

26TH YEAR OF PUBLICATION

THE FIELD ARTILLERY JOURNAL

SEPTEMBER-OCTOBER, 1936

COUNTERBATTERY IN THE AEF
—COLONEL CONRAD H. LANZA

THE CIRCULAR SHIFT
—CAPTAIN C. P. NICHOLAS

FIELD ARTILLERY SONG—1936 REVISION
—FAIRFAX DOWNEY

CAN FIELD ARTILLERY MEET THE AIR ATTACK?
—CAPTAIN JOSEPH I. GREENE

PUBLISHED BIMONTHLY BY
THE UNITED STATES FIELD ARTILLERY ASSOCIATION

September-October, 1936

CONTENTS

A Message from the Chief of Field Artillery	419
Model 1486, Caliber 512-mm. (frontispiece)	420
The Circular Shift	421
By Captain C. P. Nicholas, FA	
Field Artillery Song (1936 Revision)	442
By Fairfax Downey	
Mountain to Mahomet—And Vice Versa.	
Positions: 170 Miles Away	444
By 1st Lieutenant R. H. Wilson, FA, La. NG	
Trucking—And How.	448
By Captain Walter J. Gardner, FA Res.	
Special Notice—U. S. Field Artillery Association Prize Essay, 1937	453
Counterbattery in the AEF	454
By Colonel Conrad H. Lanza, FA	
Field Artillery School Wants Insignia	480
"Vamm"	481
Can Field Artillery Meet the Air Attack?	491
By Captain Joseph I. Greene, Infantry	
Automatic Rifles for AA Defense	500
By 1st Lieutenant Franklin P. Miller, FA	
Notice of Annual Meeting, United States Field Artillery Association ...	511
Field Artillery Books	512
Departments	
The Journal Applauds—	513
Gee-Two'd	514
Thanks to These—	516
Some Forward Observations	518
Military Books	520

VOL. XXVI

26TH YEAR OF PUBLICATION

No. 5

SEPTEMBER-OCTOBER, 1936

THE FIELD ARTILLERY JOURNAL



Patron Saint of Artillery

PUBLISHED BIMONTHLY FOR
THE UNITED STATES FIELD ARTILLERY ASSOCIATION

BY MONUMENTAL PRINTING COMPANY
32D STREET AND ELM AVENUE
BALTIMORE, MD.

Editorial Office, 1624 H Street, N. W., Washington, D. C.
Michael V. Gannon, Captain, Field Artillery, Editor

Entered as second-class matter August 20, 1929, at the post office at
Baltimore, Md., under the Act of March 3, 1879

Published without expense to the government

The Field Artillery Journal pays for original articles accepted

THE U. S. FIELD ARTILLERY ASSOCIATION
1624 H Street, N. W., Washington, D. C.

Please enroll me as a member of the Association and as a subscriber to *The Field Artillery Journal*. I enclose \$3 for subscription and dues.

Name

Rank and Organization

Street

City **State**



COPYRIGHT, 1936, BY
THE UNITED STATES FIELD ARTILLERY ASSOCIATION



Please change my address

from

to

.....

.....

(Signature)

.....



To the Officers and Soldiers of the Field Artillery



These are interesting times. The Army is making noteworthy progress on a broad front; many changes of great significance either have been made or are in the making. We have been treated generously by a thoughtful and serious Congress, fully cognizant of world conditions. We see a clear recognition of the sound policy of effective national defense.

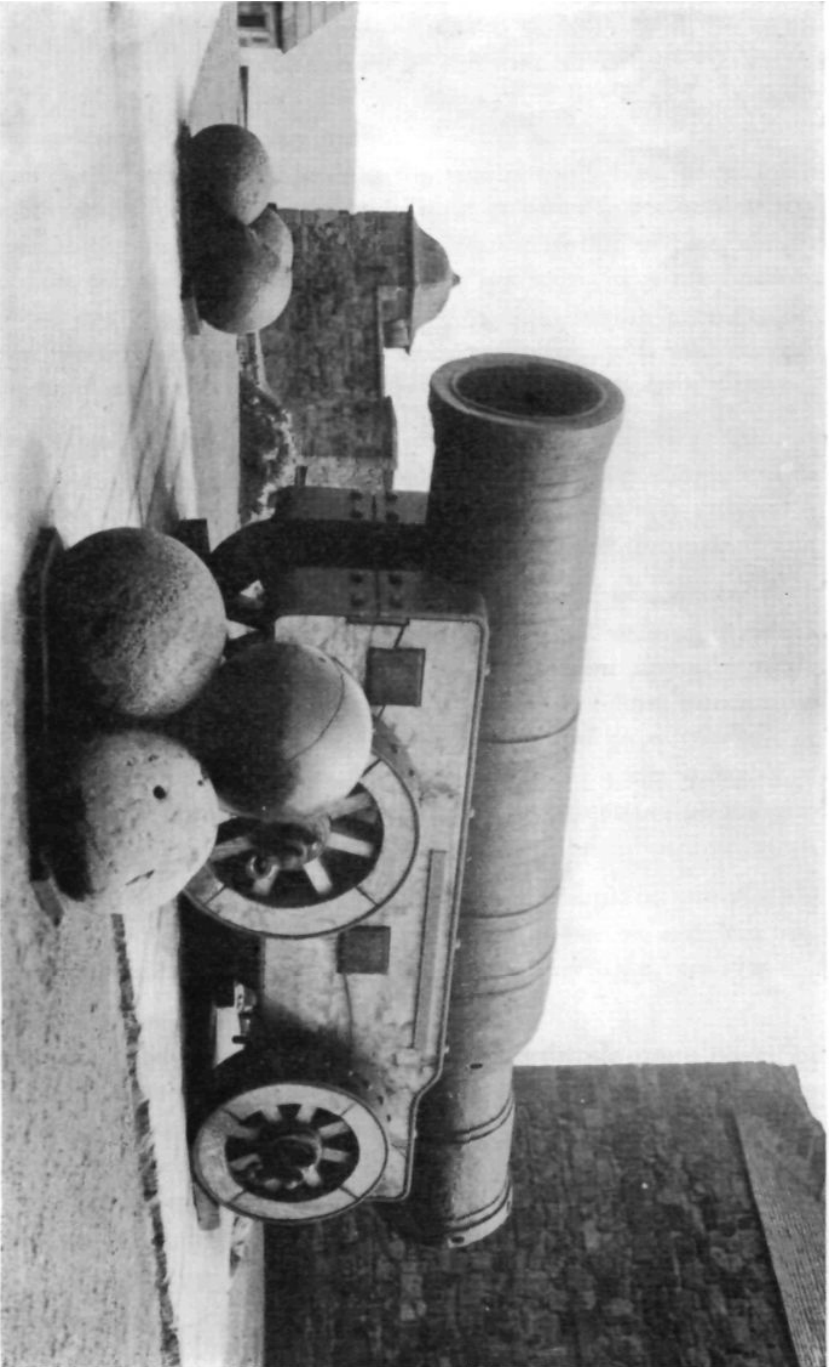
Such a setting stimulates and encourages us all. We feel that our past efforts are appreciated, and that future efforts on our part will have fruitful results. Similarly, the results of apathy or inaction will be strikingly distressing.

The greatest pleasure and satisfaction has been derived by me during the first two years of my tenure as Chief of Field Artillery in visiting every active unit, save one battery, of the Field Artillery of the Regular Army in the United States. Much first-hand information has been obtained from these contacts—information which is useful daily in influencing developments. An encouraging state of efficiency and readiness for field service has been everywhere in evidence.

The new developments in materiel, organization, technique, and tactics present to us matters of the greatest professional interest; I look hopefully to the fullest possible exploitation and application of such developments.

More than ever before has been manifested the important influence which the unit commander wields, even in peace. It is my constant concern and endeavor to secure as key Field Artillery commanders the most outstanding available officers of the arm. It is my purpose in every legitimate way to attach the greatest weight to service with troops, for the Field Artillery, as an arm, in either peace or war, will be no better than its troops, and the troops will be no better than their leaders in all echelons.

Upton Birnie, Jr.,
Major General, United States Army,
Chief of Field Artillery.



MODEL 1486, CALIBER 512-MM.

"Mons Meg," Edinburgh Castle, Scotland, believed to have been forged at Mons A. D. 1486, and used at the siege of Norham Castle, A. D. 1497. The granite shot are 20 inches in diameter, and weigh 330 pounds each.

THE FIELD ARTILLERY JOURNAL

VOLUME XXVI

SEPTEMBER-OCTOBER, 1936

NUMBER 5

The Circular Shift

BY C. P. NICHOLAS
Captain, Field Artillery

I. INTRODUCTION

FOR the conduct of observed fire on targets of opportunity, the preparation is usually incomplete because of the necessity for speed. Hence, such preparation has been termed "rapid preparation of fire." To facilitate this preparation, there is normally a preliminary registration on a base point suitable as an origin for shifts.

Registration on the base point is essentially a quick surveying operation; and, in positions occupied hastily and temporarily, is practically the only surveying operation. Hence it is of prime importance that a field artilleryman's technique include the best possible means of computing shifts from base deflection.

The perfect shift would be one guaranteed to place the center of impact immediately on the new target. At present, the chief obstacle to such a shift is the impossibility of rapidly determining the correct range.

The next best shift (and for the purposes of this discussion what I shall define as an "exact shift") is one that places the center of impact immediately on the OT line, at no great distance from the target.

A poor shift is one placing the first burst so far from the OT line that a positive sensing cannot be made without considerable adjustment. Tactically, a poor shift is at fault because it often leads to a loss of valuable time, and tends to eliminate the element of surprise.

To avoid elaboration of later remarks, let us here acknowledge that, because of dispersion, drift, weather, accidents of the terrain, and the like, artillery fire will not behave with trigonometric precision. The remainder of this discussion will concern an

imaginary perfect artillery, which behaves on the ground as it does on paper; the discussion will nevertheless be practical, for, if data be theoretically perfect, the eccentricities of artillery fire can be harnessed by methods well known. Hence, if I say that a certain result will "exactly" follow, I invite the reader to accept my use of the word "exactly" with the necessary modification.

For the computation of shifts, certain excellent methods are already taught as standard procedure. Omitting the offset method as being inapplicable to any except very favorable set-ups, I list the principal methods of shifting as: (1) The *s*-shift; (2) the *d*-shift; (3) shift with the range-deflection fan. Each of these is quick, and has proven satisfactory in practice. However, the range deflection-fan is somewhat awkward, and is limited in precision by the difficulties of drafting with inadequate tools. Moreover, as generally used, it suffers a theoretical error from the distortion of plotting a range-finder range (itself not accurate) on one side of a triangle, and a range in gun-yards on another.

The *s*-shift and *d*-shift both suffer a theoretical inaccuracy in that portion of their execution where an angle is modified by the factor r/R . This factor can be determined only approximately, and, even were it known precisely, is ineffective if the angles involved are large. In addition, the portion of these shifts involving the use of *s* or *d* is in error if the range change be great; however, to simplify the discussion, I prefer to ignore the variable nature of *s* and *d*, and to point out the r/R factor as the salient inaccuracy in either shift.

It is my thesis that:

(1) It is possible to compute shifts from base deflection so as to place the center of impact immediately upon the OT line.

(2) The means of such computation are simpler than the means now generally employed.

In developing this thesis, I shall assume that for the present we must content ourselves with the existing means of estimating the gun-target range. For want of the exact value of this quantity, it is not possible to compute initial data to secure a target hit; it is possible, however, to compute data which will guarantee a line shot. Therefore, I define a shift to some reasonable point exactly on the OT line as an "exact shift."

THE CIRCULAR SHIFT

Data to support the thesis will come from three sources: (1) Discovery; (2) Theoretical demonstration; (3) Practical research in the form of examples supporting the conclusions. There will be no supporting data from external sources.

II. THE CIRCULAR SHIFT

In this section, I shall describe and illustrate a new shift, to be called "the circular shift." Its execution depends upon the following properties of a circle (See Figure I, in which A_1B is a diameter):

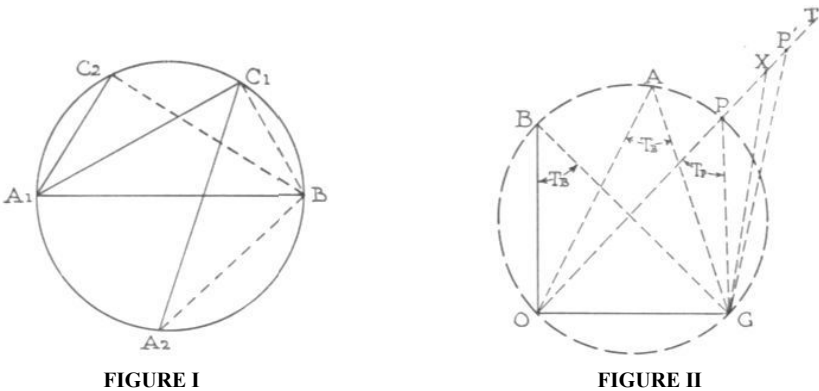


FIGURE I

FIGURE II

- (1) Inscribed angles intercepting the same arc are equal (such as angles C_1A_1B and C_1A_2B).
- (2) An angle inscribed in a semicircle is a right angle (such as angles A_1C_2B and A_1C_1B).
- (3) A chord equals the product of the diameter by the cosine of the angle between the chord and a diameter from an end of the chord ($\overline{A_1C_1} = \overline{A_1B} \times \cos \overline{BA_1C_1}$).

(See Figure II) Assume a base-point B , so located with respect to the observer's instrument, O , and the base piece, G , that the angle BOG is a right angle. Then GB is a diameter of the circumference through G , O , and B . Upon registration, the range GB , and the angle T_B are accurately determined.

Assume further that a target, P , is located somewhere upon the circumference. The observer can immediately compute perfect data to fire upon P , as follows: (1) The shift, BGP , equals the measured shift, BOP ; (2) the range GP equals the product

of the known range GB by the cosine of the measured shift. An additional convenience to the observer is the fact that he knows the exact angle T at the target ($T_P = T_B$), so that he can determine s with extreme accuracy.

In general, a target will be somewhere off the circumference, as at P'. As with the s and d shifts, the observer must in this case develop the shift in two stages: (1) Compute the data to point P; (2) shift from P to P' by adding to the measured shift the appropriate number of s -bounds for the range difference between GP and GP'. The first advantage in this shift, as compared with the s -shift, is that step One places the burst exactly on the OT line at P, whereas step One in the s -shift places the burst only approximately on the line. The second advantage is the ease of determining angle T at P': the observer has merely to subtract from the known angle $T_P (= T_B)$ the total of the s -bounds used in step Two.

Note that step Two in the circular shift is the same as step Two in the s -shift: however, since the observer knows the angle T_P exactly, and GP exactly, his value of s will be exact in the circular shift, whereas it will be only approximate in the s -shift.

If, as is generally the case, the observer estimates the range incorrectly, his error will not tend to throw the burst off the OT line. For example, if his estimated range equals the distance GX, the burst will simply fall at X instead of at P'.

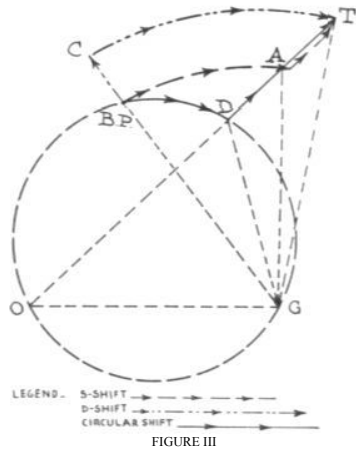
Note that the circular shift approaches, but does not fully satisfy, the standard of exactness I have set up in the introduction, for one reason: The value of s is effective only at the point for which it is computed. Hence, though the observer can compute perfect data to the point P, he will not be able to shift exactly along the OT line with s -bounds unless he be especially skillful at making allowances for the variation in s . The solution of this difficulty will appear in a later section.

Normally, it will not be possible to adjust on a base point somewhere on a line at right angles to the OG line. The point B (Figure II) is determined hypothetically as follows: The original registration having been made on a base point at A, divide the adjusted range GA by the cosine of the angle BOA to determine the range GB, which shall hereafter be termed the "basic range."

THE CIRCULAR SHIFT

In practice, it will be more convenient to use the sine of GOA rather than its equal, the cosine of BOA.

Figure III shows graphically the differences between the *s*, *d*, and circular shifts. The arcs CT and B.P.—A are concentric, with center at G: arc B.P.—D lies on the circumference O—B.P.—G.



The following three examples illustrate the circular shift:

Example I (See Figure IV)

Upon registration, with base point at B, the following observations were made:

Angle T = 570 mils

Angle O = 800 mils

Adjusted Range = 2670 yards.

Solution

Basic range = = = 3776 yards. (GB' in figure).

For use in later firing, we record: Basic range = 3780

T = 570

O = 800

Example II (Figure IV)

Upon a target at P, the following observations were made:

Measured shift—Left 400

Estimated range—3000

Solution

New O = 800 + 400 = 1200

$3780 \times \sin 1200 = 3780 \times .92 = 3480$ (range GP')

Less estimated range 3000

—————
Difference = 480 yards

The shift, base deflection left 400, with a range of 3480, will place a burst at P', which is on the observing line. In order to bring the burst to P. we require, in addition, a shift to the left of $4.8 \times s$. However, the value of *s* at P' will keep the shot on

THE CIRCULAR SHIFT

the line only in the vicinity of P'. To estimate the mean s to use, we observe that for a T of 570 (or 600) and a range of 3480 (or 3500), $s = 19$. It is evident that shifting left from P' by 5×19 will increase the value of T roughly 100 mils. For T = 700, and R = 3000, $s = 28$. Using the mean of 19 and 28, say 23, we compute: Left 400 + left $5 \times 23 =$ left 515.

Data for shift: $\left\{ \begin{array}{l} \text{BD, Left 515} \\ \text{Range 3000.} \end{array} \right.$

(New T = 570 + 115 = 685)

(On figure, new T measures 680)

The plotted position of the burst is at X, 10 yards to the left of the observing line. The error in estimation of range causes no deviation from the observing line.

Example III (Figure IV)

This example will be a repetition of Example II, except that I will approximate the sine to only one digit, and will use for s the most convenient value near P'. The process, in this case, will be quick.

Basic Recorded Range = 3800

T = 570

O = 800

Observations: $\left\{ \begin{array}{l} \text{Measured shift—left 400} \\ \text{Estimated range—3000.} \end{array} \right.$

Solution

$38 \times .9 = 3400$

Less 3000

—————
400 yds. $s = 20$.

Left 400 + left $4 \times 20 = \left\{ \begin{array}{l} \text{left 480} \\ \text{Range, 3000} \end{array} \right.$

(New T = 570 + 80 = 650)

Plotted position of burst at Y, 60 yards from observing line; deviation of 23 mils.

From the foregoing examples. I conclude that the accuracy of the circular shift is just what the computer wishes to make it. Example II requires more labor than is customary in computing a shift, but not a prohibitive amount. Example III is as rapid and simple as either the s or d shift. Personally, I feel that the precision employed in Example II is justified in that the time

THE FIELD ARTILLERY JOURNAL

lost in arithmetic will probably be more than repaid by a sensible first round.

The principal defect in the circular shift has already been pointed out: To wit, the estimation of the mean value of s over an interval is a somewhat nimble process, and not always accurate. To eliminate this difficulty, and at the same time to eliminate most of the arithmetical difficulties, I suggest a modification of the circular shift, which will be susceptible of execution on a very simple type of slide rule. I have produced a successful homemade sample of this rule, by replacing two scales of a Mannheim ten-inch polyphase rule with two upper scales, glued in place. For convenience in reference, I shall term the shift with this instrument "the slide-rule shift."

III. THE SLIDE-RULE SHIFT

To see how the circular shift is to be modified, the reader is invited to examine Figure II once more. If A is the base point, and P is the target, the gun shift, AGP , equals the measured shift, AOP . This is true because the angle T_P equals the angle T_B .

Since the sum of the three angles of any triangle equals the constant, 3200 mils, it follows that if a triangle varies in such a way that one angle remains constant, then the sum of the other two angles of the triangle must remain constant. In the figure, the vertex, A , of the triangle OAG , moved to P in such a manner that the angle at the vertex did not change. Hence the sum of the base angles at O and G had to remain constant during this variation. Therefore the angle OGA had to increase by exactly the amount of decrease of the angle GOA .

This variation having been completed, the vertex P now moved along the line OP' , until the vertex arrived at P' . During this variation, the angle GOP remained constant. Hence, the angle OGP had to increase by exactly the amount of decrease of the angle OPG .

Hence, the gun shift at G is the sum of two components: (1) The angular change at O ; (2) the change in the angle opposite OG . The first of these changes can be measured directly from the OP ; the second can be computed. In other words, the technique consists of correcting the measured shift by the difference

THE CIRCULAR SHIFT

between the base point offset and the target offset, with the appropriate algebraic sign for addition or subtraction, as in the offset method.

It is possible to formulate a rule for signs, telling when the difference is additive, and when it is subtractive. While such a rule might be helpful to some persons, I feel that it would be dangerous in general. Anyone who prefers a blind rule in this case may easily formulate his own; for others, I propose the following visual method: (1) Any increase in the angle at P necessitates a decrease in the angle OGP, and conversely; (2) visualize on the ground whether an increase in OGA requires a shift to the right or left; (3) correct the measured shift accordingly. It can be seen that this method will apply whether the guns be on the observer's right, or on his left.

It should now be evident that the basic problem in a shift is the determination of the target offset. Once its numerical value is known, a simple subtraction will determine its difference from the base point offset.

By the sine ratio, still referring to Figure II,

$$\frac{GP'}{GO} = \frac{\sin GOP'}{\sin GP'O}$$

In this identity, if $\angle GP'O$ and angle GOP' be known, angle $GP'O$ can be determined. $\angle GOP'$ cannot be determined accurately; however, it can be estimated independently by any means suitable to the observer. Any error in this estimate causes the burst to deviate from the target, but will *not* cause it to deviate from the OT line.

The angle GOP' can be measured by the observer at O.

The distance OG can be computed, after registration, by the ratio

$$\frac{OG}{GA} = \frac{\sin T_B}{\sin GOA}$$

In this ratio, all elements except OG are determined upon registration; and, GA being measured in gun-yards, OG will be determined in gun-yards. This, of course, is an advantage.

