseas duty. Has suffered from lack of efficient brigade commander and competent artillery instruction."

— Brigade, — Division. "No information upon which to base judgment."

— Brigade, — Division. "Not prepared for overseas duty. Discipline only fair. Suffering from lack of competent field artillery instruction."

— Brigade, — Division. "Not sufficient information upon which to base an estimate."

— Brigade, — Division. "Suffering from lack of competent field officers, and filled with recruits just prior to departure."

— Brigade, — Division. "Will have to undergo a long course of training before it can become efficient."

Unsatisfactory as the above extract-reports show the brigades to be, the number of them (11 ordered abroad in

one month) showed a speeding up by General March that fairly made one gasp for breath. Nine brigades (less one regiment) actually sailed that month (May), and the other two sailed early the following month, as did also five additional ones. Previous to this, not more than one brigade had been ordered to sail in any one month, and the total that had been so ordered during the first year of the war had been but seven! This was speeding up with a vengeance—about 1200%.

While not of any special interest to the lay reader and, while also not strictly germane to the present work which treats of only the field artillery while in the United States, yet, for the benefit of anyone desiring to pursue the matter further, we may spend just a moment tracing the status in France of these nine brigades which sailed from the United States in May. A check-up made on July 25th showed the following situation:

(a) All 9 brigades were in Firing Centers, but only 2 were fully equipped. Of these two, I had been in training at the Center for 31 days and the other 43 days.

(b) Of the 7 unequipped brigades, 3 were fully equipped except as to horses and of these the different brigades had 85%, 54%, and 40%; the brigades had been in training 45, 44, and 10 days.

(c) Of the 4 poorly equipped brigades, one was equipped except that it had only 55% of horses, 33% of its 155-millimeter equipment and it had been at the Center for 38 days; another was fully equipped except that it had only 57% of horses and 16% of its 155-millimeter equipment, and had been in the Center 36 days; another had its 75-millimeter equipment and horses, but no 155-millimeter or trench mortar or fire control equipment, and it had been in the Center 33 days; and the remaining brigade which had just gone into training had its full 75-millimeter and trench mortar equipment, but no 155-millimeter or fire control and had been furnished 19% of its horses.

It may be further added that of these nine brigades, four moved to the front in August, four in September, and one in October.

The question naturally arises: "Were there no better trained field artillery brigades than these that could have been sent?" The answer is that the state of training had nothing to do with it. At this time, the field artillery brigade was an integral part of each division and when a division sailed overseas it, of course, took its field artillery component with it. Later this practice was changed, as will be seen in a subsequent chapter.

But, reverting again to expediting the overseas movement of troops, it is no wonder that the governments of Great Britain, France, and Italy thanked the President on July 1st for our rush to their aid.

#### INSPECTOR-INSTRUCTORS

In putting the general scheme for training into effect, the part that got going first was naturally the use of the Inspector-Instructors, as no preparation was necessary before they could begin their work. The idea of now using a few selected field artillerymen in this capacity I got from my four years (1910-14) in the Division of Militia Affairs, where it had originated. Accordingly, I brought on to Washington those officers whom I

wanted and whom I did not already have in my office. I explained to them the situation, gave them verbal instructions as to what they were to do and general suggestions as to how they were to do it, and on April 27th sent them out "on the road" like traveling salesmen. The following were the officers selected:

*Reported for duty*

Lieut. Col. John S. Hammond .....	April 8
Lieut. Col. Thomas D. Osborne .....	April 15
Major Harvey D. Higley .....	April 16
Major Kenneth S. Perkins .....	April 16
Major Fred C. Wallace .....	April 16
Lieut. Col. Charles S. Blakely .....	April 19

I explained to them that they were not to take command; they were to report to the brigade commander and explain to him that they came, not to criticize, but to help; they were to spend several days in determining actual conditions; they were to prepare schedules of training fitted to existing conditions; they were to watch the execution of these schedules; they would give all the information and help they could at all times; they would follow no fixed plan, and make no formal inspections; they would exercise the utmost tact coupled with firmness; and that, having gotten the brigade started along sound lines, they would then prepare for the brigade commander a suggested schedule with which he could carry on until they got around again. When ready to leave a brigade, the Inspector-Instructor would then do two things: First, telegraph my office for orders as to where he would go next; and, second, write me a personal and confidential letter, giving me a clear picture of the condition of the brigade, and everything pertaining to it. I expressly stated I did not want any blank forms used, as they tend to be perfunctory. I wanted these officers to write me just what they would tell me, if we were face to face. These letters were illuminating, and it is with the utmost pleasure that I now pay tribute to the fine work of these officers.

Only one Inspector-Instructor visited each brigade; and for this one man to diagnose its ills, suggest the detailed remedies, actually start this large unit on its way toward efficiency after it had already wasted months without getting anywhere, and to do this tactfully and all in the space of two to four weeks required leadership of the very highest quality.

They, like all other regular field artillerymen, wanted to get to France, and here I was sending them out to half-trained brigades in the United States, and as soon as they had finished with one brigade I sent them to another. It was hard and discouraging work, requiring great tact. So well did they do this disagreeable task that I never received a single complaint from any brigade commander, but on the contrary received numerous

requests from the brigade commanders to assign these Inspector-Instructors permanently to them. My intention was to relieve these officers as soon as I could, and give them good assignments; and certainly they deserved it.

The use of Inspector-Instructors was intended to be a temporary feature only, something to start effective training in those brigades which apparently had been unable to make such a start for themselves. But it proved even more temporary than I anticipated. This was due to the fact that in order to get officers to command the permanent activities of the Training Scheme just approved and also for other reasons, I had to use several of these very Inspector-Instructors. Thus I had to assign Colonels Blakely and Hammond to organize and command Firing Centers, after they had visited only a few brigades. Colonel Osborne, whom I had ordered to duty in my office to be an Inspector-Instructor, never even started on this duty, as I felt obliged to send him at once to organize and command a Firing Center instead.

In response to the Inspector General's request for some excellent field artillery officers to be detailed in his department after the latter had been an Inspector-Instructor less than three months, I reluctantly had to give him Perkins, and equally reluctantly I concurred in the detail of Lieutenant Colonel Francis W. Honeycutt as a member of the General Staff Corps Training Section. I had planned to use Honeycutt as an Inspector-Instructor but, in the effort to leave him with his regiment at Fort Dodge, Iowa, as long as possible, I thus lost him to the General Staff. Although Honeycutt and Perkins were thus in other and different departments during the balance of the war, yet I considered them as practically on duty in my office, and expected to take care of them. Their work was thoroughly well done, and only the coming of the Armistice sooner than expected prevented my attempting to get them released from their respective details in order to reward their excellent work by giving them command of regiments bound overseas.

Colonel Fred C. Wallace was the only Inspector-Instructor who was kept on this duty continuously. Most of the brigades he visited were of the National Guard. There was a request from the commander of every brigade he visited, without an exception, that he be assigned permanently to the brigade. I know of no higher expression of appreciation that could be given his work. Finally I decided that, reluctant as I was to take him from this duty which he was performing so ably, he must be relieved and as a reward assigned to a regiment scheduled for early overseas service. He was en route to join his command when the Armistice came. The value of his work was recognized by awarding him the D.S.M.

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In the May-June issue of the JOURNAL General Snow will describe the organization and functioning of the field artillery replacement depots at Camps Jackson and Zachary Taylor, and will discuss the establishment of firing centers.—EDITOR.



# TWO ENDS OF THE TRAJECTORY

Terrain has a marked influence in the peacetime development of artillery tactics and technique. The methods applicable at Fort Sill, with its fine observation close to batteries in that open, rolling terrain, have produced duties for the battalion commander which, when applied to terrain like that at Fort Benning, necessitate his being in two widely separated places at the same time—impossible.

Situations at Fort Sill where each battery, as well as the battalion, can have a fine observation post, have tended to over-emphasize decentralization. Close country like that which characterizes much of the Atlantic seaboard would place too much emphasis on control by the fire-direction center. Taking both methods into consideration and applying them according to the situation will produce a fairly satisfactory solution. No one method can be a cure-all.

The following method has application under certain terrain and tactical situations and may be of interest to the Field Artillery.

## THEORY OF CONTROL OF FIRE

The application of air-observation methods (where communication is reliable) to forward ground observers is now generally accepted as a simple and effective method of bringing fire to bear on a given target in the minimum of time. This method is based on the theory that the man in front, who can see the target, takes care of his end of the trajectory—the "business" end—while the man at the battery takes care of making the delivery from what might be termed the loading end. The one in front is concerned only with the general location of the battery, which he can ascertain by firing. The one in rear, by shifting the sheaf from a point of common knowledge (a base point or a check concentration) on which some kind of adjustment has, or has not, previously been made, need only convert the sensings he receives to commands.

The results of this method have been, in the great majority of cases, most satisfactory.

The foregoing theory of handling fire is applicable to the maneuver of the fires as well as to the movement of a light battalion of field artillery which is supporting moving infantry either in the advance or in the retreat. The

battalion commander, with the aid of observers, takes care of the business end (point of burst) of the trajectory, and the executive takes care of the loading end. This gives the battalion executive a real job and lightens the load on the battalion commander. If the latter carried out the dictates of our best teachings he would, of necessity, be in the front and rear areas at the same time. This is impossible for him to do, even if it were desirable.

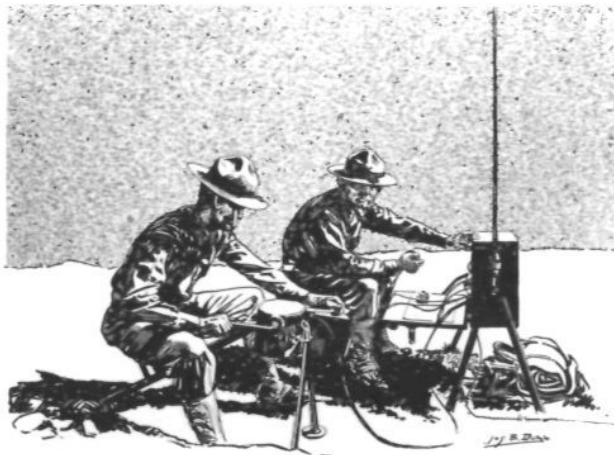
## THE THEORY AS APPLIED TO A MANEUVERING BATTALION

In order to apply this theory there must be available a map substitute such as an automobile road map, having little or no detail, or a 1:62,500 map which, our regulations say, may be obtained for some theaters of operation. It will not be a 1:20,000 fire-control map, of that we may be certain. In a fast-moving situation none of these substitutes will, unless supplemented by air photographs, permit any unobserved transfers of fire.

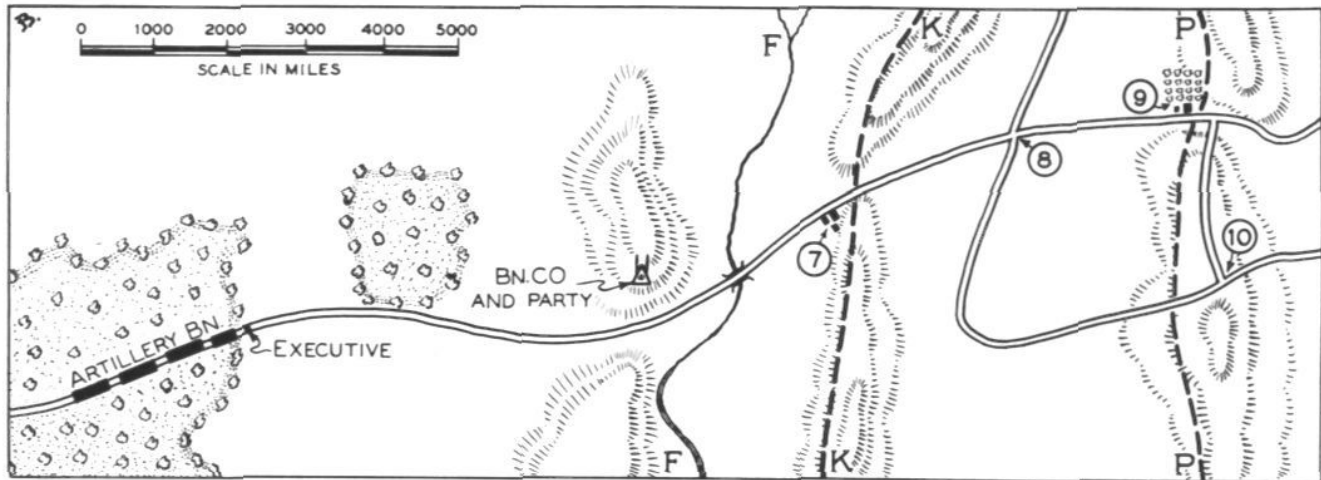
It has been noted that reconnaissance is seldom preceded by a detailed and careful map study. Such a study should be made; it would always save time in the long run no matter what map is used; and it is necessary in solving problems on the battlefield as well as school problems. In the application of the two-ends-of-the-trajectory theory to maneuvering the artillery battalion, map study is most essential.

The battalion commander should study the map along the route of march. He should, as he studies the prospective area of battle, select check concentrations, or index points if you prefer to so designate them, for their ease of identification on the map and on the terrain. In this way the entire terrain along the advance is indexed

**A thoroughly tested method of fire direction for war of movement, discussed briefly by one of the foremost authorities of our Arm.**



for greater coordination between the forward and rear echelons of the battalion as well as between the artillery and the infantry. In addition to these index points the battalion commander should determine the critical terrain features such as ridges, woods, valleys, and the like, which have importance to either our troops or the enemy. He should make these selections in conference with the infantry commander with whom he is to work. If he is to have air observation, the air observer should be furnished a marked map so that he can



*Sketch illustrating application*

more readily take an air photo of the target area. All check concentrations should be given numbers, and the critical lines (lines on the terrain where resistance may be expected) should be given lettered designations, such as AA, BB, and so on.

Letter groups which are included in the fire-control code, such as LL, RR, should not be assigned to critical lines.

For clarity and brevity a radio code should be prescribed for use in the radio communication between the battalion commander and his representative, similar to the following:

Bring battalion forward.....	RN
Put battalion in action.....	PN
Put battery in action.....	RU
Record base deflection.....	ZE
Support attack of.....	ZV
Support defense of.....	ZW

The battalion commander should arrange for necessary communication between the radio set which is with him and a set at the head of the column, if the battalion is in march formation. The details of handling this are beyond the province of this discussion, but it has been done with ease, using the present authorized equipment.

#### ILLUSTRATION OF APPLICATION

All the necessary preliminary arrangements for the control of the battalion by its commander have previously been made. Resistance is met along the line KK (see sketch) and a battery is needed at once. The battalion commander radios, "Put battery in action. Support attack of line FF. Mark No. 7. Can observe."

The executive knows where his end of the trajectory is and acts on the message. The battalion commander knows where No. 7 is, and through this common point of knowledge he or one of his staff controls the fire.

The hostile resistance is overcome and the movement is resumed. Heavy resistance is met along the line PP. The battalion commander radios back, "Put battalion in action for attack on PP. Mark No. 9. Can observe."

The battalion is placed in position by the executive. The fire-direction center should be located so as to be convenient to the three batteries. Batteries may be required to run their own wire to the battalion switchboard. The battalion detail concentrates on getting wire to the battalion commander and his observation.

#### COMMENTS

It is believed that the use of check points and critical lines throughout an action is essential to simplicity and ease of operation, both in retrograde and forward movement.

Through map reconnaissance and the use of the two-ends-of-the-trajectory method in the maneuver of the battalion, the battalion commander is given better control in the initial stages of the action and at the same time has more time to look over the area in which he is to employ the business end of the trajectory. It gives him opportunity to contact the infantry in order to ascertain in what way he can give the most assistance to them. He has a definite job for his executive.

The battalion commander may not approve of the positions selected by his executive, but time is a major element and the criterion is the prompt delivery of fire from positions from which the missions can be executed. During the march an alert executive will continually arrange to have reconnaissance made for gun positions.

The method described has its greatest advantage when flat-trajectory guns are employed in thick country. The very flatness of the trajectory precludes the batteries being in close proximity to the OP's in country of this type.

The few OP's with which wire communication (or radio) can be maintained must be available to all batteries.



A peculiar feature of modern war is that it has become a war of exhaustion of national strengths. Defeat of the enemy's armies is a means to the end. Until the present century, the customary objective was to destroy the main opposing force — an army, or some fortified place. It was easily identified. If there was more than one hostile force, there were intervals between them, often very wide ones, permitting maneuver and successive concentrations against one force or another.

In general, armies were small compared to the populations of contending states; only a fraction of the nations took an active part in war. Supplies required used to be relatively simple, both as to

variety of weapons and munitions, and as to quantities. Frequently much could be procured locally. If a main army was defeated, there was a possibility that the war would end without further struggle. Battles like Austerlitz, Jena and Waterloo decided the fate of nations in a single day.

Still this was not always the case. Reserves of personnel, resources of war material, and food for civilian populations were sometimes prime factors in deciding wars.

An excellent example is our Civil War of 1861 to 1865. Several of its campaigns had as their mission the destruction of resources. Sheridan's campaign in the Shenandoah valley, Sherman's in Georgia, destroyed resources vital to the Confederacy. Grant's campaign in 1864 exhausted the enemy's reserves, by causing casualties which it was impossible to replace. The richer and more populous northern states could furnish reserves and resources to maintain their armies; the poorer and less populous southern states could only do so partially. By spring of 1865, the forces of Lee were so reduced that he was no longer able to defend his line from Richmond to Petersburg. Lacking reserves, and with resources gone, the Confederate States succumbed.

The World War of 1914-1918 prominently brought to public attention the advantage of having reserves and

# MILITARY RESERVES and RESOURCES

By Colonel Conrad H. Lanza, FA

resources superior to those of opponents. The resistance of the Central Powers in 1918 was broken because of a constant stream of reserves flowing from America to France at a time when Germany had no comparable number of men to meet this condition. Certain resources of Germany at the end of 1918 were approaching exhaustion: No shortage of munitions, but of food for the civilian population. It had taken four years for the Allied blockade to produce this result, but it finally reduced the morale of the people through malnutrition. They preferred revolution with peace to continuing to fight. A combination of lack of reserves and of resources

of food caused the collapse of the resistance of the Central Powers.

In modern times nations *as a whole* engage in war. This has resulted in huge armies, so large that fronts habitually are continuous over great distances, without any particular part constituting a *main* army. The former primary objective of a hostile main force no longer presents itself.

With greatly increased strengths, armies require enormous quantities and varieties of materiel and supplies. Furnishing them is a major, complicated problem. It may be more difficult than the tactical handling of the troops. Unless there are available reserves of men to replace casualties, and of supplies, to continue battles over prolonged periods, defeat may be inevitable, provided the antagonist is not in the same situation. The reserves which fill gaps caused by losses in action, and the resources of food, munitions and supplies, are true main forces. They determine how long a war may continue.

No general staff omits to consider reserves and resources as major factors of war. Strategical aims are no longer limited to defeating the enemy's *main* army in planned battles. Battles are now fought primarily to exhaust the enemy's reserves and/or resources, or to deprive him of areas from which he can obtain them. Without

Sanctions, embargoes, and blockades have failed to keep the "Have-not" nations subdued. Neither does possession of a vast store of gold assure victory in modern war

reserves and/or resources, it is impossible to proceed with a war, always provided the antagonist does not himself become exhausted.

There are variations to this problem. First we have Powers which have reserves of personnel, and control all, or nearly all, of the essential resources required for their own needs. The United States, the British Empire, and the Russian Soviet belong to this class. These nations do not fear an economic blockade. They have strong armies, navies, and air forces, which make it improbable that an enemy could impose a blockade which would be effective. Through resources, owned or controlled, they could carry on for a long time. A short war would not necessarily be to their advantage. Some writers have recommended that their best policy would be to avoid an early decision, but rather hold, and counterattack after an aggressor has exhausted his own reserves and resources in a lengthy and inconclusive war. Recent campaigns in Spain and in China indicate that a short, rapid war may not be practicable even for armies and air forces which are greatly superior. If this will be true in the future, it might be possible for nations having sufficient reserves and resources to prolong a war against opponents with limited means, and who could be expected to exhaust these in a fruitless offensive. For example, this is the hope of China in its present war against Japan.

Powers in this class, if they so choose, need provide only such forces as will defend frontiers, and maintain necessary lines of communication, including those overseas. This view does not admit the possibility of an aggressor securing a decision through superior air forces. Opinion at this date is that an aggressor could make matters quite unpleasant through bombing, but could not win a war solely by this method.

A second class of Powers has considerable resources, but not enough to fight without dependence upon others. The French Empire is in this class. Best solution for this case is to be allied to one or more Powers, who can supply the missing resources, and which in return would benefit through an alliance by a decided increase of military, naval, or air power.

A third class, and the most numerous one, is composed of those states commonly known as the Have-Nots. These include large and small states who lack reserves and resources. Germany, Italy, and Japan are in this class; they do not lack reserves, but they do lack resources. Most of the other nations lack both reserves and resources. All have learned the lesson, demonstrated by the World War, that an economic blockade may be disastrous to a country dependent on supplies obtainable only from abroad. These Powers would not risk a major war unless they believed this defect had been corrected. They had previously arranged to do so by:

- a. Minor wars; securing new territories which provided new reserves and resources, and incidentally desirable military bases.
- b. Securing allies, having additional reserves and resources.

Germany, Russia, and Italy increase each other's reserves and resources.

- c. Autarchy, or manufacture of substitutes at home. If cost and man-power can be met, substantial results can be accomplished in this way.
- d. Collecting and storing supplies in advance of wars.

The great democracies which have heretofore owned or controlled the stocks of raw materials in the world have counted on using sanctions, embargoes, and blockades on nations hostile to them. Sanctions have been tried against nations, not declared enemies, who were engaged in enterprises disapproved of. Everyone will remember efforts made to stop Italy in her war with Ethiopia, later to prevent Japan from receiving war supplies during her war with China, while freely permitting the latter to obtain what she needed.

Contrary to expectation, sanctions have not worked. They have not restrained the aggressors. The generally offered explanation has been that the sanctions were not sufficiently severe, or were not continued for a long enough time. Consequently, in war blockades it has been announced that it is expected that they will require maintenance for a number of years, and they have been made more severe. It remains to be proved that they will have the desired effect against nations who have prepared for them.

Indeed, sanctions had an opposite result to what had been foreseen. Instead of preventing war, the possibility that they might do so, and thereby prevent poorer nations from securing what they considered as their legitimate aspiration, have spurred the latter to engage in wars and to obtain increased reserves and resources. Certain of these states, reorganized into totalitarian states for efficiency in war, have made substantial progress in this direction. They may succeed in freeing themselves from dependence on nations who have been employing sanctions in peace and using blockades and embargoes in war, and who in doing so were under the belief that the world's peace could be preserved in this manner. The great stocks of food and resources prior to and during the World War were either in the possession of the United States, the British Empire, or the French Empire, or access to them was controlled by their vastly superior navies. The Versailles Treaty assumed that this would continue to be the case in the future, and that consequently the three great Powers, provided they agreed among themselves, could stop any major war among other nations by throttling off food, oil, copper, nitrates, and a host of resources absolutely essential for modern war. It looked like a good idea—worth trying. The only thing wrong with it is that it hasn't worked.

During the twenty years which have elapsed since the World War the more important of the poor states have been engaged most industriously in improving their economic conditions. They have made such progress that it appears probable that the totalitarian states may have sufficient reserves and resources to enable them to wage war regardless of sanctions, embargoes, and blockades.



Signal Corps, courtesy "The Military Engineer"

*Warehouses, Ammunition Depot, Mehun-sur-Yevres, Cher, France, 1918*

The great surprise connected with sanctions has been that the stopping of financial assistance, credits, and loans (which have been in effect for several years) to totalitarian states has not interfered with these aggressive states. This was unexpected. How did they do it?

#### GOLD AS A RESOURCE

Many writers have expressed the belief that because certain nations have but little gold or foreign exchange they would be unable to wage a major war. Conversely they argued that other nations who have large amounts of gold would be able to do so. The conclusion, largely believed, was that the great democratic nations, the British, French, and Americans, who between them own nearly all the gold in the world, were in the long run bound to win a war in which they were involved. The only danger, and to be carefully guarded against, was to avoid being overwhelmed by a surprise attack, or a first overwhelming rush of aggressors. This is a dangerous argument, which has not been proved.

Resources and man power are absolute essentials for waging any war. Disregarding for the moment man power or reserves, the resources needed are *war* resources—articles and services for the fighting forces—food, weapons, ships, planes, ammunition, oil, lubricants, clothing, and other articles directly utilized to live and fight with. Manufacturing, distributing, and transportation establishments for supplying these things at the right time to the right place are also resources.

It is immaterial whether resources are obtained by purchase with gold, through foreign exchange, or by some other method. If they can be provided, war may continue.

Gold has no direct military value. Military forces do not use gold for combat purposes. Its value lies only in its ability to exchange it for articles which are really needed. If weapons, munitions, and the like, can be obtained in some other way than by purchase with gold, gold ceases to be necessary.

For a nation dependent for resources upon foreigners who will accept only gold in exchange, gold is a war

resource. Democratic nations insist on payment in gold for sale of their products to other nations, particularly to totalitarian states. As a result they are receiving and accumulating gold; may do so for yet some time. In this case gold is at least temporarily a resource for states who do not now have, or are unable to produce, certain required war supplies.

Japanese liners crossing the Pacific usually carry boxes of gold to California to pay for oil, cotton, iron, and other war resources which Japan still imports. It appears that this gold is obtained by mining, through exploitation of a program for developing gold fields in Manchukuo, Korea, and Japan; and a scheme which is to continue for several years to come. Little of this gold is used in Japan. Its mission is for shipment to the democratic powers in exchange for articles not yet obtainable locally. It is hoped by Japan that this situation can be changed within the next few years, when supplies needed for war will be secured from new territories added through recent military operations.

The Russian Soviet seems to be following a similar policy. It mines gold on a scale sufficient to enable payments to be made in gold for imports, regardless of former required exports. Wheat and oil can be used at home, instead of to secure foreign exchange, now obtainable from the sale of products of gold mines.

In Spain, the Loyalists had large gold and silver resources—still had considerable when the war ended. The Nationalists had neither gold nor silver; nevertheless they won, having obtained desired resources mostly by barter for agricultural and mineral products.

The great totalitarian states of Germany, Italy, and Japan are making progress in securing real war resources by methods other than by exchange for gold. They are increasing their manufactures; raising more crops; seizing territories producing resources; finding allies having complementary resources which the states involved can exchange among themselves; bartering other articles with neutral states. It seems probable that within a measurably short time the totalitarian states will be independent of the gold nations, and will be able to carry on with

little or no gold. They are advancing in this direction faster than is generally realized.

