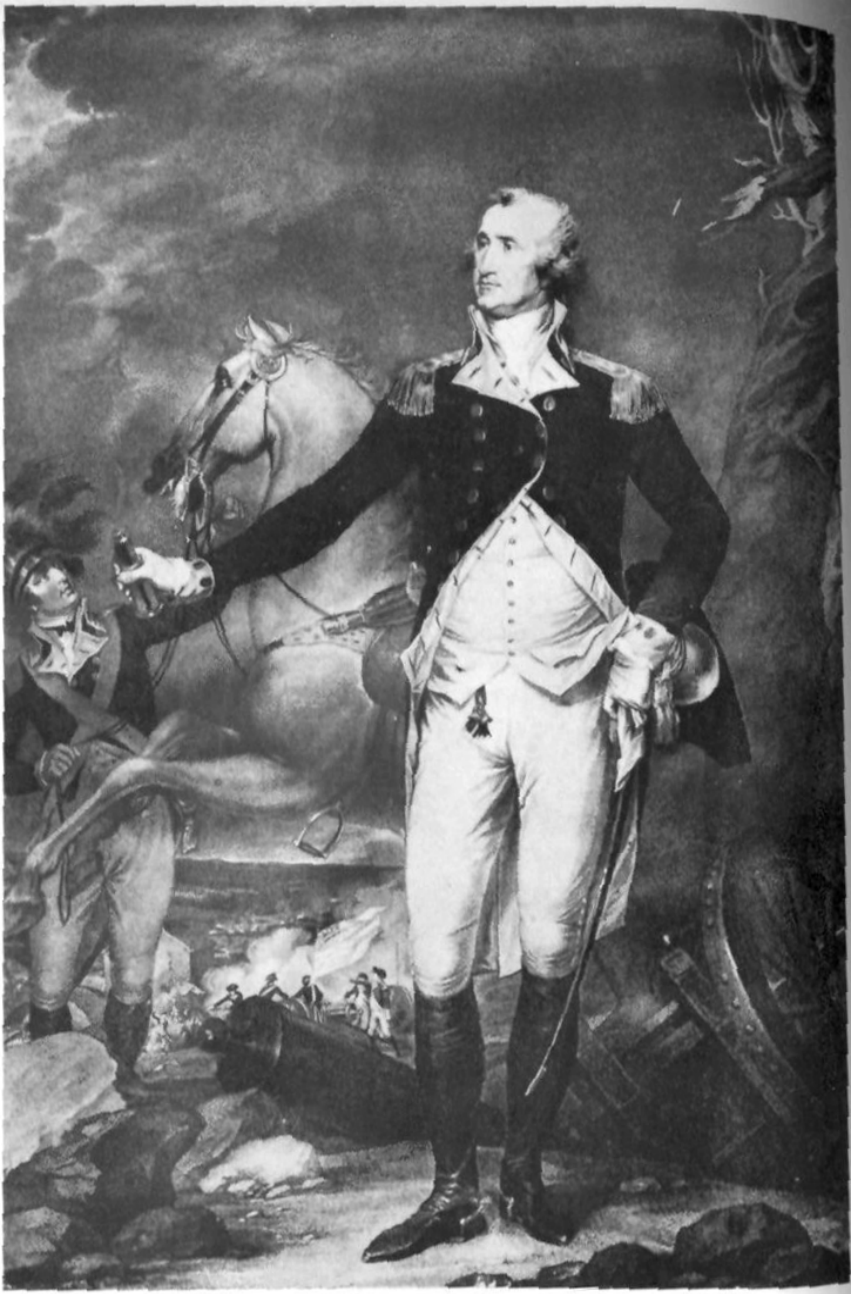


No. 2, March-April, 1932

General Washington	<i>Frontispiece</i>
Staggered Positions	121
By Capt. John M. Devine, F.A.	
Notes on Sub-Caliber Practice	129
By Major J. E. Lewis, F.A.	
The Field Artillery and Chemical Warfare	140
By Lieut. D. S. Sommerville, F.A.	
Foch	146
Yorktown, 1781	147
The R. O. T. C. at the University of Utah	148
By Major James A. Gillespie, F.A.	
Note on the Artillery in the Battle of Buzancy	157
By Col. Conrad H. Lanza, F.A.	
John Pelham	161
By Major Joseph Mills Hanson, F.A., O.R.C.	
Type Problems	178
Preparation of Texts at F. A. School	182
The Effects of Artillery Fire	183
By General Faugeron, French Army	
The Stokes-Brandt 81mm Mortar	201
By Major J. H. Wallace, F.A.	
1932 National Guard Field Officers Class at F. A. S. (Illustration)	207
5th F. A. Polo Team and Broncho Charley (Illustration)	208
Evolution of F. A. Tactics During and as a Result of the World War ..	209
By Major Vincent Meyer	
Chinese Guns Captured at Mukden, 1932 (Illustration)	225
Chinese Artillery (Illustration)	226
Japanese Artillery (Illustration)	227
The Russian Army	229
By Capt. Abraham R. Ginsburgh, F.A.	
Field Artillery Notes	239
Knox Trophy Presentations; Project to Improve Accuracy of 155mm G. P. F. Gun; 90mm Gun-Howitzer; 8-Inch Howitzer; Sound and Flash Ranging Equipment; Fire Control Apparatus for Field Artillery; 75mm Pack Howitzer; Cavalry Division Howitzer; Centrifugally Cast 75mm Gun; Progress With T2 and T3 75mm Gun Carriages; High Speed Bearings for G. P. F. Materiel; Direction Controller T1; Stereoscopic Fire Director T7.	

AUTHORS ALONE ARE RESPONSIBLE FOR STATEMENTS CONTAINED IN THEIR ARTICLES



GENERAL WASHINGTON

By John Trumbull, Courtesy of the United States George Washington Bicentennial Commission

THE FIELD ARTILLERY JOURNAL

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No. 2

STAGGERED POSITIONS

BY CAPTAIN JOHN M. DEVINE, F.A.

Department of Gunnery, The Field Artillery School

IN this day of air observation and air photography the necessity for concealment of a battery in position is obvious. A battery once spotted by a hostile plane, or picked up on an air photograph may be neutralized practically at the will of the enemy. It is, therefore, axiomatic that every possible precaution should be taken for concealment.

For a battery in position, the most important single step in concealment is staggering the guns. Regularity hardly ever occurs in nature; equally spaced spots on an air photo usually indicate the works of man, and four spots lined up at regular intervals nearly always mean a battery. Staggering alone provides a degree of concealment comparable with camouflage and it makes the business of camouflaging much simpler.

Furthermore staggering permits the use of natural cover. Only in an orchard or in the edge of a woods can guns be placed at regular intervals with overhead cover. And even then the blast marks, being at regular intervals, will frequently betray the position to hostile observers.

Admitting the importance of concealment the necessity of staggering guns is at once apparent. In the event of another war, staggering will be the rule rather than the exception.

And yet the actual business of staggering is side-stepped. Admittedly, in theory, it is the thing to do. But in practice it is avoided. It is avoided because of the difficulty of handling the sheaf when guns are not spaced at regular intervals. It is avoided because no simple means has so far been developed to overcome this difficulty.

The purpose of this article is to put before the Field Artillery a proposed solution of the problem and to provoke comment and discussion with the hope of arriving at the best solution.

THE FIELD ARTILLERY JOURNAL

The device described below is in use experimentally at the Field Artillery School. It is based on a similar arrangement in use in the German Army. The idea was suggested here by Captain von Bechtolsheim of the German General Staff, who is now at the Field Artillery School observing our methods of instruction.

Briefly, the device is merely a graphical means of determining at a glance the distances between guns for any particular direction of fire. True, it is another "gadget" added to the already rather overwhelming equipment needed by the Battery Commander in the field. But if there is any simpler way of solving the problem, this is a good time to find it out.