To solve the foregoing problems by logarithms or arithmetic is nearly out of the question. However, to solve them by the

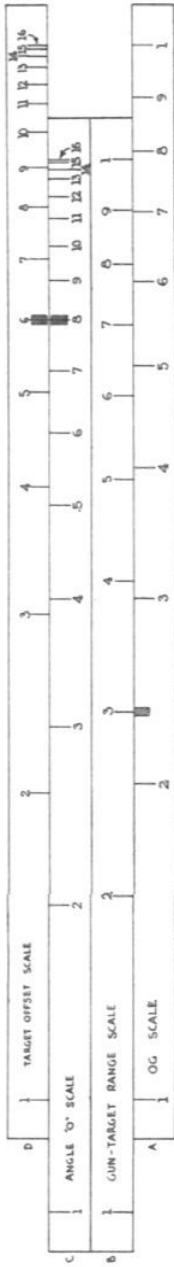


FIGURE V

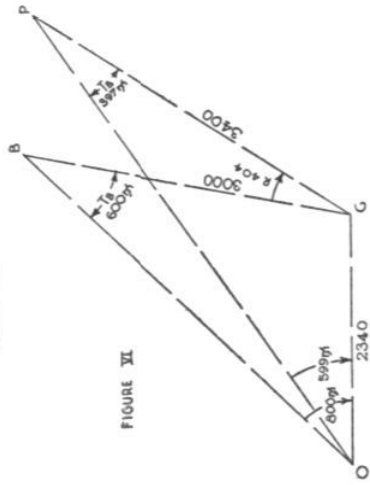


FIGURE VI

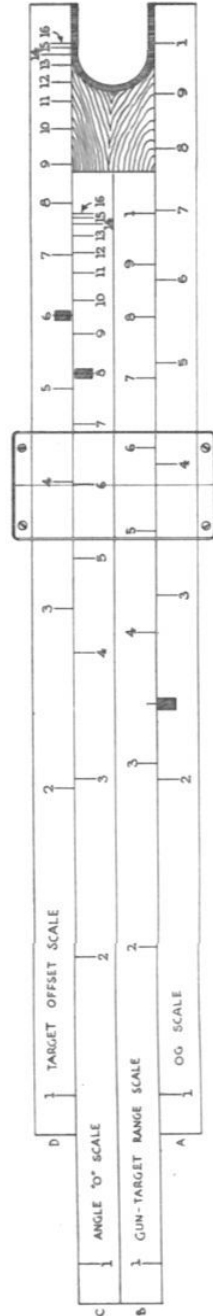


FIGURE VII

THE CIRCULAR SHIFT

slide rule now to be described is a matter of mere seconds and great simplicity. If I can convince the reader of this fact, I believe he will agree (and possibly for the first time) that this discussion is entirely practical.

(See Figure V, in which only integral graduations are represented.) Scales A and B are the regular Mannheim scales. C and D are sine-scales, graduated in mils, and to the same logarithmic scale as the numerical scales A and B. Therefore, if the ratio of two lengths equals the ratio of the sines of two angles, this proportion may be expressed by a single setting on the slide rule.

Thus (Figure VI in conjunction with Figure V) suppose registration gives $GB = 3000$, and angle $T_B = 600$ mils. Also, measurement from O gives angle $BOG = 800$ mils. Since

$\frac{OG}{GB} = \frac{\sin T_B}{\sin BOG}$,

the rule, as set in the picture, shows that $OG = 2340$ yards. The values of OG , BOG , and T_B need not be memorized; instead, their location on the scales may be marked with a pencil, as indicated by the cross-hatched rectangles on the scales in Figure V. The rule is now ready to compute shifts, the foregoing procedure being roughly the counterpart of setting-up a range deflection fan.

Next, upon target P the following observations are made:

Measured shift = right 201

Range $GP = 3400$

(See Figure VII.) Scale B is set so that 3.4 is opposite the pencil mark at 2340 on scale A. The glass runner is moved to place the hair-line at 599 on scale C (since angle O has decreased from 800 to 599). Under the hair-line on scale D read new angle $T(T_P) = 397$ mils.

$$600 - 397 = 203.$$

Angle T has decreased 203 mils. Therefore, the angle at G has made a compensating increase of 203 mils. \therefore Right 203

The measured shift was Right 201

Hence, the data: BD, Right 404, Range 3400.

In addition to providing the shift, this slide-rule offers further convenience. First, as already shown, the hairline rests on the correct new value of T ($T_P = 397$) at the point of burst. With this value of T, reliable values of s and d may be taken from

the range tables, but it will be more convenient to take them directly from the slide rule.

The reader may omit this paragraph without losing the coherence of this discussion. If, however, he wishes to verify the possibility of finding s and d from the slide rule, he may study the following operations. By changing the range from 3.4 to 3.5, on scale B (no figure is provided to illustrate this operation), we change T_p from 397 to 385, giving $s = 12$. Next, by setting scale B so that the range-finder range ($r = 4900$) is under the hair-line, we read on scale A, opposite 10 on scale B, that $d = 8 (= 7.73)$. This value will actually be $100/101.9 \times d$; otherwise, its accuracy will be limited only by the accuracy of the range-finder range.

I have not illustrated by a figure, nor explained, why these operations give the values of s and d , because it was my wish merely to suggest, in passing, some additional possibilities of the slide rule. While I consider this slide-rule good, I am not convinced that it is the best possible form. If this discussion demonstrates the desirability of using some such slide rule, a further serious study will yield a design offering the maximum convenience to the computer. For example, it might be possible to develop a slide rule which will easily give a good value of the gun-target range; it might also be possible, by additional scales for classes of fixed ammunition and fuze, to offer the computer the values of s , d , F , and c , all at one setting, thereby eliminating the necessity of thumbing through a range table in this type of preparation of fire.

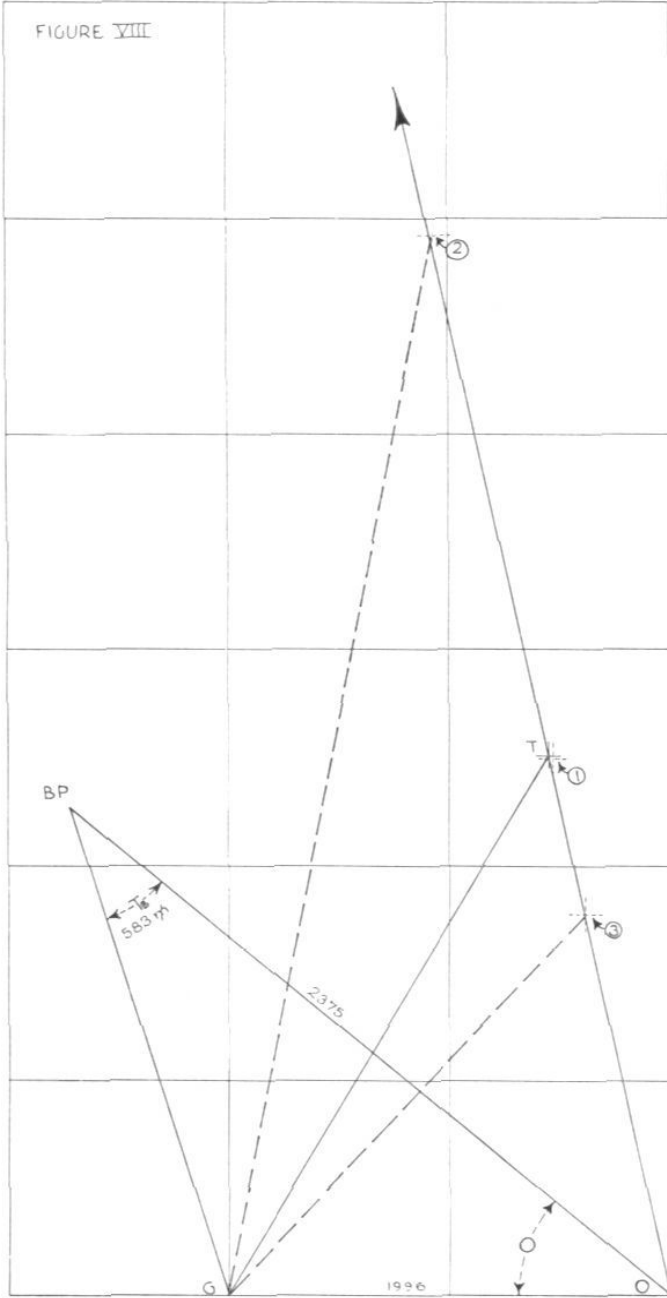
To illustrate a degree of exactness to be expected in the slide-rule shift, I have prepared Figure VIII, whereon are plotted the results of the following computations:

(a) Registration on B.P. gave
 $R = 2375$ yards
 $T = 583$ mils
 Measurement gave $O = 710$ mils
 Slide-rule gave $OG = 1996$ yards.

The values of T , O , and OG were then marked on the rule.

(b) Upon target T , observations were:
 Measured shift = $R 675$
 R (correct) = 2900

THE CIRCULAR SHIFT



THE FIELD ARTILLERY JOURNAL

Slide-rule gave: New $T = 755$ mils (an increase of 172 mils)
Therefore, the angle at G has decreased 172 mils—a shift to the right.

Shift = R 675 + R 172 = R 847, Range = 2900.

Plotted position of burst at point (1), 15 yds. from T.

Deviation = 5 mils; error in deflection = 5 mils.

- (c) Upon the same target, R was incorrectly estimated as 5000 yards.

Slide-rule gave: New $T = 410$ mils (a decrease of 173 mils)

Shift = R 675 + L 173 = R 502, Range = 5000.

Plotted position of burst at point (2), 10 yards from OT line.

Deviation = 2 mils.

- (d) R was incorrectly estimated as 2400 yards.

Slide-rule gave: New $T = 970$ mils (an increase of 387 mils)

Shift = R 675 + R 387 = R 1062, Range = 2400.

Plotted position of burst at point (3), on the OT line.

* * * * *

Comparison with s- and d- Shifts by Example

Though the blindest optimist would not expect the ground results of a shift from base deflection to be so favorable as those illustrated in Figure VIII, we should nevertheless not limit our accuracy because of the limits of precision. It is an established principle that all known sources of theoretical error should be removed before we deal with the distribution of accidental errors.

This section will illustrate, by an extreme example, the presence of theoretical error in the s -shift or d -shift, as compared with the absence of theoretical error in the slide-rule shift. The accidental errors of artillery fire applying equally in all cases, the slide-rule shift will be superior to the s - or d - shifts by the amount of theoretical error in the latter.

In computing the s - and d - shifts, I have assumed an advantage not to be expected in practice—that is, knowledge of the exact values of r and R .

(See Figure IX)

Data determined upon registration:

Range to base-point = 2375 yards.

THE CIRCULAR SHIFT

Angle T = 580 mils.

Angle O = 710 mils.

By slide-rule, OG = 1990 yards.

Observations upon target at T were:

Measured shift = Right 670

Gun-target range (correct) = 2200 yards.

Slide-rule Shift

With 2200 opposite 1990, new T (opposite $710 + 670 = 1380$)

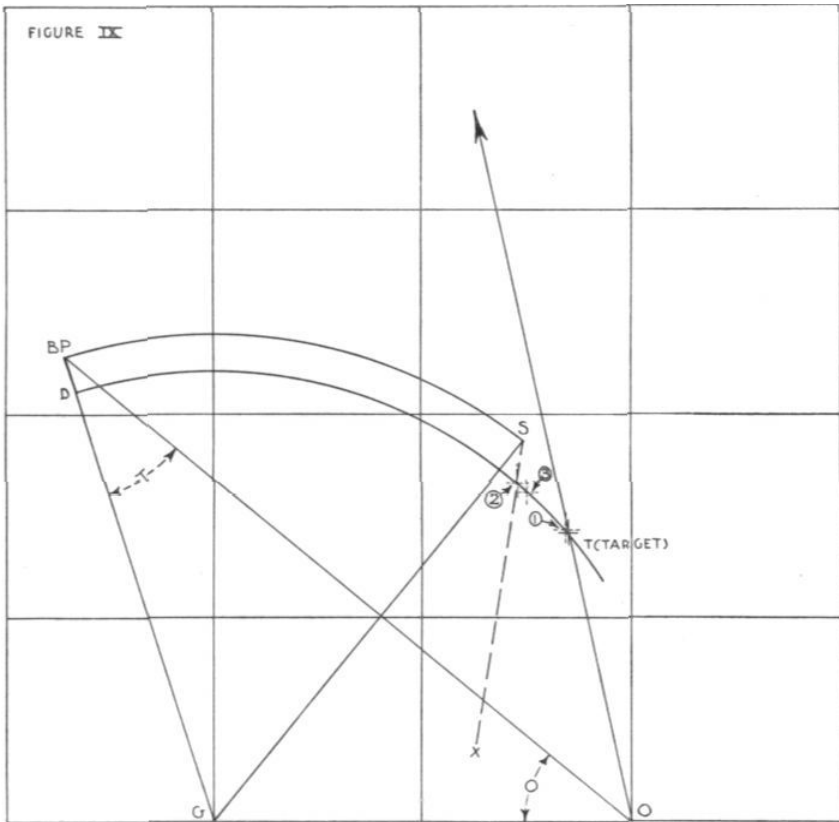
= 1105 (Increase of 525 mils).

Shift = R 670 + R 525 = Right 1195

Range = 2200

Plotted position of burst at point (1).

Error negligible.



THE FIELD ARTILLERY JOURNAL

s-shift

$$\text{At B.P. } \left. \begin{array}{l} r = 3530 \\ R = 2375 \\ s = 27 \end{array} \right\} r/R = 1.49$$

$$1.49 \times 670 = R \ 998.$$

(Right 998 at 2375 yards would place burst at point S in figure)

$$2375 - 2200 = 175. \therefore 1.75 \text{ } s\text{-bounds required.}$$

$$R \ 1.75 \times 27 = R \ 47.$$

$$\text{Shift} = R \ 998 + R \ 47 = \text{Right } 1045$$

$$\text{Range} = 2200$$

Plotted position of burst at (2).

$$\text{Deviation} = 110 \text{ mils.}$$

$$\text{Distance from target} = 340 \text{ yards.}$$

Note that the value of *s* employed caused the burst to move along the line SX, such that the angle GSX = 580 mils, the value of *T* at the base-point. If we amended the value of *s*, the best we could expect would be to keep the burst on the line OS, with a deviation of 60 mils.

d-shift

$$\text{At B.P. } \left. \begin{array}{l} r = 3530 \\ R = 2375 \\ d = 15 \end{array} \right\} \begin{array}{l} \text{Range change} = 2375 - 2200 = 175. \\ \end{array}$$

$$d\text{-change} = L \ 1.75 \times 16 = L \ 28 \text{ (placing burst at point D. with range} = 2200)$$

$$\text{Corrected measured shift} = 670 + 28 = \text{Right } 698.$$

The best reasonable value of *r/R* to use is that for the point D. where

$$r = 3380, R = 2200. \text{ Here, } r/R = 1.54.$$

$$\text{Shift} = R \ 698 \times 1.54 = \text{Right } 1075$$

$$\text{Range} = 2200.$$

Plotted position of burst at point (3).

$$\text{Deviation} = 90 \text{ mils.}$$

$$\text{Distance from target} = 280 \text{ yards.}$$

The foregoing examples are not offered as a proof, since the *fact* of error in the *s* and *d* shifts, and the *fact* of exactness in the slide-rule shift, are already evident from theoretical considerations;

THE CIRCULAR SHIFT

the examples serve merely to illustrate the degree of error or exactness in one extreme case.

The following general conclusions are justified: (1) The slide-rule shift is exact; (2) the *s* and *d* shifts may result in large errors; (3) since the slide-rule shift requires only one setting, requires no multiplication by a factor, and requires no remembering of *s* or *d* at the base-point, it is in those respects simpler than the *s* and *d* shifts.

I have so far had only limited opportunity to make field trials of the slide-rule shift. In one afternoon's service practice, at the Field Artillery School, with percussion bracket adjustments, and a target offset varying from 440 mils to 870 mils, I secured comparative data on seven problems. (I accepted only those problems for which the instructor agreed, in his critique, that the adjustment was correct.) In the absence of continued fire for effect, the deflection adjustment was necessarily not highly refined. I accepted the adjusted deflection as the best indicated deflection in each case.

In order to estimate ranges, I resorted to rapid plotting on a range deflection fan, using the range-finder value of *r*. Believing the computed angle would be more accurate than one measured on the fan. I then computed the slide-rule shift to each target. I subtracted the computed shift in each case from the correct shift shown by the final adjustment in order to determine the amount of error in the slide-rule shift. I also computed the width of the open sheaf at each central range for effect. The results are tabulated below:

Problem No.	Slide-rule deflection error (in mils)	Width of open sheaf (in mils)
1	32	26
2	5	33
3	5	30
4	20	30
5	10	50
6	25	50
7	20	50
Total	117	269
Average	17 mils	38 mils

THE FIELD ARTILLERY JOURNAL

These observations are too few, of course, to warrant a general conclusion. Also, they are of less value than if the adjustments had been precision adjustments. However, if hundreds of trials should yield a small average deflection error, we might then discover that the slide-rule shift offers favorable possibilities — such, for example, as the possibility of going into fire for effect one round earlier, in general, than with any shift now customarily employed.

IV. THE UNSEEN GUN

In the discussion heretofore, it has been assumed that the guns are visible from the OP, so that the angle O (see Figure X) can be measured directly. This is sometimes not the case.

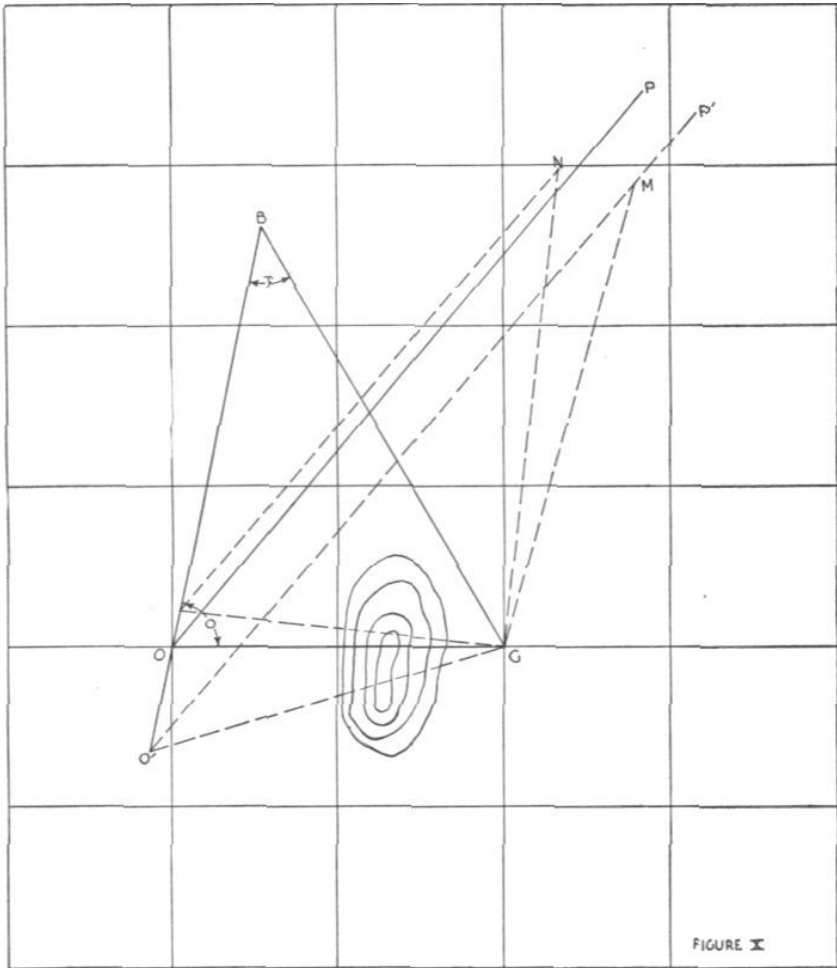
If the angle O cannot be determined accurately, the slide-rule shift cannot give accurate results. Hence I will describe a method of determining the angle O by registration.

In Figure X, the registration upon B determined the angle T to be 728 mils, and the range GB to be 3,000 yards, but the observer could make only a rough guess as to the direction OG. He decided upon 1100 mils as a reasonable value of angle O and with that figure set up his slide rule to determine subsequent shifts. In the figure, the actual value of BOG is 1395 mils; hence, it is apparent that, by the error in his assumption of 1100 mils, the observer has placed himself hypothetically on BO extended, at O' , where the angle BO'G equals 1100 mils.

The observer decides to continue his registration in order to determine the angle O accurately. He measures the shift to a target P, as far from B (in mils) as his sector will allow, and by slide rule computes the data to fire somewhere on the line OP at a range of 3000. He secures, as data for this shift, BD, Right 790, range 3000. In actual fact, these data will place a burst on the line OP' , which is parallel to OP. The burst falls at M, 80 mils right of the observing line.

At this time, the observer may reason as follows: "If an imaginary observer at O' measured a shift numerically equal to my measured shift of BOP, his observing line would be $O'P'$, parallel to and to the right of my observing line, OP. If he computed a slide-rule shift to the line $O'P'$, using the same figures I used to compute a shift to the line OP, and if the data caused a burst to

THE CIRCULAR SHIFT



fall on his line, instead of mine, evidently the basis of computation was correct for him, and incorrect for me. Hence, my assumption of 1100 mils for angle O is incorrect; it is correct only at his point, O' . By the figure, $BO'G$ must be 1100 mils; hence, BOG must be greater than 1100 mils."

However, to relieve the observer of such geometrical acrobatics, we can establish a rule, which I now state without proof: "If the burst falls between the observing line and the base point,

THE FIELD ARTILLERY JOURNAL

the assumed value of O is too large." It can be demonstrated that this rule applies in all cases.

In the present instance, the burst falls at M . on the side of the observing line away from the base point. Hence, the assumed value of O is too small. The observer therefore changes his estimate, arbitrarily, to 1500 mils, and with this value for O again computes data to shift to the line OP with a range of 3000. The burst falls at N , 25 mils to the left of the observing line. Hence, the estimate of 1500 mils was too great. The observer may now, by interpolation, compute the indicated value of O .

$$O_1 = 1100; \text{ deviation} = 80 \text{ right.}$$

$$O_2 = 1500; \text{ deviation} = 25 \text{ left.}$$

$$\therefore O = 1100 + \frac{25}{80} \times 400 = 1100 + 305 = 1405.$$

If necessary, this adjustment of O can be refined by firing additional rounds.

Though such practice is not necessarily desirable, it is conceivable that a liaison officer, or any forward observer, might go forward armed with a slide rule, register a battery, determine its location, and readily compute excellent data to open fire on targets of opportunity.

V. SUMMARY AND CONCLUSIONS

(a) The currently employed methods of rapidly determining shifts from base deflection are inaccurate. Two chief reasons are:

- (1) We cannot rapidly determine the correct range.
- (2) The mil relation is an unsuitable approximation when large angles are involved.

(b) Even with the correct range determined, the s and d shifts are seriously in error in certain situations, and refinement of calculation will not correct that error.

(c) The range-deflection fan is limited in accuracy by the difficulties of drafting with inadequate instruments.

(d) Since the present impossibility of exact range determination renders a perfect shift impossible. I conclude that the next best shift is one that will place the center of impact exactly on

THE CIRCULAR SHIFT

the OT line, at no great distance from the target. Such a shift I define as an "exact shift."

(e) The circular shift is an exact shift. It lends itself readily to any degree of accuracy the computer desires. If used approximately, its computation is as simple and rapid as either the *s*-shift or *d*-shift, and its accuracy is generally satisfactory. If used precisely, it is exact, but its computation requires more time and labor than are generally spent in a rapid preparation. Between these two extremes lies a degree of precision and speed suitable to any individual.

(f) To improve the circular shift, I introduce the slide-rule shift, for which I have designed, and made a satisfactory model of, a special slide-rule. The shift with this rule is exact, its accuracy being that of any ten-inch slide rule. Its characteristics are:

- (1) It places the center of impact exactly on the OT line.
- (2) In combined rapidity and simplicity, it is superior to currently employed methods.
- (3) It provides the computer with the exact new value of *T*.
- (4) It furnishes correct values of *s* and *d*, without requiring entry into a range table.
- (5) It provides a practical and quick method of locating the exact direction of the observer's base piece, when that piece is invisible.