It has been claimed that the diminishing quantities of gold resources among the totalitarian states may force these nations to some policy of desperation, or of surrender to the wishes of the gold-holding democratic states. This theory remains to be proved. For a considerable time, Italy, Nationalist Spain and Japan have waged fairly large-sized wars, while Germany has engaged in extensive armament and fortification programs for years prior to the present war, without use of gold within their own countries.

It would be safer not to assume that in major wars, resources of gold are essential. Iron, cotton, oil, and so on, are certainly essential, and if nations can secure such articles, gold will not be needed by them. Because the democratic nations have plenty of gold, they find it convenient to use this metal for financing. Other states with little or no gold have adopted a different solution. It will be dangerous to proceed with a war under an assumption that the solution of the totalitarian states as to finances will not work. Contrary to opinions freely offered, it has worked under difficult conditions up to the present time, and may continue to do so.

The present situation is in some respects not unlike that of the Roman Empire in the fourth and fifth centuries. The Romans had gold and wealth. They believed that the poor states bordering them could not be very dangerous. But gold and wealth did not save the Roman Empire; by themselves they may not save the democratic states.

When trade was free, and no nation produced all the resources it needed, gold was an essential resource. It may not be so for countries who do not use foreign imports. Gold, then, is not necessarily a war resource. When it is, it is only indirectly so, because some one is willing to receive it in exchange for iron, cotton, oil and other articles, raw or manufactured, which are the true war resources.

It now seems possible that certain totalitarian states, notably deficient in gold stocks, may have evolved a method of financing which does not need the precious metal as a base. They are using gold at the present time to buy supplies which they still obtain from the democratic states. Part of the gold they so require they produce, and part they obtain by sale of exports in excess of imports. They plan to provide essential resources within their own territories, or in contiguous friendly states, and thus avoid necessity of imports from the democracies, within the shortest possible time.

*No assumption should be made that possession of most of the gold in the world will confer any especial advantage.* The principle that the armies must have resources to enable them to fight is more than ever correct. The application of this principle has changed. It is not necessarily true that resources are obtained mainly through gold or gold loans.

## FOOD RESOURCES

The amount of food produced in peace can not be counted upon as continuing when at war. Farming suffers adversely from withdrawal of labor to serve with the military forces and to work in war industries; through decrease of farm animals due to demand of armies for horses, mules and meat; to rises in wages. Inability to obtain farm implements and fertilizers, or reduced quantities thereof, either because of actual deficiency or inflated prices, may cause a reduction of yield per unit of area planted. Substitution of trained farm hands by women, children, or inexperienced help may reduce areas cultivated. For the foregoing reasons decreased yields of agricultural products generally occur in war, and should be expected and planned for.

In spite of this reduced yield, war brings an increased demand for food. Military forces require good rations. Workers are called on for increased efforts; they receive at the same time higher wages, and demand better and more food.

Increased demand for food with a decreased production is the rule when prolonged hostilities are engaged in.

Reference has already been made to the result of food shortage in Germany as causing the collapse of that country in 1918. That was not the only country that then had food troubles. Food shortage was a prime cause of the revolution in Russia. Great Britain had a serious shortage of food supplies, and had to place the civilian population on reduced ration allowances. Even the United States had to adopt special measures to conserve its food, and assure a sufficient supply for the military services.

Insufficient supply of food to satisfy the demands of workers and women and children at home may cause, as in 1918, a collapse of social life, create revolutionary conditions, very materially affect a war. General staffs must count, not on the quantity of food products habitually available before the war, but on what is to be reasonably



Signal Corps, courtesy "The Military Engineer"

*Shells Stored in Warehouse, Mehun*



probable after conditions have changed owing to hostilities. Erroneous calculations are dangerous, and tend to disaster. Food should be planned for before war starts, and the quantity to be provided should include a substantial margin of safety.

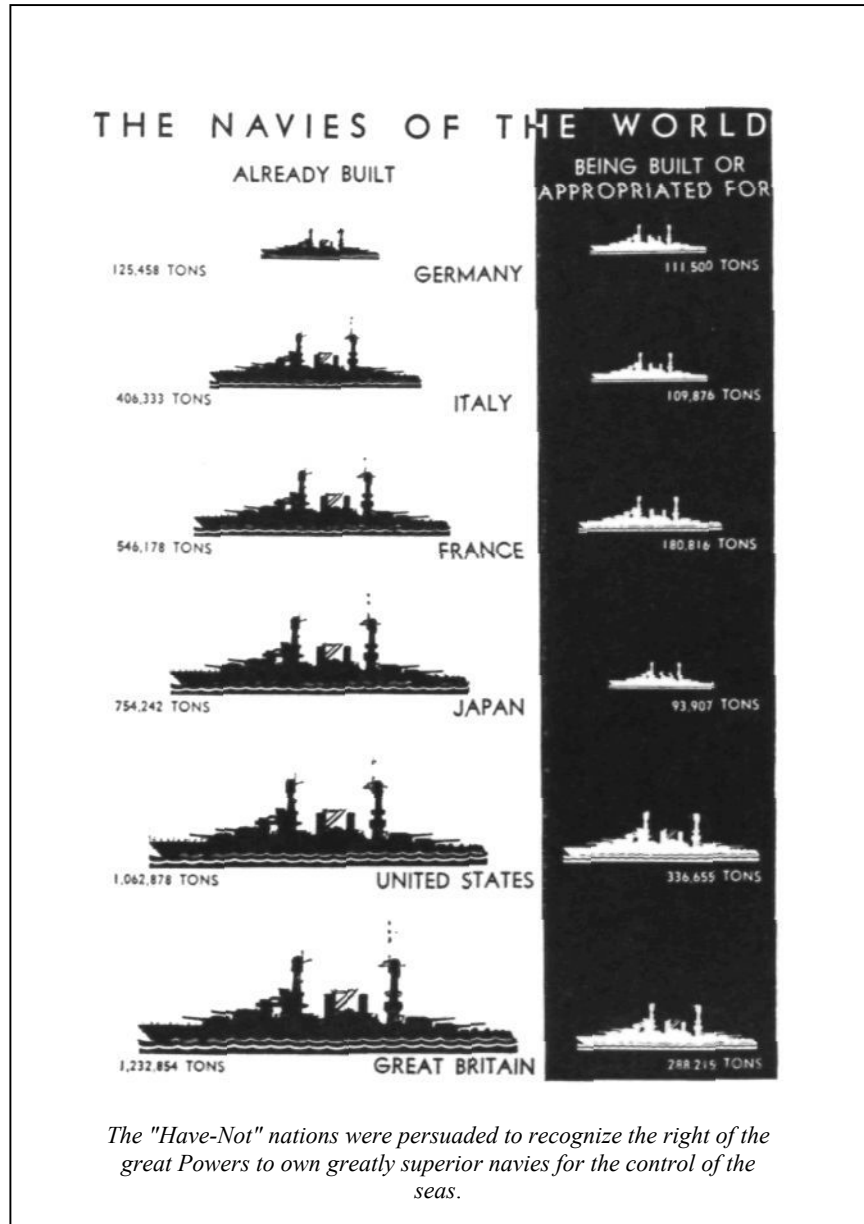
#### SANCTIONS

The World War occurred between nations of a high standard of civilization. Their peoples were able to understand what was taking place. It was clear to all that the possession of superior resources was a deciding factor in winning the war.

In 1919, the winning nations had the superior resources. Geographically the best part of the world's raw materials were within the territories of the United States, the British Empire, the French Empire and Russia. This seemed to be due to natural conditions, and apparently was permanent, provided these favored nations could hold on securely to what they at the time controlled. Russia, through internal struggles, was unable to take part in the preparation of the Versailles Treaty to end the World War; the remaining three Powers conceived the idea that it might be practicable to end war through exercising their control of raw materials and other resources. They proposed to accomplish this desirable objective by refusing to deliver any resources to any nation engaged in a war not authorized by them. Thus *sanctions* were born.

It was assumed that if sanctions were imposed, nations outside the great Powers would be incapable of waging a major war except for a relatively short period. Whenever stocks on hand became exhausted, refusal by the great Powers to furnish raw materials, and/or munitions, would end any war through sheer lack of resources with which to fight.

This new principle of international law appears in the provisions for sanctions embodied as an essential part of the Versailles Treaty. It was a means to end war, except when approved of by the great Powers. The latter would be practically unaffected by sanctions; it was they who had the resources. They anticipated no wars among themselves, and believed it possible, and a duty to civilization, to control other less favored nations through economic pressure rather than by the brutal method of force. With such a policy, the great Powers would need to maintain



only sufficient armed forces to prevent small or poor nations from unexpectedly attacking them, and to maintain control of all sea routes. No forces would be needed for war offensives of a major character. It should consequently be possible to start disarmament; this might gradually extend around the world, and ease an already insufferable tax burden.

In furtherance of this new conception of ending wars, active negotiations were undertaken to induce the poor and small nations to agree by treaty to recognize that the great Powers had a right to greatly superior navies for control of the seas, and at the same time to make substantial reductions in land and air forces. Some progress was had in this direction.

Sanctions in 1919 looked like a promising and easy

way to end war. It seemed relatively simple. Twenty years has shown that it hasn't worked. Why? It was just too simple. It counted upon acceptance by small and poor nations of agreeing to forever afterwards remain small and poor.

When sanctions were adopted in treaty form, and a League of Nations was set up to enforce it, the small and poor nations at once saw the point. If essential resources were denied to them at the will of the great Powers, they would permanently remain in a condition of inferiority—condemned to a status of perpetual dependence. It was no argument that they could buy raw materials or other resources needed for legitimate purposes. The great Powers announced themselves as more than willing to sell anything that could be paid for. They offered to facilitate purchases by a liberal loan policy, made possible by their ownership of nearly all the gold in the world. However, this treatment was contingent on the poor nations accepting the *statu quo*, except as changes might be authorized by peaceful international consent.

Sanctions, and threats of sanctions and blockades, have been the incentive to the poor states to seek economic freedom from the democratic Powers, who between them controlled the important war resources. The democracies had hoped to maintain their authority, territories, and resources, and at the same time exercise a general supervision over the world. They considered themselves the most enlightened nations in the world, and believed this to be perfectly natural and proper. They had expected to use their authority in a generous manner, always ready to consider complaints from small nations, with the understanding that their own superiority should be acknowledged. They thought it possible to avoid wars by the more humane method of sanctions, through control of resources held by them, and if necessary in war by economic control through blockades.

Certain poor (but not weak) states have rebelled against this assumption of authority. Three have changed their government to the totalitarian form, to make it possible to take quick action at decisive moments. By military, political, and economic steps they have already acquired considerable new resources and reserves. They have made a special effort to locate resources available independently of sea lanes which could be blockaded. These states are nearing self-support as to resources, and may become completely so. Obviously in this case, neither sanctions in peace, nor blockades in war, can be counted upon as effective methods to control them. Such states can be interfered with only by military action.

Since 1919, at first quietly, then by minor wars, and finally in a major war, the world has been torn by attempts of certain of the poorer states to reach economic independence through acquisition of sufficient resources as would free them from dependence on more favored nations. The latter on their side have desired to maintain their heretofore undisputed economic advantages which

enabled them to keep less favored nations from growing to such strength as to make their control impracticable and their challenge dangerous.

In this movement the leaders of the poor nations have been Germany, Italy, and Japan. All three have expanding populations, a high degree of civilization, are active, and very ambitious. They seek more territory, more commerce, improved standards of life. They knew the superior strength of the great democratic Powers; had not the slightest wish to wage war with them before they had accumulated the reserves and resources they needed to more nearly approach the standards of their rivals. They believed that if they could by gradual steps, not seriously opposed, reach a position of equality as to resources with the democratic Powers, when that condition was reached, they could receive concessions without waging a major war, the results of which no man would be able to foretell.

Initial steps were to increase their military power with sufficient resources for minor limited operations for acquiring additional reserves and resources. Important stages, which have been accomplished without causing any major conflict, have been,

- Secret rearming of Germany;
- Increasing rearming of Italy and Japan;
- Occupation of Manchukuo;
- Occupation of Ethiopia.

The last two operations promised to provide valuable resources, some reserves, and good military bases. At the same time they produced strong reactions from the three great democratic Powers, with application of sanctions, and threats of further action. The threat, to the poor states, of sanctions was now prominently demonstrated. It had an effect contrary to what was intended. It spurred the poor nations to renewed and increased efforts, to rapidly improve their position so as to be independent of the democratic nations. Following steps were,

- Pooling by Germany, Italy, and Japan of their interests, with coordination of their programs;
- Occupation of Austria;
- Occupation of the Sudeten;
- Occupation of Czechoslovakia;
- Occupation of Albania;
- Occupation of China.

All the countries occupied have important resources; some have reserves; all afford new bases for further possible military operations.

Together with the foregoing political and military moves, resources have been increased by autarchy, including development of home raw materials, and manufacture of substitutes. Other resources have come from excess sale of exports, and the products thus secured have been stored.

This has been an extensive program. It has antagonized the world, particularly in the absorption of small and defenseless states. The former poor nations are no

longer so poor. By their successive advances they have become so strong that it is at present uncertain how the great democratic Powers can in the future control the international situation. Against the three democratic Powers, there are now aligned three other Powers. Germany, Italy and Japan, strong, vigorous, partly intoxicated by really startling successes, seem determined to proceed on a path to accumulate more reserves and resources, so as to bring them to a position of equality in a race for world power. They seem to be willing to risk a major war to accomplish their mission.

It is now easy to see that sanctions have not prevented war. They have caused some minor wars, loss of sovereignty of some small states, and may turn out to be a major cause of a universal war. Some former poor nations are no longer willing to allow the democratic Powers to maintain leadership in the world on a basis of maintenance of the *statu quo* except as modified by international peaceful agreement. They are not willing to acknowledge that the democratic Powers have any right in law to criticize their annexations of other territories or to maintain, as a treaty-right, superior military forces on land, sea, or in the air.

Not only accretions of territory but changes in commerce have been made in the efforts of certain nations to secure additional resources. These states have inaugurated commercial competition to secure major control of trade with neutral countries. They have substituted barter for gold, have guaranteed prices for a considerable time in advance, and have adopted a policy of low prices, as compared with gold payments, and high prices, subject to considerable fluctuation, sought to be maintained by the democratic

nations. Trade with some parts of South America, in the Balkans, and elsewhere, has increased in favor of the barter system. At the same time, the Have-Not nations have been able to abolish unemployment, while the democratic nations have not. The economic principles of this condition will not be discussed here.

Small poor states, not yet connected with any contending Power, are being urged to join one side or the other. Very active canvassing, with most plausible reasons, are being presented. In some cases adherence is desired on account of particular special resources, such as oil, grain, and so forth, which they possess in excess of local needs; in other cases for their reserve man power; sometimes because their territories afford valuable military, naval, or air bases; or it may be only to prevent a rival from utilizing their resources.

The Have-Not states have recently gained largely in reserves and resources. On the other hand, the democratic states have not lost any; their ability to wage war is better than ever. They are not certain that this condition can be counted on to continue for the future. They no longer control all the essential resources, and their armies are not now decidedly superior in strength. They still have greatly superior navies.

What twenty years ago appeared to be a method to abolish war, has instead led to war. Sanctions, blockades, and threats of sanctions and blockades, have had a decisive effect. But not exactly what was intended. They have stimulated certain nations, formerly lacking in resources, to extraordinary efforts to overcome their handicap of dependence on three foreign democratic Powers.



Inter-Continent Photo, courtesy "The Military Engineer"

*Antitank Fortifications in Defense Line of National Belgian Fortification*

Such states wished to be independent. They have declined to appear at the international council table to discuss alleged wrongs. They wish to decide these things themselves, without reference to the democratic Powers. They will fight for this.

Sanctions would have worked, provided the former poor nations had agreed to remain in that status. On the contrary they have declined to do so. They have so far succeeded that the three democratic Powers, who used to be the unquestioned leaders in international politics, now find themselves challenged by a combination of newly formed and allied Powers.

Sanctions have not abolished war; they have instead increased the danger of war once more afflicting the nations.

#### MANUFACTURE OF RESOURCES

Modern war is a war of masses. Masses of men—armies, navies, and air forces; needing huge quantities of ships, planes, weapons, and materiel; demanding stupendous amounts of ammunition, oil, and other expendable articles.

Raw materials have to be manufactured into war supplies and implements. Because of the enormous quantities required for modern warfare, mass production is absolutely necessary. To accomplish this within a minimum time, articles for the fighting forces should be simple and easily produced by the established peace industries. Complicated and unusual articles delay production. Everything to be needed must be arranged for in advance.

It takes too much time to reorganize production of some new article after war starts. In 1917, the United States was given complete plans, and key engineers and workmen, to manufacture the French 75-mm. gun. In spite of the unequalled capacity and equipment of the country's arsenals and manufacturing plants, it took almost eighteen months before the first guns became available.

A nation must be able to produce war quantities of supplies at once upon outbreak of war. It is dangerous to count on stocks lasting until mass production starts at a later date. War waits for nobody. When it comes, it may arrive suddenly, without notice. Factories can not safely be left to be designed and constructed after war commences. A nation which has raw resources, not in a shape to be used, may be helpless against another nation with less total resources, but with sufficient to overwhelm an antagonist having more resources, but unprepared to use them.

Modern war is distinguished by requiring mass quantities of ammunition and weapons. It is useless to claim that in the World War the concentrations of artillery and the amounts of ammunition found to be necessary were due to exceptional circumstances not likely to occur again. More recent wars indicate that, on the contrary, quantities of weapons and ammunition of all kinds required for

modern battles surpass the amounts thought to be unreasonably large twenty years ago.

Articles simple to produce are greatly to be desired, as they may be placed on a production basis within a relatively short time. In 1917 and 1918, trench mortars were in tremendous demand; they were simple to manufacture and easy to provide. No one thought that they were equal to heavy artillery, but it was better to have the trench mortars than to go without other artillery, pending designing, production, and distribution of some superior weapon. Any article which is complicated and requires a considerable time to manufacture must be placed in production before or on outbreak of war. Otherwise, against a nation better prepared, disaster may result. After war commences, new articles not capable of being produced in mass within a short time can not be counted upon to be certainly available.

The tendency now is to maintain military forces, on land, sea, and in the air, at or close to mobilization strengths. This permits war to start by surprise, whenever circumstances are favorable. If one group of states is so prepared, others must be equally so, to avoid being destroyed before they can complete mobilization. To support a sudden war, and to reap advantage from military operations, it is necessary that resources in mass quantities be immediately forthcoming. Mobilization of resources on a mass-production basis effective on date of mobilization is a modern development and necessity.

Nations universally recognize the need of trained reserves, to be ready at date of mobilization. Modern war is a war of materiel. It is equally necessary to provide for mobilization of munitions, weapons, and other manufactured supplies, to be also available as soon as the men are. The latter are helpless unless the resources of their country are furnished in quantities necessary for military operations. It is of no use to start a war by surprise, or to attempt to stop a surprise attack, if preparations are not complete to support the troops with ample quantities of weapons, munitions, and supplies.

Germany has organized its industry during peace on a war basis; it can at any time produce planes, cannon, tanks, ammunition, and other materiel in mass war quantities. Some other nations anticipating the probability of war have done the same thing. Mobilization of industry now commences *before* the war. Any nation that fails to arrange for this is at a great disadvantage against another that has. To be caught, not prepared, by a hostile aggressor who has had the foresight to equip himself with mass quantities of resources, just invites a catastrophe. Battles can not be won unless weapons and munitions in mass are provided in a steady, continuous stream.

The principle of war that maximum forces should be used against the main objective has not changed. But the modern application of this principle counts reserves and resources as part of available strengths. Both reserves and resources must function on a mass basis on

the very day that war commences. If either is lacking, provided the enemy is not in a similar position, the war may be lost.

#### CONSERVATION OF RESERVES AND RESOURCES

In modern war between major forces, reserves and resources are the real main force. Whichever side can longer preserve these two essentials wins. Consequently it is important not to squander either reserves or resources. Their expenditure should be balanced against probable expenditures caused the enemy.

Attention has previously been invited to the loss of the war in 1918, through exhaustion of reserves and partial exhaustion of food. A more recent application of the principle involved that the main force is the enemy's reserves and resources is afforded by a recent campaign in Spain.

During the spring of 1938, the Nationalists penetrated through Loyalist lines to the sea, separating the Valencia sector from that of Catalonia. Valencia was gravely threatened. To save it, the Catalonian army counterattacked across the Ebro River, in rear of the Nationalists. Aply conducted, it accomplished its mission; it saved Valencia. The Nationalists then suspended their advance toward Valencia and undertook operations to reduce the salient formed by the Catalonians south of the Ebro. It required the remainder of the year to accomplish this.

Tactically the Loyalist Ebro operation was successful. It stopped the Nationalist advance for nearly eight months. Strategically it exhausted the resources of the Catalonian Loyalists to such an extent that when the Nationalists started (in December, 1938) an offensive towards Barcelona, there were insufficient resources of ammunition on hand. This was a prime cause of the loss of Catalonia, and of the loss of the war. In numbers, the Loyalists had about as many men as their enemy—they were not lacking in reserves. But with little ammunition they could not effectively fight. The Nationalists had resources; they won. The Loyalists were short of an essential resource; they lost.

The eight months' battle along the Ebro accomplished nothing directly. The terrain was not important; it made little difference who held it. But it exhausted the resources of the Loyalists, without doing so for the Nationalists. If the latter intended this to happen, they are entitled to a high rating for leadership. In modern war, with fronts continuous over long distances, the sector attacked is selected with a view to causing more losses to the opponents than those received. This the Nationalists did. It was apparently overlooked by the Loyalists.

Compare the Ebro campaign with the German offensive in France during the spring of 1918. In both cases the attackers initially won considerable tactical successes. In Spain, the Loyalists expended their resources, and were thereafter decisively beaten. In France, the Germans lost their reserves, and with them

the war. In Catalonia, when the war ended, reserves were available, but resources were insufficient. In the autumn of 1918 the Germans had resources for their army, but no reserves.

Reserves are destroyed by fighting. Considering this point of view alone, if both sides suffer about equal losses, the side with the greatest total man power should eventually win. To obtain a decision on this line, the employment of one's own forces should be where they can inflict greater casualties, while suffering less. Location of the battle may be of secondary importance. There could be several locations, or as many separate campaigns as reserves and resources permit. The more furious the fighting, the earlier will a decision be reached. It must never be forgotten that it is essential that own net losses must be less than those of the enemy.

Resources are destroyed by capturing the areas which produce them, or in some cases by shelling or bombing. They may be exhausted by expenditures in battle. While the source of resources is close to the line of battle, they may be captured while at the same time exhausting enemy reserves and other resources in the battle itself. In 1914 the capture by Germany of the Briey and Lorraine mining areas secured for them valuable resources, while serious casualties were inflicted on the opposing forces.

Where resources are an objective, a geographical region producing them may become a main objective. The old idea that the enemy's main force, and not a geographical area, must be the main objective is modified according to the facts. Resources may properly be a main force.

Reserves and resources have one important difference. Reserves are able to move. With current methods of transportation, this may occur rather rapidly. It enables successive offensives to be launched from widely separated sectors. On the other hand, the source of resources can not in general be changed. Where they are, they stay. Any area containing vital resources may properly be a main objective.

Even nonmilitary writers now recognize that resources are primary objectives. Note in the press constant references as to the next probable mission of aggressor nations being *oil* fields in Rumania, *grain* fields in Ukrainia, *mines* in Spain, and so forth.

It is a strategical question, and a most important one, whether it is better to consider as the enemy's main forces, his reserves, or his resources. He must have both. The absence of either presages loss of the war, provided the other side is not at the same time in the same situation.

In a major war, the principal effort may be against reserves and/or resources. If the enemy is weak in one, but not in the other, it may well be limited largely towards the weak one. So, in China, Japan has operated to deprive her enemy of resources, without which his innumerable reserves are not so important. On the other hand, if fighting a nation with but few reserves, it might be best to wage battles to exhaust the supply of men.

In a world war, both parties will probably have at the start considerable reserves and ample resources. Such a war may last a long time in spite of any desire to conduct it with "lightning" rapidity to an early decision. At first it may be impossible to determine whether it will be easier or more profitable to destroy reserves or resources. There will probably be prompt action against both until there is some indication that the antagonist is becoming exhausted in one or the other. There may be numerous campaigns on land, sea, and air. In 1918, major campaigns occurred at the same time in France, in Italy, and in the Balkans; and the success of each was an essential part of the whole. With increasing man power, resulting from entire nations taking arms, and with vastly increased stocks of weapons and munitions, the future may again show that several campaigns may occur simultaneously. They may all be directed against enemy reserves, or against resources, or some against one, and some against the other.

It has long been the rule to conceal from the enemy, or to mislead him, as to location of numbers of own forces. The reason has been to

- a. Obtain surprise by unexpected entry of forces, not before known to the enemy; or,
- b. To protect own forces from hostile action.

Resources are an important part of main forces. Concealment as to their character, quantity, and location must hereafter be the rule. The unexpected entry into action of some new weapon, gas, or of unexpected quantities of weapons and munitions, is just as likely to favor tactical success as the unexpected entry of reserves. Efforts to conceal probable future resources have already been started. Italy and Japan have announced that to prevent future enemies being oriented as to their resources, they will no longer furnish reports or statistics as to certain items. The list of articles exhibited at the Leipzig fairs in 1938 and 1939 indicate that Germany has resources of substitute materials for textiles, oils, and other things not heretofore produced in that country. They appear to be satisfactory as to quality. There is no reliable information as to how much of these resources are in storage, nor as to their rate of production.

Concealment of production possibilities, and as to quantities and locations of resources, is now regular procedure for some countries. Other nations may be forced in self defense to adopt the same policy.

Dissemination of false information with intent to deceive an enemy is authorized by international law and immemorial custom. To deceive the enemy in war is legitimate. Deception as to resources is as legitimate as deception as to reserves, which has been customary for untold ages. There is reason to suspect that certain countries have not waited for war to publish misleading information as to their resources. This is not limited to new weapons and munitions, but includes raw materials and manufactured goods. Statements as to commerce, especially as to production, should be tested for accuracy

in the same manner as reports received which relate to hostile forces and reserves.

#### SUMMARY

The foregoing principles are a cause of unrest among the great Powers of the world. They are a source of continual and alarming threats of war. There is extraordinary activity to increase reserves and resources, and in attempting to prevent possible future enemies from adding to theirs. Every time any nation, through a minor war, or by diplomacy, secures an accretion of strength by obtaining new reserves and resources, other nations threaten retaliatory measures, and try to obtain some corresponding advantage for themselves. There has never been such a race as is now in progress to obtain greater military strength in reserves of men, weapons, munitions, and in resources of raw materials and of food, to enable the utmost support to be given to vast hordes intended to be organized and utilized in the present wars on land, sea, and air.