The device consists of two cards, or boards, or pieces of paper, one of which must be transparent. The cards may be of

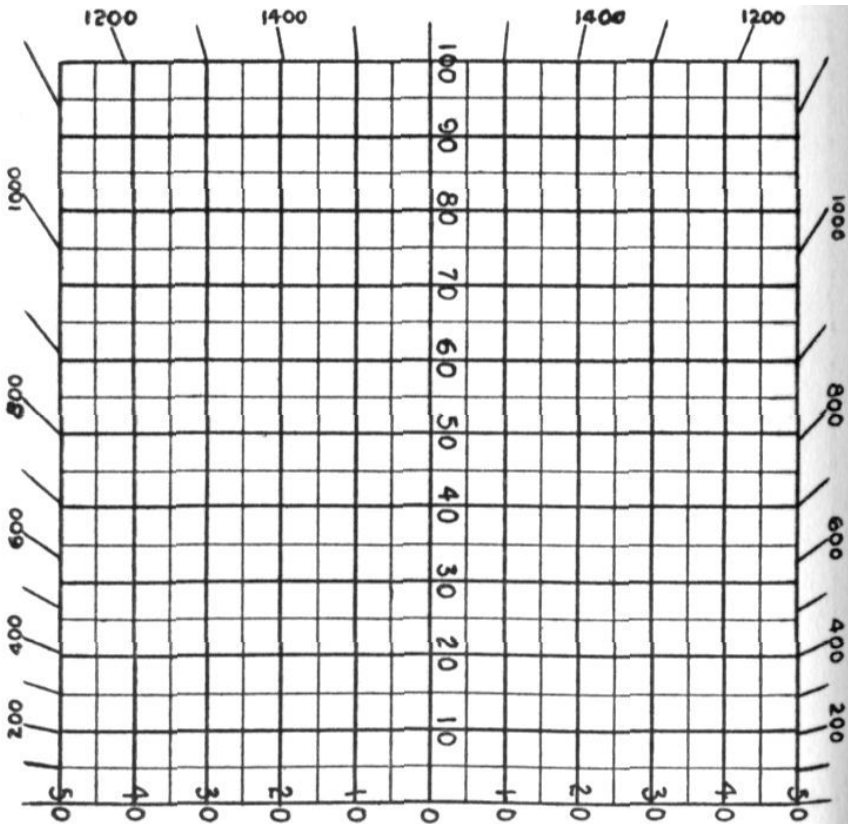


FIGURE 1.—BOTTOM OR OPAQUE BOARD.

STAGGERED POSITIONS

any material, beaver board and celluloid have been found suitable, and the size is determined by the scale desired. The illustrations shown on pages 122 and 123 are the actual size of the device as at present used. The scale is 1"=25 yards.

On each of the cards, or boards, is drawn a rectangular grid to any convenient scale. (See Figs. 1 & 2). The opaque board has, in addition to the rectangular grid, an angular scale measured from the O point, near the center of the right edge.

The transparent board is slotted along the O line and is mounted on the opaque board by means of a thumb tack through the slot and through the O point of the opaque board.

The O point on the opaque, or bottom board, is always the position of the base piece, and the vertical line through the O point is the base line. The other guns of the battery are plotted

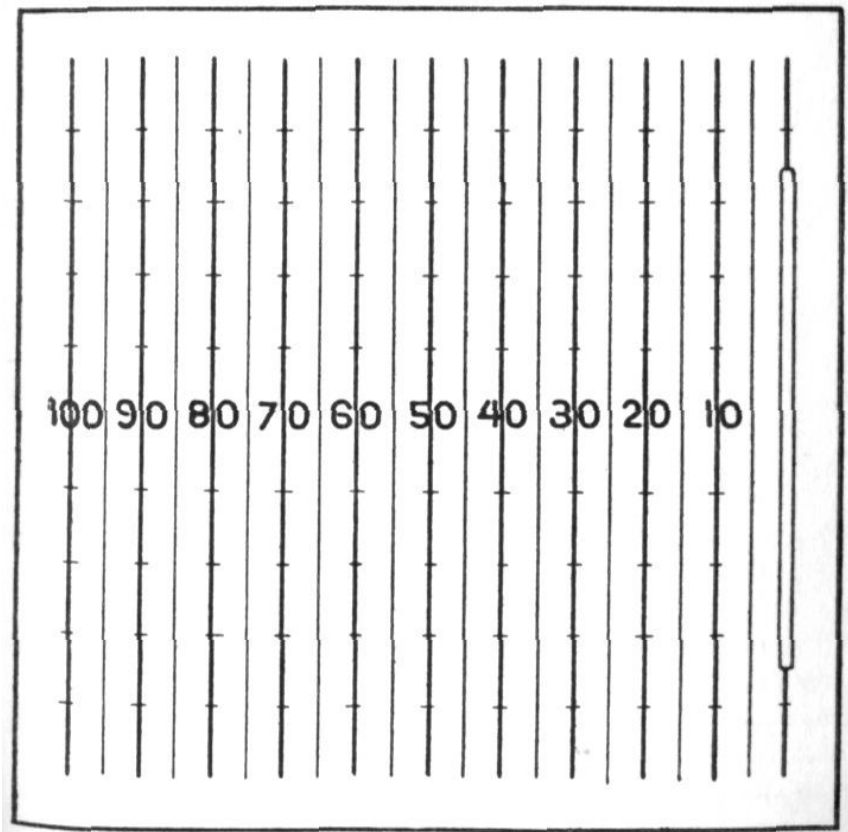


FIGURE 2.—TOP OR TRANSPARENT CARD.

THE FIELD ARTILLERY JOURNAL

on the bottom board with respect to the base piece and the base line. The device is now ready for use.

Laying the battery on the base line is a comparatively simple matter (TR 430-70 par. 31.) The guns are then parallel and any desired sheaf can be obtained by giving individual corrections. If the direction of fire is appreciably changed, however, the distances between guns (perpendicular to the line of fire) also change and getting the desired sheaf is not quite so simple. Using this device the distances between guns can be measured at a glance for any direction of fire. If a shift from Base Deflection is ordered, the transparent board is rotated about its thumb tack pivot the required amount. The distances between guns, measured perpendicular to the line of fire, can then be read directly using the parallel lines on the transparent board. These distances can then be converted to mils at the target range and individual shifts ordered to give the desired sheaf.

A conversion table, yards to mils, can be prepared in a few minutes and posted on the back of the opaque board (Figure 3).

FIGURE 3—YARDS TO MILS

Rn.	5	10	20	30	40	50	60	70	80	90	100	Yds.
1500	3	7	13	20	27	33	40	47	53	60	67	Mils
2000	2	5	10	15	20	25	30	35	40	45	50	"
2500	2	4	8	12	16	20	24	28	32	36	40	"
3000	2	3	7	10	13	17	20	23	27	30	33	"
3500	1	3	6	9	11	14	17	20	23	26	29	"
4000	1	2	5	8	10	12	15	18	20	22	25	"
4500	1	2	4	7	9	11	13	16	18	20	22	"
5000	1	2	4	6	8	10	12	14	16	18	20	"
5500	1	2	4	5	7	9	11	13	15	16	18	"
6000	1	2	3	5	7	8	10	12	13	15	17	"
7000	1	1	3	4	6	7	9	10	11	13	14	"
8000	0	1	2	4	5	6	7	9	10	11	15	"
10000	0	1	2	3	4	5	6	7	8	9	10	"

Differences in ranges for individual guns may likewise be read directly from the transparent board. If the range correction for a particular gun is more than one probable error at the range to the target, a correction should be made. Such a correction may be made individually or it may be incorporated with the calibration correction.

To better illustrate the use of the "distribution finder" let us take an example:

A battery is in position in a field in which the only available

STAGGERED POSITIONS

cover is two trees about 70 yards apart. Two guns are under each tree. The dispositions of the battery (to scale) are shown in Figure 4. The battery is on the base line.