(g) Though my conclusions are impartial, the matter of simplicity and general desirability of a method are to be determined, in the last analysis, by the reactions of several minds, rather than of one. I have shown that, for me, the circular shift and slide-rule shift are superior to the shifts currently employed. But any improvement in the preparation of fire is a matter of some moment. Therefore, I conclude that my results should be examined critically, to determine whether the methods proposed constitute sufficient improvement to warrant their adoption as standard.

Field Artillery Song (1936 Revision)

(With an apologetic salute to Col. E. L. Gruber)

BY FAIRFAX DOWNEY



I

Over hill, over dale, motorized from head to tail,
With the caissons and hosses all gone.
Stop to fix up a flat, or to get the captain's hat.
Motor trucks with the pieces hooked on.



CHORUS

*Then it's high, high, see! The Field Artilleree!
Sound off your Klaxon loud and strong!—SQUAWK, SQUAWK!
No more we'll go, with a team in low, If our
motors keep buzzin' along.*

II

See the red guidon stuck on the off side of a truck,
With the caissons and hosses all gone.
Gone are nose-bags and grass, as we feed with oil and gas
Motor trucks with the pieces hooked on.



CHORUS

Then it's high, high, see! The Field Artilleree! . . . etc.

FIELD ARTILLERY SONG

III

By the roadside we stop for some hot dogs and some pop,
With the caissons and hosses all gone.
Now we halt after dark and at tourist camps we park.
Motor trucks with the pieces hooked on.

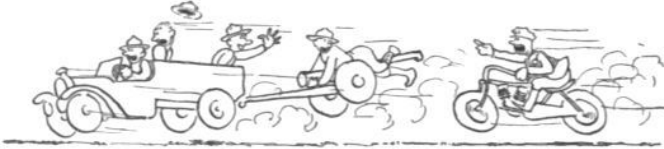


CHORUS

Then it's high, high, see! The Field Artilleree! . . . etc.

IV

Hear the bold bugles blow (amplified by radio), With the
caissons and hosses all gone.
Shove 'er, guy, into high, as the green lights flicker by.
Motor trucks with the pieces hooked on.



CHORUS

Then it's high, high, see! The Field Artilleree! . . . etc.

V

If our engines go dead, won't our faces all get red! With
the caissons and hosses all gone.
For the foemen, of course, will yell at us, "Get a horse!"
Motor trucks with the pieces hooked on.



CHORUS

*Then it's high, high, see! The Field Artilleree!
Sound off your Klaxon loud and strong!—SQUAWK, SQUAWK!
No more we'll go, with a team in low, If our motors keep
buzzin' along.*

MOUNTAIN TO MAHOMET

—AND VICE VERSA

Editorial Note. Motorization of the field artillery has opened up some possibilities with regard to training that could hardly have been imagined a few years ago. Regular outfits on the road are becoming a familiar sight to our citizens who formerly seldom encountered them. In our last issue Captain David S. Babcock described a visit of a regular battery to two ROTC units for demonstration purposes. Herewith THE FIELD ARTILLERY JOURNAL presents two accounts of 1936 summer training; one of a National Guard field artillery brigade; the other, of a Reserve regiment. The achievements of these reflect the influence motorization is exercising upon the enthusiasm and interest of our other components.

POSITIONS: 170 MILES AWAY

By 1ST LIEUTENANT R. H. WILSON, FA, La. NG

"YOU want me to believe that a brigade of field artillery was marched one hundred and seventy miles, went into position, registered, and was ready for fire missions in an elapsed time of thirteen hours and ten minutes?" A World War field artillery officer of ability and imagination was speaking and found it hard to believe the statement that had been made to him. "A march of twenty to twenty-five miles a day was considered an accomplishment in my time," he soliloquized. This officer, making his livelihood from the cotton business has, of course, had more cotton than artillery on his mind since the World War and he has not kept himself informed concerning the adaptation of the motor to military uses.

Field artillery has demonstrated its ability to keep pace of the motor age and the use of the modern motor makes possible the accomplishment, with ease, of maneuvers which to the wartime artilleryman might seem fantastic.

The maneuver above-described was successfully accomplished by the 56th Field Artillery Brigade during its field training

MOUNTAIN TO MAHOMET

period when in brigade encampment at Camp Jackson, Columbia, South Carolina, July 5th to July 20th, 1936. The 56th Field Artillery Brigade, commanded by Brigadier General Sumter L. Lowry, Jr., is the organic artillery of the 31st Infantry Division, commanded by Major General Albert B. Blanding, now on duty in Washington as Chief of the National Guard Bureau. It is composed of the 117th FA of Alabama, commanded by Colonel Percy McClung; the 116th FA of Florida commanded by Colonel Homer W. Hesterly; and the 114th FA (155-mm. Howitzers) of Mississippi, commanded by Colonel Alexander G. Paxton. The medium artillery, lacking prime movers in its equipment, was detached from the brigade for field training.

Lieutenant Colonel A. L. P. Sands, senior instructor for the 31st Division, designed the exercise for the 56th FA Brigade to embrace a march from Camp Jackson, S. C., to the Ft. Bragg Military Reservation at Fayetteville, N.C.; reconnaissance, selection and occupation of position; organization of position; bivouac at the guns; service practice, including transfer of fire; and the return march to Camp Jackson. *The entire maneuver was consummated in thirty-three hours elapsed time.*

The situation, of which this maneuver was a part, made North Carolina (Red) and South Carolina (Blue) enemy states.

The IV Army Corps was a part of the Blue force. It was composed of the 30th, 31st, and 82d Divisions. On 15 June, the 30th Division crossed the frontier with the mission of securing the important rail center of Fayetteville. The division reached the Cape Fear River and advanced up the west side, encountering slight resistance. In the vicinity of Fayetteville a general engagement with a Red division occurred, and the Reds, being without medium artillery, were forced to withdraw and took up a defensive position on Railroad Ridge on the Ft. Bragg Military Reservation. The 30th Division attacked the Red position on 14 July, and were repulsed with severe losses to both sides. The 30th Division was unable to renew the attack, and the corps commander decided to pass the 31st Division, bivouacked at Camp Jackson, through the 30th Division on the night of 15-16 July, and renew the attack at daylight on the morning of 16 July. Major General "31st Division" ordered his division (less artillery) to move by

THE FIELD ARTILLERY JOURNAL

truck at dark 15 July to detrucking points on the Ft. Bragg Military Reservation, to pass through and relieve the 30th Division and to continue the attack at daylight 16 July. He ordered the artillery to march at daylight 15 July on Ft. Bragg Military Reservation. He instructed his artillery commander to come forward at once and confer with the commanding officer of the 55th FA Brigade, which was already in position, and which would be attached to his brigade for the support of the attack from initial positions.

The 56th FA Brigade moved from Camp Jackson in two columns over parallel routes at 5:00 AM 15 July. The movement was made in battery serials, with an interval of ten minutes between serials. The time schedule provided that the head of each column would reach a point near its probable destination at 1:00 PM. Administrative details and rates of march were left to column commanders. Their orders were to march at a given time, and to arrive at a given time, marching in small serials to avoid enemy airplane attack.

The Artillery Commander conferred with Brigadier General "55th Brigade" and having previously made his recommendations for the employment of the artillery in support of the attack, received his orders at 9:00 AM from the division commander at division CP, and, by appointment, met his colonels at a nearby point at 10:00 o'clock. The colonels were each handed an overlay, showing regimental areas, limits of fire, enemy MLR, our line of departure, brigade boundary, command posts of the infantry brigade commanders, and observation posts. The colonels were joined immediately by their battalion commanders and started their reconnaissance. As soon as positions had been selected, guides were sent to control points to conduct the units to their positions. One of the principal objectives of the problem was to keep the batteries rolling without interruption from the time the brigade left Camp Jackson until the guns dropped trail at the selected battery positions. To accomplish this over a distance of 170 miles required the utmost staff coordination.

Posting of the range guard was started as soon as the units arrived at their position areas and fire for registration was opened at about three o'clock. One gun per battery was permitted to

MOUNTAIN TO MAHOMET

fire for registration. The last battery reported registered at 6:10 PM.

Concentrations of a few rounds per battery were fired intermittently until the range was closed by local rules at ten PM. Transfer of fire from battalion base points to previously placed targets was the method employed in the fire, and was carried out in good order.

Fire of the preparation for the attack was opened at five AM, participated in by all batteries. Because of the limited allotment of ammunition, the preparation was largely simulated, but transfers were made on a time schedule, the same as would have been done had the prescribed amount of ammunition been fired in each concentration. Visibility was good and officers at the observation posts stated that the fire was very effective. The ammunition supply was exhausted at 5:45 AM. Batteries were then released to their battery commanders for the return march to Camp Jackson. This was done for the purpose of giving smaller units experience in marching over the same route with other independent units.

The entire maneuver, including the publication and delivery of the various necessary orders, was carried out very close to schedule with the exception of a slight delay in getting one of the units into its position. No major difficulties developed. It must, of course, be remembered that airplane attack and long-range artillery fire were conspicuous by their absence. During the march a few trucks became disabled but they were promptly taken in tow without delay to the progress of the column.

Shortage of transportation for messengers and the many small details made necessary by such a movement was quite noticeable. Several private automobiles were pressed into service, assisting materially in overcoming the deficiency.

A great deal of work was entailed in the preparation and execution of the maneuver but the resultant training was well worth the effort of staff and line alike. The entire brigade performed all of those duties they are called upon to do in actual service, but were happily, for their first brigade maneuver, free from enemy interference.

THE FIELD ARTILLERY JOURNAL

SUMMARY:

Twelve gun batteries, each of four 75-mm. guns, truck-drawn, participated.
Average strength per gun battery. 4 officers, 65 enlisted men.
About 120 officers, 1,250 men, took part, with 5 regular officers (instructors).
75-mm. ammunition, only, was fired.
Shrapnel was fired for checking direction.
Positions were camouflaged.

TRUCKING—AND HOW.

By CAPTAIN WALTER J. GARDNER, *FA. Res.*

COMPLETING a fifteen-hundred mile road march in which sixty automobiles travelled a total of nearly one hundred thousand miles without accident to men or vehicles, the Reserve officers of the 341st Field Artillery can point with pride to a record of active-duty training periods equalled by few, if any, regiments in the Reserve Corps. Whether they are rolling over hill and dale with the horse-drawn seventy-fives, plodding along with the mules and howitzers of a mountain battery, or towing the 155's by tractor or prime mover, it's all the same to this live-wire outfit which enlivens its winter season of inactive duty training with a regimental mess, as well as weekly conference classes, in addition to the required correspondence lessons.

A brief synopsis of this summer's training of the 341st Field Artillery will be of interest to all reserve officers because of the many details concerning the performance of the new motorized FA, but the story should be preceded by a bit of history upon which the foundation of this regiment's yearly active duty is laid.

Nine years ago, while spending the customary two weeks in firing, attending open-air classes, and walking through simulated gas attacks at Camp McCoy, Wisconsin, a morning was devoted to instructing the officers in the duties of the Battery Detail. Small white cards were distributed to some of the officers; on these cards were various initials which indicated the particular duty to which the officer was assigned. Telephone operator, signal sergeant, horse holder, battery commander, bugler . . . all

MOUNTAIN TO MAHOMET

were there. That evening, the commanding officer, Colonel Leo J. Crosby, FA Res., remarked, "Next year we'll leave the cards at home: you officers will train as officers, not enlisted men. Each will have an assignment as an officer and function as such." That was in 1928. Since that time, through the cooperation of the unit instructors, Major John M. Jenkins, Jr., FA, and Major Y. D. Vesely, FA, as well as the officers and troops of the regular army with whom training is obtained, this has been accomplished. That this system of unit training is most effective is proven by the excellent esprit and keen interest of these Reserve officers; that it makes for greater efficiency is borne out by the commendatory reports made by the regular army officers who have had a chance to see the 341st Field Artillery in action. From commanding officer of the regiment to assistant battery executives, each officer has his assignment and particular responsibility. His job is laid out; he knows what he is expected to do; and he does it without excuse or alibi.

Last year this regiment was fortunate in arriving at Fort Des Moines for active-duty training with the 3d Battalion of the 80th Field Artillery, which was then under command of Maj. Everett Williams. This was just a few days after the new high-speed equipment and prime movers for the medium howitzers (155-mm.) arrived. Operating as a two-battalion regiment of four two-gun batteries with battalion and regimental staffs, a week's work of reconnaissance, selection, and occupation of position was topped off with a hundred-mile road march with the new materiel. This was said to be the first march of any such length to be made with the new pneumatic-tired howitzers.

The 1936 road march, just completed, is the longest road march yet attempted by a complete battalion of these heavy vehicles. Staffed and officered by Reserve officers, the battalion was marched from Fort Des Moines to Fort Meade in three days, overnight camps being set up at Sioux City, Iowa, and Winner, South Dakota. This distance, 709 miles, was divided into daily marches of 207, 227 and 275 miles. Only minor adjustments with the motors proved necessary and served to give valuable lessons in the method of handling disabled vehicles while on the march.

THE FIELD ARTILLERY JOURNAL

The return trip was routed through Omaha, where the personnel had an opportunity to rest for a day and a night. This march was made with an overnight camp at Winner, a stop of a few hours at Norfolk, Nebraska, preparatory to a fifteen-mile march to Madison, Nebraska, where the battalion was parked at the county fair grounds, and the troops rested until 2:00 AM, after which a night march was effected until dawn and the balance of the distance to Omaha was completed before the heat of the day. The return trip was made in four days, including the layover in Omaha. Total mileage for the round trip was 1481 miles, as shown by the average of several speedometers.

En route the officers occupied pyramidal and wall tents, the troops sleeping in shelter tents. Clothing was cotton; equipment was full field; officers carried their clothing and personal effects in bedding rolls and musette bags. In spite of the extreme heat and the drought-stricken territory through which most of the march was made, the entire group of forty Reserve officers enjoyed the training and highly praised the cooperation and friendly interest of the Battalion Commander, Major B. B. Lattimore, and his officers and enlisted personnel.

Starting from Fort Des Moines at 6:00 AM, 7 July, the battalion was divided into three sections for march control, according to the speed of the various vehicles. The fastest moving division was called the Light Column, and consisted of the station wagons and pick-up trucks; the Medium Column comprised one-and-a-half-ton cargo trucks which carried camp personnel and equipment; the guns were towed by the heavy trucks (prime movers), and these slower-moving elements made up the Heavy Column. Maximum road speeds were designated at 35, 30, and 25 miles per hour, respectively, with appropriate modifications for driving through the traffic of towns and cities. Control of each column rested entirely with the column commander and his executive, both Reserve officers, who assumed all responsibility for the march. It was interesting to observe the care and pride with which the column commanders "dressed up" their units, checked intervals, and brought them into camp "in order."

The first day's march was over concrete roads and proved the easiest of the three days it took to reach Fort Meade. The following

MOUNTAIN TO MAHOMET

two days provided longer marches, graveled roads, steep hills, and detours. In addition, boiling-hot sun ran official temperatures up to the 110-degree mark. These elements combined to add a great deal to the discomfort of the march, but owing to the excellent condition of the material and fine discipline of the soldiers there was a bare minimum of motor trouble.

Camp was pitched in areas selected by an advance party which preceded the columns each day, making a road reconnaissance and attending to supply details upon arrival at the bivouac area. All vehicles were gassed and serviced before the evening mess, which was prepared after arrival in camp. The evening hours were spent in explaining the equipment to the hundreds of civilians who thronged to the camp areas to inspect the new "army on tires."

Each day's march was preceded by a march order, which was read to all officers, written copies being given to column commanders at Officer's Call, which was held immediately after mess the evening preceding the march. Time of departure was computed for each column to bring them into the next camp as near together as possible; thus the Heavy Column was moved out first, usually at 4:00 or 5:00 AM. This necessitated computations as to the probable place the faster-moving units would overtake the slower ones, and these halts were utilized for regassing the cars. In a march of nearly 300 miles per day the gas tanks are incapable of holding the required amount of gasoline. The Medium Column carried a supply of fuel in drums and furnished its own extra gasoline, but the Light Column was forced to depend upon the Heavy Column for this service. Road distances between vehicles were left to the discretion of the column commanders, as were many other details of command. A halt was made about 11:00 AM each day, and at that time the noon lunch, with which individuals had been provided, was eaten.

Upon arrival at the camp area, the vehicles and personnel reverted to regular battery control for administration and mess. A guard was posted at each camp, with Reserve officers acting as Officer of the Day and Commander of the Guard. Two and one half of the four days at Fort Meade were devoted to firing, Sunday being a full, and Saturday a half, holiday. Ample opportunity

THE FIELD ARTILLERY JOURNAL

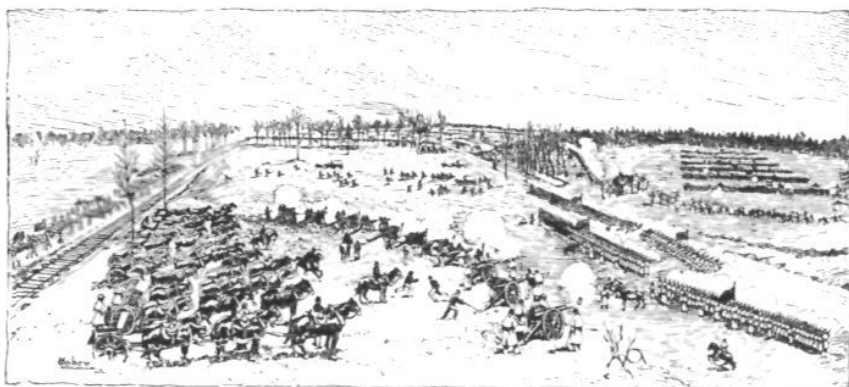
for this instruction was provided by Major Vesely, under whose supervision 1,700 rounds of subcaliber (37-mm.) ammunition were expended in axial precision, percussion bracket, lateral (small T) and lateral (large T) methods. Of the forty Reserve officers present, each had an opportunity to fire at least two problems.

The following table contains statistics which will prove interesting to those who are curious to know the possibilities of the army's new motorized and mechanized equipment, about which so much has been written these last few years:

<i>March Unit</i>	<i>Make and Type of Vehicle</i>	<i>No. in Column</i>	<i>Hours Marched</i>	<i>Hours Halted</i>	<i>Hours on Road</i>	<i>Rate of March (MPH)</i>	<i>Rate of Speed (MPH)</i>
Light Column	Chevrolet pick-up Trucks and Station Wagons	25	44½	12½	57	26.0	33.28
Medium Column	1½ - Ton Dodge Trucks (4×4) & (4×2)	20	54½	18½	72½	20.42	27.34
Heavy Column	Indiana Prime Movers (6×6)	12	67½	20¼	87¼	16.87	21.94

Eight 155-mm. howitzers, equipped with modified balloon-tire carriages, were trailed by the prime movers of the Heavy Column.

One Government Chevrolet sedan, one ambulance, and one private automobile accompanied the columns.



Special Notice

U. S. Field Artillery Association Prize Essay, 1937

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

The following rules will govern this competition:

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

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

(3) Essays must be received on or before January 1, 1937. Announcement of award will be made as soon as practicable after that date.

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

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

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

Counterbattery in the AEF

By COLONEL CONRAD H. LANZA, *Field Artillery*

OUR field artillery officers went to France, in 1917 and 1918, expecting to fire on visible hostile batteries, something like those outlined at our training grounds, and, after obtaining the desired bracket, to proceed to fire for effect. They never had an opportunity to carry out this idea. Upon arrival in France, they were turned over to the mercies of French firing centers. French instructors explained that hostile batteries, except upon rare occasions, simply could not be seen from OP's. Enemy batteries, evenly spaced, with tops of shields projecting over ridge lines, were just unknown. Location of hostile batteries was by their coordinates, determined by various methods, including:

Air photographs.....	very accurate, but not too common
Air observers	not so accurate
Flashes.....	accurate within 50 meters or less
Sound ranging	accurate within 50 meters or less
Reports of patrols and prisoners	varying accuracy
Captured documents.....	varying accuracy
Miscellaneous.....	varying accuracy

Training in obtaining, classifying, and utilizing information from the foregoing sources, and from them determining, on accurate maps, the coordinates of enemy batteries, defiladed from the view of OP's, was thoroughly taught. As the enemy could use the same system, additional instruction was given in how to emplace batteries in such manner as to avoid detection by the enemy. This led to study of camouflage, previously largely unknown in our service. This training formed the foundation of our subsequent counterbattery service, summarized as:

- a. Locating batteries,
- b. Firing on batteries,
- c. Camouflage, to avoid being counterbattered by the enemy.

In some sectors of the front defilade was not practicable. In the British sector in north France, there were extensive areas

COUNTERBATTERY IN THE AEF

nearly flat, and with few obstacles. Defiladed places were few, and insufficient for the large number of batteries in line. Most of these were necessarily in the open, and trusted for concealment to camouflage, and prompt change of position upon completion of each firing program. Great care was taken to avoid posting batteries near reference marks, which might assist in ranging on them. In such territory the other side had its difficulties, too. In the flat country there were few good OP's to give a view over surrounding terrain. Hostile batteries might never be seen until some battle forced them to fire, and then it might be too late to counterbattery them. Captive balloons watched for hostile artillery, but as they were far back from the front, and had only an oblique view, it was hard to identify the location of flashes, if these were not near some reference point which could be identified. Batteries managed to escape detection. They had to live a dog's life, but they did it. The usual daily firing was undertaken by single pieces, changing location each night, and the real battle positions were seldom fired from. Any battery that thought it had been discovered by the enemy, moved on the first occasion.

In central and eastern France, in the sectors occupied by the American troops, with some exceptions, defiladed positions were common, as there were numerous woods, and the country was generally of a rolling character. Batteries had both defilade and camouflage, and few were seen from the other side of the line. But here also, no firing from battle positions was tolerated, unless a battle was in progress; as otherwise the location of the battery by sound ranging or by hostile planes was possible. The daily firing was from temporary positions which were often changed.

Some of our officers were attached to British organizations, and others to French organizations, for observation and training in counterbattery. The two nations differed in their methods of handling this problem, and each method had its enthusiasts in our Army. Perhaps differences in the terrain had something to do with the respective suitability of the two methods. We adopted what was in effect a compromise, in which we took what we believed to be the best from each of the two systems. It went into use when the First Army was organized in August, 1918. We assigned counterbattery organically to the corps artillery. The

THE FIELD ARTILLERY JOURNAL

corps could order its divisions to assist in counterbattery, and could ask the Army to take over, with its artillery, designated targets, but the corps was primarily responsible for the location and counterbattery of enemy artillery.

The counterbattery officer was S-2, of the Corps Chief of Artillery. He had his own OP's, and had charge of the flash- and sound-ranging troops, and usually had a certain number of planes to observe, and photograph, such areas or targets as he might designate. The captive balloons were also at his disposal. He received, from Corps G-2, information obtained from front-line units, from statements of prisoners, and from captured documents; and, if the captured documents were artillery documents, they were turned over to him. The front-line units reported, at least daily, information as to enemy shelling in their sectors, including number and kind of projectile fired, the presumed target, from what direction the firing came, and *Y*-azimuths of furrows of enemy projectiles, hour of firing, and the like; and any information which would assist in identifying the type and location of the enemy artillery. From all sources, S-2 was expected to ascertain where the enemy batteries were, and with this information arrange plans to cover:

- a. General counterbattery of all hostile batteries whenever a battle took place.
- b. Special "shoots," for daily firing, against selected enemy targets, by designated batteries, at designated hours. This was part of the usual daily firing.