The old principle that the enemy's main force is the prime objective has not changed. The application has. In a major war, the main force is now seldom an army, or a part of an army, nor is it some fortress. The real main forces are the reserves and resources. One or the other must be exhausted before victory can be won.

#### COMMENTS

In the present war a decision is at this time being sought by the Allies primarily through an economic blockade. As the enemy is known to have but little gold, it is believed that this will be a serious handicap to him from the start. It further appears that he is going to be short in some essential raw materials, particularly in iron and oil. Estimates have been made, showing the German peace consumptions, the assumed much-larger war demands, and the assumed much-lesser quantities obtainable after a blockade has been established. The conclusion is reached from such studies that after a certain time German stocks will approach exhaustion, and that she must then capitulate. All very true, provided all assumptions made have been correct.

Much of this appears to be wishful thinking—a desirable easy way for rich nations to win a war over a poor one, without sacrificing lives in constant battles. It remains to be proved that it can be done. If the enemy has no resources other than those assumed, and really expends the quantities estimated within a reasonable number of years, it may work. If the enemy turns out to have secret resources, or if his expenditures of resources are less than those which have been assumed, it may become necessary to force him to a higher rate of expenditure. Military action may then be necessary. Battles require huge expenditures; they are the quickest way to exhaust reserves and resources. No assumption should be made that they will not be eventually necessary in the present wars.





## Our Newest Foreign Station

The following extracts from a letter written by Lieutenant Colonel J. A. Hoag, 25th Field Artillery, give a brief description of our newest foreign-service station in Puerto Rico:

"Camp Buchanan is the outgrowth of a small rifle range and CMTC camp, and has been expanded to hold 1500 men. The present garrison consists of the 2d Battalion 25th Field Artillery, 1st Battalion 51st Coast Artillery (GPF), 1st Battalion 69th Coast Artillery (AAA), 27th Engineer Battalion less one company, 33d Ordnance Company, and Medical Detachment. All are under canvas with concrete or wood floors. Lighting is by electricity. All tents are screened, as are the tin-roofed mess halls and kitchens. Each officer has a tent and fly. The men are six in a tent, with the possibility of more tentings making it five. All vehicles and guns must of necessity stand in the open. Much work has been done and is still being done under the WPA to provide hard-surface standings and drainage. I have seen few mosquitoes, but the camp has 40 cases of malaria in the hospital and we are taking daily quinine prophylactic. Buchanan is perhaps twenty feet above sea level and lies between two ranges of low hills which cut off most of the breeze. It is about seven miles from San Juan with excellent bus service at five cents. The reservation is

small but there is sufficient room for battery set-ups on the rifle range.

"Catano and Bayamon, the nearest towns, are each about four miles from camp but are both off limits, the former for malaria and the latter on account of friction.

"Training facilities are satisfactory. From the day we landed each battery has marched 100 miles per week, where possible including an ROOP on each march. There is no government-owned land, and permission to enter must be obtained in all cases. Battalion ROOPs are now run once a week. We expect to fire the remainder of our target-practice allowance in the vicinity of Point Salinas.

"Housing: Apartments and houses are available in the suburbs of San Juan, though practically nothing in the city. Rents run from \$50 to \$125 monthly. At present few are available and the navy people are snapping them up.

"In this climate it is impossible to work men all day. We start before daylight but the late afternoons and evenings are lonesome times for all of us.

"There is a tentative plan, dependent on appropriations for temporary barracks, to move this battalion to Cayey, probably in February, to occupy barracks vacated by a battalion of the 65th Infantry. Cayey (Army Barracks) is in the interior, 1500 feet in elevation, 37 miles from San Juan and an equal distance from Ponce."

# GUNNER IN LUZON

*Editor's note: In previous articles Gen. Scott described the participation of his two field guns in the first engagements of the Philippine Insurrection, near Manila and San Pedro Macati.*

From Manila the northern tip of the island of Luzon is distant about 280 miles airline, its southern tip 270 miles. At Manila the width of the island is about 100 miles—cut to only 10 miles of land by the waters of Manila Bay, the Pasig River, and the Laguna de Bay. The ten-mile land section was an almost impassable mass of jungle-clad mountains and there were no roads or towns on its Pacific side. From Sinaloan on the east shore of the Laguna de Bay a trail led in a northeasterly direction to a village on the Pacific, 16 miles airline, 40 miles on foot. General Hall and his infantry required one week to traverse it in October, 1900, and this without enemy opposition.

Control of the Pasig and the Laguna de Bay meant cutting the Insurgent territory in two. With this in view an old shallow draft side-wheel steamer, the "Laguna de Bay," had been prepared. She was armed and armored under the direction of Lt. Harry L. Hawthorne, 6th Artillery (ex Navy), but manned and commanded by Captain Grant, Utah Light Artillery. She did excellent work in opening the Pasig to navigation, and with some armed launches, in rounding up Insurgent craft on the Laguna de Bay and establishing control of that body of water. In April these light craft towed an expedition to Santa Cruz and Paete, which places were taken, but the expedition returned in a few days and it was not until January, 1900, that troops were permanently stationed there, and the one remaining line of communication between the Insurgents in Northern and Southern Luzon cut off.

The Pasig River is the only outlet of the Laguna de Bay and is peculiar in that its delta is at its origin rather than at its mouth. The delta covers about ten square miles and is traversed by four outlet streams, which, with some considerable streams from the north, form the Pasig River. The latter is nowhere very broad, and since it carries the

drainage of 2,000 square miles of territory that receives a 6-foot rainfall annually, it is both deep and swift.

The town of Pasig stood about half a mile east of the beginning of the Pasig River proper, between the second and third delta outlets. This gave it ready access to the Laguna through channels distant and partly hidden from the heights to the west, where Fort McKinley now stands. Obstructions against possible water moves by the Americans had been put in all channels, some defensive works constructed, and a 7- or 8-inch muzzle-loading gun was emplaced behind a coal pile to command the Pasig. There were no bridges anywhere except a small stone one in the town that gave access to the north bank.

After the defeat of the Filipinos on February 5, it would have been practicable for our forces to go anywhere, with

little likelihood of serious resistance. But the forces at hand were not sufficient to effect a general occupation of the country. Most of them were State troops in Federal service for the Spanish War—not for subsequent commitments; the only replacements in sight were six regiments of Regular infantry and a few batteries of Regular artillery. The only logical policy was the one adopted—to hold Manila securely and await replacements and reinforcements. Except for a salient astride the Pasig River—San Pedro Macati to the Deposito—the lines were practically as before the outbreak.

Withdrawals caused much adverse comment on the conduct of affairs, for which there was no justification. They did, however, give heart to the Filipinos, who probably understood their meaning less than our own grumblers.

It was possible to spare troops for strategic moves and this was done, important points in the archipelago being occupied.

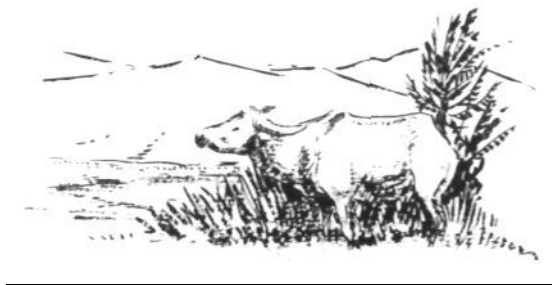
For opening up the Pasig and gaining control of the Laguna de Bay a Provisional Brigade was assembled at San Pedro Macati under the command of Brig. Gen. Lloyd Wheaton. It comprised the 22nd Infantry, the 20th Infantry, the 1st Washington Infantry (6 cos),

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## PART III

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### OPEN WARFARE 1899 STYLE



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By Brigadier General Ernest D. Scott, USA-Ret.

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*Field Artillery Afloat: The gunboat "Laguna de Bay" on the Pasig River*

the 2nd Oregon Infantry (6 cos), a squadron 4th Cavalry, and Scott's Platoon Light Battery D 6th Artillery. The gunboat Laguna de Bay and one or two armed launches are not mentioned in orders, but they assisted in the operations after removing various obstructions the Insurgents had placed in the river and its branches.

Our line, right to left, was as follows: Cavalry, 22nd Inf., 20th Inf., Oregons, Washingtons.

The plan was that our left was to threaten Guadalupe in the hope of holding its garrison, our right to push out and seize the T-Tree Ridge, then swing to the east and north to the Pasig River, effecting the capture of the Insurgent forces in Guadalupe. Intermediate units were to conform. As for my guns, they were to give general support to the whole line—but not fire over our own troops! Later they were to advance through Guadalupe.

The swing was never accomplished. Our left soon advanced and occupied Guadalupe and after our right had reached the T-Tree Ridge the whole line moved in an easterly direction.

The morning of March 13th was fine, and the advance began on time. Captain Dyer with the center platoon came out from Manila to take my place in the cemetery. I fired a few rounds into points on the Guadalupe front where resistance was probable, but our troops were little delayed there. Sounds of rifle fire grew remote; soon I did not dare fire lest it fall in our own ranks. To the south little opposition developed but it was sufficient to make the advance of the green Regulars tediously slow.

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Headquarters, Provisional Brigade, First Division, 8th A. C.

San Pedro Macati, March 12th., 1899.

Lieut Scott,

6th U. S. Artillery.

When the movement is about to commence to-morrow morning, I will telegraph to you to open fire with your guns from Cemetery Hill. Then direct your fire far to the front of our troops on Haystack Knoll, firing on any body of Insurgents you may see provided you do not fire over our troops, and using the greatest care that none of your shots are directed on the vicinity of our lines. When your judgement directs open fire on the Insurgents near Gaudalupe Church and cooperate with Colonel Wholley 1st Washington Vol. Infty., and take your guns to the ridge in your front when it will be safe and <sup>available</sup> ~~possible~~ to do so. When we occupy the ground east of Gaudalupe bring your guns along the river road in direction of Pasig unless you see the enemy on the front and right of Cemetery Hill.

Very respectfully,

*John Wheaton*  
Brigadier General U. S. Vols.

Commanding.

*Facsimile of General Wheaton's order to his artillery.*

For a long time there was nothing to do but look on at this, listen to the receding firing to the east, and wonder if anybody would tell me when to go on after that firing. At last I concluded that it was up to me to do something; the Captain could give the south advance any support it might need, the east advance might need some at any time, the Captain had not been consulted as to my services and would give me neither advice nor orders. So at last I limbered up and took the road through Guadalupe and along the river bank toward Pasig. The river was deep and swift, perhaps two hundred yards broad. Narrow grass fields bordered its opposite side, backed by dense bush on slopes that rose to 100 feet half a mile back—dominating our side. On our side (south) the road was narrow and had been formed by cutting back the ends of a succession of ridges that were perpendicular to the river. They were of the soft rock common in that country, cut by saws, and the faces left were vertical or nearly so, smooth as the wall of a house, and running up to 30 or 40 feet in height. The only escape from the road and the enemy terrain across the river was by the outlets of the valleys separating the ridges. Really quite an ideal setting for massacre!

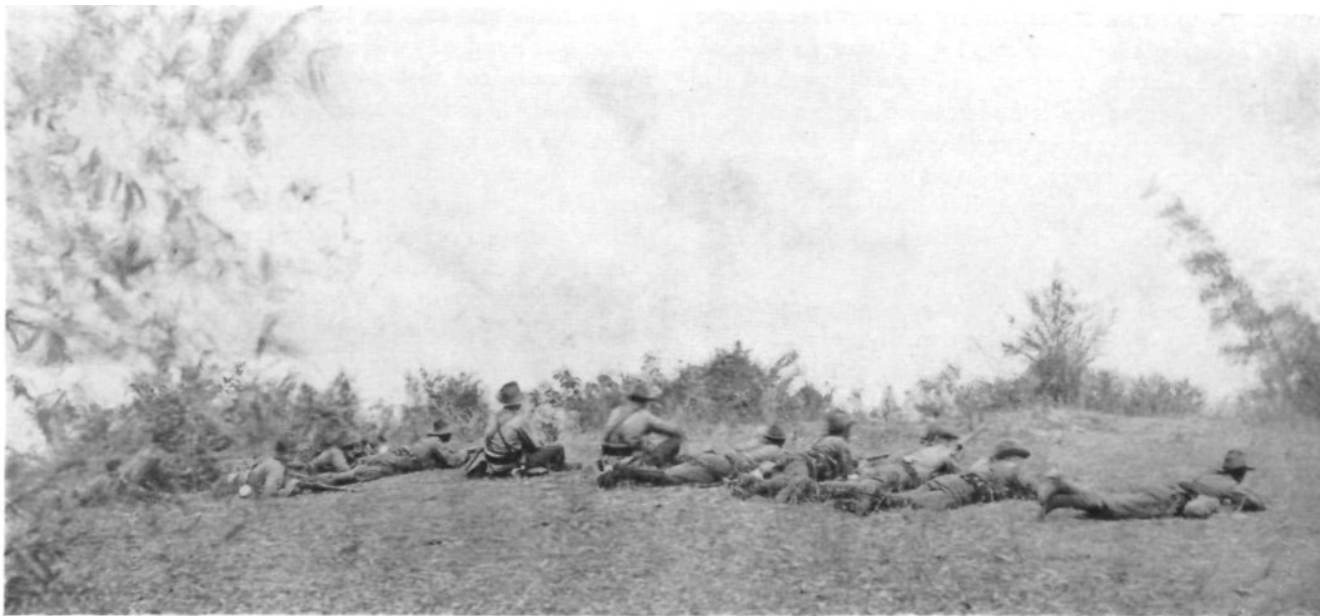
Some small covering forces were clearing the ridge country of the enemy, the remainder massed up near the eastern edge of Guadalupe and waiting. When I arrived there I fell in behind an infantry unit, I think a battalion, that had just started off on the road. Behind my guns more infantry followed. Suddenly the woods across the river came to life and the air was filled with bullets spattering on the roadway and against the vertical cliff on its right. The infantry promptly lay down and returned the fire. I could go neither forward nor back except over the bodies of doughboys! So I executed action left and began "shelling the woods." The mules acted panicky when the firing began but after a round or two settled down to grazing and never thereafter were disturbed by any kind of firing.

The enemy fire soon slackened and eventually stopped, but it was a long time before our column resumed its march. Meantime I climbed up one of the ridges and found a place from which there was a good view over the country north of the river and even Pasig was visible to the east, a couple of miles away. A gun up there might be useful and after much search I found a sort of natural stairway leading to the place from a little gulch that opened on the road near where the guns were. The "stairway" was steep, its steps from two to four feet high! I asked my friends of the Washington regiment to help, and they did. One gun was drawn into the gulch and unlimbered. Prolonges and traces were attached to the gun, poles were used as pries under the axle. By straight manpower the gun was brought to its hundred-foot position. It was a "commanding" position, and the view beautiful. No doubt many Filipino soldiers were on the visible terrain, but none were so obliging as to show themselves. Large forces could have been concealed by

the abundant bush and bamboo. I was told afterward that my gun did "great work," but I cannot now recall anything about it.

Sometime during the day we lowered the gun back into the gulch and followed the road to the Pasig crossing, then south along the Taguig River to nearly opposite Pateros. There was a good deal of firing in that direction and I was told the advance was held up by fire from intrenchments across the river. Leaving the guns under cover, I went ahead to reconnoiter. The firing was mostly by our own men, scattered along the river for half a mile or so. The river here ran southeast to northwest, its banks ten or twelve feet high, the country flat on both sides. The road followed the west bank at from fifty to a hundred yards. Huts and gardens were numerous on both sides. I reached the river bank at two or three points, and from each was able to determine that the insurgent defense was in the form of rifle pits under the huts on the opposite bank. Although little more than a hundred yards away, even movement in the shadow below the huts was hard to observe. But I saw enough and the question was how to attack them. The road offered the only open approach but not even an individual could appear on it without drawing fire from some invisible enemy. I could hardly expect the luck of the morning to hold. Besides, this was a quite different situation—then the enemy was probably without any protection except from view, and the rapid fire from a thousand rifles that was promptly poured into the concealing bush probably sent most of them scurrying far back in its depths. And the 16-pound shells bursting here and there must have been most helpful in expediting the movement. Here, however, the enemy had excellent protection, with a good field of fire. Besides, the afternoon was wearing along and the Americans had shown no signs of trying to cross the river, or assembling any means for doing so, and they must be hot, tired and hungry—quite probably they could be forced to stop there until next day.

At last I looked to the heights that rose a half mile or so to the west and went off up there, and found they gave a good view of the enemy position. We got one gun part way up by mule power and then had to call on the infantry. They (Oregons, I think) responded with alacrity and the gun was taken to the spot now occupied by the Officers' Club of Fort McKinley. The Volunteers also carried boxes of ammunition — and ruined some rifles by bending the barrels in doing so. As my fire would be diagonally across the narrow river and intended to fall on or close to the opposite bank, it would endanger our men, so they were withdrawn back of the road before I was permitted to fire. This was unfortunate, since they could not then see the enemy at all, while from the positions they had occupied along the bank they could have inflicted many casualties on the enemy as they fled from the shacks when the artillery fire began. As it happened, there were no short bursts—rather unusual, I must say.



*Skirmish line along the Pasig River*

From this position it was impossible to miss; hut after hut received a shot. Fire broke out and soon the whole village was in flames. Occasionally, individually or in small parties, Filipino soldiers could be seen making their way rapidly to the rear. Resistance was at an end and the Force began to settle down for a much needed rest.

Later I received an order to report to the brigade commander. He had established himself in a shack roof resting on the ground in the back of a small vacant field, and I was mightily flattered when he rose from his camp chair and came forward to greet me. He shook hands and complimented me on the day's work. As soon as possible I left and tried to get some rest. It had been a long day, I had ridden a pony for miles and walked further—and the latter had involved a lot of hill climbing and working through brush and fences. Besides, a day of danger and excitement of itself means severe mental and physical strain.

The next day a battalion of the Washingtons crossed the Taguig River, partly by swimming, and reconnoitered as far as the village of Taguig, which they occupied. Other infantry units scouted to the south and southwest, and the cavalry had quite a little skirmish on its own to the southwest of Taguig. Probably my command functioned in "position in readiness"; I do not recall any firing.

In the evening all commanders of separate units were assembled and plans made for the taking of the town of Pasig on the morrow. Such conferences were a regular thing in those days and my lowly grade did not bar me from attendance, for mine was a separate command. Today such a conference would begin by the distribution of mimeographed orders for the next day, and after their perusal a question by a Chief of Staff, "Any questions?" in a tone clearly indicating "Beware."

But in those days the proposed operation was the subject of much discussion among the seniors present, from which plans seemed to be evolved. Sometimes written orders followed, more often each commander merely carried off a memo as to what his unit was to do. As for me, I had no part in the discussion, and after all had been settled was almost invariably asked, "Now, Scott, what can you do?" And almost as invariably, whatever I proposed was promptly approved — which left me plenty of latitude.

The plan of operations was for the Washingtons to continue clearing the country in the vicinity of Taguig; the 22nd Infantry and cavalry the same to the south and southwest; one battalion of the 20th to cross the Taguig at its junction with the Pasig and attack the town of Pasig, supported by the rest of the regiment by fire from west of the Taguig; a battalion of the Oregons to cross the Pasig downstream towards Guadalupe and sweep its northern borders to the Mariquina River; one of my guns to support the crossing, the other the operations down the Taguig.

By daylight on the 15th, I was in position with one gun on a narrow shelf of the hillside, just west of the place where the ferry had once been. A company or two of Regulars were on my left, a battalion or more on my right, all in close order. They were to cover the crossing by fire. A small launch was the only water transportation available. A thick fog hid the town, which was less than a mile distant.

The launch was promptly overloaded. It began to careen badly before getting under way and was frantically hauled back. Part of the men disembarked and thereafter it was a case of small pay load and quick turn around. Perhaps a battalion had crossed and disappeared in the fog before any firing was heard, then it was quite

heavy. By this time the top of the church tower became visible over the slowly settling fog. I had no idea of the distance, but fired a shot. The solid report of the explosion convinced me it had reached the tower, so I tried another with greater range, and yet another. The flash of the third showed just below the top of the fog and the bell openings became visible also—one of them spouting rifle fire. My next shot entered that opening and we saw its bloody results later.

The fog now dissipated rapidly. Some insurgents opened fire on my guns and kept us uncomfortable for some time. We could not locate them, and besides did not know where our own advance had got to. Quite possibly it was beyond our attackers, having missed them in the fog. Nothing to do but grin and bear it. General Wheaton had come up and was sitting near me. He demanded at first that I put a stop to the snipers, but accepted my explanation as to why I could not. Then he put the infantry at work firing on places where our advance had not gone. They fired many volleys. Wheaton was a fierce-tempered man with the best command of vituperation and profanity I ever knew. Every time a few bullets hit the cliff behind us he poured forth his wrath on the nearest doughboy officer. But after the action he praised the officer just as loudly in the presence of his men!

The last of the fog cleared suddenly, revealing the attacking line of the assault battalion close to or entering the streets of Pasig. To their left and in the junction of the Pasig and the Mariquina Rivers was a coal pile, and looking over its top was a gun of large caliber. I do not

recall that it fired even once. I hastily sent some shells into its emplacement. Directly beyond it a couple of hundred yards was a very nice-looking house—white walls, red tiled roof, and with some foreign flag displayed. But from its windows and garden wall came unmistakable puffs of smoke, and the house became a target for my gun. Later I visited it. One shell had exploded in the dining room and it gave me some qualms to see the wreckage of beautiful crystal, china and furniture. The cloth ceiling had been torn in several places and through one hole depended about two feet of the dead body of a house snake.

I was directed to assemble my command in the vicinity of the crossing, and found a convenient place in one of the little ravines a couple of hundred yards downstream. There were several shacks for the men and I took a lone one on the bank of the Pasig, between it and the road. There we remained for three days.

There was no way to get my guns across the Taguig, where they might have been very useful. The Washingtons were having their hands full in the vicinity of Taguig, and the 20th in helping to clear up the delta. The battalion that had stormed Pasig went on to Cainta on the 16th and had quite a fight there, losing two killed and fourteen wounded. It then withdrew to Pasig.

On the 17th the 20th was relieved by the Washingtons and returned to Manila. Their crossing of the Taguig on a small raft was exceedingly slow and each battalion head of column waited near my shack until the unit was complete, then marched off. There I met the major who had stormed Pasig and Cainta and was absolutely stricken dumb at sight of the empty sleeve pinned to his breast—he actually had but one arm.

The 20th was doomed to spend the rest of its service as military police. Some wag later wrote a song of which only the refrain occurs to me now—"The Bridge of Spain will groan with pain when the 20th goes to battle." But no troops that I saw in the Islands could have improved on the work of the 20th in the few days of field service it had.

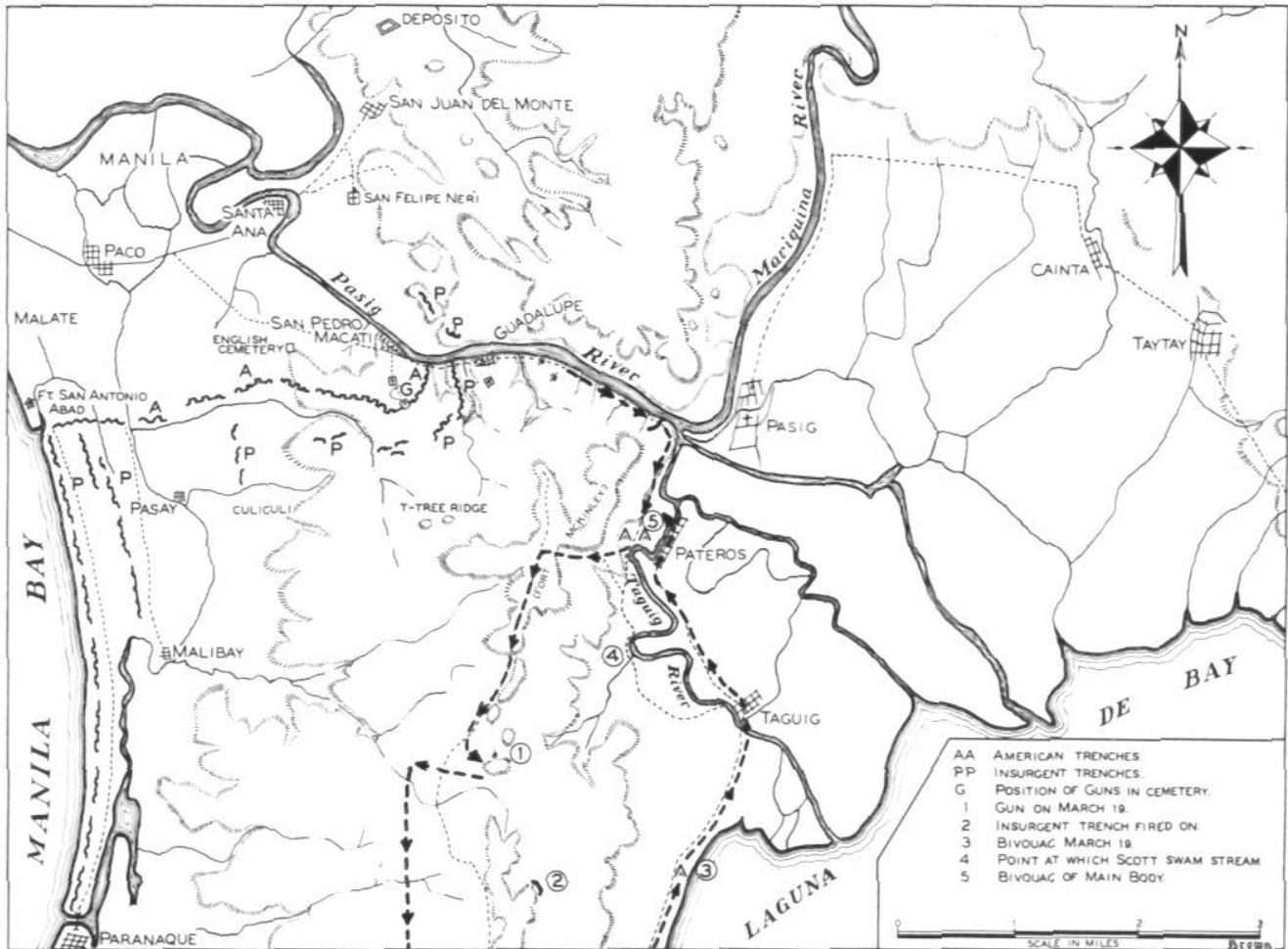
The Washingtons had left a company to hold Taguig and on the night of March 17-18 it was attacked in such force that a battalion of the 22nd spent most of the 18th clearing up the situation. I was unable to assist. There were no field telephones in those days, or radio; one got his guns to where he could talk with the man to be supported—terrain permitting, which it did not do in this case.