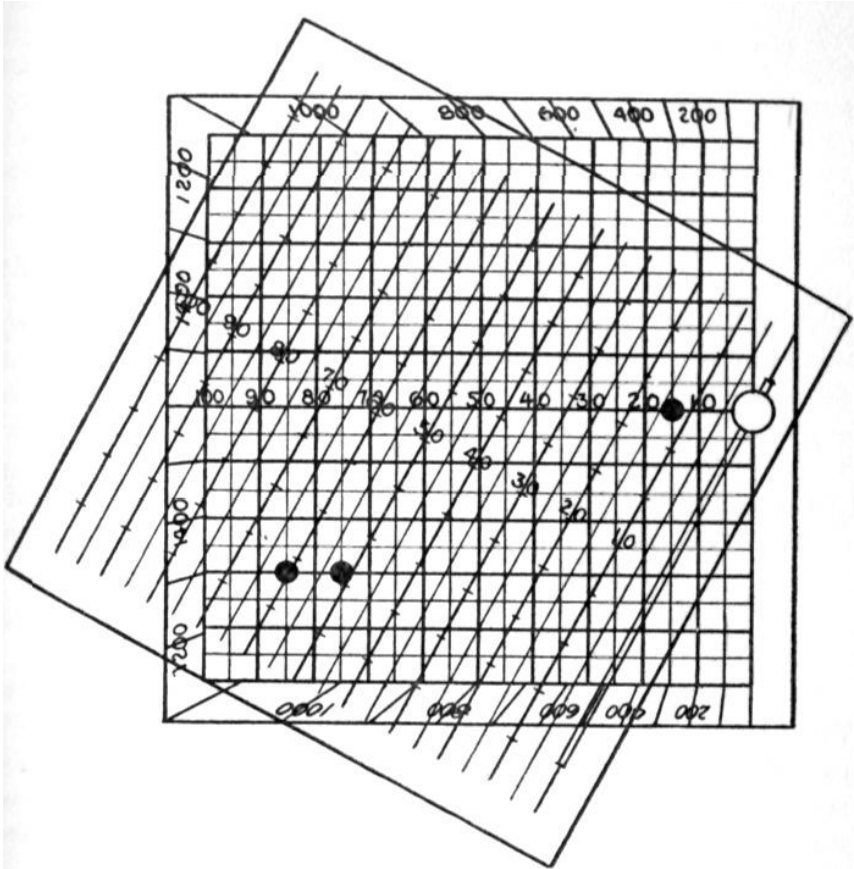


FIGURE 4.—TRANSPARENT CARD ON OPAQUE BOARD.

A target of opportunity appears about 500 mils to the right of the base point at a range of 3,000 yards. The Battery Commander wishes to open fire with an open sheaf (100 yards). Setting the transparent board 500 mils to the right of the base line he reads the distances from No. 1 to the other guns; No. 2, 13 yards; No. 3, 52 yards; No. 4, 61 yards. For an open sheaf at the target the distances required are 33, 67, and 100 yards. The command for direction then is: Base Deflection Right 500.

THE FIELD ARTILLERY JOURNAL

$$\text{No. 2, Left 7; } \frac{33-13}{3} = 7$$

$$\text{No. 3, Left 5; } \frac{67-52}{3} = 5$$

$$\text{No. 4, Left 13; } \frac{100-61}{3} = 13$$

If a converged sheaf had been desired the command would have been:

Base Deflection Right 500

No. 2, Right 5, ($13/3 = 4$)

No. 3, Right 17, ($52/3 = 17$)

No. 4, Right 20, ($61/3 = 20$)

The differences in ranges between individual guns are considerable in this case.

No. 2, 7 yards

No. 3, 62 yards

No. 4, 67 yards

Because of the length of the dispersion zone and the fact that the position of the target with respect to the line of fire is seldom known, a range correction will rarely be necessary with observed fire. For schedule fires, on the other hand, difference in range must be taken into account and a correction applied if the difference is greater than a probable error.

For a similar set up the German Army uses this command:

Base Deflection Right 500

Close by the Interval.

3,000

The Executive, using the German version of the "distribution finder," measures the distances between guns in the new direction of fire and orders individual deflection shifts to give a converged sheaf at the target. The Battery Commander announces a deflection difference to give the desired sheaf. This method accomplishes the result so far as the

STAGGERED POSITIONS

direction is concerned, but does not correct for differences in range.

The British Army uses the Command: "Concentrate at 4,000," to obtain the same result. Individual shifts are ordered to obtain a converged sheaf, the shifts being gotten from a "concentration table" previously prepared for the position. Range corrections are obtained from the Range Tables and are made to the nearest 25 yards in unobserved firing. Except in cases of extreme staggering range corrections are not made for observed fires.

In both the above cases the burden is put on the Executive. I believe that the Battery Executive has enough to do and the task of handling the sheaf should be left to the Battery Commander. The Executive, of course, must report the dispositions of the battery (TR 430-70 par. 25) to the Battery Commander unless the latter has already determined and plotted the gun positions.

The Executive, for instance, in the case given above would report:

"Dispositions: No. 2, 15 yards
 No. 3, 75 yards, minus 30 yards.
 No. 4, 85 yards, minus 30 yards.

Plus and minus meaning in front of or in rear of the normal to the base line through the base gun.

If a Concentration Table—or Convergence Table according to our terminology—is desirable, it can be prepared in a few minutes. Such a table, for the set-up in Figure 4, is shown in Figure 5. It was prepared in about ten minutes, using the "distribution finder."

FIGURE 5—CONVERGENCE TABLE

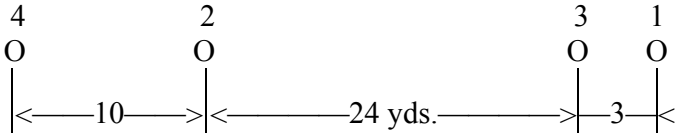
(This table gives individual shifts for converged sheaf at range shown)

	Left 600			Left 400			Left 200			Base Def.			Right 200			Right 400			Right 600					
Range	4	3	2	4	3	2	4	3	2	4	3	2	4	3	2	4	3	2	4	3	2	4	3	2
2000	44	40	6	45	40	6	44	40	7	42	37	8	39	34	7	34	29	6	27	24	6			
4000	22	20	3	22	20	3	22	20	3	21	19	4	19	17	3	17	14	3	14	12	3			
6000	15	13	2	15	13	2	15	13	2	14	13	2	13	11	2	11	10	2	9	8	2			
8000	11	10	2	11	10	2	11	10	2	11	9	2	10	8	2	8	7	2	7	6	2			
10000	9	8	1	9	8	1	9	8	1	8	8	1	8	7	1	7	6	1	5	5	1			

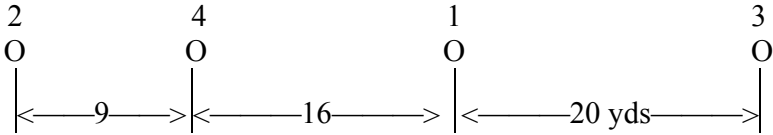
Another solution, offered from time to time to the problem of handling the distribution in staggered positions, is to adjust the

THE FIELD ARTILLERY JOURNAL

guns for a 60-yard sheaf at a mid range. This solution is satisfactory as far as distribution is concerned, only where the ranges fired are in the vicinity of the mid range used in the adjustment. In the example given above, had this method been used with an adjusting range of say 3,000 yards, at 6,000 yards (at Base Deflection) the sheaf would be as follows:



After a shift of 500 mils to the right and at a range of 6,000 yards the sheaf would be:



Obviously then, such a method does not solve the problem. Furthermore, no correction for difference in range is made.

The device may also be used to compute the deflection difference for a parallel sheaf when an Aiming Point is used. For example, suppose the firing angle is 3,700 and No. 1 gun has been laid. The guns are staggered as shown in Figure 4. [This angle was chosen so that the same figure might be used.] The Aiming Point is 4,500 yards away. After the initial deflection has been announced the individual shifts to lay the guns parallel to No. 1 would be:

- No. 2, Right 3. (12/4.5)
- No. 3, Right 12. (52/4.5)
- No. 4, Right 14. (62/4.5)

The Field Artillery School is giving serious thought to the question of staggered positions. The use of such positions will be more common in the future than in the past. Staggering should be habitual; it will not be until the problem of handling the sheaf is solved in a practical manner. The device herein described is simple, a pencil and a piece of transparent paper are all the equipment needed to make it; it can be carried in the pocket or fastened in the Firing Table—and it works.