The counterbattery officer, S-2, issued bulletins at appropriate intervals, discussing enemy artillery activity, their tactics, kind of ammunition, effectiveness of their fire, and usual targets. He issued maps showing the location and type of hostile batteries in his zone of action, as he had determined them to be. He indicated the enemy batteries as certain, or doubtful, and in some cases gave the last data recorded by him, showing information as to the battery reported on. As approved by his chief of artillery, he made the necessary arrangements for the "shoots" he had planned, and sometimes conducted the fire himself, using his own OP's, with direct communication to the battery firing. This system worked well in quiet sectors where there was time to work up the information received. When the enemy batteries were defiladed,

COUNTERBATTERY IN THE AEF

air superiority was necessary to enable planes or balloons to observe. When the targets were not defiladed, but the targets were hard to see, because of camouflage, or lack of reference points near them, bilateral observation gave good results. All this required relative quiet in the area, and little opposition by the enemy, so that there would be time to fire the customary bracket adjustment. Under these circumstances the counterbattery service solved some problems.

This method had been habitual among the Allies, down to include 1917. It formed an important part of artillery preparations. It was the main reason why these artillery preparations took many days. Every counterbattery problem required an appreciable time to fire, and visibility from OP's, or from the air, was necessary. They could be fired only in the daytime, and then only when the weather permitted. The enemy had many battery positions, and to counterbattery all of them forced the employment of four to sixteen days before every battle. Regulations and tables had been prepared showing the number of rounds required to destroy a battery, in which the variables were the range, and the caliber of the battery firing. Knowing the number and location of targets, the number, kind and location of our own batteries, and the number of hours available each day for firing problems, the total time needed for firing all problems contemplated was an arithmetical computation. The result was the main factor in fixing the length of the artillery preparation, and, for the period ending in 1917, averaged nearly 6¼ days.

This system of counterbattery never won a battle. Targets were destroyed, but never in numbers, or in time, to prevent the attacking infantry from receiving heavy losses from enemy artillery fire. It was therefore discarded in the spring of 1918. In lieu thereof, the German system of short, violent artillery preparations for neutralization only was adopted. The increasing availability of gas ammunition made this method continuously more effective. The average length of the artillery preparation was reduced from 6¼ days to about 4 hours, a reduction in time of 95%. The rate of fire was greater during the shorter period, but the total ammunition expenditure was less. For neutralization purposes, areas were selected, and visibility, while desirable, was not necessary: consequently, the artillery preparation could

THE FIELD ARTILLERY JOURNAL

be fired at night, in time to complete the firing program by daylight, and thus give the infantry an early start. The reduction in time to only 5% of what had been customary prevented the enemy from making tactical changes in his lines to meet an attack which was obviously impending.

At the French firing centers, conduct-of-fire only was taught; the tactics of artillery were not discussed. Our officers, upon graduation, left for the front without having considered the employment of artillery in battle. When they were called upon to arrange for counterbattery, they naturally at first sought to follow the old system of locating the target, obtaining an adjustment, and then firing for effect. If the target was not visible from an OP, it might be necessary to fire at coordinates, or with air observation, or by some other method, but the principle was the same as that to which they had been accustomed before they came to France; only details had changed.

Our counterbattery service began in quiet sectors. Ammunition was limited, and fire restricted to certain hours when visibility was best. The officer directing the fire went to an OP, and designated a target. He saw no enemy batteries and seldom any target, so he picked out road forks, ruined houses, or something easily recognized. Fire was then opened in the conventional way, and a bracket of a certain number of forks sought; usually the problem was satisfactorily solved. The enemy paid no attention to this firing. He himself fired in the same manner, but being poorer in ammunition, to a lesser extent. We noted the places which the enemy appeared to prefer as targets, and avoided them in our movements, and in taking positions. This kind of firing gave practice to our batteries, and to their officers, but was otherwise without value.

Our first serious effort, and the first time counterbattery in an important area was under American control, was in the St. Mihiel campaign. Of three American corps in line, two had French chiefs of artillery with French staffs, and one had an American chief of artillery (Major General William Lassiter), with an American staff. They prepared the plans for counterbattery in their respective zones of action to take effect on D day. For insuring secrecy, it was not desired to do any counterbattery earlier than this, even where it was possible to do so with advantage. The

COUNTERBATTERY IN THE AEF

First Army Artillery had its S-2 supervise the counterbattery, to see that it was properly done, and the Army Artillery undertook to help out in the firing by taking over a certain number of targets, to be agreed upon. The St. Mihiel Sector had been tranquil for a long time. Elaborate reports were on file, which included lists of positions from which enemy batteries had fired, with detailed information as to the sources used to compile the report. Some of it was remarkably complete. For one enemy battery, we had the coordinates of its battle positions, and knew the names of the officers, and roster, so well, that we knew who was on duty at the guns at any time. It turned out to be accurate, for in the ensuing battle on 12 September, we captured this battery, and with it the executive whom we had foreseen would be on duty at the hour of attack! Of course there were enemy batteries about which we had no information.

In the east part of the St. Mihiel Sector, near the Moselle River, air photographs showed groups of concrete battery positions. It was known that they had been there for about two years, and there were records showing that large-caliber batteries had fired from these places, but none recently. At the time the concrete emplacements had been constructed, the Allies had very little heavy artillery, and the concrete positions were invulnerable to light artillery fire. Our troops were worried about the situation. The Corps thought that the destruction, or even neutralization, of such protected targets ought not to be required from them, unless they were reenforced by additional batteries of not less than 240-mm. caliber. The Army undertook to neutralize these targets with their own artillery. After the battle, the concrete positions were found to be vacant of guns. The system of protecting batteries with reenforced concrete had passed out of use with the advent of heavy guns. Such positions were impossible to conceal, and became death traps when shelled by large-caliber pieces.

The First Army Artillery S-2 recommended that for the artillery preparation at St. Mihiel, a large number of hostile battery positions be fired upon. He distributed lists of these. Their number was about equal to four times the amount of batteries that the enemy was known to have. The positions were those from which fire had been delivered at some time, and apparently were mostly temporary ones. It was possible that the enemy would

THE FIELD ARTILLERY JOURNAL

continue to utilize some of these but then he might not use any. A compromise was made by S-3. Counterbattery was arranged for on the concrete emplacements, on known battle positions, and on some of the temporary positions which seemed likely to be useful to the enemy.

The general opinion of the American officers, just before the battle of St. Mihiel, was that during the battle many targets, some fleeting and some of them batteries, would be seen by the OP's. The number of OP's was the maximum the ground permitted, there being about one to each battalion of artillery. Batteries were detailed to stand by, ready to fire at once, upon notice from the OP's. It was felt that if the battle progressed according to plan, enemy batteries would have to change position and in doing so would have to show themselves. Absolutely overwhelming fire was prepared, and was ready to be launched against any target unlucky enough to be seen. It was night when the battle commenced at 1:00 AM, and when morning came, fog and mist continued until the end of the engagement, at about 11:00 AM. Neither the OP's, nor the counterbattery service located any targets. During the afternoon, when visibility was fair, some targets were seen, but they were relatively unimportant.

Two weeks later the First Army started the Meuse-Argonne campaign. Less attention was given to arranging for fire on fleeting targets; it was realized that there would be few such. The OP's were to watch, and balloons and planes would supplement them. It was hoped that the Air Service would see what the OP's missed. The counterbattery service was not changed, but better distinction was made between battle and temporary positions of enemy batteries. Known battle positions, and suspected ones, were taken under fire as part of the artillery preparation. This was all map firing. For the opening battle, fire started at 11:00 PM, the program of fire continuing for about 12 hours. Until the end of this period, the extensive battlefield was obscured by night, fog, mist, rain or smoke. The OP's failed to locate targets; they could not locate their own infantry. In the afternoon, visibility was good, and the battle went on in scattered sectors. The enemy artillery had not been neutralized, except in part, by the preceding artillery preparation, and now became very active, firing against our infantry. Not one bit of information came in,

COUNTERBATTERY IN THE AEF

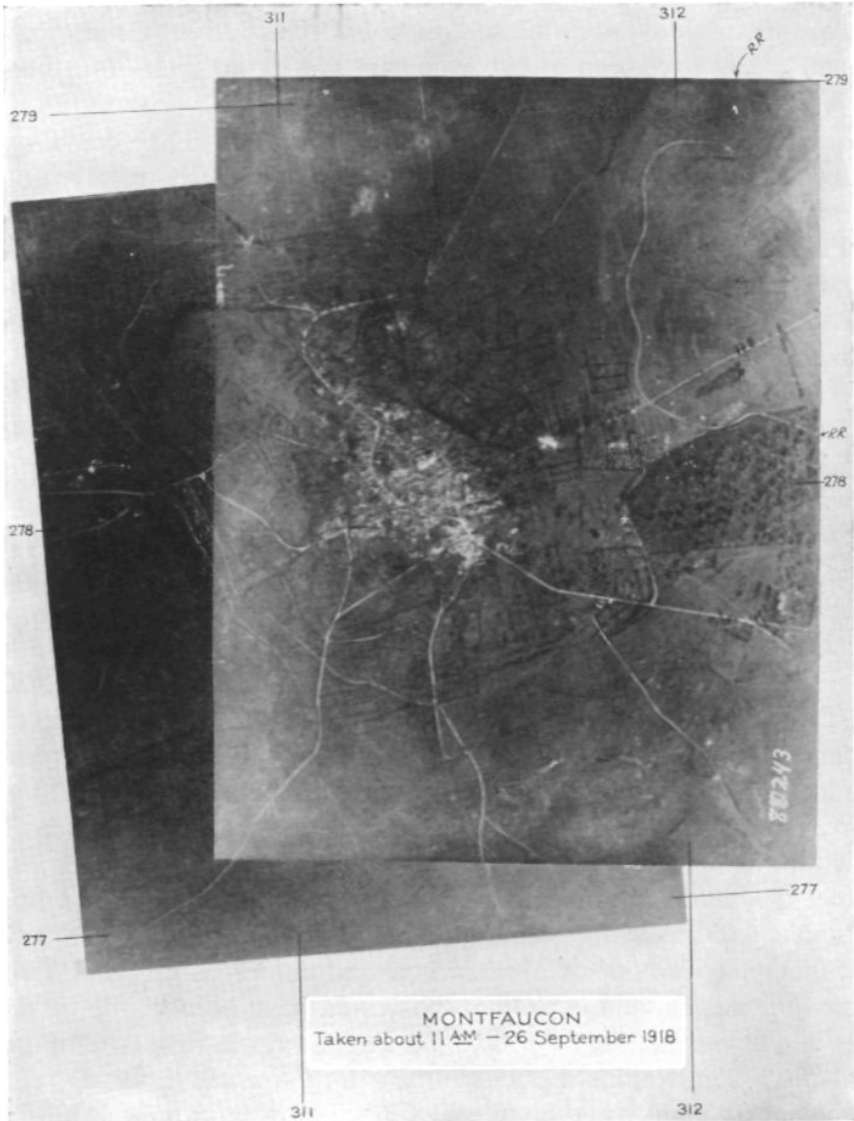
either from the OP's of 9 divisions, or from the infantry of 36 regiments, as to where these hostile batteries were. Counterbattery would have been of extraordinary use to our men—but there just was no counterbattery.

Our balloons were far in rear of the front. They could see towns on fire—smoke from railroad trains—but rarely gun flashes, and as to these they could not determine the coordinates. Planes flew over the field, morning and afternoon, and made numerous reports. We now know that these were in part inaccurate; they failed to see the enemy where he was, and mistook infantry of one side for those of the other side. They photographed certain sectors. The photographs were excellent information, but there was no system to develop and deliver them to those CP's which needed them. They were delivered next day, when it was too late. There were other difficulties. The airfields were 20 or more miles away: the photographs had to be recorded, developed, examined, marked, and transmitted to distant CP's, and hours passed by, while the infantry failed to receive the artillery support they needed.

One of the air flights passed over Montfaucon at about 11:30 AM. They took photographs, but as stated above did not deliver these until long afterward. They verbally stated upon their return, that they had carefully examined the area flown over at a very low altitude, and that there were no targets of any kind within 10 kilometers, and no enemy at or near Montfaucon; in fact they had recognized our infantry at that place. The photographs told an entirely different story; they plainly showed enemy infantry on our side of Montfaucon, and numerous targets. With modern methods these photographs could have been in the hands of the proper artillery CP by 1:30 PM. in ample time to arrange artillery support, including counterbattery, for our infantry, the positions of which were recognizable. The photographs in question showed battery emplacements which were empty, indicating that the enemy had withdrawn his artillery, and that the counterbattery service needed to seek further to the enemy rear for targets.

Our method of counterbattery, dependent on locating enemy batteries, was soon found to be unsatisfactory, owing to inability to find more than a small percentage of the hostile guns. The

THE FIELD ARTILLERY JOURNAL



—Photo by U. S. Signal Corps

TARGETS: MONTFAUCON PHOTOGRAPH

(in part only).

Approximate coordinates

1. 312.1-277.3 Trench held by enemy infantry (men leaning against south side), other enemy infantry in trench in rear.
2. 312.0-277.25 2 men in shell hole (leaning towards the north). U. S. troops; others nearby. This seems to be our most advanced infantry, held up by target No. 1.
3. 331.5-277.3 Trench extending to this point from Target No. 1, shows occasional men leaning against south side. Probably lookouts. Other men under cover, possibly in dugouts. This part of front at a standstill. Infantry unable to reach a decision.
4. 311.3-277.55 Infantry on road; possibly in support, or possibly moving (enemy).
5. 312.1-277.55 Hostile battery, with flank positions for 1st and 4th sections.
6. 312.0-277.8 TM's. or MG's in edges of woods, facing south.
7. 311.65-278.15 One of our shell bursts. Other shell burst to east, probably from same battery. Can not find a worthwhile target for this firing, which should be shifted to something more valuable.
8. 311.0 to 311.1-278.4 Large CP, with cars parked nearby. Our artillery fire fell about 100 meters short at a road fork, for which it was probably intended. The CP does not show damage.
9. 311.2-277.75 Enemy infantry astride of road, intrenched.
10. 311.0-277.55 Trench through this point held by the enemy. Wire in front has *not* been cut. Our infantry in small groups to south—held up.

Note shell holes in roads, showing general accuracy of our fire.

Editorial Note: Because of the limitations of photo-engraving, few of the particulars described above can be located in this reproduction, save for No. 1. The particulars are listed, however, to show what extraordinary information can be obtained from expert examination of an air photo, taken in the midst of battle, as this was

THE FIELD ARTILLERY JOURNAL

enemy had the same trouble, for our artillery casualties were small, and but a fraction of those of the infantry. This was the result of the use of proper defilade, and good camouflage. We had from 600 to 800 batteries in line; according to our records *not over four were out of action at the same time from enemy fire*. We daily lost some guns, equipment, or men, from enemy counterbattery; compared with the total strength present, these losses were insignificant, and in no way affected the tactical situation. Our counterbattery was more effective than the enemy; we had twice as much artillery, and several times as much ammunition, but it was not decisive. Experience convinced the high artillery command that an elaborate counterbattery service for locating enemy batteries, with a view to conducting fire on them, was not very valuable, as it did not discover much. It located many temporary firing positions, but these, unless counterbattered immediately, might escape severe injury, as they would not contain hostile elements a few hours later.

Infantry suffered heavily from artillery fire. They were often intrenched in the open, visible to enemy OP's, or in his air photographs. Our own air photographs frequently showed enemy infantry, but seldom batteries. In many cases the enemy had prepared his defenses in advance; this gave him a better opportunity to camouflage. Our men, being on the offensive, dug in where they could, and freshly turned up earth, if in the open, was usually discovered. Hostile artillery fire would then fall on our lines, and calls for counterbattery crowded in our artillery CP's. When the counterbattery asked for was the silencing of a battery. the whereabouts of which were known only vaguely, the problem was difficult to solve.

A war-worn French artillery major was asked how he handled requests from the infantry for counterbattery, when they were ignorant of the location of the battery firing on them. The major took the inquirer outside his CP. which was a dugout, and pointed to a patch of flowers. He explained that he was very fond of flowers, and cultivated these himself. He went on to state that when the infantry sent in an SOS for artillery counterbattery fire, he immediately acknowledged the call personally, answering that he would at once get busy. He then stepped outside, and attended to

COUNTERBATTERY IN THE AEF

his flowers. After about 10 to 15 minutes, he usually received another call from the infantry, stating that the hostile artillery fire was still falling, was unbearable, causing numerous casualties, and destroying morale. The major would reply "Well, well! Just give me a few more moments, and I will certainly give those fellows HELL!" He then again stepped outside, and continued to work in his garden. In the natural course of events, the enemy battery causing the disturbance would complete whatever problem it was trying to fire, and in a short time he would get another call from the infantry, expressing thanks for his efficient services in silencing the enemy battery. His recommendation was not to get excited over targets, the location of which was unknown.

The recommendation of the French major was not facetious. The same experience occurred frequently. A few days later one of our officers received a frantic appeal from an infantry regiment to counterbattery a hostile battery, which was shelling them, and causing serious losses. They were quite sure that this battery was located to the northeast, and that it was an 8" railroad battery. Upon inquiry the OP's reported that they could see no targets, but that hostile artillery fire was coming from the northeast, from behind a range of wooded hills. They were unable to give a more accurate location of the target. Examination was made of the firing map, and there was a railroad to the northeast, along which a battery would be within range of the infantry regiment reporting the firing. But the expression "northeast" covered a sector of about 800 mils, and within this area there were at least 10 very good positions for a railroad battery. After considering the advantages of the various positions, three were noted as being better than others, and orders were prepared for as many 155-mm. batteries, each to take one of these positions under fire, in the hope that one of them might turn out to be the correct target. It was a chance only. Before fire was opened, a telephone call came from the infantry regiment profusely thanking the officer for wonderful artillery cooperation—five minutes after the SOS call had gone in, the enemy battery had been completely silenced. The officer was not entitled to the compliments offered, but he thought it best not to decline them; and to sustain the morale of the infantry they were told that whenever they were in trouble, always to turn to the artillery; it was a duty and a pleasure to save infantrymen;

THE FIELD ARTILLERY JOURNAL

and the artillery was on the job 24 hours every day. Subsequent investigation has brought out the fact that, on this day, the enemy had no railroad batteries in this sector, and probably no batteries of 8" caliber. The battery firing was probably one of a number of tractor-drawn 150-mm. guns, which were in the 800-mil sector, at ranges from 8,000 to over 20,000 meters.

During the Meuse-Argonne campaign, the sector was most active, and there was never a day when our infantry did not suffer from enemy artillery fire. Outside of the big battles, daily artillery fire caused losses up to several thousand a day. We could not stop this unless we resorted to a general neutralization by employment of mass fire, which we now commenced to do for our important attacks. But for the intermediate periods we did not have the ammunition to do this. Counterbattery by firing individual problems against individual targets was a very limited case, because of the constant inability to locate more than a few hostile batteries. And yet enemy artillery caused most of the casualties, and it was clear that it had to be overcome if the infantry were to advance.

Analyzing the reports of our Medical Department, we find that for all of 1918, our losses in battle were caused as follows:

Shell.....	7.78%	
Shrapnel.....	15.07	
Shell and/or shrapnel	33.42	
Total, shell and shrapnel.....		56.27%
Gas,		
Arsine26%	
Chlorine82	
Mustard.....	12.37	
Phosgene.....	3.05	
Not identified.....	14.98	
Total, gas		31.48
Total, artillery.....		87.75%
Rifle, and machine gun.....		9.12
All others, including accidents		3.13
Total		100.00%

COUNTERBATTERY IN THE AEF

Notwithstanding ideas about infantry being independent, and being always able to advance by their own means, they could not do it. They had to have that terrific loss from enemy artillery fire kept down. Our infantry were constantly on the offensive, and it might have been expected that, for this reason, their losses from machine-gun fire would be at a maximum, but the figures show that they were not excessive. Examining into the reason for this we find:

- a. *During attacks*—the infantry would be occasionally stopped by machine-gun fire. As the trajectory of machine guns is rather flat at battle ranges, cover was usually obtainable in folds of the ground, and losses were light, but an advance was impossible until the machine guns were suppressed. With the infantry stopped, the enemy artillery searched the terrain occupied by them; this caused severe casualties.
- b. *Between attacks*—the infantry were ordinarily protected from machine-gun fire, but would be located by the enemy, and become the target of hostile artillery.

For the first case, during attacks, counterbattery by firing at *assumed* locations of hostile batteries was abandoned. Fire was directed against positions, about which there was definite information. For counterbattery of enemy artillery which could not be definitely located, mass fire was employed, following the practice of the other great Powers. This involved the neutralization of areas which surely included the enemy artillery. No attempt was made at destruction; if the enemy cannonneers became casualties, or were driven off, the problem was solved for us for that particular battle.

For the second case, between attacks, little could be done. Only a few enemy batteries would fire at any one time, and it was impracticable to find out where these were. Unless the neutralization of large districts was undertaken, the chance that fire directed against an assumed position would fall on a hostile battery was near zero, and gave negligible results. Within ammunition allowances, fire was had daily against located targets; these were largely infantry targets. Neither side had much ammunition for use outside of big battles. It was a serious proposition to organizations which were unlucky enough to be discovered, and thus

THE FIELD ARTILLERY JOURNAL

become a target for shellfire. Local losses were sometimes heavy, but for the Army as a whole such losses were replaceable, and had to be borne as part of the campaign.

Between attacks there were times when there was sufficient ammunition to counterbattery what was believed to be nests of batteries. These were usually woods, or parts of woods, where, from statements of prisoners, or captured documents, or observation, there was reason to think that there were hostile guns, although their exact coordinates were unknown. Not less than 12 batteries of at least 155-mm. caliber were used for each problem, and up to 36 batteries. Fire was simultaneous at maximum rate of fire. A check to determine the effectiveness of this fire was possible in only a few cases. In the Bois de Barricourt, three hostile batteries showed only slight damage from over 500 shells fired; but all the animals of one of the batteries were lost, as the center of impact had been close to the picket lines, which were some distance from the guns. In a group of two batteries, one of the two was apparently caught while firing, and lost severely in personnel. Battery accessories were greatly damaged, all sights but one. and all telephones, being destroyed. One gun was overthrown, and another thrown around, and yet the guns could have been put back into service had they been cleaned, and had personnel been available.

For attacks, plans for mass fire for neutralization were prepared as follows, using 1/20,000 battle maps:

- a.* Areas were marked off which certainly did not contain hostile artillery, including areas which the OP's could see, and were sure contained no targets; also, slopes too steep for battery positions, swamps, lakes, etc. In general, these areas amounted to 50% or more of the total.
- b.* Marked off so much of the remaining area as was within 7,000 meters of our infantry, and might contain hostile artillery. Artillery more distant was dangerous, but not disastrously so, as they could not fire on our infantry through OP's close by, owing to inability to see that far: and forward OP's were usually put out of communication through cutting of wires. The area within 7,000 meters varied with the progress of the battle, and was plotted for 20-minute intervals.