That evening it was decided to move with all available forces to clear the country to the south of the enemy. Part of the Washingtons and Oregons were to advance along the flats, the 22nd Infantry along the heights, one of my guns was to support the former, the other the latter.

The rough country on the heights—"El Desierto"—appeared likely to prove a severe challenge to my declaration that my guns could go anywhere, and the gun on that flank might be left far behind the infantry and be



*Scott's gun in action, covering crossing of 20th Infantry over the Pasig River. Gen. Wheaton in background.*



*The scene of operations*

in danger from lurking bands of the enemy. So I asked for and was given support, a company of the 22nd Infantry under Captain Henry C. Hodges, Jr.\* He and I talked it over and it was agreed that he with part of the company should remain with the gun on the left and about twenty men under the First Sergeant should accompany me. He had no lieutenant. His detachment was stopped by impassable terrain only a couple of miles from camp and was unable to assist in the operations.

I started off with my own detachment and for a mile or two got along very well. That brought us up on the rolling plateau where Fort McKinley now stands, a region that had once been cultivated but allowed to go back to brush and grass. Many areas had been in rice and the low dikes about the small fields proved a very serious obstacle. The ground was very hard and dry; sometimes the mules could pull the gun over the dikes, often the men had to use a pole under the axle, more and more frequently it was necessary to cut the dikes with pick and shovel to get across at all. It was heartbreaking work and only the fact that I swung pick and

shovel with the rest kept the men up to doing their best. We got no help from the support. Any Volunteers would have lent a hand to keep us rolling but not these Regulars. The First Sergeant said his orders were to provide for our safety, and whether we ever got to where we might be of service to the infantry was no concern of his. So they spent the hours resting in the shade and looking listlessly at the artillerymen toiling. Our rate of advance was perhaps a mile an hour.

At times there was quite a flurry of rifle fire to the east, but little or none in our front. Towards noon the last of the infantry had disappeared somewhere and I went up a small bald knob—the *nth* that morning—to look about. What I saw brought me back to life, all fatigue forgotten! Off to the southeast about a mile a low crest overlooked the low country that extended eastward to the Laguna de Bay, gleaming in the sunlight. Along the crest was a newly constructed trench, its direction making an angle of about twenty degrees with my line of vision. Just back of the trench, mostly seated on the ground, were four or five hundred Insurrectos, rifle in hand. About as many more, in two parties, were a hundred yards or so in rear of the flanks. A few individuals were scattered along in the trench. Directly below

\*Now Major General Henry C. Hodges, Jr., Retired.



me a shallow ravine extended far to the westward, throwing off a branch that led directly across the rear of the Insurgent position. And coming along the ravine, heading westward, was a long column of Regular infantry.

I signaled my Chief of Section to bring the gun up the rear face of the hill and then yelled to the officer riding at the head of the infantry, trying by voice and pantomime to convey the idea that something important demanded his attention. No use; he was only a hundred yards away but kept going, looking at me over his shoulder. So I ran down the hill and overtook him, explained briefly the situation, and begged him to go back with me. After some hesitation he did so, but if he got any thrill out of what he saw he did not betray it. In fact, he seemed wholly indifferent. I pointed out that if he would turn his column into the left hand ravine it would be in rear of the enemy in fifteen or twenty minutes, perhaps capture the whole outfit; I would not alarm them or attract their attention by exposing the gun or firing until his command had reached the position or was discovered by the enemy. I was very enthusiastic and talked my best. The major listened sullenly for a time, then interrupted with the statement that he had orders to extend the line to the west and would continue the march, and rode off. I stood there watching the long column winding along the bottom of the ravine, into an empty terrain, further away every step from the only known enemy. It seemed a crime.

That regiment had been on the right of the line moving southward; no firing occurred in its front but there was quite a bit to its left front. That and the easier ground in that direction probably had caused the drift that occurred. At any rate, this regiment had drifted off to the left more than the whole frontage with which it had started. No wonder that I had long before lost sight of my doughboys in our front—none were there. My dozen gunners and twenty support doughboys constituted a right flank guard for the whole command, and rather well out at that. Somebody in authority had directed that major to march his command off to the west to where it should have been had he kept a compass direction. He was probably seething with rage and humiliation when I was trying to interest him in the enemy before us. No more changes in direction for him!

The mules brought the gun pretty well up the back of the knoll and man power brought it to where it could fire. Great care was taken to avoid attracting the attention of the enemy—I meant a 16-pound shell or shrapnel landing among them to be their first notice of our proximity. Meantime I kept my glasses trained on the enemy, and it was very interesting. Their attention appeared to be directed to their front, that is to the northeast, right angles to the line from me to them. Firing was going on out there, but quite distant, and I was able to discern a few small groups of our men, their dark blue shirts showing up well in the light green foliage. Then the Insurgents

suddenly came to life, ran forward crouching, and occupied the trench. They appeared overcrowded in it. The officers remained outside, kneeling a few yards back. The bodies to the rear of the flanks remained there. They seemed to be unarmed—probably had bolos and the luckier ones would receive the rifles of the fallen. Out to their front now appeared a very light line, dodging from cover to cover, firing at something behind them.

At about two hundred yards from the trench the cover ended, and here the scouts gave up any further attempt to delay the enemy, and ran for the safety of the trench. One or two fell on the way and lay still. Behind them the fire of the 45-caliber rifles of our Volunteers considerably increased, and the whole trench began to reply. And just then a 16-pound shell exploded in that trench. It required a minute or more to get off another which landed just back of the trench and further along it than the first. There was great excitement naturally, and many casualties. Some men could be seen leaving the trench for the rear—and the officers driving them back into it with their swords. Those fellows were gallant, all right. Four rounds of shell distributed along the trench and then I changed to shrapnel. No troops would have stood under that almost enfilade fire, and suddenly the whole line dashed to the rear and were out of sight behind the ridge in a minute. I raked the area into which they disappeared with some more shrapnel but could not afford to use much. My supply was getting low, there was no possibility of getting up more, the morning was not yet gone and no telling what the afternoon might bring forth. Our troops—Oregons, I think—advanced openly and occupied the trench. I did not have a chance to visit it, but according to staff and other officers who did, the Insurgent loss by artillery fire was very great. That marked the end of resistance for that day.

Now came the task of getting where I belonged—in rear of the center of that right wing that had gone in column up that ravine into the void of the West. Its trail was plain enough and the bottom of the ravine had been a field road before the country was abandoned, and except for occasional gullies was pretty good going; seemed like a boulevard after the rice paddies! At length we came out on the plateau and there were the doughs, far off to the south, slowly moving in that direction. More rice paddies but some open prairie and about two o'clock we stood on the edge of the plateau again. Gentle slopes led to the broad coastal plain of the Laguna de Bay which stretched in glittering beauty far to the east, its banks bordered by beautiful mountains. One or two white spots on its shores marked the location of towns. It was a scene of unforgettable beauty.

Scattered on the plain over a front of perhaps two miles, and still moving on, were formed bodies of our troops—sure indication that no enemy was in sight. I had heard no firing for a long time. I had a hunch that operations in that direction were at an end and that



*Artillery on the march*

probably a withdrawal to our position of the night before would be in order. In that case we might make it before dark from where we were, but if we went down those slopes! Then some staff officer came along and, in very rude and peremptory fashion, ordered me to close up on the infantry. He refused to listen to my "estimate of the situation," or rather to consider it—for I surely gave it to him. A long and weary trek down and before we arrived I knew that we never in the world could get that gun back again. And—the withdrawal had commenced!

Some officers advised me to go east to the lake shore and assured me there was a good road there leading along it to the Pasig River. So I pushed on. The road was there all right, firm and smooth, and generally shaded by trees or bamboo. The breeze from the lake was most refreshing. There were enclosed gardens all along, but many of the huts had been fired by our troops and smoke and heat from smoldering ruins were bad at times. But for a mile or two we stepped along with new life. Then the road surface gradually changed to loose dust and sand that made traction heavy; frequent rests became imperative if mules were to be brought through alive. Meantime the infantry kept passing us until the last were gone. I found the gardens were quite hard and conceived the idea of leaving the roadway for them. It was a good move for the mules but involved a lot of hard work for the men, as bamboo fences separated the gardens, and while some could be broken down, many had to be cut. Dry bamboo is hard to cut even lying on firm ground; in fences with nothing to back it, the stuff yielded to the weight of the ax but not to its edge, and sprang back in place little damaged. Oh, we learned many things those days!

Along near sundown I left the men resting and rode forward along the road, wondering where the end would be—and found it half a mile away. There before me lay a deep estero a hundred feet or more across. The road continued from its opposite bank. There never had been a

bridge; the ferry was nowhere in sight. That definitely marked the point to which our march would be limited in the little daylight remaining; it would be useless to try to make our way through the fields around the head of the estero. Besides, if the enemy were following our retreat, we were in a good defensive position. Just where we were I could only guess, but it was certainly a long way from Headquarters, and the infantry had undoubtedly gone around the head of the estero wherever it was and so put that impassable obstacle between us and them. I had begged different commanders of Regulars to loan me a company to pull my gun, but had met only rebuffs. The Volunteers would have helped, but they had gone before we reached the area of their operations. Nothing left but to look out for ourselves and get word to Headquarters. Our "Light Transport" consisted of the one poor little native pony that I had ridden off and on all day, now quite as tired as his rider. The men were all used up, I hadn't the heart to ask any more of any of them, I was too disgusted with my doughboys to ask anything of them—I started off alone to find Headquarters.

It was quite a trip—fences, hedges, thickets, ditches forever made me change direction but I managed to maintain a general northwest course which I felt must eventually bring me within sight or sound of our troops. And then a trail led to the bank of a sheet of water over a hundred yards broad. It looked twice that, and it stretched far away on either hand. Sunset—and in the tropics that meant full darkness in half an hour—still no sign of our encampment, a long detour in prospect, toward the hills we had traversed in the morning. A few minutes consideration settled it; I led the pony into the estero and we swam across it together. It was quite a pull, tired as I was and fully clothed, equipped with revolver and ammunition belt, field glasses and other equipment. A rest and then through the darkness a mile and into camp.

I was in quite a fury and my comments to General

Wheaton about the way I had been mishandled and misinformed were anything but temperate. He remarked that he did not blame me and what was to be done now? I told him I wished to take the rest of my support, the mule team of the other gun, a few of my men, and go back to find my detachment, and orders were issued at once. By the time I had eaten supper they were ready and we started. It was necessary to go south for some distance to be sure of rounding the head of the estero I had swam, then across country southeasterly to the shore of the lake, where tracks would lead us to the bivouac. It was a slow and stumbling journey, broken by many halts to investigate fires or noises, but no enemy was encountered. Just before midnight we reached the lake shore and a peremptory "Halt; who is there?" in good American came through the darkness. In a few minutes our bivouac was being added to that of the detachment I had left. Too tired and cold and miserable to feel anything but a desire for shelter, I climbed over the corner of a fence and lay down. The place was soft and warm, sheltered from the cold lake wind—I fell asleep at once. Next day I found that I had dispossessed a family of pigs from their comfortable bed of chewed-up grass! Also I found that I was alive with fleas and bitten by them from crown to sole. I had felt nothing, but the scratching that began that morning lasted for days.

Captain Hodges had much difficulty in getting me up, and meantime had his men constructing a raft on which the crossing of the estero was accomplished by means of many trips. Then we took up the march again, over a fairly good road. In an hour or so we reached the Taguig River, where the road ended. On the opposite bank stood a small village; the stream was spanned by a footbridge, broken down in the middle. We set to work to repair this and eventually crossed even the mules on it. Hodges built a catamaran with two canoes and on that we crossed the limber and gun

carriage piecemeal. Then we lashed the gun on the catamaran, put three or four men on it, and started it off to drift with the current down to camp. We assembled the rest and marched along the bank to the village of Pateros, opposite camp. The gun was rolled ashore on the camp side and again we ferried the limber, gun carriage, harness, men and equipment over.

How to get the mules over was a problem—they simply would not enter the water and the catamaran was too small to carry them even singly, if we could have got them on it. Pateros had literally thousands of ducks. Along the river were yards with high bamboo fences, but open on the river side, apparently duck yards. I had the mules put in one of these and tried to drive them into the water. No luck at first but when I put a number of men in, armed with long branches of trees with which they beat the mules unmercifully, those creatures took to the water and started across. What a sigh of relief went up! But, halfway across, two of the brutes left the others and swam off down the middle of the stream. A hundred yards downstream there was some sort of fish trap, a V-shaped affair of bamboo, its wings extending a hundred feet or so upstream. They went straight into it and my heart sank; surely they would be tangled and drowned. But the affair pulled loose from its moorings and continued on downstream, its wings slowly closing behind its new motive power. Now I did give up hope—the mules seemed certain to be entangled and drowned. But luck was still with me, the current set towards the western shore, men swimming and following on the bank got hold of the wing and brought the whole outfit to shallow water, where the mules were released—and instantly fell to eating grass.

And so ends the chronicle of a strenuous week. Next day we returned to the comparative comforts of the little camp at the cemetery of San Pedro Macati.



*Scott's Platoon marching through native village.*



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By Colonel Edmund H. Levy, FA-Res.

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# A STRENUOUS TWO WEEKS

The 345th FA (the 155-mm. howitzer regiment of the 90th Division) usually trains at Fort D. A. Russell, Marfa, Texas, using the personnel and materiel of the 77th Field Artillery (Colonel Robert H. Lewis commanding). The 345th is organized so that all of the officers of the 2nd and 3rd Battalions are residents of San Antonio, where the unit instructor, Major M. C. Shea, is stationed. Just how much this simplifies contact and instruction, both in troop schools and by extension work, can be appreciated when comparison is made with the other organizations of the regiment, the officers of which are scattered over a radius of 150 miles; except those of us who live along the Rio Grande River from Brownsville to Rio Grande City, who are from 200 to 300 miles from San Antonio.

On the occasion which I am describing, officers ordered to active duty began to arrive on a Saturday and by midnight all but a few had reported. Twenty-nine Field Artillery Reserve Officers and one Medical Reserve Officer were present—one lieutenant colonel, three captains, and the rest lieutenants. (There is an acute shortage of captains and a complete absence of majors in the regiment.) Although I was acquainted with only four of them through previous active duty periods, and many of the other officers were strangers to each other, a very rapid and thorough shaking down occurred, owing to all being thrown together in four or five rooms of the bachelor officers' quarters. This process was accelerated, as many of the officers of the regiment are graduates of Texas A. & M., which provided a common ground of discussion and conversation.

As the program had been published some weeks in advance and it was generally known that the two weeks would be spent at a camp some forty miles southeast of Marfa, which could be reached only over a very poor road, all but one or two officers came alone, realizing that their wives would have a very poor vacation, seeing them possibly only over the week-end in the middle of the schedule. This was a deviation from usual procedure.

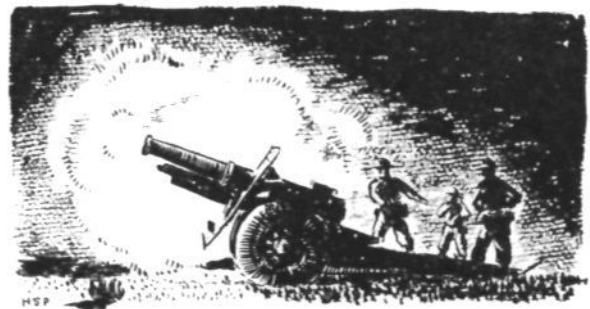
After the hazard of physical examination had been successfully overcome without a single casualty, Sunday was spent in discussion of the schedule and in preparation for the march Monday morning.

During my previous training at Fort D. A. Russell, the regular battalion had been organized so that it furnished the personnel and materiel to represent a regiment less one

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## 345th FA serves an active-duty tour near Marfa, Texas

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battalion; that is, it formed two howitzer batteries and the two battalion headquarters and regimental headquarters batteries. However, I had been notified several months in advance that this would be impossible during the 1939 training partly because of its own training, being to prepare the battalion for its mission as a supporting unit in the proposed Second Division during a test to follow in August. Undoubtedly the most important reason was the extreme shortage of transportation. How serious was this shortage did not become entirely apparent until the fact was disclosed there were but five passenger vehicles available for the training. This number proved insufficient even for one battalion.

The shortage of transportation was so acute that the battalion headquarters battery sent an advance party to the campsite on Saturday so that the proper number of men would be present on Monday when the rest of the battalion would arrive.

While shortage of transportation may be considered as the normal condition in time of war and must be expected, it is certainly not conducive to proper training. But being presented with the problem everyone immediately prepared to make the best of it. All but a few of the officers decided to drive their personal automobiles to the campsite.

All plans had been made to train as a battalion only, assignments having been made in advance, and there was no confusion. Promptly at the scheduled time on

Monday morning the battalion moved out, Major W M. Tenney, 77th FA, commanding.

Starting with a good gravel road, the route rapidly became rough, crossed by many cattle guards and fragile bridges. Because the weight of the howitzers and their prime movers was too much for these bridges, the entire column turned out of the road each time and used previously prepared crossings to get through the dry washes.

A word here about the prime mover: This vehicle is a big, rugged truck, developed for use in the oil fields, and is an assembled job by Beiderman. It is a 6 by 6 type and remarkably efficient. Equipped with air brakes, it operates air brakes on the howitzer itself also. Under ordinary conditions, only the four rear wheels are used for traction, but a special transmission gives traction on all six wheels, and this transmission is equipped also to give a 100% overdrive, under which conditions all shifts are doubled, giving tremendous power. The howitzer is also equipped with pneumatic tires; experience had indicated that the howitzer rides best when the air in the tires is reduced to about fifty per cent of the rated pressure.

As the road lengthened out, the country became bare and rocky, crossed by deep dry creek beds showing considerable erosion, in particular Alamito Creek, about 150 yards wide, giving promise of serious difficulties if caught at a time of carrying off a heavy rain from the surrounding hills.

But without incident or mishap the column arrived at the already prepared camp, without any vehicle falling out, not even a privately owned one.

Arriving about mid-morning, everyone began setting up temporary housekeeping. The camp was in the vicinity of San Jacinto Mountain, what seems to be an extinct volcano, the lava core exposed by erosion, and looking from a distance like a Rhineland crag with turreted castle on the summit.

The campsite had been covered with heavy gravel, giving some relief from blowing dust and sand. But on later occasions the wind became really interested and began imitating the Washoe Zephyr of Mark Twain's "Roughin' It." All water had to be hauled from Rawls Ranch house about three miles away and that limited the hauling to water necessary for drinking, cooking, and rudimentary washing.

The intensive training schedule was begun at 1:00 PM. Officers having been divided into three groups, three activities were conducted simultaneously, conduct of fire with the F. A. Trainer, use of fire-control instruments, and the firing battery, the groups spending an hour on each. Many of the officers present had had no previous experience with the 155-mm. howitzer, *some of them having never seen one.*

Some difficulties developed with the F. A. Trainer. The wind is very strong and blows in vicious gusts. The burst is very tricky, the dust blows rapidly and gives little time for sensing. It was necessary to reduce the range to 40 or 50 yards, whereupon excellent results were obtained. All types of problems were fired.

After retreat, some time was spent in going over the subjects covered in Subcourse 30-1 and 30-4, which have developed into what might be termed a major hazard in obtaining certificates of capacity for promotion to captain.

Tuesday morning the schedule included instruction in the service of the piece, organization and operation of the fire-direction center, and communication; the last-named was demonstrated by establishment and operation of a miniature net. Tuesday afternoon was a repetition of Monday afternoon, except that all problems on the F. A. Trainer involved lateral observation.

Wednesday morning survey plans and procedure were taken up, every officer taking part in each step. On Wednesday afternoon all officers were freed for a reconnaissance; it is interesting to report that many did reconnoitre the surrounding country, but some made an attempt to G-2 the tactical problem due the second Monday. On Thursday morning began 37-mm. firing, which continued to include Saturday morning. The fire-direction center was established and firing charts were constructed to be used later.

I will not quote statistics, but all types of problems were fired. By far the most interesting part of the program was the computations of K, both from center-of-impact adjustment and precision adjustment. But you know K.

Kay is a fickle dame,  
And she plays a wicked game,  
Within proper transfer limits  
Of the shell,  
And when she works,  
She works very, very well,  
But when she goes wrong,  
She's as wrong as . . .  
Well, she's unpredictable.

Also in lateral precision fire many of the targets were on a very positive slope (near side of San Jacinto Mountain), with the addition of an oblique slope, so that referring to Book 161, page 256, Par. 278 *b* (1), line 7 quote, a factor gives exact results only on level ground and when there is no dispersion unquote. The factors did not work very well. It's these delightful uncertainties which made the study of artillery dangerous to equanimity.

After several problems and both precision and bracket fire had built up the fire chart, forward-observer problems and liaison problems were given, with fair success considering the circumstances.

In the bracket problems I was particularly impressed with the necessity of changing the size of the bracket which might be acceptable before going into effect. The present system seems to be reminiscent of the "good old days" (whatever they were). Although the radius of effect in the 155 shell is much greater than that of the 75, yet the acceptable bracket for both weapons is still the same. It seems that in bracket adjustment with the 155, the bracket acceptable might be twice that of the 75. Of course fire with the 155 is slower but it has

greater coverage. The movement which might be made by a mobile target is not equitably figured with respect to the two weapons. If a hundred-yard bracket is acceptable for 75's in the case of a battery in position, surely 200 yards should not be too great for the 155. Then, too, the officer conducting fire has to estimate or measure range in yards (or use map or range-finder range in yards), then look in the tables for the elevation. Why not have the executive make the change? Why not let the observer (who is trying to keep his eyes on the target, his mind on overs, shorts, and dispersion) give the commands in yards, and have the executive, who has all the time and assistants (and assistance) he needs, do that small favor for him? Some day I am going to try that, when there is no unit instructor available, on the trainer first and then possibly on the 37-mm., but my opportunity may not come for some time. (Why don't you try it?)

But to get back to my story: On Monday we began tactical problem, which was to continue until Wednesday morning. The beginning of the problem was to be at 9:00 AM and at that time the battalion was to be assumed to have been marching southeast from Marfa (having preceded the regiment from San Antonio) and at that hour was to be at the Rawls Ranch gate, a few hundred yards from the camp. At the time and place stated the battalion commander was handed an order requiring him to place his battalion in a concealed bivouac area in the vicinity of the San Jacinto Mountain.

The unit instructor and I, and the two lieutenants who were to act as enemy observers left early and posted ourselves in the enemy line (to play fair, we actually occupied an OP well in the enemy territory, about 8½ miles from the campsite).

Although the campsite was located through the BC Scope without difficulty and the position of the battalion was known, it took considerable time and effort to locate the latter, owing to the fact that it was halted and there were no movements of any kind in the vicinity of the vehicles. At the distance the "enemy" observers were, some 15,000 yards, the howitzer with its prime mover was somewhat less than a mil wide and could be easily lost behind one of the reticular lines of the instrument. Nevertheless the column was located; and movement completely disclosed the battalion. It was very interesting to note that each vehicle carried along with it a thin vertical column of dust, about five mils high, but only one vehicle disclosed itself as a piece of artillery. An experienced observer having no prior knowledge of the composition of the column could not have definitely identified it as artillery, except in the one case mentioned where howitzer and its prime mover was located. This was caused by the dust cloud behind it being brightly illuminated by the sun, while the carriage itself was in the shadow, and the silhouette was thus plainly revealed. The number of vehicles was accurately estimated, and the direction of movement could not, of course, be concealed. The area

chosen by the battalion commander was one well suited for the purpose. Each vehicle disappeared in turn, and as soon as the dust column had settled, there was nothing to indicate movement, and as far as terrestrial observation was concerned, there was nothing to show what had become of the organization.

Leaving the two enemy observers to keep the area under observation, Major Shea and I went to the bivouac area. Although I knew accurately the position of the two observers, they had lowered their instrument, and the enemy OP was invisible. The troops were then marched back to camp, leaving the materiel in the bivouac area, as it was not contemplated using either troops or materiel until dark. Announcement was then made that the next situation would be issued at 12:30. Several vehicles moved from the bivouac area to the campsite, and the troops marched in small groups. None of these movements were picked up by the observers. At 12:30 PM the battalion commander was given the regimental order requiring that his battalion occupy a position, after dark, in support of the division, and to stake out positions, not only for his own battalion, but for the other two battalions of the regiment, which were assumed to arrive during the night. In his reconnaissance and survey and in all movements during daylight he was limited to the use of seven vehicles to move not less than one mile apart, and to travel at not to exceed ten miles per hour. Incidentally this rate of speed was followed throughout the rest of the problem, and thereafter the observers were forced to look very closely and diligently to discover the very few movements they were able to report.

The usual difficulties accompanying such a problem immediately presented themselves, with the added hazard of reduced transportation, and that not utilized to the fullest extent, owing to inexperience. However, orienting lines were staked out, place marks located, battery positions selected, plans made and orders issued for the night movement (not necessarily, however, in that sequence). Incidentally, all orders were issued in fragmentary form.

Because the 77th is exceptionally well trained, the night movement was accomplished without incident. Considerable experience was gained in laying the batteries, particularly by some of the officers who had not had the opportunity of seeing it done, or I should probably have said the equivalent of seeing it done, as it was accomplished in comparative darkness. Very few lights were used and only those which were absolutely essential.

After the position had been occupied, establishments set up, and communications established, the situation was allowed to quiet down and no problems were given during the remainder of the night.

During the following morning forward-observer problems and air observation were assumed to keep the fire-direction center operating, and enough messages transmitted to keep message center active.

Late in the morning the battalion commander was advised

that the regimental commander would issue an order at 12:30 at Rawls Ranch house, covering activities during the afternoon, and a night movement into the position which would be occupied for service practice the next morning (Wednesday).

The order was issued as planned and the early part of the afternoon was used for battalion and battery reconnaissance. All was prepared for the night movement, gun positions staked out, firing chart prepared, all wires laid.

The weather had been threatening for some hours, and about 3:00 PM a heavy rain was seen approaching up the valley from the south. It took some time to reach the campsite, where all able to had taken shelter. The heavy downpour began about 5:00 PM and continued for over an hour, indicating that all the creeks would be up, and it was decided to call off the night movement and bring the battalion back to camp at once. Radio communication was impossible because of the distance. The battalion commander left to bring in the troops, and water was just beginning to show in the creeks. It was evident that soon they would be impassable. After going about halfway, we met the battalion coming in. The executive had only waited until the rain had ended, starting in as soon as he realized the situation, without waiting for orders. As it happened he was delayed more than two hours by having to wait for two creeks to lower before crossing, and he was met about three miles from camp. Realizing that the creeks between us and the camp were filling rapidly, the battalion was directed to move on, but we were too late. Not more than a mile from where we had met them we ran into what a few minutes before was a narrow cut about a foot deep, but was now a foaming gully more than twenty yards wide, and filled with rushing water.