NOTES ON SUB-CALIBER PRACTICE

BY MAJOR J. E. LEWIS, 1ST FIELD ARTILLERY

MANY of us view with alarm the reduction from year to year of the allowance of service ammunition for target practice, although gunnery becomes more varied in types of fire and higher in standards, and the training of the civilian components becomes increasingly important and broader in scope.

But even better bricks must be made with limited straw—we must adapt ourselves to the use of sub-caliber ammunition and avoid or overcome its limitations, and capitalize its advantages.

In general sub-caliber may be said to consist of 30 caliber and 37mm, generally Low Explosive Shell.

One of the important limitations of sub-caliber is its short range. Another limitation that many officers fail to grasp is the small and fleeting burst which on damp ground and in heavy vegetation is difficult or impossible to see. Careful selection of the target area must be exercised, or a situation may arise such as a Battalion Commander once produced by assigning a target consisting of a clump of trees protruding from a 40-acre patch of tall guava bushes. Twelve battery salvos were fired and not a round was seen. He roundly damned the little 37mm, yet on this same range were large areas on which 95% of the rounds fired could be seen.

At very short ranges, except against steep positive slopes, ricochets are obtained and with the 37mm the burst may be a considerable distance beyond the point of impact and the latter may be difficult to pick up.

The small and fugitive burst and the increased time of flight also bring additional eye strain, even if care is exercised to avoid needless use of optical instruments.

In general the reduced cost or the possibility of firing so many more rounds for a given sum is the greatest advantage.

30 CALIBER

Specifically the 30 caliber is the sub-caliber cartridge, caliber 30, model of 1925, with a muzzle velocity of about 2,025 foot-seconds and costing .05782 cents per round at present.

Caliber 30 has the great advantage that it can be fired on

THE FIELD ARTILLERY JOURNAL

miniature ranges which are readily accessible to barracks, camps, armories, or campuses or it can even be fired on indoor ranges.

Caliber 30 tubes are furnished for the French 75mm and 3" guns, and front and rear adapters can be made by any good shop for the rifle barrel for use in any other caliber. The Ordnance Department at Fort Sill has already improvised them for the new 75mm T-1 assigned to Battery E, 1st Field Artillery, permitting excellent training on moving targets with that battery.

The psychological hazard at the O. P. is probably the principal reason why actual firing does not approximate the class room standard, but when using the little round which only costs six cents the tension is materially decreased, and lack of ammunition does not prohibit clearing up points by firing or carrying a problem to its logical conclusion.

It is also noticed that problems can be fired in approximately one-third (1/3) the time consumed by service ammunition.

The range guard problem may often be materially reduced by using a back stop which is a boon where men are scarce.

After considerable firing with this caliber no necessity can be seen for firing precision axial with a larger caliber. A beginner can master the mechanism of firing this simplest type and recover from his stage fright at much less cost in time and funds.

The training of gun commanders and gun squads of anti-tank guns is believed largely a matter of developing or confirming decision and mental agility in the gun commander and the highest order of team work in the gun squad by the repetition of individual acts in the service of the piece until they become almost subconscious and are reliably performed under the stress of the tank and gun duel. Thus the use of 30 caliber ammunition on a miniature tank range is a rapid and economical solution of a part of this interesting problem. Some of the allowance of 2,000 rounds per battery of this caliber can also be used in the training of selected enlisted men with a view to their use as officers, in the event of mobilization.

Ranges. A range of from 100 to 300 yards having a target area with a positive slope of at least about 75 mils is desirable. If it has a high ridge in rear of the target area as a back stop so much the better. At one R. O. T. C. unit, a large quarry with a

NOTES ON SUB-CALIBER PRACTICE

vertical wall over 100 feet high as a back stop formed the range.

If the target area is not sandy or always so dry as to permit sensing, it can be generally kept dry by frequent disking or plowing. Such a range in Waikoloa Gulch at Schofield Barracks was satisfactory except during the wettest weather. The South Slope of Medicine Bluffs No. 3 and 4 at Fort Sill are entirely satisfactory except during prolonged rains without any artificial aid. At any rate the range must be kept free of vegetation except very short grass and not even that if it is to be used in wet weather.

No elaborate targets are needed. Broken crockery and tin cans will do very well for precision, machine gun, and battery targets, while infantry can be realistically represented by bits of broken crockery distributed in lines or over areas, and trenches can be indicated by old boards set on edge in the ground. The targets should be about 1/10 actual size.

Due to the steep slopes, it is advisable to have "ground rules" which prohibit sensings based on the relative angle of site of target and burst, thus almost eliminating terrain sensings.

Due to the difficulties in the computation of data by hasty methods it is suggested that instruction, practice, and tests of this phase be held some other time and place. Of course this isn't traditional, but one can get a lot more shooting done, and that is the reason for the presence of the guns and men on the range. Shifts work well, of course, and the relocater sheets do also if the scale is exaggerated 10 times.

Data should be checked to avoid large initial deflection errors and the resulting "lost." Since the splash is very small on all except very dry ground, observing instruments must be used even for initial rounds.

Indoor ranges can be provided with a layer of firm dry soil two or three inches deep over a floor, or the natural soil of a basement may be used as a target area, but the protection necessary on three sides of the range is generally so expensive that it has few practical advantages over the several excellent terrain boards now available or readily susceptible of construction.

Precision, Axial. If r and R are approximately equal no telephone is needed as the O. P. must be at the piece, but they may be arranged to differ considerably and thus practice for the communication

THE FIELD ARTILLERY JOURNAL

personnel be provided. A fork varied from 3 to 5 mils as the range is increased from 100 to 300 yards is satisfactory.

Percussion Bracket, Axial. It is advisable to emplace the guns with 2 yards intervals and to arrange your targets with similar fronts.

The use of the 75mm or 3" range scale is satisfactory for this type, but better results are obtained if the following is done: Use a basic site of 200 instead of 300, or minus 100 instead of zero, compensate for this by using an average range setting of about 3,500. One hundred yard changes in range settings in this vicinity have the added advantage of changing the angle of departure by about 4.5 mils, while at 1,000 it is changed only 2.5 mils.

Since this ammunition is so accurate, it is possible to keep the point of impact definitely below the top of a bank by prescribing the maximum combination of site and range as a safety precaution.

Some batteries will show need of calibration rather badly and the following expedient is useful: Have each chief of section adjust his piece on his own portion of the target by precision methods using the target as an Aiming Point, and apply the comparative correction in mils to the angle of site.

The reader may ask why the section chief does this. The answer is because all guns can be fired simultaneously. Not only can the chiefs of section be taught to do this, but many gunners of the 1st and 11th Field Artillery can execute the adjustment with despatch. In the chaotic world of today it may not be amiss to have these men educated a bit beyond their daily requirements.

The pieces as laid may then be referred and base deflections recorded, to avoid the difficulties of computation of original data on a miniature range. Shifts work very well thereafter.

Lateral. It is convenient to establish a parallel sheaf on a base point such as a battery target by an axial bracket or precision adjustment before proceeding to a lateral adjustment.

It is advisable to select targets on terrain of fairly uniform slope as otherwise the very flat trajectory which actually has very small dispersion gives the opposite appearance.

NOTES ON SUB-CALIBER PRACTICE

Lateral Precision Adjustment. Since the factors solved as per Par. 85 f (1) TR 430-85, or obtained from a Firing Table will not prove sufficiently accurate, it is believed best to become reconciled to determining new values of r/R and c/d to get on the line, and to determine arbitrary values of S/C and C/S to stay on the line by actually firing problems on that particular range.

Bracket Adjustments. The above statement concerning the determination of the values of the factors by actual firing applies here with equal force. A very experienced officer should do the firing necessary to work out the rather arbitrary factors to be used, but after that is done firing may be done very rapidly and with reasonable facility by inexperienced officers.