COUNTERBATTERY IN THE AEF

- c. The artillery preparation was planned to break all material obstacles, and overthrow machine guns, trench mortars, etc., immediately in front of the jump-off line, so that the infantry was sure to obtain a good start. Guns not needed for this purpose were available for counterbattery. All enemy artillery areas within the selected areas had to be under neutralization fire for some time prior to H hour. After initial gassing, two 155-mm. rounds, or equivalent, per minute, for areas 200 meters wide and 100 meters deep, were found sufficient to maintain the neutralization of targets not having cover.

Because of the mobility of modern artillery, even when batteries were located they were hard to destroy, on account of the time needed for precision adjustment. Unless the initial rounds fell on the target, the latter had an opportunity to move. An enemy battery of 150-mm. guns started to counterbattery one of our 8" railroad batteries southeast of St. Mihiel, at a range estimated at 16,000 meters. Our battery was believed to be well camouflaged, and had not fired. It is not known how the enemy discovered it; it might have been from one of his OP's, of which he had several within 6,000 meters. However, he did discover it, and on a nice, sunny afternoon, with visibility excellent. Fire was by platoon; the first two shells fell about 600 meters short. Our battery noticed these at once, and made an assumption that they were probably the target, as there was nothing else around worth firing at. The executive promptly ordered up his locomotives, kept always in war with steam up; the gun squads showed extraordinary efficiency in placing the guns in traveling position. There was fortunately an interval of several minutes between salvos, probably owing to long lines of communication. The next two rounds were between 200 and 300 meters over, and did no damage. The executive noted that the enemy apparently had a deflection bracket and needed only to split his bracket for range. Everyone was working at utmost speed, and the locomotives were coming up. The third series of rounds fell about 150 meters short, and luckily again failed to do any damage. Before any more rounds arrived, the little locomotives were pulling all guns out, and disappearing rather rapidly to the rear. The enemy completed

THE FIELD ARTILLERY JOURNAL

his bracket, and fired a very good problem, considerably damaging the ground on which the battery had been. When he had finished for the day, the battery waited until it was dark, sent in a detail to clean up, cussed out the camouflage officer, and sent him back to correct whatever was wrong. The guns were then brought back. They were not again fired at.

The firing-ground problem of counterbattery, with a target wholly or partially visible, and consisting of 4 evenly spaced objects, all on the same line, does not give a fair idea of counterbattery in war. In war only a small percentage of batteries were visible. Batteries in line ran from 10 to the kilometer in quiet sectors, to 25 to the kilometer in very active ones. They were distributed in depth, and guns were usually irregularly spaced, both in line and in depth. Where defilade was possible, it was rare to see a hostile battery. Where there was no defilade, batteries fired only when there was a worth-while mission, so that their flashes would not betray their positions, otherwise well camouflaged. As soon as the firing mission was completed, the batteries moved elsewhere.

Even when flashes of batteries could be seen, it was not always possible to locate the battery. On 9 November, 1918, from the heights behind Brandeville, over the plains of the Woevre, the view extended to the horizon. There were extensive forests in the foreground, and from them was coming a heavy volume of enemy artillery fire. From the OP on the heights, the flashes of only one battery were seen, and it was way inside the forest, not near any reference marks. Had a flash-ranging battalion been on hand, the coordinates of the flashes could have been determined, but it takes time to install flash-ranging equipment, and in the moving warfare then existing this had not been done. Obtaining a bracket on gun flashes is very difficult, unless one can obtain a burst directly behind the flash. If the hostile battery stops firing this possibility disappears. It was impracticable, in this case, to locate the flashes of the one battery seen, and no other hostile battery was visible, although many were firing, and none had defilade. It would have been possible to neutralize sections of the forest by mass fire, using gas, and it could have been done successively, but there were not enough batteries, nor ammunition,

COUNTERBATTERY IN THE AEF

available at the time. The enemy continued to hold the forest, and our infantry advance stopped.

Shellfire required an extraordinary amount of ammunition to neutralize a battery. It varied with the range and type of battery firing. Gas was a better projectile, as it was much more economical. When persistent gas was employed, its effects lasted for a considerable time. Mustard gas was the prime counterbattery ammunition, but there was little of it to be had, and this was reserved for special occasions. For daily firing, HE shell, as the only available projectile, was customarily used.

Early in November, 1918, the colonel of one of our field artillery regiments called up his brigade commander. In accordance with orders from the brigade, the regimental CP was at Montigny-devt-Sasse, a small village at that date about 1,500 meters in rear of the front line. Two batteries of the regiment were in the village. The telephone conversation was something like this:

"Sir, this is no place for a regimental CP. We want to move further to the rear."

"What's the trouble, Colonel Blank?"

"Sir, we're being shelled by three batteries at once, a 240, a 150, and a 77 long. We've got to move. Do you hear *that*?"

That was the crash of an exploding shell which could be heard over the phone. But the brigade commander did not like the idea of withdrawing either guns or CP's, so he phoned back that he would personally inspect the situation that day, and would withhold his decision until then. In the meantime, the colonel and his two batteries were asked to hold on. The brigade commander started at once. It was 8:00 AM. and he had other places to visit, but he expected to reach Montigny about noon. Because of the activity of the sector, so many things happened that he was unable to keep to his schedule, and it was around 5:00 PM before he was in sight of Montigny. He was going parallel to the front, from west to east, and saw shells falling in the village as he approached it. He wondered whether his car would get through, but decided there was nothing to do but to keep going. Luck came to his aid; the shelling stopped just as he was entering Montigny, and he was able, quietly, to find his way through debris and ruins. He found the regimental CP about 500 meters beyond

THE FIELD ARTILLERY JOURNAL

the far edge of the village. It was an abandoned German dugout, deep and solid.

The regimental commander reported terrific shelling all day by the enemy, on his CP and his batteries, which, as noted, had just ceased. The regimental detail was much troubled over the possibility of an enemy shell coming through the door of the dugout, which faced the enemy's lines. They were sure the enemy knew of this dugout, since he had built it himself, and consequently had its coordinates. They were nervous. The brigade commander made a hasty mental calculation as to the probability of a direct hit on a small door, defiladed from the enemy's view, at the probable battle range. He then explained the result, pointing out that a direct hit was possible, but not probable. (In fact, there had been no hit even near the door.)

But the colonel reported that the serious question was that an infantry brigade had its CP in Montigny, and that the general commanding was furious against the artillery, and demanded that the two batteries be moved out at dark. From the hostile shelling, this general had lost that day his aide, and several other men of his headquarters; his CP had received direct hits, and there were many other infantry casualties. He attributed all this loss to the enemy's attempts to counterbattery the two batteries, and was certain that if these could be gotten rid of the enemy counterbattery fire would stop, and many infantry lives be saved. In his opinion, these two batteries were too close to the front, in locations where they were sure to be discovered, and where they only brought distress to others. The colonel was asked who the infantry general was. but he didn't know; he hadn't himself seen him; it was the liaison officer who had brought in these messages. The liaison officer had reported that the infantry general had used such strong and shocking language, as to what he thought of the artillery, that the colonel thought it best to stay away, and he had not asked what his name was.

The artillery brigade commander did know who the infantry general was. He remembered him as an officer of the Old Army, well known for his kind and courteous disposition. Something was apparently wrong. So he asked the colonel to join him in a visit to the infantry CP, while the chauffeur rustled some supper.

COUNTERBATTERY IN THE AEF

The infantry CP was found to be a sizeable reenforced concrete house, at an important crossroads. It had obviously been hit by large shells, but was so solid that none had penetrated. The shell holes indicated that the center of impact was nearby, but the crossroads appeared to be the probable target for the enemy; neither of the two batteries was close.

The two artillery officers entered the CP. It was packed with infantrymen, and the air was so foul from tobacco smoke, and lack of ventilation, that it was some time before the infantry general was located in a back corner. His artillery colleague immediately received the hearty welcome he had expected. He explained that he had brought with him the artillery colonel commanding in that vicinity, in order that they might discuss the best methods of cooperation, and smooth out any difficulties, which he was sure were not real. Would you believe it—the infantry general and the artillery colonel recognized each other as uncle and nephew, who had been hunting for each other since they had been in France! Yet they had been in the same village, within 500 meters of each other, sending each other impertinent messages, without either of them visiting the other, or inquiring as to his name. Seeing what the situation was, the artillery commander stated that he would withdraw, and inspect the batteries, leaving his colonel to discuss local troubles. He did not say so, but he felt that he was more likely to contract some contagious disease in that CP than he was to be wounded outside by hostile fire.

The first battery was clear of the north edge of Montigny. It was defiladed from enemy view by woods, and it was supposed to be camouflaged. But the enemy had undoubtedly located it, for it had been under constant shellfire all day. Evidently the enemy had a good bracket, both for deflection and range. Many shells had struck within the battery, and yet after 10 hours' counterbattery fire not a man had been injured. The damage to materiel was limited to No. 2 gun (a 155-mm. GPF). A 240-mm. hostile shell had struck just under the trunnions, and, bursting, had bent the barrel upwards. The gun was unserviceable. The gun squad had heard the 240 coming; had jumped into their trenches, and escaped all injury. The entire battery had been doing the same

THE FIELD ARTILLERY JOURNAL

all day. They were dirty and tired, but they were a happy lot, as they had fired all problems assigned them. Their brigade commander complimented them, promised No. 2 section a new gun, and gave them the latest news, not forgetting to mention the reasons for their own fire. The battery was disturbed as to the ammunition due them that night. Another 240-mm. shell, which went over, had hit a stone house in Montigny, along the only road leading to the guns. The house was blown outwards into the street. An engineer train happened to be passing at the time, and the combination of the house on top of the train blocked all navigation. On inspection, the result, as an obstacle, was rated as *Superior*. It would take a great deal of labor to clear it. But reconnaissance discovered a practicable detour, which settled this problem. In all, this particular counterbattery fire had been annoying, but it had not stopped the battery.

The second battery was in the center of the village. The guns were very unevenly distributed, and camouflage was excellent. No hostile shells had fallen within the battery, and it looked as if the enemy had not discovered it. The battery was complimented on its camouflage. The morale was high, for the men had carried out all missions efficiently, and on time, and without losses. They had a kitchen in a nearby cellar, and the brigade commander was glad to take supper with them.

He then went back to the infantry CP. Cutting his way through the murky interior, he found the infantry general and artillery colonel, sitting on a pile of ammunition boxes, with their arms around each other, happy as two doves. He felt it unnecessary to make any comments, and saying goodby, left, found his car, and went on to continue his inspection. As he drove off, the enemy once more started his shelling of Montigny. But the brigade commander felt that he had solved a problem in artillery liaison, and that as long as the enemy used HE shell only, the counterbattery fire would have but minor results, and would not neutralize his batteries.

The objection of the infantry to have artillery near them was common. The infantry knew of that 87% of artillery casualties. They could see it. They lived in daily dread of it. They understood that only our artillery could save them from that terrific

COUNTERBATTERY IN THE AEF

percentage through successful counterbattery of enemy guns. They could understand that the enemy would try to counterbattery our guns, to save *his* infantry. If hostile fire fell on them, and one of our batteries was near by, they were prone to assume that they were suffering from fire intended for the battery, which, through incorrect handling of the firing data, was actually falling on them. They wanted us to counterbattery the enemy; they asked for it; but they did not want our guns to be near their positions, drawing enemy fire.

Records fail to show that enemy fire intended for our artillery, through inaccurate data, or poor firing, missed the target, and fell on our infantry. It may have happened, and there may also have been cases where fire, intended for our infantry, accidentally fell on artillery. But proof is wanting. Air photographs were numerous, and these show far more infantry targets than artillery targets. Infantry in attack made tracks showing exactly where they had gone to, and many of their positions were right in the open, and rather easily located. Artillery displacements were usually at night; their movements were camouflaged, and few were discovered. It was necessary to have artillery well forward, and sometimes a major part of the artillery was in forward zones—their mission required it. It was out of the question to reserve forward areas exclusively to the infantry, and there is no evidence to show that infantry suffered less when the artillery was kept to the rear. Unfortunately for them, the infantry were the major sufferers from artillery fire, and they knew it, but this fire was intended for the infantry, and was not inefficient counterbattery fire erroneously falling on the infantry. The artillery meant to hit infantry targets. Artillery also fired at the opposing artillery, but owing to inability to locate the greater part of the hostile batteries this fire was ordinarily of limited character. Only when large amounts of ammunition were available for mass fire was counterbattery everywhere effective. On other days counterbattery was only partially effective, and the infantry of both sides were the sufferers.

In mass fire, gas was employed to the limit of the supply on hand. The counterbattery covered areas which surely included most of the enemy artillery. It took time to make the neutralization

THE FIELD ARTILLERY JOURNAL

effective. The amount of gas shell to use was determined from tables furnished, where the factors were the kind of gas, the weather, size of target, and the like. Histories of the German divisions opposite to us were studied to discover the effects of past shoots against them; statements of prisoners, and an occasional captured document of our own earlier operations added to the data obtained from past records. A heavy and rapid concentration of gas was sent over at first; this would force the enemy to wear masks. Thereafter gas, and HE shell mixed, in reduced quantities, were fired, at the rate of about two 155-mm. shells, or equivalent, per minute, for each 10,000 square meters of surface. This fire did not need to be absolutely continuous, but could be fired in bursts, not over 10 to 15 minutes apart. Two hours of such shelling, following the initial gassing, neutralized all batteries except those of first-class divisions. For the latter, four hours shelling was frequently necessary, and occasionally even this was not enough.

The greater part of the counterbattery was included as part of the artillery preparation, which usually preceded the infantry jump-off. Persistent gas was used, if it could be had, unless the location neutralized had to be passed over by our troops. In such cases semipersistent gas was used. Where persistent gas had been used, the infantry were given overlays, showing the areas gassed, and warned to stay away from such places, the artillery assuming responsibility for causing the enemy to evacuate the areas.

Utilized in this way, over extensive sections of the terrain, for a few hours preceding and during an attack, our counterbattery fire was effective. It was not perfect, and did not stop all hostile artillery fire, but it reduced it, so as to make it possible for our infantry to move according to the planned schedule. The same system could be used on the defensive. On the night of 14/15 July, 1918, the 3d Division, along the Marne, used neutralization fire in part, against certain woods, with great success.

Mass fire replaced precision fire. For the period of the artillery preparation the rate of fire was great, but the 95% reduction in the length of the preparation reduced the total expenditure of ammunition. It was the only method which won battles other

COUNTERBATTERY IN THE AEF

than limited ones. During the years preceding 1918 the Allies had stuck to precision fire, and refused to adopt mass fire, on the ground that it wasted ammunition, as much of it would fall on ground where there were no targets. But they never won, while the enemy, using mass fire since 1915, uniformly won. There were other factors required to win battles; the artillery could not do it alone. Thus, when the Germans attacked across the Marne on 15 July, 1918, they used mass fire in the correct manner, particularly directed against the supposed locations of the Allied artillery. But they had violated the principle of secrecy, and the Allies knew of the proposed attack, and also its date and location. They withdrew their artillery, to avoid the enemy counterbattery fire, and nearly all of the infantry likewise, and succeeded in keeping this secret. When the battle started, the tremendous mass fire of the German artillery fell mostly on abandoned terrain, and his infantry then found themselves in face of a new position, a few kilometers back of the old one, intact and fresh. The Germans had no longer sufficient ammunition for another artillery preparation, and they lost the battle.

Any caliber of guns could be used for *gas* neutralization, but the most useful in 1918 was the 155-mm. gun or howitzer. There was no experience with larger calibers, as there was no gas for these. For *shell* neutralization, as an accessory to gas, and following it, the 105-mm. gun, borrowed from the French, was the smallest efficient caliber. The 75-mm. gun was not efficient for this purpose.

COMMENTS

Because of universal use of defilade, and of camouflage, artillery on the battlefield is seldom seen. Once in a while a battery is observed, but this is a rare event. Others are located by flash- or sound-ranging, by air photographs, or in other ways. Yet the majority of the enemy artillery does not fire until a battle commences, and is not discovered, or is discovered only after it has accomplished its mission. Counterbattery, if limited to hostile batteries which have been located, will be of minor importance in the future, as it was in 1918. Medical reports of all Powers agree that 80%, or more, of infantry losses, are from artillery

THE FIELD ARTILLERY JOURNAL

fire. Consequently the counterbattery problem has to be solved, for if it is not, the probability of the infantry making successful attacks is small.

Training, as given in Map Problems, and in Extension Courses, represents counterbattery by announcing that hostile batteries have been located at designated coordinates. If the student provides for fire against such places, the problem is satisfactorily solved as to counterbattery. This type of problem gives a false impression of counterbattery. Only a restricted percentage of the enemy artillery is likely to be located, and unless direct observation is available, which will be rare when defilade is possible, we might fire all day at such batteries, and not neutralize them, unless we have the right kind of gas to do it with. But the real problem is the neutralization of that part of the enemy artillery which has not been located, which is the larger part, and the dangerous part. On this our texts are usually silent.

The solution is to neutralize areas within which the enemy artillery is contained. Gas is essential for this, and will have to be furnished in the next war, if our counterbattery is to be successful. Much can be done with HE shell, but for counterbattery, nothing has yet been found to equal mustard gas. A reasonable amount of this, sprinkled around, accomplishes its mission in a minimum of time, and it may be fired in advance of attack periods, if secrecy or other reasons do not advise to the contrary. Other gases may be used, but they are less efficient.

Neutralization of large areas by mass fire is practicable. On account of paucity of ammunition, in 1918, this was done only when there was some mission warranting such large expenditures of ammunition. Such missions may be attacks, or defense against a hostile attack. For periods between battles, both sides can be expected to indulge in as much artillery fire as the ammunition on hand permits. Such fire will be against targets located, and these are ordinarily infantry targets, and the infantry are bound to be the great losers. They can be saved only if the amount of ammunition provided is sufficient to enable counterbattery to be a normal event, instead of an occasional one. It should be practicable to reduce the number of men in forward areas to the least number needed for security purposes, and this

COUNTERBATTERY IN THE AEF

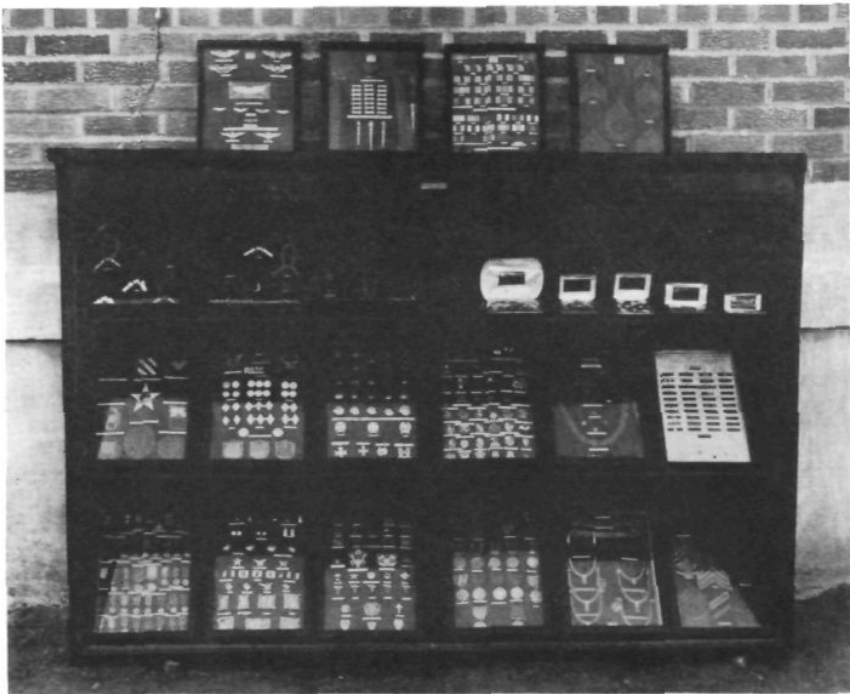
practice should be habitual, whenever an attack is not in progress. Considering the efficiency of modern methods for discovering the imminence of enemy attacks, we can safely withdraw from front lines, between battles, nearly all artillery, and most of the infantry, and reduce the daily casualty lists. Our own daily artillery fire can be handled by batteries, especially detailed, firing from temporary positions, changed nightly—defiladed if possible, and certainly camouflaged. The mass of artillery needs to be employed only in battles, where there is an important mission, and this artillery, to avoid losses, can be kept out of range, concealed, and brought up into position, only just before the need for its employment arises. The same procedure can be followed, and with greater ease, for the infantry.

Many writers assume that in the next war there will not be sufficient guns and ammunition to support the infantry as was customary in 1918. If this is true it means death to the infantry, They can not overcome that 87% casualty list, unless our artillery helps them, by counterbattery of the hostile artillery. The artillery has to have guns and ammunition. Ammunition was all that was necessary in 1918 for counterbattery purposes, as we had enough batteries. But there was only sufficient ammunition for special occasions, and on other days our infantry were sometimes killed like flies while crying desperately for better artillery support. Are we going to let this happen in the next war? Or are we going to save the lives of those of our young men who serve in the infantry, by providing guns and ammunition?

Field Artillery School Wants Insignia

Here is one of the exhibit cases of the Field Artillery Museum, part of the Field Artillery School, Fort Sill, Oklahoma. The Commandant asks that officers of field artillery, National Guard, Reserve, and Regular, send him, direct, exhibits of their regimental and unit insignia for inclusion in the Museum. It is hoped that no organization will overlook this opportunity of having representation of its entity, history, and achievements recorded permanently in the Field Artillery Museum, the largest and most comprehensive of its type in the country. Let no one fear to duplicate a regimental entry. All contributions of insignia or other suitable material will be appreciated.

The exhibit case in the illustration contains many insignia loaned by the N. S. Meyer Company.



"Vamm," Russian Academy of Mechanization

(EDITORIAL NOTE: *Those who underestimate the ability of the Russians to employ their huge forces, in the belief that the general level of education in the U.S.S.R. is low, may wish to revise their concepts in the light of this account of what can well be termed an extraordinary school.*)

SOVIET Russia has a name well in keeping with the size and length of course of its military technical university. It is, "The Military Academy of Motorization and Mechanization of the Workers' and Peasants' Red Army in Honor of Stalin," abbreviated, for the initial letters of its Russian name, to "Vamm."

The purpose of the Soviet Government in founding the Motorization and Mechanization Academy was to gather into one school the principal agencies of experiment, test, and exploitation of the motorized and mechanized instruments of warfare; to arrive at correct principles of tactics and strategy in the use of motorized vehicles and mechanized equipment in warfare; to train a sufficient number of student officers in these principles so that the new methods of warfare might be thoroughly understood throughout the Red Army; and to train a sufficient number of specialists in the requirements of the Army to enable these specialists to be sent back into industry to assure the success of procurement programs for motorized and mechanized equipment. The academy is located in the eastern suburbs of Moscow near the Yauza River, a small tributary of the Moscow River. It is also near the main line of the Kursk Railroad. It is housed in a series of buildings, the principal one of which was formerly the Palace of the Empress Anna Ivannovna, built about 1730. This huge palace containing more than 500 rooms is comparable in size to the State, War, and Navy Building. It contains most of the classrooms and laboratories of the school. A recently completed building of almost equal size adjoins the main palace and houses the student officers and several of the faculty members.

As there is insufficient open space for practical work in the

THE FIELD ARTILLERY JOURNAL

vicinity of the Academy, a special proving ground 60 kilometers from Moscow has been assigned to the Academy for testing purposes. This proving ground is located in broken country which permits adequate tests over various obstacles on various slopes and in sand, mud, and snow.