There was nothing to do but wait for the flood to subside, which of course it did after about an hour. Wondering what the other two creeks toward the camp were doing, the march was recommenced. Fortunately the worst was over and except for the discomfort of getting wet feet (the water was only up to the bed of the car) and feeling the force of the current trying to swing the vehicle downstream. Very little damage was done at the campsite except to wet everything that had been on the ground.

Service practice which had been scheduled for Wednesday morning was postponed to Thursday morning and the day was spent in drying out, and in instruction on machine guns and automatic rifles.

On Thursday morning, with two batteries in position, service practice was begun. Only sand-filled shell was used. This shell functions very well as a practice shell and, as it allows the gun crews to remain at their posts during firing, time is saved and firing is more natural. The earth thrown up at the point of impact allows excellent observation, except under the most adverse circumstances. Having only forty rounds, it was necessary to exercise extreme care in allotting ammunition for problems.

Problems simulating forward observation and liaison method were demonstrated with more than ordinary success. The firing chart was found to be very accurate, and transfers were made, but could not be demonstrated properly, as it was possible to fire but one round at the center of the zone, and I do not believe that zone fire can be demonstrated effectively, except by firing through the entire zone with all guns.

As a whole the firing was considered very instructive. But I doubt the value of such a small number of rounds. My last previous active duty was in 1936, and I found myself very hazy on some of the most important points, and can thus sympathize with officers who were observing fire for the first time.

To complete the day, and conclude the training, cleaning of materiel was undertaken by the officers themselves, giving them experience in assembly of breech blocks and in taking the howitzer in and out of battery. A short march was made in the afternoon, during which antiaircraft and anti-mechanization defense was demonstrated.

On Friday morning camp was broken and the march to Fort D. A. Russell was made by organization.

In this discussion, no mention was made of assistance received from the regular officers of the 77th. It would be impossible to overrate the help received from them. One unit instructor attempting to take care of all of the instruction in a regiment can soon find himself inadequate, and the regular officers present pitched in with a will.



**WINNER OF U. S. FIELD ARTILLERY  
ASSOCIATION MEDAL FOR HARVARD  
R.O.T.C., 1939**

H. GAYLORD DILLINGHAM

Honolulu, T. H.; Captain polo team; 3d varsity crew; President, A. D. Club; VP, Caisson Club; Varsity Club; Hasty Pudding Club.





# FIELD ARTILLERY ABROAD

## *FRENCH METHODS VS. GERMAN*

Captain Lenhard, of the German War College, is the author of two studies, printed in the *Artilleristische Rundschau* for July and October, 1939, which use a parallel-column method to show his conception of how German tactics may be adapted to meet French combat methods. The translations from which the following resume is taken were made by O. L. S.

The French General Herr writes, in the preface to his book, *Artillery, Past, Present and Future*:

"An army must have tactics corresponding to its armament. The plans and the method of combat of the troops must make the best use of the characteristics of its armament; every improvement in armament must bring a corresponding change in combat methods.

"But it is clear that tactics and armament bear a close relation with the combat methods of the enemy. One would not attack a horde of tribesmen with the same formations that would be used against a European army, and one would not require such highly perfected armament. On the other hand, against a modern army, which possesses the best of material and knows how to use it, one must have material which is at least as good, if not better, must know how to use it, and must be ready to adapt one's own equipment and procedure to any modifications that the enemy may make."

The principles of leadership and the combat methods of an army take into account, as a rule, only its own armament, its own training, the characteristics of its own people, and the qualifications of its own generals.

The army of a state which has to take into account only one opponent, by reason of its geographic or diplomatic situation, may take into account also the characteristics of that opponent.

The following pages are based upon the French

"Regulations for the tactical employment of large units." They suggest the reflections of an artilleryman in the presence of an enemy fighting according to French principles.

To bring out relationships clearly, this study is presented in parallel columns; in the left column the procedure of the French division, in the right that of the opposing artillery.

## A—COMBAT METHODS OF FRENCH INFANTRY

### I—ORDER OF BATTLE OF A FRENCH DIVISION

The normal French division is organized as follows:

- (a) Three infantry regiments of three battalions each, with light and heavy machine guns, mine throwers, infantry guns and antitank guns;
- (b) A reconnaissance detachment, including one squadron of cavalry, one of motorcycles, one of machine guns and one of antitank guns;
- (c) One light artillery (75-mm.) regiment of three battalions;
- (d) One heavy artillery (155-mm.) regiment of two battalions;
- (e) Signal and pioneer troops.

For decisive action, this division may be reinforced by light guns or heavy howitzers; tanks and armored cars of various types; antitank weapons; machine gun battalions, and so on.

In dealing with such an enemy, our artillery must expect to fire upon infantry troops, light and heavy machine guns, infantry cannon, mine throwers, armored vehicles, and light and heavy artillery.

The French infantry division advances in several columns, or in groups of all arms—by day avoiding roads exposed to observation, and by night making full use of the road net.

## II—ATTACK BY A FRENCH DIVISION

### 1—MARCH OF APPROACH

#### *Procedure of a French division.*

*Distant reconnaissance* is handled by the corps reconnaissance detachment, reinforced by motorized infantry or artillery. This detachment also occupies zones of the ground until the division advance guards arrive.

#### *Action of our artillery.*

If our own reconnaissance indicates that the ground is held only by hostile distant reconnaissance groups, the guns should go into position promptly and assist our own advance guards in seizing the occupied ground

*Close reconnaissance* is handled by the advance guards of the march columns. These advance guards consist of infantry and engineers, perhaps reinforced by antitank guns, armored vehicles, and small detachments of artillery.

If the indications are that the enemy's close reconnaissance groups have taken over occupation of the ground the guns should still go into position promptly, to support our own advance guards and to seize the occupied ground before the enemy's main body can come up.

#### 2.—ESTABLISHMENT OF CONTACT

The first contact is established by the reconnaissance detachments of the corps or divisions.

The guns should go into position promptly, and fire at long range into the enemy's rear areas, to break through the hostile distant reconnaissance and delay the advance guards until our own advance guards have occupied the selected position.

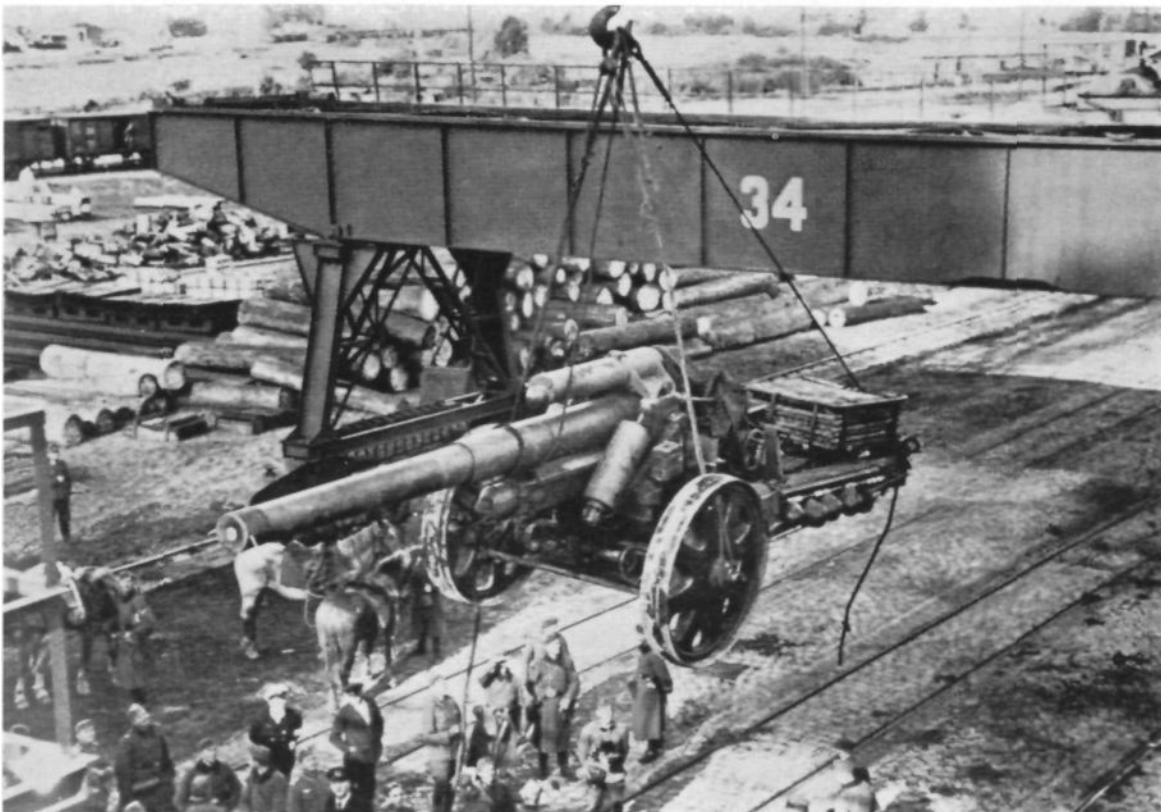
If already in position, the guns should fire at long range to delay the enemy's distant reconnaissance; and, by concentrations in front of our own advanced positions, prevent their capture.

Fire should be directed especially upon the gaps between our own advanced positions and combat outposts, to prevent the enemy from penetrating, and to deceive him as to the location of the first or main line of resistance, thus leading him to a premature deployment of his main body.

#### 3—PRELIMINARY ATTACKS

Weak infantry forces, supported by artillery, and sometimes by tanks, perform combat reconnaissance, and seize observation and areas favorable for deployment.

Our artillery should discover, by means of forward observers, the approaching attack, break it up by concentrations at the threatened points, or, by protective fires, limit farther advance.



*Loading field guns and ammunition for Germany's Western Front.*

## 4—ATTACK

The French division assembles its assault groups, under cover, close up to the point of attack. If tanks are to be used they may be with the infantry or back out of artillery range. After an artillery preparation which may last minutes or hours, the attack is launched. The French advance through a series of successive objectives, each of which is consolidated before they advance to the next.

Our artillery must make plans to deal not only with the French infantry but also with the tanks. Concentrations are fired (by map) as soon as indications of the attack are received. When the enemy launches his attack our artillery fire is placed just behind his barrage, to catch his infantry. The tanks are left to our AT guns. If he appears to have reached his objective we place heavy concentrations on it.

## III—DEFENSE OF A FRENCH DIVISION

## I—POSITION TO BE HELD AT ALL COSTS

The French defensive position is organized into two zones, the outpost zone and the main fighting zone. The former has a line of observation and a line of resistance. The main position consists of a main line of resistance and a support line. The position must have good observation,

covered routes to the rear, and an obstacle in front. The power of all weapons is concentrated in defense of the main line of resistance.

The division is organized with regiments abreast.

## CONDUCT OF THE DEFENSE

*Procedure of a French division*

The approach of the attacker is delayed by mixed detachments of cavalry, and mechanized and motorized troops. When forced to withdraw, these detachments retire to the main position. Centers of resistance and strong-points, mutually supporting, provide the main defense. Reserves are used to limit local successes or to counterattack. General counterattacks are carefully prepared, and may be supported by tanks.

*Action of our artillery*

The mass of our artillery does not go into position until the hostile main position has been located. Guns are emplaced well forward, outposts are driven in, and smoke is used to screen our advance. Centers of resistance to the right and left of our point of attack are smothered by fire. Counterattacks are broken up by concentrations. Forward observers are used liberally.



*French heavy gun moves to front.*

International News Photo

## 2—DELAYING ACTION

Executed in a standard manner, generally withdrawing before becoming closely engaged, attempting to gain time or to lead the attacker toward a prepared position. Lines are selected so far apart that the attacker's artillery will have to displace, and the lines make use of natural obstacles. Withdrawal generally at night or under cover of fog or smoke.

Indications of withdrawal must be watched for, and fire placed on lines of retreat. Map study will indicate next position. Batteries follow infantry closely.

## B—COMBAT METHODS OF FRENCH ARTILLERY

The organization and armament of French artillery is as follows:

## Divisional artillery:

- 1 light regiment of 3 battalions; 75-mm. guns, range 11,200 meters.
- 1 heavy regiment of 2 battalions; 155-mm. howitzers, range 11,200 meters.

## Corps artillery:

- 1 heavy regiment of 4 battalions; 2 battalions 105-mm. guns, range 12,300 meters; 2 battalions 155-mm. guns, range 18,000 meters.

## Army artillery:

- Motorized regiments, light and heavy; tractor-drawn heavy regiments; railway artillery. Armament:
  - 75-mm. guns, range 11,200 meters.
  - 155-mm. howitzers, range 11,200 meters.
  - 105-mm. guns, long, range 12,300 meters.
  - 155-mm. guns, long, range 21,000 meters.
  - 155-mm. guns, long range, Filloux, range 21,000 meters.
  - 220-mm. guns, long, range 22,800 meters.
  - Other guns, presumably with greater caliber and longer range.

## Fortress artillery:

Guns in works, casemates, and armored turrets; and guns outside the works (artillery of position and mobile pieces). The ranges of the fortress weapons are materially greater than those of the field artillery.

## Ground and reconnaissance system:

Ground observation by firing units.  
 Observation battalions, normally one to each corps, sometimes temporarily attached to divisions.  
 Observation balloons.  
 Reconnaissance airplanes.

General principle: Full use will be made of the maximum field of fire of the guns, both in deflection and in range.

Inference: The French divisional artillery, the 105-mm. battalions of the corps, and the light artillery of the army, will generally be emplaced within the zone of observation of our observation battalions and within reach of our divisional artillery. Artillery of longer range will generally be located by artillery scout planes, and attacked by long-range guns.

## I—ATTACK BY THE FRENCH INFANTRY DIVISION IN MANEUVER WARFARE

## 1—APPROACH MARCH

*Procedure of the French artillery*

Division commences to deploy as soon as it comes within range of our artillery. Each infantry regiment has a light artillery battalion in close support; rest of artillery follows march columns. Single batteries are prepared to assist advance guard.

*Tasks of our artillery*

Our artillery must march well to the front in our columns; reconnaissance for position must be continuous. Some artillery always in position. Platoon of observation battalion must be with the advance guard. Artillery plane available, and pilot already has had understanding with artillery commander.

## 2—ESTABLISHMENT OF CONTACT

When French reconnaissance detachments have made contact, the close-support artillery goes into action to facilitate the infantry advance against specific points. French observation battalions not likely to go into action at once.

We can tell from the amount of French artillery fire how nearly ready the enemy is for combat. If we are on the defensive, most of our artillery and our observation battalions go into position at once to destroy the French artillery before it can get into action. We make strong effort to secure fire superiority from the outset.

## 3—PRELIMINARY ENGAGEMENTS

The French will often conduct a preliminary fight to secure observation or to drive in our outposts and secure terrain favorable for an attack. All their divisional artillery will participate in this action.

We can determine the preliminary nature of this attack from the amount and caliber of artillery employed, and from the targets fired on. (Indicates value of having observation battalion in position early.) We must attack their artillery at once since it will move anyway, and must observe its forward movements carefully.

## 4—ATTACK

The French prepare their attacks systematically and thoroughly. The divisional artillery is liberally reinforced, and corps and army artillery also participate.

*a. Dispositions for the attack.*

- (a) Close-support groups of at least a battalion each support each infantry regiment.
- (b) All light battalions not in close support, and the medium regiment, are in general support.
- (c) Corps artillery forms a counterbattery group.
- (d) Long-range artillery is used to fire on distant targets such as reserves, headquarters, routes of approach, supply installations.

Our close-support groups are placed near the infantry, the counterbattery and long-range groups farther back. Our observation and reconnaissance must be intensified during this period. Enemy OPs and batteries must be fired on.

*b. The preparation.*

The French always fire a heavy preparation unless they can secure surprise through the use of tanks. The preparation is directed against our infantry, antitank defense, artillery, and reserves.

During this period the mass of the enemy artillery discloses its positions. All our observation agencies must be active, and our artillery will be engaged mostly in counterbattery.

*c. Execution of the attack.*

The French attack progresses according to an accurate time table, the artillery fire being carefully coordinated with the successive rushes of the infantry. There may be a rolling barrage.

If the French artillery program is thrown out of gear, his infantry attack will also break down in confusion. Consequently we concentrate on his artillery, including OPs. Low-flying planes reinforce this fire.

*d. Continuation of the attack to final objective*

The French consolidate each intermediate objective before they advance to the next. The first thing they do when they arrive on a position is to prepare for its defense. Their artillery must change positions, or regroup, and they will not advance until this is done.

While the enemy artillery is displacing, our balloons and airplane observers keep them under observation. Our artillery fires on the French batteries while they are displacing and after they have gone into their new positions. This is a good chance for us to regroup and to bring up more ammunition.

## II—ATTACK OF A FORTIFIED FRONT

The procedure will be similar to that above, except that more artillery will be used, the preparation will be more powerful and methodical, and the infantry will clear up the foreground before advancing to the general attack. The front will be worn down by artillery fire.

The appearance of specially powerful artillery attacks will suggest that an attack is imminent. Our artillery will place its fire so as to interfere with ammunition supply, as well as perform the regular defensive missions. Our reconnaissance agencies must be active, and our own batteries must move frequently to confuse the enemy. An ample supply of ammunition must be assured.

*Summary*

The strength of the French artillery lies in its employment in mass and in its close cooperation with the infantry. We must oppose it offensively, endeavoring to locate the French batteries as soon as they appear, and

fire on them, thus reducing the enemy strength and upsetting his plans. By thus disrupting his carefully integrated artillery-infantry scheme we will secure the best results.

CHARACTERISTICS OF VARIOUS FOREIGN CANNON. *From Artilleristische Rundschau*, November, 1939. Translated by O. L. S.

*France.* Mountain guns.

1. The 75-mm. mountain gun L/14 M 1919, Schneider-Creuzot, is so constructed that the gun proper divides into two loads for pack transport—first, the tube, and second the jacket and breech mechanism. In firing position, the two are locked together by a special device. If the connection is not complete, a safety device prevents firing the gun. The weight of the projectile is 6.5 kg; there are four powder charges, 105, 157, 218 and 323 g. The maximum charge gives a muzzle velocity of 400 meters per second and a range of 9000 meters. For comparison, we may mention the 75-mm. mountain gun L/22, Rheinmetall-Borsig. This piece has the same projectile weight, 6.5 kg; it uses five powder charges, of which the heaviest gives a muzzle velocity of 470 meters per second and a maximum range of 9800 meters.

2. The 10.5-cm. mountain howitzer, L/12 M 1919, Schneider-Creuzot, is of construction similar to that of the 75-mm. mountain gun. The piece proper is divided for pack transport into three loads—tube, jacket and breech screw. The rifled portion is 988 mm. long, and has 32 lands with uniform pitch of 12 degrees. The projectile weighs 12 kg. There are five charges, without cartridge cases, giving muzzle velocities from 184 to 350 meters per second. The maximum charge, 465 g., gives, according to the *Rivista di Artigliera e Genio*, a maximum range of 7850 meters. This may be compared with the 10.5-cm. mountain howitzer, L/28, with box trail, by Rheinmetall-Borsig. This piece fires a 15.5-kg. projectile; the maximum charge, 885 g., gives a muzzle velocity of 475 meters per second and a maximum range of 10,500 m.

*France.* 9-cm. anti-aircraft gun.

This piece was originally adopted by the French Navy for coast defense. It is now reported that it has been adopted also by the Army.

*France.* Projectiles with colored smoke clouds.

These are used in concentration fire, to distinguish the shell bursts of the different batteries. The colors used are red, yellow, and green. The powdered coloring matter is placed in the nose of the shell, and is disseminated upon impact by a special fuze.

*France.* Aluminum rotating bands.

Experiments were recently made with aluminum rotating bands. It has been shown that they are not satisfactory for general use; in war time, in case of a shortage of copper, they might be used in cases where the strain is not great.

*Russia.* Seacoast guns.

The following guns are in use for coast defense, apparently all mounted on fixed carriages.

1. 34-cm. gun.
2. 28-cm. gun.
3. 28-cm. gun.
4. 25.4-cm. gun.
5. 23-cm. gun, M. 1877
6. 23-cm. gun, M. 1867
7. 15.2-cm. gun, Canet.
8. 15.2-cm. gun.
9. 7.6-cm. gun, S. K.

The details are as follows:

Type of piece	Length, calibers	Weight of piece, tons	Total weight, tons	Weight of projectile, H.E., kg.	Weight of bursting charge, kg.	Weight of projectile, armor piercing, kg.	Weight of bursting charge, kg.	Weight of propelling charge, kg.	Muzzle velocity, ms.	Maximum range, m.
1	35	85	....	.....	....	589	6	262	561	11,000
2	22	29	54	212	20	245	4	36	498	12,000
3	20	26	42	196	15	229	3	36	466	11,000
4	43	29	46	229	6	229	2	65	765	14,000
5	22	16	33	114	9	122	2	12	466	11,000
6	20	16	33	106	8	122	2	12	453	10,000
7	45	6	20	40	1	40	.409	12	780	12,000
8	22	3	8	32	4	36	.409	4	450	8,000
9	30	.35	.980	6	.818	6	.818		579	6,000

The bursting charges are of black powder, trotyl, lydite, or melinite. Smokeless powder is used as propelling charge, except in the 34-cm. gun, which uses brown powder.

Besides the above described pieces, there is a mobile 24-cm. Army coast defense gun. The total weight is 115 tons. Transport is in four separate loads, carried on a gun-wagon, a carriage wagon and two platform wagons. The wagons have rubber tires for movement by road, railway wheels for movement by rail. The weight of the projectile is 135 kg; with an elevation of 60 degrees, *the range is 65,000 m.\** The maximum rate of fire is two shots per minute.

*Russia.* Caterpillar carriages.

It has often been noted in this department that the Russian heavy guns use caterpillar treads instead of the ordinary wheels. Two types are in use—a 20.3-cm. howitzer and a 15-cm gun, both on caterpillar carriages. The howitzer, in firing position, weighs 6500 kg.; the maximum range is 10,000 m. For the march, a two-wheeled limber is used. The pieces are drawn by a small caterpillar tractor, which is being replaced by a larger one with wheel belts, carrying the gun crew. Both types of gun are of Russian manufacture.

*Italy.* New gun.

Ansaldo has designed a new 145-mm. gun, with a range of 24,000 meters.

\*Kurt Passow's *Taschenbuch der Heere* (J. F. Lehmanns, Berlin, 1939) shows a photo of a French 21-cm. RR gun which is supposed to have a range of 58,000 yards.

SOUND-RANGING RESULTS BY CALCULATION. By Oberwachtmeister Faber, in *Artilleristische Rundschau*, November, 1939. Digested from translation by Lieut. W. M. Connor, Jr., FA.

Sound-ranging results frequently show errors which are a result of inaccuracies inherent in any graphical method. These errors could be eliminated if the intersection of the hyperbolae (which locates the sound source) were calculated instead of plotted. But this is ordinarily a lengthy process, and is not practicable in the sound-ranging system used by the Germans. Various foreign armies, however—notably the English—have improved sound ranging by using a regular, pre-planned base in which the stations are accurately located by survey. This gives them greater accuracy in sound ranging than the Germans obtain.

The use of an accurately-surveyed system suggests the use of a relatively fast *computed* solution of the hyperbolae intersection. If polar coordinates are used instead of rectangular, the equations for the curves may be written as first-degree equations instead of as quadratics. The author goes into the mathematics of this, showing in detail how it is done. He then goes on to say that two of these equations may be solved by using a calculating machine, which he refers to specifically as the *Brunsviga 13 Z Doppel*. Apparently this device enables even an enlisted member of the sound-ranging battery to solve a set of rather formidable equations so as to produce the coordinates of the intersection as quickly as, and more accurately than, the plotted method. The inference may be drawn that such a machine will (and probably does) have various other uses in the artillery, especially in connection with survey.

The latter part of the article is devoted to a detailed description of how to operate the calculator in connection with this particular problem. It is not clear whether the machine is a commercial product or a special military device.

COOPERATION OF ARTILLERY AND INFANTRY ON THE DEFENSE, UP TO THE WITHDRAWAL TO THE MAIN LINE OF RESISTANCE. By Maj. Gen. von Tittel. (From *Militär Wochenblatt*, Oct. 13, 1939. Translated by Lieut. W. M. Connor, Jr., FA.)

The type of combat under discussion here will be frequently employed, at times with the solution of the problems presented left in the hands of the individual battery commander, even though the grouping of batteries into battalion units is characteristic of the modern use of artillery. In most such cases of an independent battery, the supervision of the battalion is not even considered; though how important this is will be shown during the course of the article.

It will also be shown how necessary even in the action in front of the MLR is the cooperation between infantry and artillery. Here are encountered the situations, so often sought in field service, in which a single battery acts in

support. Thus it appears that the discussion is likewise of moment to the infantryman, who is to be supported. Obviously, however, he should not pass up the cooperation of the artillery battalion commander or his representative.

The keynote of the many phases of the combat in front of the MLR is delaying action; and always-difficult questions for the artilleryman in this connection are (1) When should I evacuate the OP and (2) When should I evacuate the gun position?

I. *Resistance of troops deployed in front of the MLR.* First and foremost this resistance should be most accurately planned and prepared by the artillery commander. The arrangements for fire missions during combat will follow well-known tactical principles. The preparations, however, must be especially concerned with adapting the actions of the artillery to the withdrawal of the infantry; that is, they must lay down the manner of changing position, whether individually, in echelon, or as a battalion.

In order to come to a clear understanding, the infantry commander must tell the artillery commander clearly:

(a) "I will withdraw from my line of resistance at H hour." The defense therefore lasts until H hour.

Or (b) "I will withdraw my line of resistance when the enemy reaches such-and-such a line (as for example, the edge of a wood) with units capable of further attack." Such an arrangement will be made when the line of resistance is unfavorable, that is, in open terrain. It will not always be easy to determine when enemy "units capable of further attack" are present. It is in fact not the usual task of the artillery to support the infantry in terrain which offers no visibility; but the case may nevertheless arise where the artillery, in utilizing the limit of its range in harassing fire or in counterbattery, may be emplaced directly behind such a line of resistance. The infantry has then become responsible for the protection of the artillery, and cannot require that the artillery support its withdrawal; but on the other hand it must hold the line until the battery is in safety.