Anti-Tank Fire. It is submitted that under the stress of the "tank—anti-tank gun duel" and due to the speed of modern tanks, only the simplest system will prove reliable or effective.

Whatever division of duties between the gun commander and the members of the gun squad may be made, each man's function must be simplified to the ultimate and he must be so confirmed in it by repetition that his acts become almost automatic. The desired degree of decision and mental agility of the gun commanders can not be developed entirely by terrain board.

A miniature tank range is believed to be a very important step in this important training.

The tank consists of a block of wood (preferably oak), about 6" \times 6" \times 18" long, with ends tapered and preferably re-inforced with a few bands of strap iron. Provide each end with a screw eye to which is tied a cable such as an old telephone wire. Pass the wire through a pulley at the initial and final stakes of the run. (See Figure 1). A man towing it at a walk gives it an angular travel equal to a speed of approximately 25 miles per hour at a range of 1,000 yards. Another soldier at the trailing end of the cable can quickly return it to the initial point, or tow it in the opposite direction.

By varying the initial and final points, the position of stakes along the path and the direction of pull, a variety of set-ups can be arranged. After some experience, some irregularities in the terrain are desirable, as it further varies the course of the target and occasionally defilades it. Such a set-up is quite realistic and

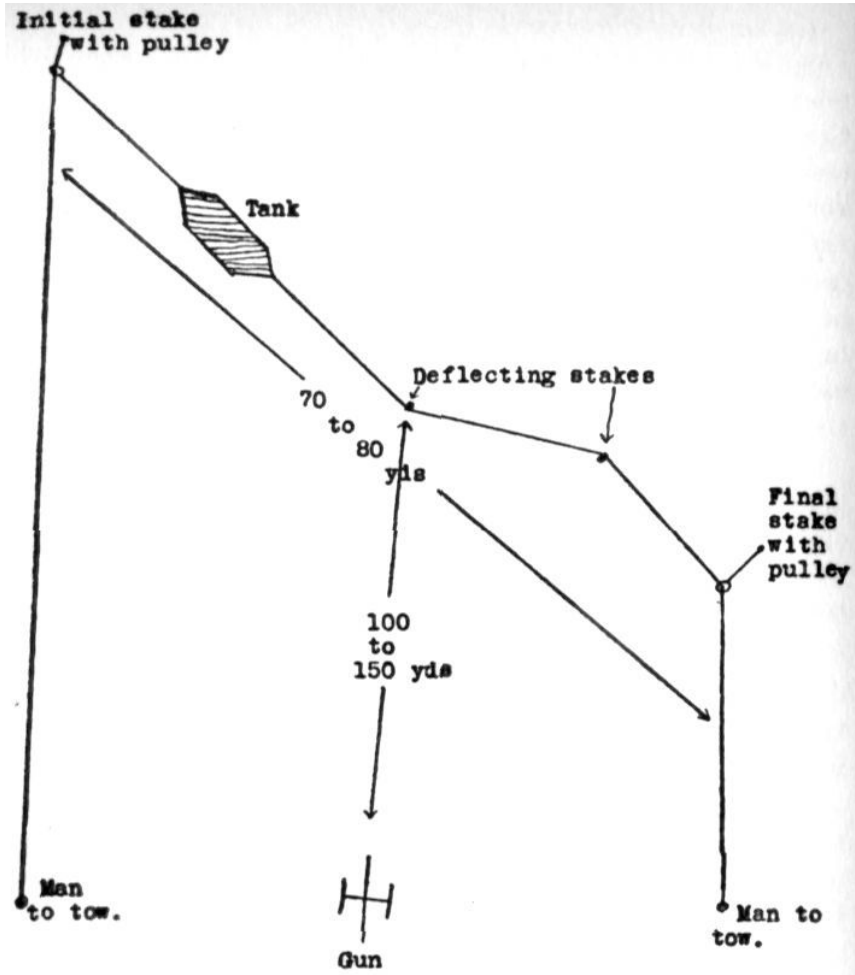


FIGURE 1

enlisted men get a huge "kick" out of this shooting. The interest element is provided, and as it requires such a short time for each run, instruction is imparted very rapidly. About ten or twelve rounds per minute can be fired during a run.

Of course, direct laying is employed. After a few runs the ranges are memorized by the gun commander. This can be counteracted by changing the setting of the tilting head of the panoramic sight on pieces so equipped. By this expedient the range can easily be varied a 1,000 yards. With the collimator sight on the French 75mm a variety of set-ups must be used.

NOTES ON SUB-CALIBER PRACTICE

Its simplicity recommends it.

Such a set-up against Medicine Bluff No. 3 was successfully tried with batteries of the 1st Field Artillery and at two O. R. C. Camps at Fort Sill in the summer of 1931. A Reserve 2nd Lieutenant who had never seen it before was selected from among the volunteers and obtained two hits in the twelve rounds fired in the first run. The average for the two camps was about ten problems per hour. About one and one-half hours were devoted to this type of fire and with three or four guns in use each officer fired at least one problem, and was satisfied that even with our present armament, the Red Tank Corps will be far from a safe place to spend the war.

With a piece like the new 75mm (T-1, E-1, and E-2) having a wide and rapid traverse the necessity of carefully training trail shifters is practically eliminated. While the old 3" and the French 75's present some difficulties, they will work and the training can be carried out on them.

37MM LOW EXPLOSIVE

The advantages of this ammunition are its low cost—\$3.10 per round, its range of more than 4,000 yards which permits its use at ranges which force the battery commander to study the terrain and yet be able to solve the problem presented by the average terrain features. Its smoke permits sensing on wet, but not swampy, ground, and as its accuracy compares favorably with the 75mm, it is sufficiently accurate.

The 37mm gun tubes can be adapted to any type or caliber of gun or howitzer either as ex-caliber or sub-caliber. At Fort Sill they are used as sub-caliber on the American 3 inch and 105 howitzer and ex-caliber on the French 75, the new American 75, and the 155 howitzer. In Hawaii they are used sub-caliber on the British 75.

For axial precision and bracket adjustments, the use of this ammunition does not differ materially from the service round except in its shorter range, much longer time of flight, and the fact that greater care must be exercised so that the rounds do not fall on broken ground or in dense vegetation over 2 or 3 feet in height. Due to the gearing of the range drum on the French 75 which gives it an upper limit of 5,500 yards for service ammunition

THE FIELD ARTILLERY JOURNAL

or about 3,400 for 37mm, resort must be had to the use of the quadrant or the use of a false site for bracket adjustments beyond this range. Fortunately the addition of 100 mils of site at 2,500 yards is almost exactly equal to an increase of 1,000 yards in range.

Unfortunately false range settings must be employed with the French gun approximately as given in the following abbreviated range table for the Low Explosive shell:

Range Yards	SETTING							Drift	Time of Flight
	Elev.	C	Fork	Ep.	3"	75mm			
500	11.7	3.8	2.6	17	720	685	0	1.5 sec.	
1000	33.2	4.7	3.4	18	1475	1515	L 1	3.5 sec.	
1500	59.7	5.7	4.4	19	2230	2335	L 3	5.0 sec.	
2000	91.5	6.9	5.5	20	3005	3170	L 5	8.0 sec.	
2500	130.0	8.3	7.3	22	3815	4015	L 8	11.0 sec.	
3000	176.0	9.8	9.8	25	4650	4875	L 11	14.0 sec.	
3300	207.2	10.7	11.8		5160	5375			
3400	218.2	11.0	12.5		5325				
3500	229.6	11.4	13.2	29	5500		L 15	18.0 sec.	
4000	291.7	13.2	18.5	35	6335		L 21	22.0 sec.	

Thus it is seen that a range setting increment of 100 yards gives a range increment of only about 60 yards. The use of an auxiliary range disk giving approximately correct ranges for this ammunition is desirable. At least one such has been developed (see FIELD ARTILLERY JOURNAL, November-December, 1931, Pages 641-645).

While the extreme range with this projectile is about 4,400 yards, beyond 4,000 yards either with range settings or corresponding elevations it becomes a bit erratic, and as the burst is too small for sensing without undue eye strain it is better to be content with shorter ranges.