The academy is under the command of Komkor Markian Yakolevich Germanovich, a tall, thin, energetic, corps commander, 41 years old, with a distinguished record of service in the Civil War and later in various infantry units in the Transcaucasus, Kharkov, and White Russian Military Districts, Komkor Germanovich is not a technical specialist, and was evidently chosen for his present responsible position by reason of his organizing ability and his administrative skill. The sharp, incisive way in which he promptly settled various questions referred to him incidentally during the inspection indicated clear, quick, judgment and great energy.

The Chief of Staff of the school is Kombrig Rudinsky. The Chief of Instruction is Voyeningener of 1st Rank Orlovsky, and the senior instructor in tank tactics is Kombrig Malevski.

The other instructors, about 350 in number, range in grade from Colonel to Captain, with a considerable number of civilian employees in the assimilated ranks of Captain and Lieutenant.

The Chief of the Department of Physics and the Chief of the Department of Experimental Chemistry, both professors, held the assimilated rank of Corps Commander and wore the corresponding uniforms.

The student body at the Academy numbers about 2,000. The students are practically all officers of the Red Army detailed from all arms. A few engineers and economic experts from the automotive industries are also detailed to the Academy as students.

Officers detailed from the Red Army must be under the age of 33. A few exceptions are permitted if officers otherwise qualified have been prevented by reasons of service from attending the Academy at the proper age.

Selection of students is made on the basis of competitive examinations held annually in all military districts. Although there is no limitation as to grade, the age limit is a practical barrier for all except Lieutenants, Senior Lieutenants, and Captains.

RUSSIAN ACADEMY OF MECHANIZATION

The above limitations do not apply to officers detailed to the Academy for refresher courses. Such courses, generally lasting six months, are maintained especially for senior officers who have not had the necessary technical preparation for the regular course but who have performed valuable services in administrative capacities in the grades of Major and Colonel. Those detailed for refresher courses are principally tank officers, artillery officers, and engineer officers.

Officers detailed to the Academy from the Red Army for the regular four-year course must have had a minimum of three years' service in the Red Army, not all of which need be in commissioned grades.

The limitations as to age, service and preliminary education result in a student body of mature officers 26 to 30 years of age, extremely interested in the technical work of the school and beyond the stage where routine military training or routine political instruction is needed.

The course of instruction at the Academy lasts four years. The student body numbers 2,000. As a rigid elimination system prevails throughout the four years, entering classes number nearly 600 and graduating classes average between four and five hundred.

Three distinct departments are recognized, each with four year courses known as Courses I, II, and III. The first two years of the courses at the Academy are identical for all students. Specialization in the three courses takes place in the third and fourth year.

All courses include the group of studies known as automotive engineering throughout the four years. All courses also include the tactics and technique of the separate arms.

During the first two years all courses include such technical subjects as physics, chemistry, mathematics, mechanical drawing, field engineering, telephony, telegraph and radio, languages, metallurgy, and mechanics.

Course I, which might be called the "Command Course," specializes during the third and fourth years in tactics, strategy, and logistics, together with military history, military intelligence, and the political aspects of contemporaneous international relations.

THE FIELD ARTILLERY JOURNAL

This course also studies intensively the application to warfare of the latest principles of mechanization and motorization. It is intended primarily for commanders of tank units and for higher commanders.

Course II is known at the Academy as the "Exploitation" course. It specializes during the two final years in research and development. The research includes pure research in the departments of physics, chemistry, and mathematics and also the practical exploitation of inventions in the field of motorization and mechanization. The course also carries on higher studies in metallurgy, radio engineering, and optics. It is intended primarily for the training of automotive engineers and technicians.

Course III is an industrial course. It specializes during the third and fourth years in all aspects of factory operation and management. It prepares graduates for duty in the automotive industry as factory managers or as supervisors of military procurement. This course includes shop work, cost accounting, budgeting, economic geography and geology, general economics, and industrial management.

It was stated that at least half the graduates of each class are members of Course III and are subsequently detailed to the automotive industry for duty.

Classroom instruction is given to student officers in groups of 10 to 25. Thus, in each day's program of work, approximately 100 classes are holding their sessions simultaneously.

Laboratory work is conducted with groups of 25 in well equipped laboratories under an instructor with several assistants. About 30 such laboratories were inspected.

Each department of the school has one or more lecture halls which vary from conference rooms seating about 50 to assembly halls seating at least 500. Twenty such lecture halls were inspected. The best halls were very well equipped with complete electric controls at the speaker's desk which regulate lighting, the drawing of window shades, the automatic feeding of lantern slides for lectures and the automatic focusing of spot lights on maps, models and blackboards in various parts of the hall.

Each department is provided with an instructor's clubroom in which late technical developments, technical literature, and the answers to various technical questions are displayed for study.

RUSSIAN ACADEMY OF MECHANIZATION

In the classrooms, student officers are required to demonstrate either at blackboards or from actual models the subject under discussion. They themselves conduct map problems, sand table problems, and artillery problems at the many indoor ranges with which the school is equipped.

Here, as in other Red Army Schools, the greatest emphasis is laid on practical work with actual materiel or with models of materiel. Each department is packed with instructional equipment enabling the student to actually see the part which is being described and the way in which it works.

The department of tank gunnery is particularly well equipped with models, landscapes, and sub-caliber devices. Among these are rows of tank superstructures equipped with tank guns and aiming devices. The superstructures are mounted on wobblers which imitate the motion of a tank crossing rough ground and which therefore permit the registration of hits with aiming devices under conditions approximating actual field conditions.

Other rows of tank superstructures are rigidly mounted but aim at a screen on which moving pictures of various tank targets are thrown. The gunner in the superstructure "fires" at the target and thereby closes an electric connection which throws a bright beam of light on the screen and at the same time momentarily stops the moving picture reel. "Hits" are thus noted and scored by observers and the gunners are duly rated.

In addition, a large number of miniature ranges give the tank gunner an opportunity to improve his marksmanship against small objects, disappearing targets, airplanes, and the tiny flashes of miniature artillery batteries under night firing conditions.

The department of gunnery is of course provided with the usual sectionalized equipment for all types of guns and ammunition and the models of the theoretical trajectories of guns, howitzers, and mortars of all calibers. Optical instruments, range finders, periscopes, and lenses of all types, both sectionalized and complete, are displayed in this department.

The automotive engineering department is likewise provided with a wealth of sectionalized equipment showing all types of motors, guns, and tanks.

The fourth year students in Course II (the Engineering or "Exploitation" course) apparently have research problems of

THE FIELD ARTILLERY JOURNAL

some importance to carry out in the various laboratories of the Academy. While the exact nature of these problems was not learned, the equipment in use indicated that experiments were in the field of metallurgy, heat treatments, strength of materials, welding methods, and optics. As assistants to the student officers performing these experiments, about 60 civilians were employed.

In the laboratories of the Chemistry Department research on powders and explosives as well as on gases for chemical warfare was under way. Forty civilians were employed in the laboratories of the Chemistry Department.

The laboratories of the electrical engineering department seem to be particularly well equipped, but the experiments under way concerned principally the testing of electrical devices already standardized.

A hydraulic laboratory is maintained for the study of flows in cylinders, also for experiments with amphibian tanks.

Under the Chemistry Department an oil laboratory is maintained for the testing of all lubricants which are of interest in the automotive world.

The senior students in the Command Course are given instruction in all the details of field service with tank units and are later required to carry out these projects at the school proving ground and during the summer camp period.

The field service classrooms contained most elaborate models of the three types of motorized camp; Permanent quarters, semipermanent camp, and bivouac. The camp models were noteworthy for the extreme care given to the routing of traffic and the orderly succession of operations to be undertaken on incoming tank units. Every detail of inspecting, cleaning, light repairs, heavy repairs, parking and despatching seems to have had adequate study. The various model camps were laid out to scale and all important distances prominently marked so that the student could easily retain a mental picture of the ideal lay-out for tank units of various sizes.

Much attention was also devoted to models of dispatch boards and to methods of keeping constant check on the condition and location of all automotive units. The models contained actual miniatures of tank battalions of three companies each with places on the board for actually transferring tanks from the battalion

RUSSIAN ACADEMY OF MECHANIZATION

to "light repair," "division repair shop," "detached," and other destinations. The tank companies thus displayed consisted of 12 units: 10 tanks, 1 repair truck, and 1 light car.

A somewhat more practical dispatcher's board was elaborately equipped with tiny electric lights—red, white, and blue being used for the three tank companies of the battalion,—with a separate light showing the exact location of each tank in the battalion.

The field service section also contained exhibits of every tool used in automotive work displayed beside an actual photograph enlarged to life size showing the tool in actual use in the field.

Sectionalized models of tanks, tractors, and trucks showed the various possible malfunctionings of all parts and the appropriate methods and tools to be used in repair.

Such accessory equipment as gasoline supply tanks and camp gasoline stations were shown in the smallest detail in carefully scaled models.

The Academy is provided with a library of 600,000 volumes. Most of the books are technical. Technical journals from all principal countries of the world are on file and judging from the interest displayed in foreign journals, the student officers have an extreme desire to familiarize themselves with all types of automotive equipment and to adapt the appropriate equipment to their own purposes.

The library is open from early morning until 12:30 AM, and the demand for books is so great that even at midnight the library is stated to be crowded with student officers working on research problems.

A library staff of 70, mostly attractive young women, is employed on the work of indexing and cataloging current literature.

The school year, which has heretofore begun in the Fall, is now being shifted so that students will enter in May. This will permit new student officers to familiarize themselves first of all with practical work in the field during the summer months before starting their theoretical studies. Two and one-half months during the summer are spent at the proving ground and in camp on field tests. The indoor season of class work lasts approximately 7½ months. Two month's leave is permitted student officers after the completion of summer camp.

The routine day at the Academy consists of 5½ hours of class

THE FIELD ARTILLERY JOURNAL

or laboratory work with an estimated three hours of preparation required daily. In addition to these hours, certain experimental projects must be completed by each student. The extra time required for these investigations is spent in the laboratory after school hours. All laboratories are open until 12:30 AM and most of the special work is done during the evening.

In the large number of subdivisions in the course of automotive engineering emphasis is constantly laid on practical operation and maintenance. With this purpose in view, students are liberally provided with every imaginable kind of machine tool, gauge, scale, and measuring instruments.

The mounting and dismounting of all mechanisms is of course a basic requirement in all courses.

Tool making is also included as a major subject. It includes not only the actual manufacture and gauging of the tools but also an analysis of steels, studies of cutting edges and gear teeth irregularities, and micrography. These studies lead naturally to another section of the course dealing with the redesign of parts after tests made in the physics laboratory.

The gauge division of the automotive engineering department studies not only the manufacture and application of gauges but also estimates requirements for master gauges, and provides means for expansion of gauge operations to supply new factories.

In all discussions of gauging operations the greatest regret was repeatedly expressed by Soviet engineers over the fact that American engineers had not yet adopted the metric system. The belief was expressed that Soviet industry would long ago have accepted American models and American types for all its equipment if they had been of standard metric dimensions. Nearly all the instruments observed in the laboratories were of German manufacture. This was particularly true of optical instruments and measuring instruments. Soviet industry is just beginning to turn out machine tools and measuring instruments but these constitute as yet only a small part of the laboratory equipment.

The ordinary guard and police at the school is performed by an especially detailed school battalion of infantry troops.

The Academy is equipped with a large and well equipped gymnasium. Although the student officers are beyond the age when

RUSSIAN ACADEMY OF MECHANIZATION

a rigid athletic routine is demanded of them, great interest is apparently taken in gymnastic work.

The Academy supports various athletic teams, including hockey, skiing, swimming, basket ball, track and football and the officers were all proud of their team records.

A special short course for noncommissioned officers is given at the Academy. The course consists in practical tank operation and is apparently limited to about fifteen Sergeants.

In addition to the civilian professors and laboratory assistants a number of civilians are employed as instructors, economists and statisticians in Course III. Among these assistants were several women. It was stated that several women had also finished Course III as students and had been assigned to duty as factory directors.

The Academy of Motorization and Mechanization is attempting to grapple with the whole problem of mechanization and motorization and the application of these subjects to national defense. In this respect it is perhaps the world's most comprehensive project for treating motorization and mechanization in all their aspects and carrying through the problem from questions of research, design, and manufacture to the application of new principles of tactics and strategy in warfare. Parallel with these studies the Academy prepares its graduates for actual work in every stage of the problem; for the research laboratory, for the budgeting and planning offices, for the automotive industry, for the motorized and mechanized units and for the higher military staff which drafts plans for warfare.

At each stage also the activities of the Academy are closely tied in with the activities of the nation. The laboratories and research departments are in constant and close communication with the section of inventions and patents of the Council of Labor and Defense. The budgetary planners are in close touch with the State Planning Commission. The school instructors are part of the general body of instructors of the military schools of the Red Army and are therefore in close touch with Red Army principles in all matters of military doctrine. The work of the economic course is not only in close touch with the automotive industry of the Soviet Union, but actually supplies to this industry

THE FIELD ARTILLERY JOURNAL

many of its best factory managers and economic experts. Finally the whole projects for motorization and mechanization in the Red Army is in close touch with the plans of the general staff because instructors and graduates of the Academy are detailed to positions in the Frunze Academy and to important posts in the General Staff.

The methods of instruction, the constant emphasis on the practical and the intense concentration on fundamental technical matters created an excellent impression. The most noteworthy point about the Academy is its ability to treat an extremely complicated series of problems as a whole and to find answers to these problems directly applicable to the problem of national defense of the country.

Can Field Artillery Meet the Air Attack?

By CAPTAIN JOSEPH I. GREENE, *Infantry*

ALTHOUGH the low-flight, sweeping method of aerial attack against ground units seems, perhaps, the method any hostile air force is most likely to use, there is a distinct danger in assuming that no other will be employed. Our preconceived ideas in this regard have largely resulted from the fact that our own Air Corps teaches the low attack, and has perhaps gone farther in its development than the air arms of other nations. Nevertheless, there is nothing whatever to hinder an aerial enemy from reverting to a type of diving attack, especially such a method used in combination with a low-flight approach. Moreover, from a broader viewpoint of air-warfare doctrine, no matter what we may decide upon, ourselves, as the primary uses for our air units, we must always remember that those uses are not likely to be identical with the methods of an enemy. All armies, at present, are leaning toward a maximum use of bombardment air forces. But regardless of that, one of the very nations that has openly adopted the Douhet doctrine, also takes the precaution of covering in its regulations the wholesale use of attack aviation on the battlefield itself. In fact, when the emergency warrants, its regulations indicate that fighting airplanes will be borrowed from every possible source, in order to concentrate their strength in the sector of the main effort.

Two other things are also worth noting here: First, no principal air force has yet abandoned the possibility of using attack aviation, whether near or on the battlefield or against profitable personnel targets in rear areas. And second, in every period of hostilities the world has seen since the War, airplanes have been used as much against troop targets as against any others, if not more. In the Rif, in Afghanistan, in Nicaragua, and in China, Ethiopia, and Spain, attacking planes have played an important part. It is true, these wars and expeditions have none of them assumed the proportions of major warfare. Nevertheless, they indicate that the thought of using planes against ground troops is

THE FIELD ARTILLERY JOURNAL

far from being considered an antiquated idea, and it is particularly noteworthy that attacking planes in these recent hostilities have often reverted to the diving type of attack.

Now, with these preliminary assumptions stated, let us discuss some of the problems that are liable to face field artillery units, when an enemy decides to employ attack aviation against them.

Against infantry and similar units capable more often than not of moving in somewhat dispersed formations, or capable of taking up such formations in a few seconds once the alarm for an air attack has been given, the low, "single-sweep" method is certainly to be expected. Here the hostile planes need to cover an area with their machine-gun fire and bombs. They could, of course, dive at a single platoon or company from an altitude of 600 or 800 yards and well-nigh destroy it by the intensity of their fire. But this is not the effect to be desired, especially since it is not only uneconomical but dangerous. Every ground unit not in the small areas covered by the fire of such an air attack, could direct its fire unmolested at the diving planes.

Against field artillery, especially animal-drawn units on the march, the grazing attack is even more effective than against infantry, simply because the horse is so much bigger than a man. In Volume IX of The Infantry School Mailing List, 1934-35, an analysis of the machine-gun fire from a single attack plane shows that when this fire is delivered from an altitude of 20 yards on flat, treeless ground, each bullet creates a ground danger area for sitting riflemen of about 2.4 square yards. This figure takes ricochet into account.

But a standing horse is many times larger than a sitting man. Assuming for rough calculation that a horse presents a target 6.0 feet high and 2.0 feet wide to a bullet with an angle of fall of 10.0 degrees, the danger area thus created by each bullet for a horse can readily be calculated as approximately 29.0 square yards.

An attack plane moving 200 miles an hour can cover, with its four forward guns, an area 3,000 yards long by some 200 yards wide—60,000 square yards. Along this strip its guns, assuming that they function perfectly, can spread some 2,400 bullets in half a minute. But as we saw in the paragraph above, each bullet

CAN FIELD ARTILLERY MEET THE AIR ATTACK?

makes a danger area for animals of about 29.0 square yards; hence the total danger space created is $2,400 \times 29.0$, or roughly 70,000 square yards.

This means that under the best conditions for the air attack (flat, open terrain) a horse or mule has 7 chances to 6 of being hit by the machine-gun fire alone of an attacking plane. There are many factors, it is true, which reduce the efficacy of the air attack; but most of them, such as protection from small irregularities of the ground, benefit a man considerably, but a horse very little indeed. Any way we look at the matter—making large allowances for error on the part of the enemy airmen—the only conclusion we can arrive at is this: In the face of well-directed low-flight attack the chance of the horse to escape unhit is very slight. For we must remember that we have not taken into consideration at all, up to this point, the tremendous effect of the 20 to 30 fragmentation bombs that an attack plane can drop within a 3,000-yard-long space. These add some 45,000 high-explosive fragments to the machine-gun bullet attack of each plane. Here, too, a man has some chance, as careful studies have shown, but an animal practically none.

We have already seen, however, the danger of assuming that hostile attack units will confine themselves to the low, grazing swoop. It may be the best method to use against infantry and similar troops, and field artillery on the march, all of which occupy a considerable area, at least as regards length. But there is no guarantee against the diving attack. And against field artillery in battery, that type of attack is perhaps more likely to be used than the other.

Here, suppose we refresh our minds a little by examining some detailed accounts of what happened twenty years ago:

The effect of German low-flight attacks on British troops during the retreat in March, 1918, was greatly discounted in British orders. One bulletin was so ridiculous as to say that the Germans were flying low because their morale was poor owing to their having been driven down from the upper air. The troops knew better, however. Brigadier Robert White, commanding the 61st Brigade (British), writing on March 22 says: "It has been very unfair to our troops deliberately to hide what German aircraft did against our infantry and artillery."

THE FIELD ARTILLERY JOURNAL

Brigadier Dawson, commanding the South African Brigade, records in his diary on the same day: "The retirement of the (British) artillery had been going on . . . but the enemy's planes to the number of about 30 were causing the teams considerable annoyance." This record breathes an air of true British understatement.

The following excerpts from the 1918 records of the Army Group of the German Crown Prince (Marne Source Book, Command and General Staff School, 1923) give an idea of a single week's efforts against ground troops:

June 14—Combat planes in ten flights attacked hostile trenches and reserves.

June 15—Combat planes attacked hostile troops in AM. In PM . . . eight flights attacked trenches and several batteries.

June 16, AM—Planes of Corps Staabs attacked hostile batteries, traffic, and villages with 79 bombs and 15,800 rounds of ammunition. Planes of 7th Army . . . 300 lbs. of bombs and 7,900 rounds of ammunition on hostile batteries.

June 16, PM—337 flights by 7th Army planes vs. hostile batteries, infantry units, etc. First Army aviation attacked batteries and road traffic.

June 17—17 flights by 1st Army planes vs. hostile artillery and infantry. Seventh Army planes attacked road traffic and enemy batteries in both AM and PM.

June 18—First Army, 14 flights vs. infantry, reserves, and traffic. Seventh Army, 212 bombs, 40 hand mines, and 3,400 rounds of ammunition.

June 19 and 20—Similar work.

The daily record throughout the battle continues to record the flights thus made. Consolidated figures given on June 20 show for the period May 27-June 15 these totals: 4,488 bombs and grenades and 449,197 rounds of machine-gun ammunition, used against enemy batteries, villages, traffic, infantry, and railroad works in 2,174 flights. On June 20, it is also interesting to find, the orders state that aerial losses from all causes (including ground fire) will thenceforth require a more economical use of planes. The ground attacks continued regularly, however.

The orders of July 7 record that German losses from air attacks

CAN FIELD ARTILLERY MEET THE AIR ATTACK?

have also been heavy and recommend passive measures—distribution of marching troops and use of cover—to reduce losses. On July 10 mounted troops are directed to place their animals near walls and embankments for protection in case of air attacks.

On September 8, 1918, Captain Beauchamp-Proctor, leading a flight of six planes of No. 84 Squadron, R.A.F., was engaged in attacking infantry and artillery ground targets from a low altitude. Near the town of Athies they saw a German field gun firing at them. Captain Beauchamp-Proctor dived on the gun and killed several of the crew with machine-gun fire. The remainder of the gun crew fled. A second plane dropped a bomb on the limber, killing several of the horses and scattering the drivers.

One artilleryman tried to escape on a horse, but the flight leader circled around and caught him with a single burst. This attack took hardly more than a minute and was only one of many made by the same planes on the same day.*

The British Official History records many details of air attacks on artillery:

On his homeward journey from bombing a German airdrome in 1917, a British pilot of No. 23 Squadron saw a German battery firing. Flying along the line of guns at 200 feet altitude he raked them all with machine-gun fire. A little farther on toward his lines he encountered another battery and gave it the same dose.

Another pilot of No. 70 Squadron discovered a column of horse-drawn artillery on the way forward. He attacked; the drivers jumped and ran; the horses, some of which were hit, became unmanageable, and the column was entirely disorganized.

On October 27, 1917, British planes dropped 9,000 lbs. of bombs and fired 6,000 rounds of ammunition at German troops and gun emplacements. On November 6, 11,000 rounds at active guns and infantry.

In another 1917 attack the British Official History records: "The attacks by fighters on German batteries were not to be haphazard. By long and careful observation, lists had been compiled of the known German guns expected to be most troublesome.

*"The Story of the Fourth Army in the Battles of the Hundred Days, August 8, November 11, 1918," by Major General Sir Archibald Montgomery.

THE FIELD ARTILLERY JOURNAL

These were divided into three groups, and systematic attacks by fighting pilots were planned against each group. One group set down for Flying Corps attention was at Flesquieres and another at Lateau Wood. The third group was at Vaucelles Wood. Four DH-5's of No. 64 Squadron arrived over Flesquieres at 7:00 AM and found the German batteries fully active, the guns being still in their pits. The pilots bombed the gun-pits, with their 25-lb. bombs, scoring at least one direct hit, and expended their ammunition against the gun-detachments. One group of gunners, who ran for shelter to a house, got jammed in the doorway and, immovable, were riddled by the bullets of the leader of the DH-5's. One of the pilots had a stoppage in his machine-gun and had flown some distance eastwards before he had rectified the stoppage. He turned back towards Flesquieres, but when he came over the German battery positions again at 7:45 AM he could find no activity of guns or personnel. Several corpses of men were lying near the pits, and dead horses and a limber were on the road. It is possible that in the interim the guns had been pulled out and that the earlier low-flying attacks had caused or accelerated this precaution. The guns could be more easily dealt with in their known pits, which were in fact marked targets for the British artillery, than in unknown open positions, mist obscured, on the reverse slope of the crest. While these attacks were being made on the Flesquieres batteries, nine Sopwith Camel pilots of Nos. 3 and 46 Squadrons were making similar attacks on the batteries in Lateau and Vaucelles Woods."