If artillery support is still required, another battery which is already in its rear position must send up a forward OP and provide the support; that is, fire upon the attacking enemy until the friendly infantry has gained sufficient distance. The officer conducting fire must be ready to withdraw with the infantry after he has delivered his fire. If this has been properly placed, it may be effectively continued for a short period without observation. That is greatly superior to a scheduled barrage; and it may deceive the enemy.

Often the forces actually clash in this mid-position. Here the artillery cannot render much assistance, unless it be from a forward OP as described above. It is helpful here if this OP may fall back, where necessary, along its own wire, which must then be laid so that the forward observer will return through a succession of points giving good observation. This may be arranged by the



remainder of the battery detail, if it is not too weakened by the detachment of the forward observing party.

Or else (c) "I will withdraw from my line of resistance when the enemy line has reached a certain line." This is the way the action should be planned in open country affording good visibility. One should here take note of whether only the terrain before the line of resistance is open, or whether that behind the line is as well. The first is the ideal case.

The more open land behind the line of resistance (as in the case of a large valley without shrubbery), the earlier must the gun position be evacuated. The artillery commander must tell the infantry commander how long he needs to get his battery back under cover. On this depends how close the infantry may allow the enemy to approach. But the infantry must not be left in such a terrain without artillery support. It must tell the artillery when the main body will withdraw, and when the rear guard will evacuate the line. The artillery commander must then arrange that artillery fire from covered positions in the rear be placed in front of the line of resistance for as long as detachments of our own troops remain (this requires a forward observer!), and that the artillery fire be placed upon the abandoned position at exactly the moment when the enemy appears there. This requires a change of position in echelon, either by section within the battery, in the case of weak artillery support, or by battery within the battalion in the case of strong support. The artillery commander cannot allow himself to be put off with vague expressions such as: "I will hold as long as possible," or "When I withdraw, do likewise."

Both the infantry and the artillery are interdependent. The needs of each must be carefully compared. The final decision is in the hands of the infantry commander. The discussions essential to this problem occur seldom in peacetime exercises.

In general: The regulations prescribe "strong artillery support" for such units deployed forward. That is of course to be taken relatively. When weak forces—for example, a company—are to be so detailed, a battery is strong support. If it is a battalion, at least a battalion of artillery must support, or a withdrawal in echelon is out of the question.

Seldom in the maneuvers of single batteries is the role of battalion commander properly played. All questions are left to the battery commander—which is, however, tactically incorrect. Even when single batteries have been given absolutely clear orders, as above, the action may still present enough surprises; as for example, a sudden enemy breakthrough, or a withdrawal by a neighboring battalion, or hostile fire on the gun position which impedes its withdrawal (in which case the infantry must be asked to hold out longer). These suppositions, in peacetime, must be tactically sound, for our aim is to learn what should be done.

We are deliberately not going into the easy problem, in this connection, of a night withdrawal from a line of resistance.

II. *Advance position.* (a) Should either deceive the enemy—in which case it has filled its purpose when the enemy has deployed considerable units and brought in his artillery. The advance position will generally lie a great distance forward of the MLR. The withdrawal then takes place under the fire of the artillery of the MLR as in the case above of troops deployed in front of the MLR.

Or else (b) It should hold good observation ground for its own artillery for as long as possible and prevent its use by the enemy. A certain amount of deception is thus also obtained.

According as the position is directly before the MLR or farther away, the troops holding it will have orders to hold until the entire front is attacked, that is, defend themselves directly, or to conduct themselves as in a delaying action.

The artillery supports as indicated in I.

Here also is a definite agreement urgently needed. It must, however, not be arrived at by the commanders in the heat of battle. It is just as important to the artillery of the MLR to have clear orders from the senior infantry commander. The decision to withdraw batteries emplaced forward must naturally be made as late as possible. That is only possible, though, when it is certain that they will be brought back at the proper time. For this, the battery emplaced forward must have communication with the battalion commander, to be able to inform him of the situation. Only then is the battalion commander able to open fire at the correct time and thus close to the enemy the heights which have been held by our own troops—at least until the units in front of the line have been brought in safely.

III. *Outposts:* In most cases only OP's [details?] are sent up to the outposts. The batteries involved may remain behind the MLR. If they are waiting there in the open for an enemy who has overrun the outposts or are even out in front of the MLR, the outposts must hold until the battery is brought in to a safe position. In this case the designation "outposts" is false, for it is playing the role of an advance position. This point is stressed, because so often the infantryman, unaccustomed to thinking of artillery, does not distinguish. The artillery must point out that the characteristic of an advance position, in contrast to an outpost, is that artillery is attached to it. The actual distance from the MLR is not the criterion. Outposts can be farther from the MLR, in kilometers, than advance posts. They must only "lie within the effective range of the light artillery of the MLR." (T. R. 457, Par. 1, last sentence.) "Effective" means that the line of outposts may be supported by observed fire. To the infantry this may appear to be hairsplitting; but it is important to the artilleryman because it governs his conduct.

The cooperation of forward OP's with outposts must

be particularly close. Orders should be issued as to which infantry will cooperate with which OP. The two must form a combat team. Otherwise the artillery observer cannot fulfill his mission efficiently, and also the artillery otherwise seldom learns when it should deliver its final fire to shield the withdrawal of the outposts; for the outposts will naturally carry out this movement under cover, even from their own OP's. Rockets are dangerous, for they betray to the enemy the time of the withdrawal.

IV. *Utilization of forward OP's some distance in front of the MLR.* This procedure is employed especially with terrain affording poor visibility, when the enemy is still distant. It is not mentioned in regulations, but it provides an excellent means for the artilleryman to adjust his long-range harassing fire. It is better than map-firing and quicker than air adjustment. This observer, well forward, must be protected by a strong cavalry or armored car patrol. He adjusts by means of radio. He conducts himself as though on a reconnaissance patrol; that is, he conceals his OP along a route of march so that he may catch columns on the march as they leave a village or a cut. The battery prepares its fire from the chart. The observer gives the command to fire and improves the adjustment. When the enemy can be so entrapped, the purpose of harassing fire has been admirably accomplished.

There is required here, as well, close teamwork between the patrol leader and the observer. It is better that the two

return together whenever possible; but for this the patrol must be prepared to combat weak enemy patrols, because the observer is hindered in fast movement by his radio equipment.

In terrain affording no observation this method is especially confusing to the enemy who receives a sudden burst of aimed artillery fire. The French in 1870 were masters of this use of artillery, although they had only wire, or local lines when in their own country.

V. *Communications:* Since radio is so highly developed, wire installations—especially in a war of movement—will be avoided whenever possible. One should, however, bear in mind that the following is possible:

1. Restriction on radio for secrecy.
2. Damage to a complicated set, as by rifle fire.
3. The set may be too large under certain circumstances.
4. It may be too heavy, as for a forced march on horseback.

This type of action must therefore be practiced with wire.

VI. *Battery Detail:* When a battery operating as above must withdraw, it needs for its echelon movement the NCO's of the battery detail. It should, therefore, seek to reinforce the complement of the firing battery with whatever members of the detail may be spared. Above all one must watch that only one officer or NCO who is familiar with the arrangements for the move is taken from the battery.



Courtesy "The Military Engineer"

# 75-mm. Gun Adapted for Use as Antitank Gun

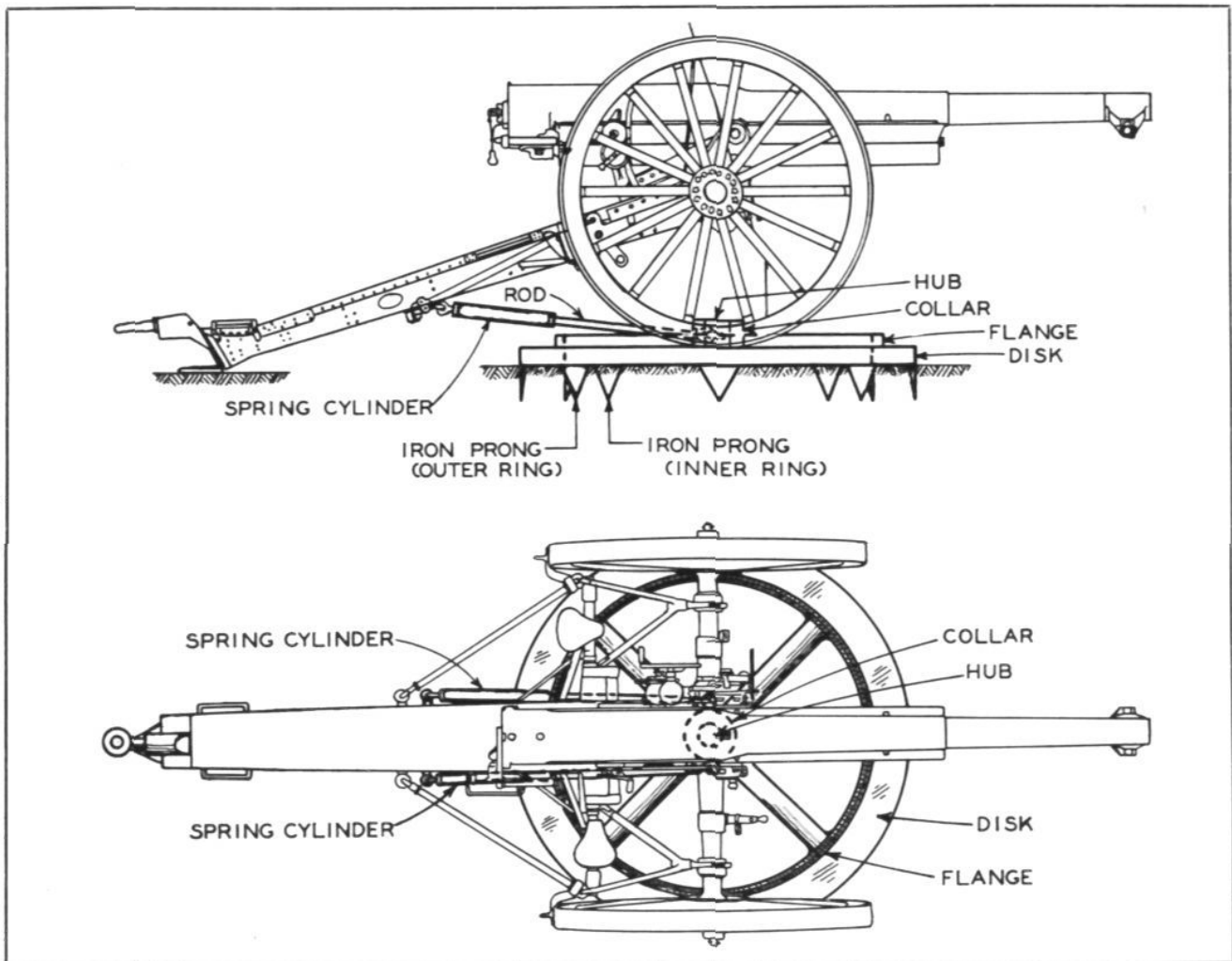
Several European armies have adopted a method of converting the 75-mm. field gun into an antitank gun by means of a portable steel platform. The platform consists of a disc whose diameter is the axle length of the wheels of the piece carriage (tread). An interior flange makes a track in which the wheels revolve during rapid shifts in deflection. The under side of the disc has a series of 6-inch prongs which, when imbedded in the ground, take up the shock of recoil and hold the carriage in place. From the center of the disc two metal rods with springs are attached to the lower portion of the trail, thus coupling the carriage to the base and obviating the necessity for a trail pit or log. The springs help cushion the shock of recoil and reduce the thrust on the retaining rods. In order to use this arrangement the trail spade should be removed or hinged so that the trail may be shifted rapidly by one

By R. C. S.

or two cannoneers. The retaining rods prevent the piece from rolling from the disc when the gun is fired.

The platform is of hollow metal construction for lightness; for traveling it is carried on a caisson or limber. When the piece is emplaced the cannoneers throw the platform on the ground, jump on it to imbed the prongs firmly, then quickly roll the piece on to the disc and couple the retaining rods.

By means of this device, the gun crew is able to go into action against tanks in little more than 60 seconds, and can deliver fire at the rate of 15 to 25 shots per minute.

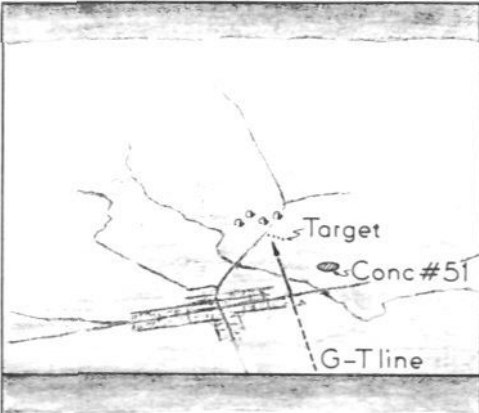
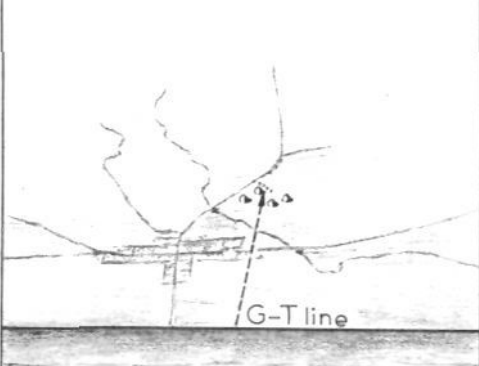



# PROBLEMS IN GUNNERY

## ADJUSTMENT OF FIELD ARTILLERY FIRE FROM THE AIR

Fire unit available: 1 battalion, 155-mm. howitzers (2 batteries).

Observing airplane flying a figure-8 over artillery position area. Altitude: 6000 feet.

<i>Sensings and commands</i>	<i>Results</i>	<i>Remarks</i>
<p>Air observer to FDC: "Concentration No. 51, 400 right, 500 short, enemy battery, request battalion, ready to observe, FIRE."            FDC to observer: "Conc. No. 65, Adjust Battery B."            FDC to Battery B: "Left 60, Cv 7000, On No. 1 op 10, Sh Mk I, Ch V, FQ, BR, Q, 400."            FDC to observer: "Battery has fired."            Observer to FDC: "50 left, 200 over."</p>	 <p>A hand-drawn sketch of a target area. A dashed line labeled 'G-T line' runs horizontally across the middle. Above the line, there are several small circles representing shells or bursts, with an arrow pointing to them labeled 'Target'. To the right of the target, there is a label 'Conc #51'. The sketch shows a landscape with some terrain features.</p>	<p>Battalion has just fired on check concentration No. 51, which, among others, was marked on an air photo furnished the observer.            At this time Battery A is laid to conform to the observer's initial sensings, but does not yet fire. If these sensings are not greatly in error, the battery, after minor corrections, can fire for effect promptly.</p>
<p>FDC to Battery B: "R 7, 384."            FDC to observer: "Battery has fired."            Observer to FDC: "Right, 100 short, fire for effect."</p>	 <p>A hand-drawn sketch of a target area, similar to the first one. A dashed line labeled 'G-T line' runs horizontally across the middle. Above the line, there are several small circles representing shells or bursts. The sketch shows a landscape with some terrain features.</p>	<p>It has been prearranged with the air observer that, in firing for effect, Battery A will initially fire "Battery Right" and Battery B will fire "Battery 1 Rd," each at the center of the zone; this will identify each battery's fire, in case further adjustment is needed.</p>
<p>FDC to Battery B: "L 2, B1 Rd, Zone 388-396."            FDC to Battery A: "L 5, BR, Zone 384-392."            Observer to FDC: "Battery B, range correct, Battery A, 30 left, over."</p>	 <p>A hand-drawn sketch of a target area, similar to the previous ones. A dashed line labeled 'G-T line' runs horizontally across the middle. Above the line, there are two distinct clusters of shells or bursts labeled 'A' and 'B'. The sketch shows a landscape with some terrain features.</p>	<p>After firing initial salvo at 388, Battery A covers remainder of zone with volleys.            Of the zone fire for effect, only the initial volley and initial salvo are shown in sketch.            FDC interprets sensing of "over" as less than 100 yards and decides to decrease range of Battery A by 50 yards.</p>

**Comments.**—An observing airplane, flying over its own artillery area, is no doubt vulnerable to hostile pursuit aviation and, in some measure, to antiaircraft fire; but not so much as when circling over the target area. Observation is good if visibility is good; the burst of the 155-mm. shell is easily recognized.

The airplane, by flying an elongated figure-8 (possibly 2 miles in length), will be in a position for observation except when doing the quick turns at either end. However, the pilot, by "listening in," can usually turn at the right time.

**Note.**—In the sketches, the oblique view of the landscape is subordinated to the target and bursts which, for clarity, are large in proportion.

## PERCUSSION BRACKET, AXIAL

**Target:** Infantry howitzer reported in the vicinity of a bush. **Mission:** Neutralization. **Materiel:** 75-mm. gun (M2). **Ammunition:** H.E. Shell, Quick Fuze. **T = 80, r/R = 0.8.**

<i>Commands</i>	<i>Results</i>	<i>Remarks</i>
Battery adjust, BDR 50, Cv 4000, Site 305, Sh Mk I, FQ, No. 2 1 Rd, 4000		Wind from the right flank and slightly from the front. Range short; sensed on forward slope.
L 20, BL, 4200		All rounds doubtful, and pushed to the left by small target offset, and failure to apply r/R.
R 7, 4200		A good range.
R 3 (or 5), on No. 2 op 6. B 1 Rd, 4200		Smoke of bursts of Nos. 1 and 2 blew short of bush.
4300		Smoke of No. 2 burst blew beyond the bush.

4100

**Comments.**—The adjusting point was on flat terrain at an altitude the same as the observation post. Terrain sensings, except for the first round fired, were almost impossible. With a flank wind, some information could be obtained from the smoke of the bursts of Nos. 1 and 2. From the last salvo and the first volley, it may be concluded that 4200 is a good center range; it can hardly be more than one probable error away from the adjusting point. No further adjustment of range or deflection is needed unless the howitzer and its personnel are seen moving.

The first salvo at 4200 indicates that, with a converged sheaf, the deflection must be accurately handled.

The command for the volley at 4300 was given before seeing the first one at 4200.

## PRECISION, LATERAL, Large T

Target: Check point. Mission: Registration. Materiel: 75-mm. gun (M2), on the right. Ammunition: H.E. Shell, Quick Fuze.  $T = 700$ ,  $F = 3$ ,  $s = 18$ ,  $c/d = 0.2$ .



Commands	Elev.	Dev.	Rn.	Df.	Remarks
No. 1 adjust, BDL 320, Sh					
Mk I FQ, No. 1 1 Rd, Q	100	Line	—	—	
R 72	112	12 R		?	
	114	8 R		+	Line at 116.
L 36	108	10 R		—	Line at 110.
R 18	113	6 L		—	Line at 112.
R 9	114	3 L		?	
	113	6 R		—	Line at 114.
R 5, 3 Rds,	115	5 R	—	?	Sensing by rule.
		6 L	+	?	
		2 R	—	—	
R 3 (or 2)	115	Line	—	—	
		1 L	+	+	Deflection is now correct.
		6 R	—	?	Fork is now 4.

6 Rds, 115.7. (Or cease firing if registration calls for no further precision.)

Comments.—Precision adjustment, large T, is usually working against dispersion. Computations to the OT line must therefore not be considered as exact; they are numerical guides which facilitate adjustment. Small deviations could possibly be ignored.

The observer should make careful note, mental or otherwise, of those rounds which establish the limits of the successive brackets. This will help him visualize the progressive narrowing of those brackets, for range and deflection.

Note: In this problem  $s'$  was determined by considering a fork of 72 yards (4 times the probable error of 18 yards).  $s = 25$ ; therefore,  $s' = .72 \times 25 = 18$ .

## THE EFFECT OF TIME SHELL

By LIEUT. KENNETH LARKEY, FA-RES

The above picture sharply illustrates several principles of our new weapon, time shell.

Time shell is several times as effective as shrapnel. A 75-mm. shell bursts into approximately 700 fragments driven by 26 ounces of TNT, as against the 270 balls driven by 3 ounces of bursting charge in the shrapnel.

The pattern of time shell begins directly beneath the burst. In the above picture, the gun is on the left, and the nose spray can be seen marking the plane of fire, while the side spray is perpendicular to the plane of fire.

Our texts allow us to figure the effective width of a 75-mm. shell burst as 30 yards, but the photo indicates that



this is very conservative.

This picture was taken on the Signal Mountain area of the Field Artillery School at Fort Sill, during a time shell demonstration given by Capt. W. H. Bartlett, FAS, to his students in the Fall 1939 National Guard and Reserve Officers' Class. The burst shown is about 500 yards in front of the dugout from which the picture was taken.

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# *A Thought on Sensing*

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This series of photos, taken with a super-high-speed movie camera, demonstrates the development of a single 75-mm. shell burst which occurred 5 yards beyond the target. An 8 mile per hour wind was blowing almost directly from the point of burst to the target.

The photos should be studied with particular attention to TIME. Note that in ONE SECOND a burst 5 yards beyond the target has practically obscured the target. If not observed in this first second a definite OVER may be sensed wrongly as a SHORT. If the burst occurs closer than 5 yards the chance for a wrong sensing will be greater.

Since the 155-mm. howitzer burst spreads farther than the 75-mm. burst the chance for a wrong sensing will be greater than for a 75-mm. Because the 37-mm. shell makes so little smoke, close shots can easily be sensed erroneously.

It is most important, therefore, to be LOOKING AT THE TARGET AT THE INSTANT OF BURST in order to see whether the target is silhouetted against the burst or is obscured by it.

To sense correctly, START LOOKING AT THE TARGET AS THE INSTANT OF BURST APPROACHES. CONCENTRATE ON LOOKING HARDER AND BE LOOKING HARDEST AT THE TARGET WHEN THE BURST OCCURS.



*0 Sec.*



*.008 Sec.*



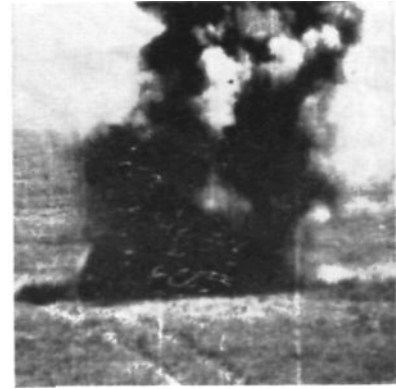
*.016 Sec.*



*.2 Sec.*



*1 Sec.*



*1.4 Sec.*



# SIC TRANSIT ALIDADE



By  
Captain  
Charles  
Nathaniel  
Tupper, FA

In the past, you surveyors have been playing around with plane tables and open-sight alidades. Your former easy life is over, I'm afraid. I might as well tell you frankly, you are going to have to use a transit. At least you are if you happen to be survey officer for the artillery section of the new division headquarters. There are fifteen men in this section, and I am told that they are to be meteorological men and surveyors, taking the place of the recently-deceased brigade detail.

What are you going to do with them? What equipment will you have? What texts are available in which you can hastily "learn your stuff"?

No current training manuals, field artillery books, extension-course material, nor other text that has come to my attention specifically deals with higher artillery survey. There is, however, a wealth of literature which deals fully with any purely technical phase of the subject that the survey officer may be likely to encounter. Specifically I would recommend *Field Artillery Field Manual, Volume IV*, and TR 435-325. No new methods of survey have been developed in recent years (except those pertaining to mapping by aerial photography). None will be brought forth in the future unless new equipment based on some hitherto unknown principle of physics is developed, or unless a mathematical discovery involving a newly discovered cosmic law springs from the brain of a Newton yet unborn. Therefore you may approach your new job confident that it consists principally in correlating and making the best use of the information and equipment already provided.

The essential items of equipment are (if they are the same as for a brigade detail):

- 1 drafting set (not strictly for the survey detail's use)
- 2 poles, ranging, 6-foot, 2-section
- 1 rod, stadia, 12-foot, folding
- 1 topographical equipment, FA, "A" set:
  - 1 alidade, open sight
  - 1 alidade, telescopic
  - 3 plane tables, with accessories
  - 1 rod, stadia
  - 1 stadia computer
  - 2 tables, logarithm, 5-place
  - 1 tape, steel, 100-foot, graduated in feet and tenths

1 transit, engineer, 1-minute.

There are a few minor deficiencies in the above list, but in general it provides everything essential for running in a third-order system of control. Of course, no primary triangulation nor other work ordinarily performed by the Engineers or Coast and Geodetic Survey is possible with a minute transit. So don't be trying any twenty-mile shots between stations.

The task confronting the survey officer in any given situation may be laid down specifically in the orders of the divisional artillery commander. More often he will have to deduce it from his own knowledge of the situation and the needs of the regiments. It will vary from the most difficult case, in which no topographic data exist and none will be provided by higher units or other troops, to that in which detailed fire-control maps are available and topographic points—bench marks, triangulation stations, and the like—are plentiful throughout the area.

Before the survey officer can plan his work he must learn from the artillery commander what type of map or map substitute is to be used as a firing chart throughout the division, and what topographic control or triangulation system is needed for the accomplishment of the artillery mission. Probably it will fall to the survey officer to decide, from his own information obtained by reconnaissance, what amount of control is necessary.

These bits of information, and these decisions and orders, do not arrive like a bolt from the skies. Usually the situation is a continuing one. The survey officer knows that he is about to enter unmapped terrain, for example. Or he has learned that certain data will be provided by the engineers or by the corps observation battalion. His own reconnaissance and survey goes on night and day. He is ready at any time to formulate his survey plan for a given situation. In fact, if he has exercised proper forethought it may well be that most of his work is already accomplished when he receives the divisional artillery plan.

The survey officer should at all times provide himself with all topographic information (pertaining to his probable theater of

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Hints for the employment of  
the artillery survey detail of  
the new division

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operations) which he can secure. He should seek this out, not wait for someone to hand it to him in a routine manner. Too many people, too many arms and services—each with their own tribulations—are concerned in this, to make sure that he, John R. Doe, First Lieutenant, Umpteenth Divisional Artillery, will get coordinates of such-and-such just when and where he needs them. Furthermore, it is the unfortunate truth that topographic data in the United States are not to be found all in one source. Coast and Geodetic Survey publications furnish some, Geological Survey others. Much will come from the Engineers—divisional, corps, and army—the observation battalion will be a fruitful source; state, county, municipal, and private surveys and maps must be searched. There are soil survey maps, oil exploration charts, road maps, air mosaics, fire-control data sheets and, finally, tourist maps. There will be Lambert grids, U. S. grids, geographic grids, arbitrary grids, no grids. In the worst case, no data will exist; the survey officer will be forced to establish an initial point, assign arbitrary coordinates to it, assume a direction for orientation, and lay out a base line on which to build his triangulation system.