The Book Department, Field Artillery School, publishes range cards for 37mm Low Explosive Shell, giving range, elevation, "C" (elevating change for 100 yard range change), Fork, Ep., and range settings for 3 inch and 75mm (French) guns.

Lateral—It is perfectly feasible to employ this ammunition for Lateral, but it is well to remember that with the larger angle T it is considerably more difficult to obtain sensings due to its small burst.

Unless an auxiliary range scale for 37mm Low Explosive shell giving practically correct ranges is available the factors

NOTES ON SUB-CALIBER PRACTICE

S and D must be corrected in bracket adjustments. The correction is approximately .6. This is a convenient expedient, but it must be remembered that a change in range setting of 400 yards actually yields only about a 240-yard range change so especially with estimated data, it will often prove insufficient.

It is further suggested that deflections and shifts be carefully checked as those much in error may give "lost."

Anti-tank—The 37mm is easier to fire against dummy tanks than service ammunition because the trail is much easier to shift since it does not dig in, or jump off a trail log if one is used.

Unfortunately the service of the piece is not the same as with service ammunition as the tubes must be mounted ex-caliber near the muzzle of the piece on the French Gun. However the most important members of the gun squad—the gunner and number 1—get exactly the same training.

It might be mentioned that the collimator sight of the French gun as well as its slow and limited traverse render it far from a suitable gun for this purpose; but the tanks may not wait for us to rearm, so it is suggested we learn to use it for this mission which is daily increasing in importance.

The lack of an ocular device having a mil scale with which the gunner, from a fixed base can measure the deviation of the rounds and make the correction instantly, practically bars that excellent method of handling the deflection with this gun.

Full size dummy tanks can be towed by trucks at the same speed as real tanks.

Direct laying is the generally accepted method and is the reliable one.

It should be realized that the deflection is the difficult element of the data to adjust and change, because the path of the tank varies. Remember that the error of even 1 mil in the deflection may mean a total "miss." A tank approaching head-on is so easy to hit that it must zigzag.

Especially with the French 75 with its collimator sight it is suggested that the method used approximate as closely as possible the procedure and service of the piece necessary or desirable with service ammunition. More exactly, let the gun commander handle both range and deflection, having an extra man set off the

THE FIELD ARTILLERY JOURNAL

deflection changes, thus leaving the gunner more free to track the tank. Two trail shifters should be provided to shift the trail as soon as the piece returns to battery after each round if the direction of travel of the tank is at an appreciable angle to the direction of fire. This should be done under the immediate direction of the chief of section. The shift should be such that the line of metal is just ahead of the tank, the deflection change, if any, is made and the gunner then relays on the tank for the next round, making a small shift towards it. Under all conditions the chief of section should warn the gunner and shift the trail well before the limit of traverse is reached.

If sufficient practice is had in detailed service of the piece, in the exact timing of performance of each man's act in relation to the operation of the gun squad as a whole, in "dry runs" and in sub-caliber practice, very little service ammunition will be needed to attain proficiency even with the French 75.

Transfers—This ammunition works very well for any method of transfer except the "V" method, which is barred by the lack of complete firing tables. Since the drift to the left is so large at longer ranges it must not be overlooked.

Air Observation—A limited amount of this was done by the 1st Bn., 1st Field Artillery, with the cooperation of the 88th Observation Squadron, at the Field Artillery School, during 1930 and 1931.

With experienced airplane observers it worked very well, but with inexperienced ones difficulty was encountered if the data was poor. The bursts being so small and fleeting they could not be found if not where the observer expected them. Of course altitudes of about 1,000 feet were used rather than the service altitude of 5000 feet or better.

When care is exercised that the initial data is accurate and that the terrain in the vicinity of the target is open, it is believed to be a valuable exercise.

In the six problems fired with balloon observation at altitudes of about 1,000 feet, considerable difficulty was experienced, but on each of the three firing days the ground was damp and the light was poor. However it merits further trial and further cooperation by the 1st Balloon Company has been arranged. Something

NOTES ON SUB-CALIBER PRACTICE

worthy is accomplished even if nothing more than just having the two branches work together.

The present allowance of service ammunition being so meager and none being allowed Air Corps observation units, it usually results in little instruction and practice in this important type of observation. It is suggested that a 37mm Smoke shell filled with titanium tetra chloride—(F.M.)—(Ti C14) which would be far easier to sense, be developed and provided with a view to removing this limitation and thus aid in securing better Field Artillery-Observation Aviation cooperation.

When we remember that in the Field Artillery Brigade the ratio of enlisted men to guns is about 67 to 1 and 3 plus to 1 for officers, we must admit that firing efficiently is imperative, and that it must be attained regardless of allowances of service ammunition.

But we can console ourselves that for some types of fire sub-caliber is even more suitable than the service caliber and often permits material economy of time and effort. At least the elementary and simpler types of firing can be accomplished by sub-caliber practice, thus permitting service ammunition to be used almost entirely for the more advanced forms of tactical firing.



THE FIELD ARTILLERY AND CHEMICAL WARFARE*

BY 2d LIEUT. D. S. SOMMERVILLE, 6th F. A.

THE World War proved that in all future wars in which chemicals are used, the use of chemicals by artillery will find an increasingly important role. Toward the latter part of 1918, the consumption of chemicals and chemically filled munitions assumed vast proportions, and the great bulk were artillery shell. It is only logic to assume that we will start in with the next war where the last one left off.

As historical background, it is interesting to recapitulate the chemical activities of the American artillery during the last months of the war. Statistics show that of all shell between the calibres of 75mm and 240mm, from one-third to one-fourth were chemically filled. Some of these, like cyanogen, were probably of little casualty producing effect, save for a chance direct hit, or a lucky penetration of a dugout. Others, like mustard, were very effective. Between these extremes lay a variety of agents that found uses peculiar to individual characteristics. Lewisite was never used, as the war ended before it could be made available at the front.

There was no time to perfect range tables and ballistic charts for these new projectiles. Those who used them knew little more about them than a hazy conception of their effects on their victims. The existing knowledge of their peculiar tactical uses was neither comprehensive nor accurate. But on all sides, it became apparent that the newcomer had come to stay, and that its study could not be neglected once the war was over.

Subsequent years have found the Field Artilleries of the world striving to perfect themselves in these activities.

AGENTS.—There are today six chemical fillers for shell which are most likely to be used:

Mustard (HS)—toxic vesicant, persistent.

White Phosphorus—smoke, incendiary.

Chloracetophenone (CN)—tear gas.

Phosgene (CG)—toxic lung irritant, nonpersistent.

Chlorpicrin (PS)—toxic lung irritant, nonpersistent.

*This article first appeared in "Chemical Warfare," a publication of The Chemical Warfare School, Edgewood Arsenal, Md.—Editor.

THE FIELD ARTILLERY AND CHEMICAL WARFARE

Titanium tetrachloride (FM)—smoke.

There are others, such as diphosgene, Lewisite, and brombenzylcyanide, which are suitable fillers, but it is believed that they will not be used unless existing conditions change.

It is unnecessary to outline each of these agents and describe their odors, specific gravities, vapor densities, or physiological effects. The purpose of this article is only to regard these agents and their uses with a view to outlining some characteristic that each has exposed to research and experiment and to correlate these characteristics with present tenets of artillery practice.

Mustard is the agent par excellence, but some means must be devised for improving it before it can be exploited as it deserves. It is too persistent, and this tenacity, sometimes lasting for weeks at a time, denies areas to friendly occupation.

Its vesicant action is too retarded. The ideal vesicant is one which makes itself felt immediately, and mustard burns may lag from two to twelve hours behind the exposure to the vapor, depending on the concentration and length of exposure. Lewisite is much quicker in this respect, but its rapid hydrolysis and consequent destruction in humid atmosphere make it an unlikely agent for use in climates which this country will encounter in war time.

White Phosphorus is the best known agent for producing smoke. But the intense heat developed upon ignition sets up convection currents which have a tendency to cause the smoke clouds to rise quickly, necessitating increased expenditures of shell to keep the cloud intact. However, the smoke is denser than that formed by any other practical filler.