Here is still another official account in which tanks also come into the picture: "The low-flying pilots were plentifully supplied with targets, and they had the satisfaction, on occasion, of watching the tanks and infantry profit from the air attacks. In the morning, for example, DH-5's of No. 68 (Australian) Squadron found the attack held up in one corner of Bourlon Wood by a German two-gun battery which had brought three tanks to a standstill. Lieutenant F. G. Huxley, one of the DH-5 pilots, from a height of 100 feet, dropped four 25-lb. bombs and temporarily silenced the guns, so that the three tanks, with three others which came up behind them, were able to go forward again."

These examples from World War history are only a few typical

CAN FIELD ARTILLERY MEET THE AIR ATTACK?

instances of thousands that happened. Indeed, on one day in 1918, 37 of the 60 British air squadrons in France were engaged in making low-flight attacks. And scores of French and German squadrons were doing the same thing.

These World War attacks on batteries of artillery were bad enough, but they are nothing to what diving attacks with modern planes would be. Then, as the British History says in one place, low-flying attacks were considered more effective against infantry than against batteries. "Bullets, and even light-weight bombs, could not, except by chance, do much harm to a gun. Furthermore, the target was small and the detachment usually had some measure of shelter. . . . Psychology enters into it. The gun-detachment probably feel that what matters is the gun. That is the chief target for attack, while they themselves are subsidiary, and if one or two of them become casualties, there will still be someone to serve the guns. . . ."

A diving attack by a modern plane is a different story. It carries at least four forward guns, each of which fires three times as fast as the World War machine guns. That makes six times as intense a fire. The modern plane, however, goes twice as fast. Hence, the final figure of machine-gun fire intensity in a diving attack is about three times that of the World War. But the modern bombs are also more effective than those of two decades ago. And we must consider, too, the possibilities of thermite and persistent chemicals—the latter especially.

To all this I suggest that the field artillery has but one main answer—and that is to increase its antiaircraft fire power. The antiaircraft fire power of infantry against the low-flying attack is tremendous. Moreover, the maximum possible small-arms antiaircraft fire of infantry is about to be multiplied by three by the adoption of the semiautomatic shoulder rifle and an improved automatic rifle or light machine gun. The maximum fire of the new regiment is 3,482 rounds per second as compared to 1,251 rounds per second for the old. The proposed new infantry rifle battalion would have something like four and a half times the maximum antiaircraft fire power of the old.

The possibilities of such intense fire against hostile attack planes are especially evident when we read the very same British Official History, from which I have quoted at length above, as

THE FIELD ARTILLERY JOURNAL

regards the effect of fire from the ground. The extensive attacks by planes of all armies on ground targets were followed by greatly increased air losses, to which the untrained antiaircraft fire from rifles and machine guns in the hands of ground troops contributed no little. There can be no question, when these matters are given close study, that modern infantry can inflict far greater losses on low-flying squadrons than infantry of old.*

But field artillery is not benefiting, except indirectly, by the improvements that better the infantryman's lot. Furthermore, two or three caliber 0.30 machine guns on tripods for the protection of each field piece are not enough to make the air attack so costly that he will think twice before he attacks again.

By great coincidence the evening paper arrived as I reached this point in writing this article—containing the first accounts of the attack on the column of 200 trucks between Guadalajara and Atienza on August 17 by a squadron of rebel bombers.

Apparently the truck column was nearly destroyed by machine-gun fire and bombs from low altitude. But what antiaircraft defense did the truck column attempt? It contained 2,000 troops, who were probably equipped with rifles but who even more probably had not the slightest training in or knowledge of rifle antiaircraft fire. The planes returned again and again, says the report, to bomb the column. That means, too, that the planes could well have been targets for the fire of troops every time they returned. But probably little ground fire, if any, was directed at them. Yet the potential antiaircraft fire power of 2,000 bolt-action rifles is nearly twice as great as that of 100 machine guns, the approximate number that a column of 200 truck-drawn field artillery vehicles would contain.

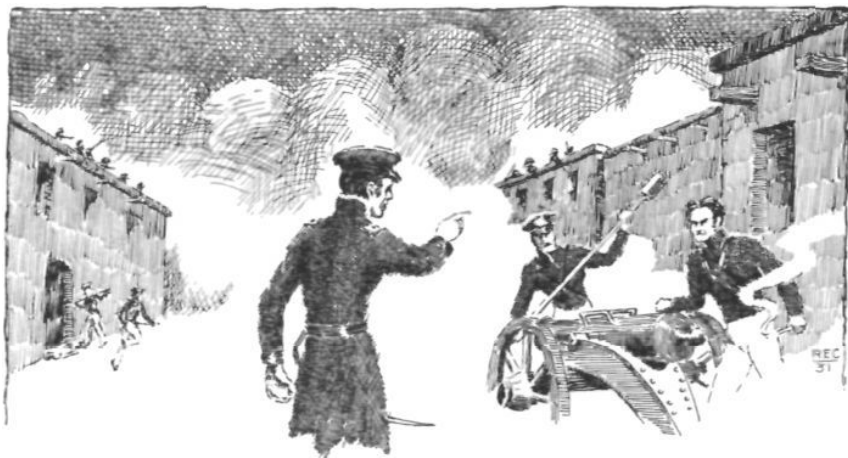
Field artillery's present antiaircraft defense weapons in the hands of trained men would cause casualties to an air enemy undoubtedly. But why not make its fire power intense enough to be on the safe side?

The suggestion I am posing is, of course, not one for an infantryman to answer. And so I shall, in conclusion, simply suggest further several possible ways:

*This point is discussed at length in Army Extension Courses Special Text No. 267, Infantry Antiaircraft Defense, 1936 Edition, which is also the Infantry School textbook on the subject.

CAN FIELD ARTILLERY MEET THE AIR ATTACK?

1. To equip members of batteries with the semiautomatic rifle.
2. To substitute the caliber 0.50 water-cooled machine gun for the caliber 0.30. The caliber 0.50 is harder to handle, but one hit on the engine of a plane puts it out of business. The caliber 0.50 may have its antimechanized uses, too.
3. To equip certain members of gun crews and other battery personnel with a light automatic weapon—this, of course, in addition to the heavier antiaircraft weapons.
4. To equip certain members of gun crews and other battery personnel with the Thompson submachine gun. (This weapon, now used by the Marine Corps, has never had, however, an adequate test of its antiaircraft value.)



Automatic Rifles for AA Defense

By **FIRST LIEUTENANT FRANKLIN P. MILLER**, *Field Artillery*

IT IS common knowledge that, among the many new weapons developed during the World War, one of the most difficult for Field Artillery to combat is the airplane.

No Jules Verne imagination is necessary to visualize the destruction which may be inflicted on a marching column by a vicious triangle of planes, howling out of a low-hung cloud, or zooming over a concealing crest to strike and roar away to safety in a few brief seconds of time. Too many instances of their deadly efficiency are on record to leave any doubt of their menace. Their threat is real, and it must be met by a defense which will make them keep their distance, or pay for their audacity a price so costly that only targets of vital importance to the enemy commander need fear a visitation.

After watching the maneuvers of an attack squadron, which included a descent upon a simulated column of artillery, the author was strongly moved to investigate precisely what means of defense were available within the artillery combat unit to make these airmen keep a respectful distance. Judging from his own reactions, he felt a strong disinclination to "hunch his shoulders and take it," without a reasonable chance to fight back.

As a result, it was discovered that defensive effort against aircraft could be divided into two classes: passive and active. Under the former are included such devices as concealment, camouflage, night marches, deployment, and the use of air guards equipped with radio to give warning of the hostile plane's approach. Under active means are included the protection of friendly pursuit aviation, and the fire power of antiaircraft weapons within the unit itself.

Obviously, a complete treatment of these various means would be meat for several large volumes, and such a treatment could, at best, be of only temporary value, since the passive methods in particular are in a constant state of flux, changing with each new development in aircraft speed and armament.

AUTOMATIC RIFLES FOR AA DEFENSE

In proof of this statement, it is only necessary to point out that the introduction of chemical sprays in aircraft has resulted in orders to halt the attacked column *on the road* (Par. 13, TR 430-135) whereas it was common practice to deploy *off the road* under previous conditions.

On the other hand, the actual weapons supplied for anti-aircraft defense have been relatively stabilized for a period of years. Each gun battery, for instance, is now armed with two Browning machine guns, caliber .30, Model of 1917; and these are supplemented with approximately ten Browning automatic rifles, Model of 1918, caliber .30.

These, then, are the weapons with which an artillery unit is expected to answer the airman's threat. They are standardized and definite, and a knowledge of their relative efficiency should be a matter of vital concern to every artilleryman.

The generally accepted theory seems to be that the *machine gun* should send skyward a barrage of bullets through which the attacking planes must fly. As for the automatic rifles, they would add a few bullets to the barrage, and reduce the feeling of impotence from which the ground troops suffered by the psychological value of their noise.

This theory persisted for a considerable time, until a few began to question it, basing their doubts on certain reasoned facts.

With two machine guns of a battery firing, they argued, the lack of accurate aim or leading by one lone gunner would render 50 per cent of their fire useless, while five of the ten automatic riflemen must be off their target on every shot to produce the same result.

In addition, a few moments of trial with the automatic rifle proved conclusively that there was no difficulty in aiming it ahead of an air target, whereas the two types of anti-aircraft machine-gun mounts then issued to the artillery were proved to be much less flexible.

Based on this and similar reasoning, the author became convinced that the roles of these two weapons should be reversed. In brief, his untested hypothesis was *that the automatic rifles of an artillery unit were superior to its machine guns for anti-aircraft defense.*

THE FIELD ARTILLERY JOURNAL

THE COLLECTION AND EVALUATION OF DATA

This hypothesis might easily have remained untested for years, except for a streak of rare good fortune. In 1932 the author was detailed to conduct the annual regimental training in both machine gun and automatic rifle firing simultaneously, and to report thereon.

Thus an unusual opportunity to test the hypothesis was offered, and, because of the encouragement of the regimental and battalion commanders, every facility was afforded to make the test accurate, unbiased, and under conditions as nearly parallel as possible.

To obtain data upon which an honest comparison could be based, the author decided the following conditions must be obtained:

1. The weapons allowed by tables of organization, or available and contemplated for immediate war-issue, should be used as a basis of comparison.

2. The personnel firing both weapons must be identical.

3. The training time allotted to each weapon must be equal.

4. The same instructor should be used to give training in the use of both weapons, and should himself be equally trained in their use.*

5. The course of training should be parallel for both weapons.

6. The same courses must be flown by the plane for both weapons in towed-target work.

7. The ammunition allotted to each weapon for practice should be equal.

8. The time during which firing was possible on each course should be approximately equal and carefully recorded.

9. The plane should simulate actual attack as closely as safety precautions would permit.

To illustrate how nearly these conditions of laboratory control were complied with, a brief chronological narrative of the course is necessary.

Under the terms of the memorandum, 46 enlisted men of the

*The author was the sole instructor, since the assistant instructor was placed on other duty before the course began. The author's qualification in both weapons was that of marksman only, and he had had no previous experience in firing on antiaircraft targets with either weapon.

AUTOMATIC RIFLES FOR AA DEFENSE

regiment were detailed to take the course, distributed throughout as shown in Table Number 1.

TABLE No. 1

4 Gun batteries	8 men	each—Total	32
3 Headquarters batteries.....	4 men	each—Total	12
1 Service battery.....	2 men	—Total	2
Grand Total			46

The men detailed were average soldiers, at least one from each organization being a corporal. No attempt was made to select a picked group, but 22 of those detailed had been given previous courses in machine gun firing, while only 12 of the 46 had had any experience with the automatic rifle.

This group was excused from all other duties to devote the entire training time between August 15, 1932, and September 10, 1932, to the course. No absences were permitted except by order of the post surgeon.

For the training of this special group, the materiel shown in Table Number 2 was available.

TABLE No. 2

4	Browning machine guns, caliber .30, model of 1917, mounted on Cygnet type mounts, model of 1918, in tractor-towed carts.	
4	Browning machine guns, caliber .30, model of 1917, on antiaircraft tripod mounts, model of 1918.	
8	Front-area antiaircraft sights, one per gun.	
28	Browning automatic rifles, caliber .30, model of 1918.	
9	Springfield rifles, caliber .22, Mark I.	

The ammunition which was made available for the course is shown in Table Number 3.

TABLE No. 3

3,340 rounds, ball, caliber .22 L.R.
11,300 rounds, ball, caliber .30
2,000 rounds, ball, caliber .30, tracer.

Since the same instructor and personnel were to be used in the firing of both weapons, it becomes immediately evident that the human equation was balanced. However, a difference in the training itself, or in the time allotted for the training, might weight the scales in one direction or the other.

Because of this, it is necessary to cover briefly these points, and to recount the conditions under which the ultimate peacetime test of firing against sleeve targets towed by planes was conducted.

Based on TR 300-5, Antiaircraft Combat, a complete schedule

THE FIELD ARTILLERY JOURNAL

was drawn up and followed rigidly during the remainder of the course. By means of this schedule, the training time of each separate day was evenly divided, to insure that each man spent the same identical time in learning to aim, lead with, fire, and maintain both weapons.

After the usual sighting exercises, in which sighting bars were employed, each man was given a thorough course in estimation of leads and actual firing on both stationary and moving targets on a 1,000-inch range.

This range, incidentally, had been specially constructed for the course, by the men themselves, previous to the starting day. It was located at the bottom of a deep gulch, and moving targets were provided by stringing wires from the lip of the gulch to the bottom. Down these inclined wires the targets were allowed to slide, after being released by a simple tripping mechanism. The resultant effect was that of airplanes diving on the firing point from varied angles of approach.

For this basic section of the course, 2,300 rounds of caliber .22 L.R. ammunition were expended as preparation for later automatic rifle firing. Since no caliber .22 machine guns were available, an equal amount of caliber .30 ammunition was allowed for machine gun training.

This departure from parallel conditions was unavoidable, and rendered the machine-gun training *more* effective than that in the use of the automatic rifles, since the men were employing the weapon they would use in the actual test, whereas the Springfield .22 is vastly different from the automatic rifle.

Here the deficiency of the Cygnet mount with its handwheels for elevation and traverse became apparent. It was found impossible to elevate it with sufficient speed to lead a target which was approaching the gun. The antiaircraft tripod mount was sufficiently flexible, but its excessive vibration made it difficult to control. Even the addition of six sandbags around the mount as ballast did not correct this, since there was nothing but the strength of the gunner's hands to act as a control.

After 10 drill days, which afforded 30 hours of basic instruction to each man on each weapon, the 1,000-inch range was abandoned, and the remainder of the course completed on the regular antiaircraft range.

AUTOMATIC RIFLES FOR AA DEFENSE

The variety of moving targets available on the service range deserves rather complete enumeration. They are listed in order of difficulty in Table Number 4.

TABLE No. 4

1. The horizontal target, moving perpendicular to plane of fire.
2. The diving target, moving perpendicular to plane of fire.
3. The pendulum target, swinging perpendicular to plane of fire.
4. The diving targets, moving toward gunners at 30°, 45°, and 60° angles.
5. The vertical-drop target.

The remaining 1,040 rounds of caliber .22 ammunition were expended in accustoming the men to fire at service ranges. When that was accomplished, 3,060 rounds of caliber .30 ball, and 300 rounds of caliber .30 tracer were divided equally between the automatic rifles and machine guns, and each man was made to fire on every type of target with both weapons.

As a result of these preliminaries, it was discovered that the automatic rifle should be fired without the sling to provide full flexibility, and that modified standing, sitting, or kneeling positions were all suitable. Of these, the standing position gave the best results in practice, but each man was permitted to choose the position he found best suited to his own needs in the towed-target tests later on.

In this second phase of the preparatory course, 8 drill days were consumed, giving each man 24 hours of practical experience in the use of each weapon. The total ammunition expended is shown in Table Number 5.

TABLE No. 5

3,340 rounds, ball, caliber .22 L.R.
5,360 rounds, ball, caliber .30
300 rounds, ball, caliber .30 tracer

The men were now ready for towed-target work so far as the limited time and ammunition available would permit them to be. Consequently arrangements were made with the Air Corps to have a plane tow standard sleeve targets on three successive days. The flights were to be similar on each day, and made in conformity with Table Number 6.

TABLE No. 6

Course 1	$\left. \begin{array}{l} 1 \\ 3 \end{array} \right\}$	practice run firing runs	perpendicular to line of fire.
Course 2	$\left. \begin{array}{l} 1 \\ 3 \end{array} \right\}$	practice run firing runs	at a 45° angle (approximate) with the line of fire, from the left.
Course 3	$\left. \begin{array}{l} 1 \\ 3 \end{array} \right\}$	practice run firing runs	at a 45° angle (approximate) with the line of fire, from the right.
Course 4	$\left. \begin{array}{l} 1 \\ 3 \end{array} \right\}$	practice run firing runs	directly down line of fire.

THE FIELD ARTILLERY JOURNAL

To insure conditions approximating those of actual service. the pilot was requested to fly at any altitude suitable for attack, to use the highest speed his target would permit, and to simulate an attack by any air maneuver which would ordinarily be employed. This prevented any possibility of the author or his men having previous information on which to estimate ranges or leads.

After the close of the tests, it was learned that the altitude varied from 300 to 800 feet, and the speed from 110 to 140 miles per hour, the latter attained in shallow dives.

The unit of fire power to be employed was taken as that of a howitzer battalion, based on the two limiting factors listed below:

1. A howitzer battalion would be the *smallest* unit profitable for air attack under normal conditions.
2. A howitzer battalion would be the *largest* unit which a single attack plane would be able to engage.

To make certain of accurate and impartial scoring, the target was dropped at the air field after each course; one type of weapon only was fired in any one course; and an officer not connected with the experiments was detailed to do the counting and to certify his count.

On the first day, all firing was done with automatic rifles, 23 of them being used, based on the number available in a howitzer battalion. The full four courses were completed without using up the plane's flying time, so an additional course, flown at an angle of 60° to the line of fire, was ordered and conducted.

The results of this firing are listed in Table Number 7.

TABLE No. 7

Course	Firing time per run— seconds	Firing time per course— seconds	Rounds fired	Hits	Percentage of hits
1	9	27	386	29	7.51
2	8	24	408	27	6.61
3	8	24	394	26	6.59
4	11	33	425	39	9.18
5	7	21	372	32	8.60

Note: In this firing, one round of tracer was used for every three rounds of ball ammunition, and a noncommissioned officer was assigned to watch each four men and to correct their aim or leads as indicated by their tracer fire.

Since no machine guns were fired on this day, no direct comparisons between the two weapons could be made. However, the

AUTOMATIC RIFLES FOR AA DEFENSE

percentage of hits obtained was much higher than expected by the author, and from an analysis of them the following conclusions were drawn:

1. That automatic rifles were highly effective against targets towed by airplanes.
2. That the various positions chosen for firing were flexible enough to meet attacks from any direction.
3. That excellent results could be attained with limited training time and average personnel.

In connection with these results, it should be noted that all 46 men were given a chance to shoot on each directional course, the 23 who fired on the first run yielding their places to the remaining 23 on the second. This systematic alternation was continued throughout the three firing days.

For the firing of machine guns on the second day, four guns were used, each with a three-man crew. While it was impossible for each man to fire on every course, each had an opportunity to act as gunner on at least two runs apiece.

For the first course only, in which the target was towed perpendicular to the line of fire, it was decided to use the Cygnet mount. On all others the anti-aircraft tripod mount was used.

Automatic rifles were fired on the third course of this day as a demonstration of their ability for the officers of an artillery regiment. Their results are included in Table Number 8, but were eliminated in comparing the final results since it was the second time they had been fired, and there was not sufficient time available to fire a similar second course with machine guns.

TABLE No. 8

Weapon and Mount	Course	Firing time per run in seconds	Firing time per course in seconds	Rounds fired	Hits	Percentage of hits
M.G. } Cygnet }	1	9	27	111	2	1.80
M.G. } A.A. tripod }	2	10	30	128	4	3.12
Auto Rifle	3	9	27	461	42	9.11
M.G. } A.A. tripod }	4	11	33	143	4	2.79

An analysis of the first two days of firing brought several surprising items to light. Most astonishing, at first glance, was the small number of rounds fired by machine guns, actually only

THE FIELD ARTILLERY JOURNAL

382 in *three* courses compared to 461 from the automatic rifles in one course.

A partial explanation of this was the fact that three jams were reported by the machine gunners, each jam of sufficient length to keep the gun out of action during one whole run. No such jam was reported by the automatic riflemen.

A second explanation was the difficulty which the gunners found in leading their target, even with the best available mount. Since they had not fired when their lead was uncertain, their resulting bursts had been fewer than initially expected.

Another important conclusion from this day's firing was that the tripod mount is superior to the Cygnet, even on the one course in which the latter was thought to be serviceable. This was proved by the fact that the Cygnet-mounted guns obtained only 1.80% of hits, where the tripod mounted guns on more difficult courses obtained 3.12 and 2.79% respectively.

Because of the conclusions drawn from these two days of record firing, it was decided to shoot two more courses on the final day with tripod-mounted guns. This would give four identical courses for both machine guns and automatic rifles as a basis of final comparison.

It was also decided to have the machine gunners shoot continuously, instead of assuring themselves of lead and aim before firing as they had done before. This decision was made to meet a possible objection that the machine gun barrage was more effective than aimed groups of shots.

For the remaining three courses of the final day, automatic rifles were to be fired, to provide a demonstration for certain division staff officers who had been interested in the effectiveness of the automatic rifle as disclosed by the first day's figures.

The results of this final day of firing are shown in Table Number 9.

Weapon	Course	Firing time	Firing time	Rounds fired	Hits	Percentage of hits
		per run in seconds	per course in seconds			
M.G.	1	9	27	562	5½	0.98
M.G.	2	9	27	461	4½	0.98
A.R.	3	9	27	398	42	10.55
A.R.	4	11	33	548	63	11.49
A.R.	5*	8	24	206	22	10.68

*Note: On Course 5 the towing cable was cut by a bullet. Firing was halted immediately.

AUTOMATIC RIFLES FOR AA DEFENSE

Two conclusions of importance could immediately be drawn as a result of this final day of firing:

1. That the hits obtained by machine guns were not dependent on the number of rounds fired, but on accurate aim and estimation of leads.

Proof of this is seen in the fact that this "barrage" of 562 rounds had produced only 0.98% hits, compared to 1.80% from the 111 rounds fired by the same course the day previous, in which bursts were fired only when aim and lead were believed to be correct.

2. That automatic-rifle fire increased in deadliness much more rapidly than did that of machine guns, the same amount of training and practice being allotted to each.

Much as the author regretted it, however, the automatic-rifle records of the final day had to be disregarded, since no parallel opportunity for machine guns to fire all courses a second time was available.

In the same spirit of fairness, the somewhat better record of the Cygnet-mounted machine guns on the one course within its powers had to be eliminated. It would clearly be impossible to carry both mounts, changing from one to the other as special situations arose. The split-second warning which precedes an air attack makes such a suggestion sheerest folly.