While initiative and energy are commendable in instituting survey, much time will be saved eventually, as well as possible embarrassment, if the survey officer will coordinate his plan with that of higher echelons, especially artillery. If the division is part of a corps, it is probable that corps artillery headquarters, utilizing the observation battalion, will have planned the control for the entire area. The observation battalion may already be at work on it. Hence the divisional survey officer should maintain close liaison with this unit, and attempt to keep tied-in with what they are doing. Otherwise, if the situation is one in which initial data are assumed, several independent systems of survey, like a three-ring circus, may be in progress throughout the area, all of which will have to be coordinated later.

I stress the fact that the survey officer himself will usually have to insure that this necessary planning and coordination be accomplished. The other officers on the staff, and the higher commanders, will not concern themselves in it until they discover that everything is in a muddle. Then they will quite properly hold John R. Doe responsible.

Suppose the division has just arrived in a new area. The survey officer must, of course, make a reconnaissance before he can complete his plans. A few extra minutes spent in reconnoitering will frequently save hours of traversing or triangulating. Doe may be able to take part or all of his detail with him, and issue fragmentary orders along the way so that by the time the reconnaissance is completed the detail can proceed with its work.

Frequently the reconnaissance must be made in the late afternoon, so that the survey (or most of it) will have to be done after dark. The survey officer should not wait until after sunset to arrange for his initial orientation. But if

night orientation is necessary, and there is no distant known point which can be illuminated, Lieutenant Doe and his men must be prepared to lay on Polaris or some other star. They will need an Ephemeris, and will have to be able to determine the deviation of grid north from geographic north. I'm sorry. There just doesn't seem to be any easy way out.

Nothing should be taken for granted. Even the possession of a transit and Ephemeris does not insure that the detail will not get lost after dark. The driver of the truck, in particular, should be familiarized with the route during daylight hours. And here is a practical hint: If one is searching during darkness for a "lost" survey detail, stop occasionally, have your driver shut off his motor, and listen. Eventually you will hear floating down the night air the shout "Chain!" or perhaps some more picturesque cry of the detail at work.

During his reconnaissance the survey officer should attempt to decide such questions as: If a base line is to be established, where will it run, what is its length and initial point? What is the general layout of the triangulation system, if any? Which is most convenient, intersection, resection, or a traverse? These matters should not, in general, be left to the discretion of the sergeant, unless he is an unusually capable and experienced man. The officer also will have to designate the general, and often the specific locations of place marks in the regimental areas. These items usually depend on the divisional artillery plan of operation, and involve a comprehension of the tactical set-up beyond the grasp of the enlisted members of the detail, be their technical qualifications ever so excellent.

After the survey officer completes his reconnaissance and issues his orders to the detail, he directs the computers to perform such computations as are necessary for the field crew to proceed. These operations may include, for example, an initial azimuth for orientation, an angle to be turned, a distance to be chained, or the coordinates of a new point to be located. Generally speaking, survey will consist in starting with known coordinates and obtaining the coordinates of a known point on the ground. The computers go with the detail into the field, and carry forward such computations as they have made initially.

Before the detail is sped on its way the officer had best inquire into several small matters the neglect of which sometimes wrecks even the best plans. He might well assure himself that the computers have with them all the necessary data, and that it is correct. These men are worthy souls, but they do not carry the weight of the war on their shoulders, and they have been known to forget. Ascertain by personal inspection that they have plenty of flashlights, with fresh batteries therefor. Otherwise the men may sit out in the brush waiting for daylight, and not tell you anything about it. Verify that they have lunches, full canteens, that the transit case contains a plumb bob, and that all equipment is serviceable. Later you may be able to leave these details to the sergeant, but at the outset, Doe, see to them yourself.

Then go out several times during the night to make sure that matters are progressing satisfactorily. Or, better yet, if your duties do not demand that you double in brass for some other member of the staff, spend the entire time in the bosque with your detail. Even after the regimental RO's have been given the coordinates of their placemarks you may be able to give them further assistance which will expedite the opening of fire.

I recommend that you organize your survey detail as follows:

Sergeant—Instrument operator and in charge of group

Corporal—computer No. 1, and relief for sergeant

Corporal—computer No. 2

Private—front chainman

Private—rear chainman

Private—front rodman

Private—rear rodman

The computers should go with the detail, carrying the computation forward as the field work progresses, so that at any time the instrument operator can know the coordinates of the particular turning point at which his instrument is set up. Thus he can receive, at any time, from the computers any angle which he must turn, or azimuth to set for orientation, or distance to chain to reach a point whose coordinates are known but which has not been located on the ground. By the time the field work is completed all computations should also be finished and checked. This method is much faster and more satisfactory for artillery survey than the common one in which the field notes are worked up later in an office or CP. Nevertheless the sergeant should keep neat and complete field notes (in any prescribed form), together with a sketch, so that his work may later be checked or computed independently for any other purpose.

Heretofore it has been more or less standard practice for artillery survey details to run traverses to (or locate by intersection or resection) stakes or other topographic points which have been marked on the *ground* as being convenient for or essential to the orientation of the gun batteries. For rapidity and accuracy of transit survey there is a variant of this method which has been thoroughly tested and should be employed wherever practicable. It cannot be used where there is no map substitute or map or chart of any kind whereby points on the ground may be roughly located with respect to the chart. However, if this unfavorable condition does not exist, proceed as follows:

Select on your map, air photo, or whatever chart you are using, a point which will serve satisfactorily as a place mark, bench mark or other topographic point. Scale off its coordinates according to whatever grid you are going to use. *Assume* that these arbitrary coordinates are correct, and proceed to traverse to a point on the ground which has these coordinates. Usually it will be sufficiently close to the area on the ground which you desire to use. But if the stake does happen to fall in an unfavorable location, change it a definite number of yards in any desired

direction, and change, by simple arithmetic, its coordinates accordingly. Note that the difference between this method and the old one is that in the old method you drive a stake in the ground, then determine its coordinates by survey; in the new method you select the coordinates on the map and then survey in the point on the ground.

This method has the advantage that the computers can often obtain ahead of time the angle to be turned and the distance to be chained to reach this point from a known starting point. In other words, all computation will be completed while the officer is making his reconnaissance; and it can be checked carefully before the field work commences. The greatest advantage is that it permits traverses to be run along roads rather than cutting across country. This facilitates chaining, since roads are generally more or less straight (and level as compared to the open fields; or at least the slopes are more gradual), furnishes better visibility, and obviates much brush cutting. On the whole it is faster and more accurate to traverse along roads than to make a "straight shoot" across fields, swamps, and woods. The traverse is run to a point on the road from which it is convenient to cut in to the point to be located. In large sections of the United States where roads follow section lines, this method is especially efficacious.

Everyone, I think, understands the necessity for closing a traverse. In a poorly mapped or unmapped country, however, it may be impossible to close a traverse. This will always occur when the survey commences from a single initial point whose coordinates have been assigned arbitrarily. In this case the surveyor should not hesitate to run his traverse over again. And a better check will be obtained if a different instrument operator is used; in other words, rotate the members of your detail so far as possible.

Properly trained chainmen can keep a straight course and cover distance more rapidly if no attempt is made to aline them with the transit. The rear chainman alines the front one, by eye, on the front rodman. At the same time, it is inadvisable to employ too many refinements in obtaining a proper tension on the tape. The chainman should hold it horizontal by eye, and attempt to stretch it tight, at the time the measurement is made, without the use of any special tension indicator. The front chainman uses a plumb bob to mark the point on the ground under the end of the tape or other graduation which he is using as an index of measurement. He then inserts a pin where the plumb bob touched the ground, or marks the point with a crayon if the traverse is being made along a hard surface. The amount of foreshortening of the tape caused by sag is compensated for sufficiently by the slightly zigzag course run by the chainmen when they are alined only by eye. Similarly it is usually not worthwhile to attempt to chain parallel to a slope and correct by means of the vertical angles. It is quicker and sufficiently accurate to hold the tape horizontal, "breaking" it at divisions less than a tape length where

the slope is steep. Usually it is advisable to lengthen a traverse to avoid steep slopes; that is, avoid such slopes by traversing around them where possible.

Before a survey officer decides that a long traverse is necessary, he should be certain that an intersection or resection will not do just as well. Triangulation is generally more rapid and accurate than traversing where long distances or rough terrain are involved, especially when motor transportation is available for quick movement to distant points to be occupied. Also, in hilly country, it usually is best to locate a point on high ground by triangulation, then run a short traverse down to the placemark which it is desired to locate near the guns. In many cases, too, it is feasible to check a traverse by triangulation.

There is nothing complicated about intersection using simple trigonometry and logarithms. All phases of this operation are described in the texts mentioned, as well as in FA Book 161. There is a quite general lack of appreciation, however, of the advantages of a mathematical resection, and few field artillerymen seem to have available the formulas by which this method is applied. For that reason these formulas are given here. It should be understood that this resection is considerably more accurate than the Italian or other graphical methods, and, when the computers have become experienced, and work in pairs to check each other, it will be found to be little if any more lengthy. If the set-up is good, that is, where the angles between the three points are greater than twelve degrees, and are measured accurately, the solution will usually be as accurate as that obtained by intersection. Seven-place logarithm tables should be used, to obviate interpolation. If a mimeographed form is prepared, the problem will reduce to a mechanical solution involving only the use of logs and arithmetic. No trigonometry nor analytical geometry are required.

Let P be the unknown point which it is desired to locate. Letter the three known, distant points A, B, C, clockwise as seen from P, designating any of the three points as A. Call

the dX and dY of BA,  $x_1$  and  $y_1$  respectively (difference in the X and Y coordinates of B and A); and the dX and dY of BC,  $x_2$  and  $y_2$  respectively. Call the clockwise angle from PA to PB,  $\alpha$ . Call the clockwise angle from PB to PC,  $\beta$ . Be sure to use the correct signs for  $x_1$ ,  $x_2$ ,  $y_1$ ,  $y_2$ ,  $\cot \alpha$ , and  $\cot \beta$ . In getting the signs of  $x_1$ ,  $x_2$ ,  $y_1$ ,  $y_2$ , remember that lines measured north from B or to the east of B are positive, while those measured south or west of B are negative. In getting the signs of  $\cot \alpha$  and  $\cot \beta$ , remember that the cotangent of an angle in the second quadrant (between  $90^\circ$  and  $180^\circ$ ) is negative.

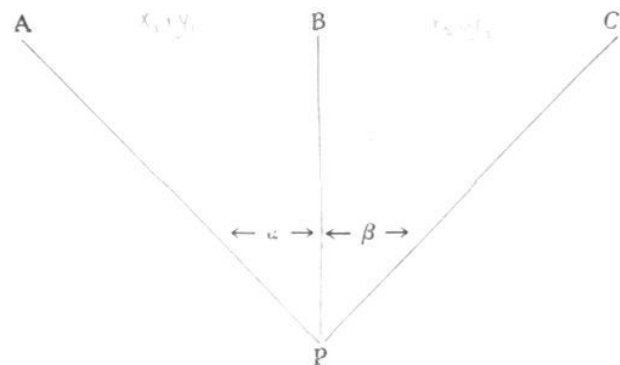
Solve the following equations for the dX and dY of BP and apply them to the coordinates of B to get the coordinates of P:

$$\frac{(X_1 - y_1 \cot \alpha) - (X_2 + y_2 \cot \beta)}{(y_2 - X_2 \cot \beta) - (y_1 + X_1 \cot \alpha)} = K$$

$$\frac{K(y_1 + x_1 \cot \alpha) + (x_1 - y_1 \cot \alpha)}{K^2 + 1} = \text{dX of BP}$$

$$\frac{K(y_2 - x_2 \cot \beta) + (x_2 + y_2 \cot \beta)}{K^2 + 1} = \text{dX of BP}$$

$$K \text{dX} = \text{dY of BP.}$$




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*The article "Marching Animal-Drawn Field Artillery" that appeared in the November-December FIELD ARTILLERY JOURNAL has been construed in some circles as a reflection upon the Veterinary Service. Such was not intended by the author, the Chief of Field Artillery. The Field Artillery should be able to make marches under the conditions cited without benefit of Veterinary Service. The responsibility definitely lodged on the shoulders of the specific unit commander, and not on a member of the Veterinary Corps. In this particular instance the Veterinarian warned the battery commander that his horses were approaching heat exhaustion and even went so far as to renounce all responsibility if the march were continued. Investigation discloses the fact that the Veterinarian had clinical thermometers with him, but that they were not used for the reason that in his opinion heat exhaustion symptoms were very marked. Had a thermometer been used, as an aid to diagnosis, its convincing evidence should, and might, have prevailed upon the unit commander to take the steps necessary to prevent loss of animals.*

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FIELD ARTILLERY: KING OF BATTLES, by Major General Harry G. Bishop (originally priced at \$2.00), reduced to 65c.

See advertisement inside front cover.

# Casket Mounting for 75-mm. Gun

A cargo truck, being still a cargo truck, regardless of how it is painted and surrounded with pomp and ceremony, is not a respectful nor particularly dignified vehicle on which to convey the remains of a dead comrade.

By Major Ward C. Goessling, Jr.

The 152d FA, Maine National Guard, being dissatisfied with using a cargo truck as a hearse in military funerals, constructed a casket mounting to place on the 75-mm. gun.

This mounting allows the use of the gun carriage as a hearse, as tradition indicates is the proper conveyance for the soldier dead.

This mounting has been used successfully in military funerals for the Veterans of Foreign Wars, The American Legion and for the deceased members of the National Guard.

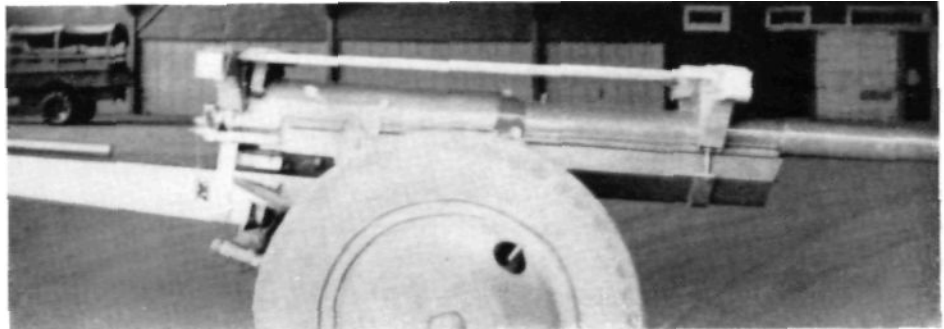
The mounting is simple and inexpensive. Those in use in the 152d FA are manufactured by the battery mechanics.

The timber risers are cut from three by fourteen inch oak forty inches long.

The one on the breech end is recessed for the rear sight, which centers and secures the riser.

The one on the muzzle end is recessed to fit over the jack roller bearing and is thereby held in place.

Webbing straps, or adjustable rings, secure the casket and flag to the mounting. Side movement is prevented by moving the rings on the end of the webbing straps into the side of the casket and by sponge rubber strips on the top of the risers under the casket.



*Side view*



*End view*



*Casket mounted on 75-mm. gun*

# STREAMLINING RESECTION

Field Artillery Book 161, in its chapter on survey operations, gives several methods of resection, the best of which is undoubtedly the Italian. But this method, together with the simpler triangle - of - error and tracing-paper methods, necessitates exposing the plane table during the process. Once this undesirable exposure is eliminated



resection will become much more valuable than it is at present. That it can be eliminated is proven by the two methods described in detail below. All that need be done is to place an aiming circle in a position from which three distant, easily located points can be seen, and measure the two angles between these points. Then seek cover as rapidly as the urgency of the situation demands . . . with or without the aiming circle. At leisure, and under cover, the resection can be carried to completion without the mental strain caused by the realization that one is not only visible but vulnerable. Such a strain must have a deleterious effect on the resector. Furthermore, it is likely that battery commanders will be eager to use a system which lengthens the interval between breaking in reconnaissance officers. No doubt the RO's will be just as eager.

Another advantage of such a method is its adaptability to forward and rearward displacements. During the reconnaissance of a new position the plane table will usually be in use at the old OP. Yet it is desirable to have everything all ready to shoot, and as accurately as possible, as soon as the battery reaches the new position. All that has to be done is to measure the two angles, draw a couple of lines on a map, or mosaic, and the new position is accurately located. Fire can be put on the same areas and concentrations without any delay other than laying the battery.

The author of this article claims no credit for either of the methods herein presented. Sergeant Joseph Haber, Instrument Sergeant of Battery D 7th Field Artillery, deserves most of the palms, and the Coast Artillery must be credited with an assist. While looking through an old Coast Artillery book<sup>1</sup> Sgt. Haber found two resection

<sup>1</sup>Orientation, compiled by Major Walton C. Clark, C.A., published by the Coast Artillery School, 1918.

methods applicable to Field Artillery. The first of these, the

"Segments Capable" method,<sup>2</sup> described later in the article, is, with one or two exceptions, practically unchanged. In addition to this and the methods of resection described in F.A. Book 161, Sgt. Haber found three quite complicated methods<sup>3</sup> which, owing to lengthy dealings with involved formulae, logs, sines, and the like, have no place in the orientation work

of mobile artillery. Then he noticed that one of these (the Trigonometric Solution) lent itself as readily to geometric solution as to trigonometric. The author has, to his own satisfaction at least, proved that this method, when done with the accuracy which all artillery survey methods require, is at least the equal of the Italian method in accuracy and far surpasses it in simplicity. It was Major John M. Devine, FA, who first noticed that the method is, in effect, a geometric solution of the Italian method of resection.

The "Geometric Italian" and the "Segments Capable" solutions, together with all other methods of resection, except for the rather inaccurate back-azimuth method, cannot be solved if the point to be located is on a circle drawn through the three known points.

Should the explanation of these methods make them seem complicated or involved the fault lies in the choice of words of the author and is not inherent in the methods, both of which are very simple, as a little practice will conclusively demonstrate. A rather dogmatic method of labeling points and angles has been used because the solutions seem to be more easily committed to memory if labeled in the manner illustrated.

## FIRST GEOMETRIC METHOD—GEOMETRIC ITALIAN

1. Pick three points on the map which can be readily identified on the ground. Label these points A, C and B, as in Fig. 1. These points must be chosen so that P, the point required, is not within triangle ABC.

2. With B.C. Telescope or aiming circle measure accurately the horizontal angles between A and C and between C and B. Call these angles  $b$  and  $a$  respectively.

<sup>2</sup>Ibid. p. 119.

<sup>3</sup>Ibid. pp. 194, 198, 202.

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By Lieutenant Trevor N. Dupuy, 7th FA

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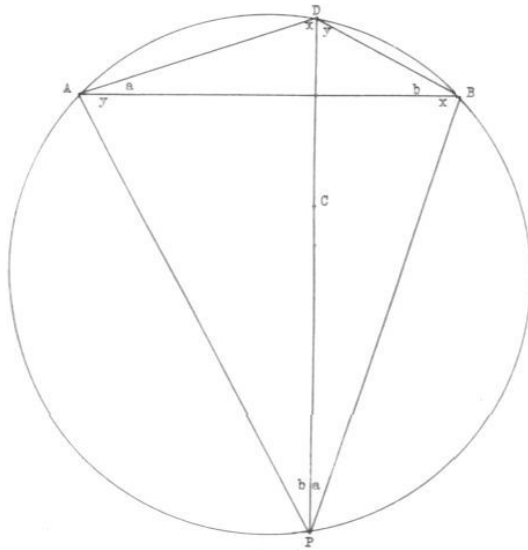


Fig. 1

The condition of step 1 is fulfilled when the sum of angle *a* plus angle *b* is not greater than  $3200''$ .<sup>4</sup>

3. On the map draw line AB and at point A lay off angle *a* on the far side of AB, and at B lay off angle *b* on the far side of AB. (Note that angle *a* is measured between C and B and that *b* is between A and C.)

4. The far sides of these angles will meet in a point D. Draw line DC and extend it towards P's anticipated position.

5. Measure angle ADC (angle *x*) and angle BDC (angle *y*). Lay off angle *x* at point B on the near side of AB and angle *y* at point A on the near side of AB. (Note that again the angle laid off at A is measured between C and B and the angle laid off at B is measured between A and C. Merely remembering this one fact will help the problem solve itself.)

6. Extend the sides of these angles. They will meet at a point on line DC extended. This is P, from which angles *a* and *b* were originally measured.

It is interesting to note that even if C is near the circumference of a circle through A, B and P the problem is solvable so long as a definite line can be drawn between D and C. It is only when D and C actually coincide (i.e., P is on the circumference of a circle through ABC) that the problem is unsolvable. In order to prevent even this remote possibility it is best to choose C so that it is as near or nearer to P than are A and B.

<sup>4</sup>The conditions of steps 1 and 2 are introduced only for simplicity's sake. There is no special case, other than the one already mentioned, where the problem does not work. For those who do not wish to be limited by the above conditions the following is offered:

When P is within the triangle ABC it is possible for the geometric solution to go beyond the limits of the plane table (because of the small size of angle ADB) unless the following procedure is adhered to in labeling the points. By inspection it is possible to tell in approximately what part of the triangle the resector is situated. Pick the line (not necessarily the points) that is farthest away and call it AB. If the resector seems to be in the center of the triangle, any of the three lines can be used as AB. Remember also that angles APC and CPB must be subtracted from 3,200 mils in order to be laid off at B and A as angles *b* and *a*.

The mathematical proof of this problem consists merely in the geometrical theorem that equal arcs of a circle subtend equal inscribed angles. A glance at Fig. 1 shows the application of the theorem.

SECOND GEOMETRIC METHOD—SEGMENTS CAPABLE

1. Pick three points on the map which can be readily identified on the ground, labeling them A, C and B, as in Fig. 2.

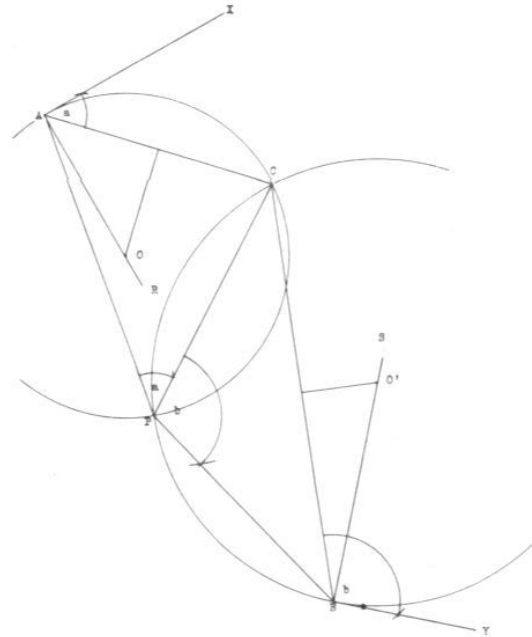


Figure 2

2. Measure the angles between A and C and between C and B. Call these angles *a* and *b*. (Note that this is just opposite from the lettering of the angles in the preceding method.)

3. On the map draw lines AC and CB (not AB as in the previous method) and on the far side of line AC lay off line AX making angle *a* at point A. Similarly on the far side of BC lay off line BY making angle *b* at point B.

4. Draw line AR perpendicular to AX and line BS perpendicular to BY.

5. Draw the perpendicular bisector of AC intersecting AR at O. Draw the perpendicular bisector of CB, intersecting BS at O'.

6. With O as a center and radius OA describe a circle. With O' as a center and radius O'B describe a circle. These circles will intersect at C and at another point P. P is the point required.

The mathematical proof of this problem is slightly more involved than that of Geometric Italian. In its essentials it consists in the construction of arcs of two circles so that both circles must contain the point P. The intersection of these circles will then locate the point.

All right, Mr. RO, start practicing. If the worst should come it will be much more comfortable to sit in a cozy dugout and figure where you were than to locate your grave on the spot.

# MUZZLE BURSTS

This page is for "Letters to the Editor," or any other random thoughts which readers wish to share with others. Let your conscience be your guide. *The Field Artillery Journal* pays for all "Muzzle Bursts" accepted.

## UTOPIA

TO THE EDITOR:

In keeping with the Olfacto-Scope, I'm enclosing two drawings which represent the pro and con of another gadget. This one represents what can be accomplished, with proper equipment, to eliminate the noise, congestion, and confusion around a fire-direction center. The S-3, properly relaxed in mind and body, sits beside a speaker-microphone-switchboard gadget, similar to the inter-office telephone in general commercial use. This gadget is connected to the firing batteries by direct telephone circuits simplexed over the usual wire system; it is connected to the battalion observers by wire-radio combination. The wire circuit being connected into the radio set for talk-listen purposes. This would allow the liaison officer at his radio to talk directly to the F.D.C. without intervening retransmission of his message. Now to go through with a fire mission as it might be handled.

A red light flashes on the gadget panel marked Ln 1. S-3 presses the talk-listen button on that panel and says "What is it, old man?" The liaison officers voice blares forth from the loud speaker with the following reply, "There is a damned machine gun out here raising hell with the infantry, and incidentally making my life miserable. The base point is 500 yards over and 100 yards right. Fire when ready Gridley." S-3 replies, "As a special favor you may adjust Battery 'A.' Let's call this concentration 13." S-3 then presses the talk-listen button

for Battery A and says, "Fire-mission liaison 1." The draftsman having heard all, by this time, has the initial data to place the fire of Battery A on the target. He steps to the gadget and sounds off the initial data. S-3 then presses the party-line buttons on the A Battery and Ln 1 panels of the gadget, thereby placing the Ln O in direct communication with the battery. S-3 says, "Take it away, boys," and takes another sip of mint julep. As soon as the adjustment is completed the battery executive reports the adjusted data to the fire-direction center. Another target nailed to the observed-fire chart, another victory for the field artillery. All this without effort, with speed and dispatch. The more I write and think about it the more convinced I become that my gadget is superior to and more practical than the Olfacto-Scope.

Enthusiastically yours,

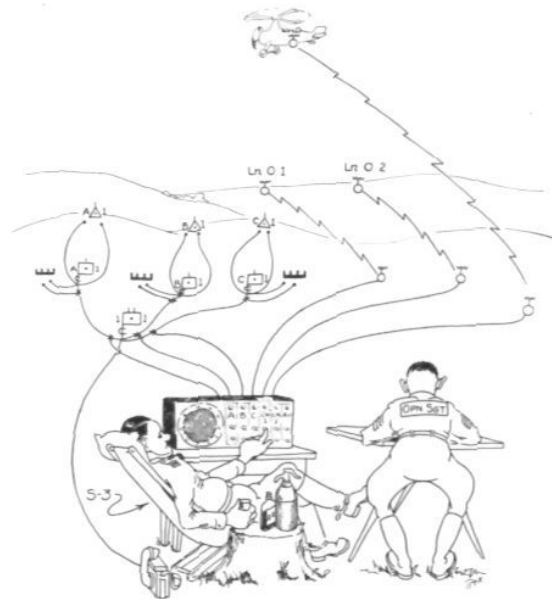
CAPTAIN REX E. CHANDLER

## A'TRaveling WE WILL GO

In the Spring, the Army's fancy turns to thoughts of moves. Not so lightly. For moving is serious business. Mrs. Selah suddenly realizes that she's lived in one place for four years. That's a long time in military life. The people next door have only been here three, and their orders were in last night's paper. The people across the way have only been here two, and their name was in the morning paper. The Selahs will soon be leaving for an unknown destination. Where? It's like sticking a pin



FIRE DIRECTION  
As it is?