There have recently been conducted experiments to determine the effectiveness of adding red phosphorus in an attempt to improve this agent.

Chloracetophenone is probably the best known agent in use today. As it is a non-toxic lachrymator, it is much used as a training substitute for the toxic gases, and is also in widespread use in police tear gas bombs. It is an established fact that tear gases are best made by using the halogens, and the most efficient of these is bromine, probably a strategic material. The superiority of the German tear gases was due to their bromine content, a material easily obtainable as a by-product of the dye industry. The British used iodine, and our own gas, as its name implies,

THE FIELD ARTILLERY JOURNAL

uses chlorine. The DuPont laboratories have evolved a process of extracting bromine from sea water, which has a content of about .0017, but the method is slow and the yield small. Even though we have, in brombenzylcyanide, a perfected product which is more persistent than CN, it is doubtful if we will be able to make it on a large enough scale to supplant the latter in the event of war.

Phosgene, Chlorpicrin, etc. The Field Artillery is not yet satisfied with the results with non-persistent agents in shell, pointing in particular to the enormous amounts of shell required to lay down concentrations that experiments have shown necessary for maximum effect. Phosgene and chlorpicrin are at present the two best agents of this class, but even gases of such toxicity require the fire power of entire brigades on relatively small areas. Until some solution to this problem is found, such as the development of more toxic agents, the artillery will look with disfavor on these agents.

Titanium tetrachloride is used as a peace time training substitute for white phosphorus, and as the agent in airplane smoke apparatus. It does not form as dense a cloud as the phosphorus, but as its reaction is the result of hydrolysis, the cloud is not so prone to rise. This quality must be remembered in any final decision as to its use by artillery.

Ballistics.—High explosive shell and shrapnel have solid fillers. The majority of chemical shell are filled with liquids. Therefore, we can presuppose, in the use of the latter, the introduction of certain elements that will result in different ballistic characteristics. The local forces set up by the rotation and translation of a liquid-filled shell are many and complex, and it is difficult to study them individually.

No shell is completely filled with a liquid. A certain volume is always left to take up internal hydrostatic pressure, the size of this void varying with the agent and the calibre of the shell. There is therefore, considerable room for movement. Upon acceleration the center of gravity of the filler moves to the rear; upon deceleration it goes forward.

Some fillers, such as mustard, have a relatively high freezing point. Depending on its purity, mustard freezes at between 45 degrees and 55 degrees, Fahrenheit. Let us imagine then a shell

THE FIELD ARTILLERY AND CHEMICAL WARFARE

which has been lying on its side, or canted at an angle, and which has frozen in that position. If the heat of the gun chamber or the heat of the propellant gases does not return the filler to the liquid state, there results a lopsided shell, as far as accuracy of flight is concerned.

Liquids do not conform to a rotational impetus in the same manner as do solids. Their inertia is not homogeneous, and "layer friction," or the sliding of layer on layer is a lagging precession that varies with the radius of rotation of each layer. This friction, at the surface, is directly applied to the periphery of the shell casing, and acts as a brake on the revolution of the shell, slowing down the rotational velocity. At the same time, it becomes a complex, internal system that sets up a gyroscopic action much more powerful than that imposed by a tight, solid filler.

The most significant difference between the two classes of projectiles, lies in the difference in weight of the fillers. At the present time both use the same casing, and we thus have the situation of direct substitution of a lighter shell for a heavier one, using, uncorrected, the same range tables for both when they are accurate for only one.

Test firings carried on at Aberdeen Proving Grounds with 75mm shell have shown what are perhaps encouraging results. Shoots based on firings of five rounds at each elevation have demonstrated that:

a. At angles of elevation of less than 15 degrees, liquid filled shell (HS) show little difference from HE in either range or deflection.

b. At angles above 30 degrees elevation, the liquid filled shell consistently fall short, the error increasing with increased elevation of the piece.

There are several items to keep in mind in digesting these observations. The 75 is a light, flat trajectory shell. Its time of flight, because of its short range, is small. It has a smaller percentage of filler to shell (by weight) than have larger calibres. These factors should work to make us hesitant to predict the same results when we apply them to the ballistics of heavier projectiles. However, there is no reason to believe that there cannot be formulated, even for higher calibers, a sliding scale of corrections with which we can enter the present range tables, correct

THE FIELD ARTILLERY JOURNAL

ranges used for other shell, and immediately substitute gas shell at any time during fire without huge error. The value of this, if we would take advantage of the chief asset of gas—its surprise element—is obvious.

Immediate Needs.—The vital question is, after all, "What can we do if the emergency comes tomorrow?" The agents we have today are those on which we would be forced to depend. We could not afford to sit and wait until research or experiment had developed better ones. We must be prepared at all times to use the tools in our hands. The artillery's practical view of this is embodied in two paramount requests:

a. A simple, accurate means of adapting existing firing tables to the use of gas shell.

b. Accurate information as to the exact amounts of any given agent that must be used to produce maximum effect on a given area without waste of ammunition.

The answers to these two requests will go far toward solving immediate problems confronting the branch.

Future Possibilities.—Manifestly it is impossible to catalog the future uses to which artillery gas shell will be put. But there have evolved several logical conjectures and theories that are well worth consideration:

a. White Phosphorus as a casualty producing agent. Tests carried on at Edgewood Arsenal have demonstrated that under certain conditions this agent can produce at least half as many casualties as HE. Moreover, its demoralizing effect is very great.

b. Time fire with gas shell. Tests have proved beyond a doubt that the effect of a vesicant is enormously increased when the point of burst is raised above the ground. Even a small calibre like the 75mm can sprinkle liquids, with casualty producing concentration, over an area approximately three hundred yards in depth, whereas the same shell, striking the ground, dissipates much of the content into the cup formed by its crater. Although a high wind may reduce this effect obtained with air bursts, it is still much more effective than that obtained on impact.

c. Gas in anti-aircraft fire. The Calibre Board, in its recommendations that future design permit light artillery to elevate to 80 degrees and traverse 360 degrees, expresses the view that artillery must be able to fire on aerial targets as well as terrestrial.

THE FIELD ARTILLERY AND CHEMICAL WARFARE

There are those who believe that perhaps the ideal way to combat massed formations in the air will be to build up clouds of vesicant or toxic agents through which the enemy must fly to accomplish his mission. They could be started before the attack comes within range.

d. New agents. If means are found to adapt such ideal agents as carbon monoxide and hydrocyanic acid to war uses, they will surely displace the present lung irritants. Their toxicity is far greater than that obtaining with present agents, and it would not require prohibitive amounts of shell in order to build up a lethal concentration.

Germany could not have carried on her extensive use of chemicals without her dye industry. Realizing that the real backbone of chemical warfare is national industry, we have expended much money and energy to interest commercial organizations in processes that may be diverted to military use. Results have been very encouraging. Already we can be sure of commercial sources of thiodiglycol and chlorydrin, vital items in the production of mustard gas. There is at least a good possibility that we may develop a source of bromine. Chlorine can be had in any quantity.



FOCH

Captain B. H. Liddell Hart in "Foch: the Man of Orleans," adds much to his reputation as a contemporary military writer. This book should take the rank as one of the best books in our language on military subjects.

To Field Artillery readers the book is particularly interesting. It reveals Foch's earlier career as an artilleryman and shows how he first obtained prominence by outstanding knowledge and efficiency in his arm. It contains innumerable facts and anecdotes about the life of this great artilleryman and his associations. His difficulties in finding himself when he became instructor at Ecole de Guerre are explained in a very human manner. The part dealing with his career in the World War is most illuminating, particularly because it is not confined to praise, but brings out many difficulties and traits of character in a critical yet generous manner. One cannot read this book without obtaining an excellent knowledge of Foch's personality and generalship, as well as of the workings of higher staffs.