With these eliminations made, the wholly parallel data have been combined in Table Number 10.

TABLE No. 10

Course	4 Machine Guns				23 Automatic Rifles			
	Rounds	Hits	Time in seconds	Percent of hits	Rounds	Hits	Time in seconds	Percent of hits
1	562	5½	27	0.98	386	29	27	7.51
2	128	4	27	3.12	408	27	27	6.62
3	461	4½	27†	0.98	394	26	24	6.59
4	143	4	33	2.79	425	39	33	9.18
Totals	1,294	18	117	1.39*	1613	121	111	7.50*

†Actually fired on Course No. 2. (See Table No. 9).

*Percentage of total hits to total rounds fired.

SUMMARY

With these data in mind, let us summarize briefly the manner of its obtaining, before deciding upon the soundness of the original hypothesis in its light.

The hypothesis was that the automatic rifles (23) of an artillery

THE FIELD ARTILLERY JOURNAL

unit are superior to its machine guns (4) for antiaircraft defense.

An opportunity to test the truth of this hypothesis was presented when the author was detailed to conduct a school in the use of both weapons, simultaneously.

All the essentials for a controlled experiment were present. The same average enlisted men were taught by the same instructor. An equal number of hours of instruction in the maintenance and use of each weapon was provided, and equal ammunition allotments were used in the preliminary target work.

Precisely identical practice targets were fired upon, and one pilot with the same plane did all towing of targets for the final tests whose results are tabulated in detail.

The same directional courses were flown in each instance, the firing time of each course was approximately equal, and every man fired both weapons to eliminate any inequality in aptitude.

The resulting data were then rigidly examined, and all courses not absolutely parallel were eliminated, though in so doing some of the higher scores made on a second firing of certain courses had to be discarded. After this elimination process, the remaining data were tabulated in Table Number 10.

CONCLUSIONS

After studying the data thus obtained, it is believed that the truth of the hypothesis is overwhelming, since the following conclusions are obvious:

1. That the automatic rifle is sufficiently flexible to meet an air attack from any direction.

2. *a.* That the machine gun, on a Cygnet mount, is not sufficiently flexible in elevation or depression for use against modern planes.

- b.* That the machine gun, on a tripod mount, is sufficiently flexible, but extremely difficult to use because of excessive vibration.

3. That the fire of automatic rifles increased in deadliness much more rapidly than did machine guns, in the same amount of practice time.*

*Compare Tables 7, 8, and 9. On the last day both weapons were being fired for the second time on the courses flown. The machine gun percentage was 0.82% *lower* than on the first day, whereas the automatic rifle scores ranged from 2.31% to 3.94% *higher*.

AUTOMATIC RIFLES FOR AA DEFENSE

4. That the machine gun produces more hits when fired in short bursts of 15 to 20 rounds, each burst preceded by an adjustment of aim and lead, than it does when fired in a continuous barrage.

5. That the automatic rifles of an artillery unit can place more bullets in the air in a shorter space of time than can its machine guns.

6. That the automatic rifles of an artillery unit can produce a greater percentage of hits than can its machine guns.



THE UNITED STATES FIELD ARTILLERY ASSOCIATION

In compliance with Article VII, Section I, of the Constitution, notice is hereby given that the Executive Council has fixed 4:45 PM, Friday, December 11th, 1936, as the time of the annual meeting of the Association, to be held at the Army and Navy Club, Washington, D. C.

The business to be disposed of will be the election of a Vice-President and of two members of the Executive Council, one from the Regular Army, and one from the Field Artillery Section of the Officers' Reserve Corps, and the transaction of such other business as may properly come before the meeting.

In view of the fact that the Constitution requires fifty percent of the members in the United States to be present in person or represented by written proxies to constitute a quorum, it is urgently requested that the return postcards which will be mailed to the members of the Association be filled out and returned to the Secretary.

FIELD ARTILLERY BOOKS

(Published as instructional matter for the Field Artillery School
and as texts for the extension courses.)

Of the several publications printed at the Field Artillery School, Fort Sill, Oklahoma, and for sale by the Book Department there, those issued in 1936 include:

Field Artillery Book 161, "Gunnery"75 cents.

This book, containing approximately 320 pages and 159 illustrations, is a complete revision of TR 430-85 and includes all the latest developments in gunnery for field artillery.

Field Artillery Book 162, "The Firing Battery"20 cents.

Simultaneously with the publication of a work on gunnery, there has been prepared this book, replacing the 1932 edition. Both are texts for the gunnery extension courses, seven of which were revised coincidentally for issue this fall.

Field Artillery Book 204, "Reconnaissance, Occupation, and Organization of Position".....50 cents.

This book contains approximately 199 pages and 48 illustrations. Camouflage, fortification, and defense in general are covered, as well as the technique of, and illustrative cases for, reconnaissance by units of horse-drawn and truck-drawn artillery.

In addition to these, with which no field artilleryman can afford to remain unfamiliar, the School prints *Field Artillery Book 140, "Elementary Mounted Instruction,"* 1933 edition, which contains 279 pages and 99 illustrations, and sells for 70 cents. Equitation instructors consider the first two parts of this book, "Hippology and Care of Animals," and "Elementary Equitation," as being of great value to the beginning rider, because of their wealth of illustration.

THE JOURNAL APPLAUDS—

MAJOR DEAN HUDNUTT, FA, *BECAUSE*: He is the Captain of the United States Olympic Pistol Team; *because*, as Secretary-Treasurer of the United States Field Artillery Association (1932-1936) he steered the finances of the Association successfully through a very severe depression (Remember it?); *because* he edited twenty-five consecutive issues of the FIELD ARTILLERY JOURNAL, and is still gay and buoyant and, finally, *because*, when the proceedings of the last Annual Meeting included a vote of appreciation to him on behalf of his services, he omitted mention of it in publishing the minutes.



MAJOR JOHN H. FYE, FA, *BECAUSE*: While at summer camp he brought to the attention of a group of Reserve officers the desirability of joining the Field Artillery Association; *because* he announced that he would receive subscriptions from those who wished; and *because*, as a result of his interest and initiative, sixteen memberships were secured.

CAPTAIN FRANK DORN, FA, *BECAUSE*: He has enlivened the walls of many garrison quarters with his pictorial, historical, and very amusing maps of Fort Sill, Fort McKinley, and Fort Stotsenburg; and *because* he has recently added to this list the ancient city of Peiping, China, where he is now a language student.

LIEUTENANT COLONEL FRANK E. LOWE, FA Res., *BECAUSE*: When he recently concluded a two-year term as national President of the Reserve Officers Association, during which the membership increased from 20,000 to 32,000, he took great pains, in his annual report, to distribute the credit to everyone except himself; and *because* he is one of our own, having been a member of the Field Artillery Association for many years—in addition to his other duties.

GEE-TWO'D

The 8th FA, Col. William K. Moore, celebrates its 20th anniversary, at Schofield Barracks, and fires "The Salvo" (a publication devoted to its history, personnel, and recent achievements), one round of which lights on this desk. . . . The 16th FA (Ft. Myer), and the 6th FA (Ft. Hoyle) polo teams distinguish themselves in circuit tournament at Washington, D. C., but yield palm to 3d Cavalry Yellows, circuit champs . . . Thomason Act appointees welcomed at motorsheds, picket lines, and duty rosters throughout the field artillery, where their fellows, because of past officer-shortage, have met themselves coming off guard. . . . At Toledo, Ohio, 1st Lt. Leon Kettring publishes July number of *The Observer* (most news in smallest 1936 compass), organ of the 20th FA, containing information as to what happened to horses when artillery was motorized—officer claims he discovers Preston Brand on Swiss steak. . . .



Field Artillery Association's most distinguished member, General of the Armies John J. Pershing, seen riding at Fort Myer, Va. . . . Colonel L. S. Ryan, FA, is chosen President of the Army-Navy Club at Oklahoma City. . . . Alexander Hamilton Battery (D, 36th FA, Capt. Dan B. Floyd), Fort Bragg, N. C., drops direct hit from its 240-mm. howitzer on target at 10,000 yards in night air adjustment test initiated by Bn CO, Lt. Col. C. M. Busbee. . . .



Colonel Bruce Palmer, Cav., who commands Mechanized Force at Second Army Maneuvers, critiques to effect that it is more frequently desirable to place combat vehicles in fire position than to use them for assault; that the Force did not hesitate "to detach strong forces to fight for artillery observation"; and that it marched more than 1,000 miles in seven days, engaging the enemy in operation twelve times. . . . Colonel George P. Tyner, FA, is nominated for the stars of a brigadier general.

GEE-TWO'D

Master Sergeant James K. Brought, 12th FA, Fort Sam, hurls 11-inning baseball game to prove he didn't expend all his stamina in winning Croix De Guerre and Silver Star in France . . . Pfc. William Townsend, former 18th FA boxer and Olympic contestant from Hawaiian Division, changed from middle to light heavy after first fight; generally gave away ten pounds.

●

Major Dean Hudnutt, FA, tramps deck of *Manhattan*, en route to Olympics. "May we join you?" ask couple of Yankee stalwarts, falling into step alongside. Tramp continues. End of second hour Major Hudnutt inquires, "What event are you boys in?" Answer: "Fifty-thousand-meter walk."

●

1st Lt. Edmund C. Murphy, 304th FA, installs, on the radiator-dash brace rod of his CCC trucks, a piece of IC'd woolen cloth, 3 by 6 inches, folded and stitched, for wiping the oil-level gauge, thus saving uniforms from oil stain, facilitating inspection, and reminding drivers of oil check every time hood is raised. . . . 144th FA, California NG, wins distinguished attendance record with 99.52 per cent. (Of 16 officers and 167 men, this means one individual missed one drill.) . . . Captain Wm. L. Kay, Jr., FA, 1st Lt. Ralph Franklin, 182d FA, 1st Lt. A. M. White, 192d FA, and 2d Lt. David M. Ackerman, 158th FA, only field artillerymen we can identify among minor prize winners at National Rifle Matches, Camp Perry, Ohio.

●

Brigadier General Ernest D. Scott, CO 16th FA Brig, after 42 years of service, most of it with the scarlet guidon, retires. . . . Lt. Col. Jacob L. Devers, FA, new graduate manager of athletics, USMA, sends out more than 11,000 application blanks (nonmember) for football tickets. Schedule high points: Columbia, Oct. 10; Harvard, Oct. 17; Colgate, Oct. 31; Notre Dame, Nov 14; NAVY, Nov. 28. . . . Artillery football coaches' chance to steal march on opposition offered by forthcoming book, "Fifty Football Plays," by "Dutch" Bergman, C.U. coach. Published by A. S. Barnes and Co., New York.

THANKS TO THESE—

The frontispiece was snapped by CAPTAIN THOMAS NORTH, FA, while on a European tour this summer. Captain North, who has served with the Battle Monuments Commission, is now the Field Artillery liaison officer with the Engineer Board at Fort Belvoir, Virginia. (He quoted the Encyclopedia Britannica for the caliber of Mons Meg as being 20 inches, although his own measurements showed 22. His American rule probably shrunk in the Scotch atmosphere.)

Precious little could be obtained from himself about FAIRFAX DOWNEY, who composed "THE FIELD ARTILLERY SONG—1936 REVISION." From Scribner's we secured a copy of Burriss Jenkins's



drawing, showing Mr. Downey at the wheel of his guitar. "Who's Who" helped us G-2 that he will celebrate his 43d birthday come next Army-Navy game; graduated from Hill School and from Yale (A.B., 1916);

was Sergeant. Yale Battery; Lieutenant 12th FA, 2d Div; and Captain 31st FA; is one of the brothers of Zeta Psi; and ex-leg-and-staff man for the *Kansas City Star*, *New York Herald-Tribune*, and *Sun*. He is the father of Fairfax, Jr., and Marjorie, which may account for the titles of two of his many books, written in this order: "When We Were Rather Older," and "Young Enough to Know Better." Scribner's is publishing his "Portrait of an Era as Drawn by C. D. Gibson," this fall.

Mr. Downey is *most* widely known, of course, for his past contributions to THE FIELD ARTILLERY JOURNAL.

The illustrations accompanying the song (as well as several others throughout this issue) are the product of the pen of LIEUTENANT COLONEL S. LEROY IRWIN, FA, now attending the Army War College, who will be remembered by our readers as the depicter of the truck-drawn soldier thumbing a ride.

CAPTAIN JOSEPH I. GREENE, INF, whose "CAN FIELD ARTILLERY MEET THE AIR ATTACK?" we publish in this issue, is customarily introduced by military journals, for whom he is a regular contributor, by the words: "Captain Greene needs no further introduction . . ." He has written on many military subjects and is a member of the staff and faculty of The Infantry School, Fort Benning, Georgia.

THANKS TO THESE—

Fortunately for a well-rounded discussion of anti-aircraft defense, this issue is able to present a technical commentary on Captain Greene's conclusions with "AUTOMATIC RIFLES FOR AA DEFENSE" by 1ST LIEUTENANT FRANKLIN P. MILLER, FA, who wrote his article before Captain Greene wrote his. Lieutenant Miller is a recent graduate of the Regular Course at the Field Artillery School, and now is stationed in Hawaii.

COLONEL CONRAD H. LANZA (COUNTERBATTERY IN THE AEF) is the distinguished field artilleryman who, from a point of vantage at Artillery Headquarters, First Army, made those observations and secured those impressions which he has since contributed to the pages of THE FIELD ARTILLERY JOURNAL under many well-remembered titles. He went to France as CO, 19th FA, 5th Div; was G-3, Artillery, First Army: early in November commanded 66th FA Brig, artillery of III Corps. Beneath his uniform blouse (which is entitled to the blazonry of the Distinguished Service Medal, Silver Star with Oakleaf Cluster, and Purple Heart, as well as several campaign ribbons) there lurks a subtle humor peculiar

to his very individual style. He is now Chief of Staff of the 98th Division, with headquarters at Syracuse, N. Y.

CAPTAIN CHARLES P. NICHOLAS, FA, is the Secretary of The Field Artillery School, Fort Sill, Oklahoma. His article on "THE CIRCULAR SHIFT" was written as a thesis during his attendance at the 1935-36 Regular Course at the School

1ST LIEUTENANT R. H. WILSON is ADC to the Commanding General, 56th FA Brigade, of the Louisiana National Guard. He wrote "POSITIONS: 170 MILES AWAY" after returning to his desk with Marshall J. Smith and Co., Ltd., of New Orleans.

CAPTAIN WALTER J. GARDNER, FA RES., the author of "TRUCKING—AND HOW!" is Plans and Training Officer of the 341st FA, whose activities he describes so enthusiastically, and is President of the Lincoln (Nebr.) District Unit of the Reserve Officers' Association.

JOIN THE RED CROSS



OF ALL the books on horsemanship we've ever read, none answers our most important questions. Why doesn't someone sit down and write a book on "One Thousand Resistances of a Horse, and What To Do About Them"?

We are reminded of a time when we had a horse whose former owner, a ranchman, permitted him to gallop always on the left lead. We wasted much time on this animal trying to cure his port-sidedness. Aware that as soon as we stretched him out it would be on the right lead, which he despised, the ingenious beast adopted a singlefoot (left lead, of course) from the walk, and refused to trot. This went on for some time. Despairingly we put the case to Captain Eddie Argo, Olympic equestrian.

"When he starts to singlefoot," said Eddie, "pull his ear."

We gave the ear one yank and the horse hasn't singlefooted since. But we don't have Eddie around all the time, and the inventiveness of our mount has developed along other channels.

Once, long ago, when we were riding a remount at the School, and had his chin against his chest to keep him from swarming all over the horse ahead, the instructor told us: "Let him have his head, he'll go all right." So we did, and the horse did, right through the pack. The instructor viewed us with a brow like thunder. "I didn't say to spur him," he said.

This is all very mysterious to us.

●
WE READ Colonel Lanza's "Counterbattery in the AEF" in the manuscript, in the galley proof, and again in the page. This was for business. When this issue appears we shall read it again, for pleasure and profit. The line that struck us particularly was—describing the battery under ten hours of shellfire from heavy calibers—

"They were dirty and tired, but they were a happy lot. as they had fired all problems assigned them."

The new unit searching for a suitable motto for its insignia might well consider the French, the Latin—even, perhaps, the American—for, "Tired and Happy."

So far as that goes, how about, "We Rate Our Obstacles as Inferior."

●
WE HAD a visitor the other day, a captain, to whom we expressed the hope that some of our remaining eligibles might enroll as members of the United States Field Artillery Association.

"Why don't you begin with me?" he asked.

"Do you mean to say," we replied, "that as enthusiastic a wagon-soldier as you does not belong?"

It turned out that many years ago, when he was about to graduate

SOME FORWARD OBSERVATIONS

from the Academy, some clerical mistake had sent an invitation to membership to his roommate, who had chosen the Coast Artillery, while omitting him. And so he had never quite got around to joining.

The Editor offers a private essay contest, first and only prize for which will be a subscription to THE FIELD ARTILLERY JOURNAL, paid for from the Editor's personal funds, if any, and open only to nonmember eligibles, on the subject: "What has kept me from joining." The letters should be bitter, sarcastic, and scathing; and as long as you please. They will be burnt, with appropriate ceremonies, immediately after being read by the Editor only.

The name of the winner will not be announced.

●

AND WHILE the open season on editors is under discussion, here is a word to the members: This Journal is your Journal. What suggestions have you to offer? We take it that you get enough magazines with a bathing girl on the front cover and more of them on the back. This magazine costs you less than a cent a day yearly, for which price you can usually obtain plenty of lurid literature in the daily papers. But between luridness and stodginess there is a medium as happy as it is difficult to achieve. If you can write something down the middle of the aisle thus indicated, or can draw a cartoon, won't you send it in to us? And if you can't, but know a fellow who can, give us his coordinates.

We will attempt to envelop him.

Three entries in the 1936 Essay Contest have been received. Don't put off yours any longer. We understand that last year a good many Christmas trees were trimmed just the way Mother wanted them (for the first time), because Daddy was writing furiously against that January deadline. The children got to play with their own toys too—but the delay had certain disadvantages. After all, three hundred dollars is a lot of dollars; and there are no bottle tops, or things like that, to send in. You won't have to glue your ear to the radio for announcements, nor write 100 words additional telling why you think your entry is best.

All you have to do is fill in the blank spaces for up to 8,000 words.

●

AND NOW, to close on a dignified and informative note, let us look at Article II of our constitution:

The objects of the Association shall be the promotion of the efficiency of the Field Artillery by maintaining its best traditions; the publishing of a JOURNAL for disseminating professional knowledge and furnishing information as to the field artillery's progress, development, and best use in campaign; to cultivate, with the other arms, a common understanding of the powers and limitations of each; to foster a feeling of interdependence among the different arms and of hearty cooperation by all; and to promote understanding between the regular and militia forces by a closer bond; all of which objects are worthy and contribute to the good of our country.

MILITARY BOOKS

Following is a list of latest books on military subjects which are recommended for their professional value as well as interesting reading:

	<i>Price</i> (Domestic postage included)
FIELD ARTILLERY: The King of Battles— <i>Maj. Gen. H. G. Bishop</i>	\$2.00
THE AMERICAN ARMY IN FRANCE— <i>Maj. Gen. James G. Harbord</i>	5.00
WITH NAPOLEON IN RUSSIA— <i>Gen. de Caulaincourt</i>	4.00
R. E. LEE— <i>Freeman</i> (4 vols., each)	3.75
A MODERN MILITARY DICTIONARY— <i>Col. Mas B. Garber</i> —Cloth	2.50
—Leather	2.75
INFANTRY IN BATTLE	3.00
ITALY'S PART IN WINNING THE WORLD WAR— <i>Colonel G. L. McEntee</i> ..	2.00
THE NATION AT WAR— <i>Gen. Peyton C. March</i>	3.00
FOCH: THE MAN OF ORLEANS— <i>Capt. Liddell-Hart</i>	4.00
SPIES AND THE NEXT WAR— <i>Rowan</i>	2.50
VERDUN— <i>Pétain</i>	4.00
REMINISCENCES OF A MARINE— <i>Lajeune</i>	4.00
JULY, 1914— <i>Ludwig</i>	3.50
FOCH SPEAKS— <i>Bugnet</i>	3.00
IT MIGHT HAVE BEEN LOST— <i>Lonergan</i>	3.00
THE OLD ARMY: MEMORIES— <i>Parker</i>	4.00
ULYSSES S. GRANT— <i>McCormick</i>	5.00
INTRODUCTION TO MILITARY HISTORY— <i>Albion</i>	2.25
AMERICAN CAMPAIGNS (2 vols.)— <i>Steele</i>	10.00
COLOSSAL BLUNDERS OF THE WAR— <i>Woods</i>	2.50
POLO PONIES— <i>Cullum</i>	5.00
ROBERT E. LEE, THE SOLDIER— <i>Maurice</i>	4.00
FIFTEEN DECISIVE BATTLES— <i>Creasy</i>	1.00
ORDEAL BY FIRE— <i>Pratt</i>	3.00
OFFICERS' MANUAL (Revised)— <i>Moss</i>	3.00
OFFICERS' GUIDE, 1930	2.75
HINTS ON HORSEMANSHIP— <i>Lt. Col. McTaggart</i>	2.50
ARTILLERY TODAY AND TOMORROW— <i>Rowan Robinson</i>	2.00
SOME ASPECTS OF MECHANIZATION— <i>Rowan Robinson</i>	1.50
THE FELLOWSHIP OF THE HORSE— <i>Lt. Col. Goldschmidt</i>	5.00
LIFE OF GRANT— <i>Fuller</i>	5.00
THOUGHTS OF A SOLDIER— <i>Von Secht</i>	2.50
HORSE SENSE AND HORSEMANSHIP— <i>Brooke</i>	5.00

A reduction of 10% will be made to JOURNAL readers who purchase any of the above books through the U. S. Field Artillery Association.

The Association is in a position to obtain for its members not only books on military subjects but biographies and fiction as well, at a reduction of 10%.

The United States Field Artillery Association

ORGANIZED JUNE 7, 1910

OFFICERS

PRESIDENT

MAJOR GENERAL UPTON BIRNIE, JR., U. S. Army

VICE-PRESIDENT

MAJOR GENERAL HENRY W. BUTNER, U. S. Army

SECRETARY-EDITOR AND TREASURER

CAPTAIN MICHAEL V. GANNON, Field Artillery, U. S. Army

EXECUTIVE COUNCIL

MAJOR GENERAL UPTON BIRNIE, U. S. Army

BRIGADIER GENERAL WILLIAM S. KEY, Oklahoma National Guard

COLONEL LESLEY J. MCNAIR, U. S. Army

COLONEL RALPH MCT. PENNELL, U. S. Army

COLONEL RENE E. DER. HOYLE, U. S. Army

COLONEL LEROY W. HERRON, Reserve Corps

COLONEL HAMILTON GARDINER, Utah National Guard

LIEUTENANT COLONEL THOMAS J. J. CHRISTIAN, U. S. Army

LIEUTENANT COLONEL RALPH C. BISHOP, Reserve Corps

Subscriptions to *The Field Artillery Journal*:

Domestic, \$3 per annum.

Single copies, 75 cents.

Canada, \$3.25 per annum.

Countries in the postal union, \$3.50 per annum.

Checks drawn on banks in the Philippine Islands, Hawaii and Canada should include 25 cents for collection charges—from the Canal Zone 35 cents.