FIRE DIRECTION  
As it could be?!!



in a map of the world. Mrs. Selah starts to figure. So does Captain Selah. It's a big world. Gradually they narrow the possibilities. After all an American captain would not be sent to the Island of Bali or the desert of the Sahara.

There's a place for a captain in the Philippines. Mrs. Selah remembers a sale of cotton goods. Summer things will be needed in the Philippines. It's only practical to take advantage of the sale. There're some nice summer uniforms at the tailors. Captain Selah must have something to wear when he arrives. Captain Selah begins to study the Oriental situation. He mixes Spanish, Chinese and Japanese at the dinner table. He is handed pepper instead of salt. Mrs. Selah looks around the house. It will have to be cleaned, since Army quarters must be inspected and approved before the occupants depart. It would be best to start now. Mrs. Selah still has a nightmare about the last inspector finding dust behind a basement radiator. Captain Selah is still explaining the dust in official letters.

Closets are the place to begin. It's amazing the things that can be found in closets. The old saying about skeletons takes on new meaning. Here's Aunt Mary's wrapped-but-never-mailed Christmas present. The lack of a thank-you letter is explained. But what to do with it now? The discarded Book of Etiquette beside it says nothing about delayed Christmas presents. Perhaps the waste basket is the place for both. Here are broken toys and empty boxes. Here's wrapping paper and pieces of string. Here are half-empty medicine bottles and Mrs. Selah's lost scissors. Here's the dress she bought and never wore. Here's the blue uniform Captain Selah bought and was never allowed to wear because the style was changed. Closets are like a *True Confession* magazine. Mrs. Selah destroys and gives away until she's prepared for a tropical journey. So is Captain Selah. He understands the Far Eastern situation. He can say good morning in Spanish, Chinese and Japanese.

Then he reads the Army Orders. There's a vacancy for a captain in Alaska. Mrs. Selah notices a bargain in fur coats in the same paper. Alaska would be nice. The fur coat sounds warm. Captain Selah looks over her shoulder. Fur caps and gloves are also mentioned. A good soldier must always be prepared. The house is surveyed again. The contents are once more sorted. Captain Selah starts to read of polar expeditions and igloos. He's not sure he will like a diet of fish. Travel, though, is good for one's mind.

Another vacancy occurs. It's in New York. Captain Selah issues invitations to the World's Fair. Mrs. Selah begins to study the theatrical pages of a New York magazine. The contents of the house are once more sorted. So many things are not appropriate for city life. There's been a dust storm and the house must be cleaned. Red paint has been spilled on a floor. It must be painted, lest the Inspector think of blood stains and detective stories.

Mrs. Selah promises to give away her cook. Captain Selah gives away his boots. There's a detail in a motorized

regiment. They wait. They watch. Mrs. Selah feels like Bluebeard's sister-in-law. Captain Selah feels like a shipwrecked sailor. But at last the dust and sail appear. They are not to move. Their plans and work have been in vain.

Mrs. Selah, though, brightens as she realizes the house is clean and they'll have to buy new furniture and clothes. It's just the same as a move. Captain Selah, too, brightens when he's asked to give a talk to the Boy Scouts in the Philippines. There are advantages to the annual Spring Army game of seeing and knowing the world!

—MADGE ELWOOD

### MECHANICAL DATA COMPUTER

The training of artillery officers in the conduct of fire and fire direction has always been the most important function of the Field Artillery School, and of officers who are on duty as instructors with the Reserve Officers Training Corps and with civilian components.

Looking back over thirty-odd years of artillery service, it seems to me that our most difficult problem has always remained the same; that is, to teach officers how to conduct fire skilfully. Our materiel, both guns and fire-control instruments, represent a high degree of development and accuracy. The errors and inaccuracies of artillery fire can be attributed in practically all cases to the human factor and exist almost in as marked degree today as they did years ago, that is, the same errors are almost always present no matter whether it be in the service practice of officers at their various posts and stations or at the Field Artillery School at Fort Sill.

There has always been one cogent fact, however, and that is, where there is the most firing practice, there is usually the most accurate firing. In other words, field artillery conduct of fire requires an enormous amount of practice and this practice must be repeated year after year in order to maintain a satisfactory degree of training. The errors of today are the errors of yesterday—human errors.

In addition, the service practice required in the training of artillery officers involves an exceptionally high cost, due to the expensive character of artillery ammunition, which is approximately for 75mm shrapnel fourteen dollars and fifteen cents a round, for shell eleven dollars and sixty-two cents, and for 155mm shrapnel fifty-one dollar and seven cents and for shell thirty-five dollars and thirty-nine cents a round.

With these facts in view, I am of the opinion that the time has arrived when our thoughts should be given to the development of some form of mechanical data computer or fire director for field artillery which will eliminate in some degree the human error, thereby improving the accuracy of fire and reducing the enormous cost of training officers in the conduct of fire.

—COLONEL JOHN W. DOWNER, FA

## TRANSFER-EASE

One balmy June afternoon I sat in the orderly room by myself, wrestling with the semi-annual clothing settlement. In came a neat, respectful soldier wearing three "hash" marks on his sleeve, but no chevrons. He saluted, and after the usual formalities announced that he would like to transfer to my battery. Inwardly flattered, I informed him that I was not the BC, but that I would speak to Captain Blank about the matter at the first opportunity. I questioned him briefly, and a little later walked down to the sheds to speak to the BC about this and other matters.

Ostensibly the Old Man was supervising some post-season gunners' instruction which was in session at a howitzer parked on the cinders in front of the gun shed. Actually the captain was more interested in what the first sergeant was doing. The latter, directing the activities of three languid GI's in fatigues, was busily engaged in the construction of a covered drain at the end of the new wash rack. The BC and the top kick were buddies on jobs like this. They loved nothing more dearly than to build a new garbage rack back of the kitchen or a pit in the mechanics' stall at the garage. And they would discuss for hours the plans for a gravelled drive around the paint shop, all nicely bordered in white-washed stones.

But the battery commander hailed me genially, and after inquiring absently how my work was proceeding, questioned me also concerning the man who had applied for transfer to the battery.

"Why'd he want to come over here?" he asked.

"Oh, the usual reasons, sir. Wasn't getting ahead very fast in the Nth Field. Thought he could better himself in your outfit. Seemed to be a good man. Two years in high school. Been in the islands. Drives a truck. Has been acting supply sergeant."

"How much service?"

"On his third enlistment."

"I don't want him," said the Old Man, with finality.

"But captain—we need a new supply sergeant!"

The BC squatted down and drew pictures in the gravel. "Son," he said, "let me tip you off. I've learned about this the hard way. I used to be a sucker for these snappy gents who wanted to transfer to my battery. It bootlicked me to think that they wanted to serve under me. Once I took a jasper who claimed he was a college man. Could take

shorthand. Was a whiz on the typewriter. Had been a clerk in some regimental headquarters. His hair was a little long, and a little greasy. But I took him. I needed a good clerk. I soon found out what the score was. This clown had a habit of writing direct to the Secretary of War, or the President. Maybe he even wrote to King George. He wanted justice, or better working hours, or something. He got longer hours; I doubt if they were better.

"Then there was Private First Class Bibber. Took him from the Nth Field, too, come to think of it. The scoundrels never let on how glad they were to get rid of him. At first, to my delight, I found that Bibber made orderly every time he went on guard. He had fifteen years' service, was quiet, respectful, and the hardest worker I ever saw. But he *would* take a little drink soon after going by the pay table. The MP's knew him intimately. He used to charge by their gate in a stolen taxi at 3 AM payday night, whooping defiance and challenging them to a chase. The MP's always won. Bibber spent the 1-3 inclusive of each month in the clink. Always contrite afterwards. I hadn't the heart to really tromp on him. But eventually he robbed the Post Exchange, kidnapped a janitor, deserted a wife and four kids, and hasn't been seen since.

"Private Specialist Fifth Class Jipes always will stand out in my mind. He was a fine soldier—a real old timer. Had been in charge of a QM warehouse. More lately helped one of the dentists at the station hospital. It was his extra-curricular activities which finally soured me on him. He had an unfortunate habit of easing out of the warehouse and into the brush occasional bales of pants, blankets, or boxes of shoes. They never knew how he did it. But he sold them to a swarthy citizen who operated an "Army and Navy" goods store down town. Jipes also did a little dental work for his friends on the sly—for a nominal sum, of course. I had to try him. No end of embarrassment.

"No, Cliff, I'll always take my chances with the common, run-of-the-mill recruits to fill all vacancies in this battery. Will have to train them, of course. May pass up a few good men who want to transfer. And may get an occasional over-ripe egg from the recruit detachment. But it works out better that way. The percentages are in your favor. They're nearly a hundred to one against you the other."

—LIEUT. CLIFF D. WELLER

## NOMINATIONS FOR MEMBERSHIP TO THE RED LEG IMMORTALS

(a) *The supply sergeant of that Regular Army battery on the Border who believed that he ought to be "over" one each—or at least one—of every item of equipment in the outfit, including three-inch guns, and who acted accordingly, to the detriment of a neighboring battery.*

(b) *The untutored staff of an artillery brigade who, in preparation for an impending CPX, took a get-rich-quick course in signal communication; then sat up half the night trying to unscramble the MIF MIF message by means of the Cipher Device.*

# BOOK REVIEWS

*VERDUN.* By Jules Romain. Alfred A. Knopf, New York. 500 pages. \$2.50.

This authoritative and serious study of one phase of the World War is divided into two parts which are called books. The first of these is a critical analysis of the Allied conduct of the war up to the opening of the Battle of Verdun; the second deals with that battle itself. Although classed as fiction, the book appears to contain little that is not factual. The author has simply employed a favorite "dodge" of contemporary writers which permits them to investigate representative individuals and actual events without the restraint inevitable where the characters are real persons.

No one has written a complete and detailed account of the World War, nor even of any major part thereof. *Verdun*, however, approaches this ideal closely insofar as the Verdun campaign is concerned, and disregarding purely tactical aspects of the action. The reason for this is that the author has shown us the motivations and actions of the many and varied persons who go to make up the battle or had some effect on it. He is not content merely to furnish a description of men in trenches shooting at each other; he tells about the statesmen and politicians back of the front, the war profiteers and manufacturers, the war lords, division, corps, and army commanders, secret agents, infantry corporals in the holocaust, subalterns, and staff officers. An understanding of the parts played by all these is necessary if one is to grasp fully the surge and trend of so complex and mighty an event.

*MILITARY HISTORY OF CARLISLE AND CARLISLE BARRACKS.* By Lieut. Col. Thomas G. Tousey, Medical Corps, U. S. Army. 447 pages with 33 illustrations. Richmond, Virginia: The Dietz Press. 1939. \$3.50.

As denoted in the title, this book traces the military history of Carlisle Barracks, and incidentally of Carlisle, Pennsylvania, from the time when the first stockade was erected in 1750 up through the present Medical Field Service School.

The book divides the existence of the post into the period of occupancy through the Revolutionary, Mexican and Civil Wars with the intervening periods; its identity as the Indian School, from 1875 to 1918; as General Hospital No. 31, from 1918 to 1920; and as the Medical Field Service School, from 1920 to date. Up to 1875 the post was garrisoned by varying number of troops, and at times furnished the early training for Cavalry troops. During the Civil War, the post was partly demolished by Confederate guns. The period of existence of the Indian School is

described in an interesting, authentic manner. The origin and progress of the present Medical Field Service School is related.

Documentary data were obtained from official archives, national and state libraries both of this country and in England, individually owned manuscripts, and personal communications.

In the appendix are listed the names of all officers of the Army who have been stationed at Carlisle Barracks since the Revolutionary War up to 1939, with their tours of duty, branch of the service, and main duty performed.

This book relates the historical facts in an interesting narrative style and should be of interest to those who are historically inclined, and especially those persons who desire knowledge of the services performed by the line troops of the U. S. Army in this vicinity, and of the Medical Department both at General Hospital No. 31, and its successor, the Medical Field Service School. Those persons who are interested in Indians will find an excellent account of the Indian School during the forty-three years of its existence.—E. A. C., JR.

*THE BIRD, THE GUN, AND THE DOG.* By Ledyard Sands. Carlyle House, New York, 1939, 488 pages, 24 illustrations. \$7.50.

One may purchase separately several excellent books dealing with quail and quail shooting; with ducks and wild geese; or with dogs and guns. But here is a book that covers all these subjects thoroughly, and more too. As the author says, it is really twelve books in one. You will find your favorite game bird described, together with his natural history, how to hunt him, what gun to use, and what breed of dog is best.

The delightful descriptions of the country in which the game is to be found, together with interesting anecdotes of hunting experiences, authoritative natural history, and a collection of fine prints—some of them in natural color—combine to form a huge book, a lifetime gift. And very handsomely manufactured. Highly recommended to the officer who enjoys hunting or a study of wildlife in field, wood, and marsh.

*HOW STRONG IS BRITAIN?* By C. E. Count Puckler. Veritas Press, New York, 1939. 239 pages. \$2.50.

An attempt by a German economist-sociologist to analyze the strength, actual and potential, of the British Empire. Investigating, in turn, its industry, agriculture, shipping, banking, finances, its military power and its general economy, he arrives at the conclusion that, although Britain has greater military strength than in

1914, its supporting structure shows definite signs of weakness.

He believes that England's insular position, formerly a bulwark, is now a source of weakness, in that the nearness of her vital areas to the sea prevents organization of adequate outer defenses. He is convinced that the effectiveness of Britain's strongest weapon, the blockade, will be more than neutralized by the new economic sufficiency of Nazi Germany, and her ability to import supplies from eastern and southeastern Europe. This fact, he believes, will force Britain to take the offensive in the expected war, an offensive certain to be unsuccessful.

Apparently a man of keen insight, the author has no illusions about Empire unity. He concludes that the Empire is a vital and vigorous association of peoples, inspired by a common ideal, and is not, as many imagine, an institution rapidly approaching the end of its tether. He believes that Canada will prove to be Britain's most difficult problem; events of the last three months have shown him to be wrong, in this respect, at least.

Although the author has shown uncommon ability to marshal and analyze statistics, some of his conclusions appear to have been influenced by the Nazi viewpoint. However, his book is well worth study, for the facts brought out, if one is prepared to apply the proper obliquity factor to some of its conclusions.—R. W. B.

*CHEROKEE CAVALIERS.* By E. E. Dale and Gaston Litton. University of Oklahoma Press, Norman, 1939. 308 pages. \$3.00.

In these days of oppressed minorities, a holier-than-thou attitude on the part of Americans may be avoided if we remind ourselves occasionally that we once indulged in this type of oppression. It may surprise some readers to learn that the Cherokee Nation, who received very scurvy treatment indeed from our government in the first part of the nineteenth century, contained many well-to-do, educated, and cultured members. Although their lands in Georgia and elsewhere had been guaranteed to them for all time, they were uprooted from their homes, churches, schools, and communities in the dead of winter and forced to make a twelve-hundred-mile trek to the wilds of what is now Oklahoma. They lost much valuable property and many of them died along the way. It was all a consequence of the old truth that "as long as the Indian has an acre of land or a dollar the white man will not be content until he has got it away from him."

*Cherokee Cavaliers* is a collection of letters written between 1832 and 1872 by several prominent Cherokees, in which the affairs of their people, as well as other contemporary American events, are discussed with intelligence and feeling. A prominent figure in the book is Stand Watie, a Cherokee chief who was the last Confederate brigadier to surrender in '65. The letters also shed light on the life of the times and, incidentally, several of the less literate correspondents furnish indirect evidence

as to how Americans of Southern birth pronounced many of their words one hundred years ago.

*WARFARE. The Relation of War to Society.* By Ludwig Renn. Oxford University Press, New York, Inc. \$2.50.

Commencing with a brief analysis of wars of liberation, predatory wars, wars of annihilation and extortion, under the title War Aims, the author follows through with a most interesting discussion of War Economy, Strategy, Tactics, and Propaganda. The historical background is stressed and well presented, and all the more interesting because it is combined with practical information, views and thoughts which have the atmosphere of front line trenches. *Warfare*, however, is neither a history, a textbook, nor the diary of a war correspondent—it is an analysis of what the author terms "War in General" and "The Practical Conduct of Warfare" presented in an understandable way by one who has learned in the School of Practical Experience, and which will appeal to the non-military reader and yet be more interesting to those who seek and enjoy compilations of factual military history.

The author compares the lessons learned as a line officer in the German Army during the World War with similar experiences in Spain with the Nationalist forces, and holds the attention of the reader from War Economy "where the shell which explodes represents no addition to the national wealth" to his final claim that "only the superior who is himself human can ever learn to be a good commander."—W. H. S.

*HANDBOOK OF THE WAR.* By John C. deWilde, David H. Popper and Eunice Clark. Houghton Mifflin Company, Boston. 248 pages. \$2.00.

This book is intended primarily for the general reader, but is an excellent background book for the soldier. The authors' summaries of political, economic, geographic and naval factors are better than their combat estimates of the armies involved in the current war or their ideas of strategy, tactics and technical equipment and methods.

Surprisingly, the feminine member of this team of authors is the one listed as "a research specialist in military affairs." The military reader will question the indiscriminate use of "barrage" for "concentration" and "preparation"; the statement that a "modern regiment takes into the trenches 50 to 60 automatic 37-mm. antitank guns"; and the statement that the Germans are weak in individual initiative. If the last statement is true it must be in spite of both their doctrine and traditions. One General Francois wasn't notably handicapped by lack of initiative in 1914, if we remember correctly. There is also a reference to "Hannibal and his elephants" outflanking the Romans at Cannae. This may be correct, but both Schlieffen and Leavenworth ignore the elephants.

—H. W. B.

*EUROPEAN JUNGLE.* By F. Yeats-Brown. Macrae Smith Company, Philadelphia. 408 pages. \$3.00.

This book was originally written in May, 1939, and published in England immediately thereafter. That it could be republished in America late in 1939 without essential change is, in itself, a tribute to its soundness.

The author is, of course, best known to Americans as the author of "Lives of a Bengal Lancer," but has a background of professional soldiering, extensive travel, and work as a journalist that combines with his literary ability to make possible a book that is not only readable, but one that includes much accurate reporting of the history of Europe since Versailles. The author has definite opinions, and doesn't pull his punches. History may prove him wrong on some of these opinions, but it hasn't yet.

—H. W. B.

*THEY WERE NOT AFRAID TO DIE.* By A. C. M. Azoy. The Military Service Publishing Company, Harrisburg, Pa. 303 pages. \$2.00.

Without invention of dramatic detail, Col. Azoy has made the military history of the American Revolution into a gripping story. By the clarity of his writing, and the excellent selection of incident from the great mass of source material available on the Revolution, he gives new interest to the oft told tales of Lexington, Concord, Bunker Hill, Long Island, Trenton, Princeton, Brandywine, Saratoga, Monmouth and Yorktown. Several of his chapters have appeared as individual articles in *The Infantry Journal* and *The Coast Artillery Journal*. Unfortunately, the sketch maps that accompanied them there are not included in the book. Excellent though the description of the tactical situations may be, the military reader is advised to have the map volume of Steele's "American Campaigns" at hand as he reads this book.

—H. W. B.

*THE CRUISE OF THE RAIDER WOLF.* By Roy Alexander. Yale University Press, 1939. \$2.75.

At this particular time in World events, the story of "The Cruise of the Raider Wolf" has an unusual attraction and appeals to the imagination of those who are interested in the "capabilities" of a raider along the trade routes and sea lanes of Nations.

The author, who was one of those taken prisoner by the Wolf, gives an interesting, exciting, and unique story of his experiences, and those of other prisoners, and a very full account of the 65,000 mile voyage of the World War German raider resulting in the loss of 135,000 tons of shipping. Covering the period November, 1916, to February, 1918, the book provides a maritime dictionary, and illustrates very forcibly that which was possible—or should it be said, that which was possible and was accomplished twenty-two years ago.

The very nature of the Wolf's mission made it prohibitive to touch port or to use the transmission key of the radio. Through constant listening in and intercepted messages, the voyage of this raider was made possible, for captured ships were essential to supply food and fuel for continued operation, and for the return to her home port after her work was done.

It is a remarkable story told in a fascinating manner, and is now in its third printing.—W. H. S.

*TWENTIETH CENTURY WARFARE.* By Lowell M. Limpus, Captain, Inactive Reserve, U. S. Army. E. P. Dutton & Company, New York. 205 pages. \$1.75.

The author has attempted to condense into one small volume the C and GS School's teachings as to strategy and tactics, and, in addition, to cover the functioning of general and special staffs, and the tactics and technique of the separate arms,—all this in language that can be understood by the civilian reader. The most difficult part of this large order, the presentation of the principles of strategy and tactics in non-technical language, has been fairly well done. That the author takes controversial matters and settles them in a brief paragraph is, of course, justified by the necessity of simplification, brevity and holding the interest of the non-professional reader.

Staff functioning, also an admittedly difficult matter to describe with clarity, is covered in a chapter which is not completely successful. Even so, the author would deserve commendation for a difficult job well done had his chapters on the arms and services been equally adequate. Unfortunately they are full of errors that will be obvious to any military reader. The description of the way that field artillery functions, for example, includes a completely abnormal picture of the activities of a battalion commander, his staff, and battery commanders. After placing a battery commander, erroneously of course, "out beside the guns," the author continues with this description:

"The captain rips out commands to his gun crew which sound like so much Greek, but they are perfectly clear to the cannoneers. 'Aiming Point,' he snaps, 'to left front. That column of infantry. Deflection 220. On Number 2 Open 10. Site 290. Shell Mark Four. Fuze quick. Battery right. Five thousand.'

"The members of the gun crew leap to their tasks. They whirl wheels and spin pointers. Presently the lieutenant who is watching them with hawk-like attention, faces about and reports: 'Ready to fire.'

"The captain barks: 'FIRE!'

"The executive officer repeats: 'FIRE!'

"And the guns roar together. That's Field Artillery in action." It may be. If the field artillery reader survives the Alice in Wonderland touch of a column of infantry as an aiming point, and a deflection of 220 for an aiming point to the left front, he'll probably accept the rest. —H. W. B.

# Some Forward Observations



Lieutenant Bernard  
Thielen, FA

■ LIEUTENANT BERNARD THIELEN, Field Artillery, winner of the 1940 Prize Essay Contest of the Field Artillery Association, has furnished the following brief history of his military service:

He enlisted in the 7th Infantry at the age of nineteen and eventually got an Army appointment to West Point. Since graduation in 1932

he has served with the 76th FA, the CCC, 8th FA, 1st FA, and 10th FA. He graduated from the Field Artillery School, Regular Course, in 1938, and is now an instructor in English at West Point.

Lieut. Thielen indicates clearly the disadvantages in assigning fires by overlays; and presents, as an additional method, what he calls a standard-pattern system. Lest some of us be inclined to reject his ideas without adequate consideration and test, the following is offered for what it may be worth: The Germans, who rarely equip themselves with useless devices, have in their field artillery units a template somewhat similar to Lieut. Thielen's, and use it in much the same way. It is ruled in small squares instead of circles, and the squares are not overlapping; it can be used with a map or photo of any scale.

■ REACTION TO THE NEW format of the FIELD ARTILLERY JOURNAL has been very favorable. Most readers have quickly spotted the advantages of this style, including the ability to use larger maps, more attractive displays of art work, photographs, and printed material, and so on. This larger size, though at present printed in 80 pages, instead of the 96-page size, used prior to the January-February issue, contains 27,000 more words than the latter. In spite of this, the cost of printing, exclusive of increased cost of illustrations and fees to authors, is no more than for the smaller-size magazine. In the future it will be possible to print illustrative problems in the tactics and technique of artillery which require the use of

one- or two-page maps of nearly full scale; such articles and problems are solicited from our contributors.

■ SPECIAL ATTENTION is invited to Captain Lenhard's article in *Field Artillery Abroad*. Brief as this resume is, it contains most of the essential features of French and German combat doctrines as applied to infantry divisions and divisional artillery. These are discussed in a remarkably frank manner. Note, for example, the bold use by the Germans of their artillery reconnaissance agencies prior to and just after the establishment of contact in a meeting engagement. The reader should bear in mind the fact that the observation battalion is a part of the division, and that the Germans "farm out" to divisions most of what we consider as corps artillery.

■ THE CONCENTRATION of an Allied army under General Weygand in Syria reminds us that Asia Minor, especially the Trans-Caucasian region, has been a theater of war for centuries. Prior to 1914 Russia maintained here three veteran corps, many units of which had a long tradition of fighting the Turks and the nomadic Caucasian tribes. On the outbreak of the war in 1914 operations again commenced along this front, and in spite of initial disasters the Russians generally were successful. The region is a rugged one with lofty precipitous mountains, swift deep streams, bitterly cold winters and heavy snows. Roads are few and poor, railroads generally lacking. In the mountains are important deposits of copper and manganese. On the shores of the Caspian Sea are great oil fields. All these, as Col. Lanza points out, are important military objectives. It would not be surprising if interesting events again transpired in the Trans-Caucasus when the snows have melted.

■ IT SHOULD BE reemphasized that the FIELD ARTILLERY JOURNAL conducts, in part, a forum wherein new ideas are presented and discussed. Some of these suggestions prove impracticable or for other reasons fall by the wayside; some are adopted officially and become a part of our training doctrine. Today the subject of fire direction holds a high place in the interest of our contributors. In these pages, therefore, will be found different systems of fire direction which have been conceived by various members of the Arm. That they are published in this magazine does not mean, necessarily, that they have been given official sanction; but their value in stimulating thought and debate is undiminished by reason of this.



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Number 1, Vol. I; Number 1, Vol. IV; Number 3, Vol. XXVI, and Number 1, Vol. XXVIII, not available.

Take advantage of this opportunity to complete your set of THE FIELD ARTILLERY JOURNAL before stocks are exhausted.

SUGGESTION: Are you interested in *counterbattery*? There have been eleven articles in the JOURNAL on this subject. Would you like to have back copies containing *Colonel Lanza's articles*? These copies are available at the JOURNAL office.

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