A few words about the author may be of interest. Captain Liddell Hart went to Cambridge and entered the British army as a university candidate. He served throughout the war and was badly wounded. At the age of twenty he commanded a battalion in battle. At twenty-four he wrote the post-war official training revision for the British Infantry. He retired from the army in 1927 and at the age of twenty-nine succeeded Colonel Repington on the *London Telegraph* as permanent military critic. He is the military editor of the Encyclopedia Britannica. His writings on mechanization and on the theory of future warfare have been noted with interest throughout the world and have had particularly pronounced effect on the British army.

The book is published by Little, Brown and Company and costs \$4.00. A reduction of 10% will be made to members of the U. S. Field Artillery Association who purchase it through the Association.

YORKTOWN, 1871

COLONEL H. L. LANDERS, Field Artillery, on duty in the Historical Section of the Army War College, has written a book entitled "Yorktown, 1871," which deserves a place on the shelves of every public and military library in the United States.

George Washington was at his best in the remarkable series of land and sea operations that culminated in the surrender of Cornwallis at Yorktown. His masterful leadership in effecting the final concentration, involving the employment of French and American troops in harmonious cooperation with the French fleet under De Grasse, is ably presented in "Yorktown, 1781."

In preparing this book, the author has gone deeply into the most authoritative original sources, and has studied the ground with an appreciative eye for military values. His work embraces the background of diplomatic maneuvers in England and France that had direct bearing on the outcome of the struggle then going on in America. Among the chapters devoted to the leaders on both sides, those on Lafayette, D'Estaing, Rochambeau, Cornwallis, and Franklin at the court of Louis XVI, are especially worthy of note. The story of the sea battle between the fleets of De Grasse and Graves, off the capes of Virginia, is one of absorbing interest. It is the most comprehensive account of this action that has appeared in print, and the only one that is adequately supplemented with a battle map showing the positions and movements of the ships.

This book is published as Senate Document No. 273, 3d Session, 71st Congress, by the U. S. Government Printing Office. It is beautifully printed, well-illustrated, and supplied with excellent maps. For the Yorktown area, the maps show both the fortifications of 1781 and the present road net, so that a person on the ground would have no difficulty in orienting himself. In addition, there are several oblique airplane views of Yorktown and its environs. A limited edition, cloth bound, is available for distribution by members of Congress; additional copies may be purchased from the Superintendent of Documents, Washington, D. C., cloth bound, at \$1.75 per copy. It has 219 pages, 19 illustrations and 7 maps.

THE R.O.T.C. AT THE UNIVERSITY OF UTAH

By MAJOR JAMES A. GILLESPIE, F.A.

THE idea of instituting Military Training at the University of Utah was first conceived in the Fall of 1916 by Wm. H. Leary, Dean of the University Law School, and Major (later Brigadier General) Richard W. Young, U. S. A. (Resigned), a member of the Board of Regents of the University and a graduate of West Point in the class of 1882. The fact that the country then seemed likely to be drawn into the European War and interest in military preparedness was commanding attention throughout the land enabled these gentlemen to interest the student body in the project and a student petition was presented to the Board of Regents by Dean Leary requesting that a Military Department be added to the University and that military instruction be made available on a voluntary basis. It is worthy of note that from the very beginning the idea of voluntary military training was paramount even to the extent that the student body petitioned that military instruction be established. This idea has been consistently adhered to, with the result that the Military Department has established a place for itself in the scholastic and social life of the campus on the merit of its wares and has enjoyed a consistent and healthy growth, and is today the largest voluntary Field Artillery R. O. T. C. unit in the country.

The original project of General Young and Dean Leary was an elaborate one, involving the establishment of a modified West Point at the University with the students who volunteered for the work being regularly enlisted in the Army and quartered at the neighboring military post of Fort Douglas. General Young interested his friend, General J. Franklin Bell, under whom he had served in the Philippines while in command of the Utah Light Battery, in the matter and it was referred to the War Department for consideration; before a decision was reached we entered the World War and the essence of the idea was embodied in the Student Army Training Corps which was established at many educational institutions, one being established at the University of Utah.

With the discontinuance of the S. A. T. C. at the end of the war, steps were inaugurated looking toward the establishment of

R. O. T. C. AT THE UNIVERSITY OF UTAH

an R. O. T. C. Unit. Ever since Spanish War days, when the Utah Light Battery had made a name for itself and its State at the taking of Manila, sentiment and enthusiasm for military training had leaned strongly toward the artillery. The National Guard troops from Utah in the World War had consisted of the 145th Field Artillery and so, quite naturally and properly, a Field Artillery R. O. T. C. Unit was established at the beginning of the school year in the fall of 1919 with Major Marshall G. Randol as P. M. S. & T., and with one hundred and twenty students enrolled in the unit. From that time the growth has been steady and consistent under the successive P. M. S. & T.s, viz. Majors George S. Gay, R. C. Batson, and the writer, and with the steady support and co-operation of the Board of Regents, the President of the University, the Faculty, and Student Body. Some three thousand individuals have received one or more years of training and two hundred and forty-one graduates have been commissioned as 2nd Lieutenants in the Field Artillery Reserve. The unit at present has six hundred and fifty students.

PLANT AND FACILITIES

With the single exception that no indoor riding or drill hall is available, the facilities provided for artillery instruction are unsurpassed. Two model brick and concrete artillery stables house the seventy-six public and private animals. We have also a gun shed with enclosed machine, saddler, horseshoeing shops and storeroom for instruments and other equipment. Each of the four classes has its classroom for theoretical work; the freshman classroom seats seventy students on terraced benches to facilitate instruction in materiel and when not in use as a classroom is available as a 60-foot, four target, indoor pistol range. Immediately east of the stables lies the Fort Douglas Military Reservation which, through the courtesy of each succeeding Post Commander, is available for outdoor training of all sorts. Two large riding pens and a polo field have been constructed on the reservation by the men of the Enlisted Detachment and the 9,996 acres of varied ground available, unhampered by fences or cultivation, enables us to include practical work in reconnaissance, occupation of positions, maneuvers limbered, and cross country rides in our program. If ammunition were available

THE FIELD ARTILLERY JOURNAL

we could include sub-calibre and service practice up to 3,000 yards range.

INSTRUCTION AND CREDITS

As previously stated the work is entirely voluntary on the part of all classes. It carries credits toward graduation equivalent to other elective courses in the institution as follows: Freshmen year: one credit per quarter; Sophomore year: three credits per quarter; Junior and Senior years: four credits per quarter; a total of 36 credits available toward a total of from 183 to 206 credits required for graduation in the various schools of the institution. The course follows closely the War Department Program with each class receiving its theoretical classroom instruction individually under a staggered hour's program. Seniors act as assistant instructors at freshman drill and sophomores, juniors, and seniors are combined in two-hour afternoon sessions for mounted instruction with the seniors providing the officers and chiefs of section and the juniors and sophomores the drivers. At this mounted instruction every effort is made to follow the best Regular Army routine and the students not only learn to harness and unharness, but are required at the conclusion of drill to clean the bits and bearing portions of the harness and to groom the animals with the cadet officers supervising the work. Twice a month in the Fall and Spring quarters the regimental organization of six batteries and a band assembles for dismounted drill and ceremonies. Owing to the staggered hour's program neither the regiment nor any complete battery can be gotten together at any other time; this somewhat handicaps regimental and battery esprit and instruction in command and leadership for cadet officers and non-commissioned officers. Nevertheless a rating of "Excellent" has been given the Unit at the annual inspection every year since 1925.

ACTIVITIES—ATHLETIC AND SOCIAL

Both pistol shooting and polo are recognized as minor sports and the Athletic Council of the University confers the award of a minor sport U on those members of the R. O. T. C. Pistol and Polo Teams who are recommended for it by the coach and approved by the P. M. S. & T. In pistol practice, shoulder to shoulder

R. O. T. C. AT THE UNIVERSITY OF UTAH

matches are held against local clubs, and matches by mail with other R. O. T. C. Units. Last year our team won second place in the .22 calibre Chief of Field Artillery Match.

In polo our distance from other colleges is a handicap, but we have a turn-out of from 60 to 80 candidates each fall who develop a good team by play amongst ourselves. We play a four-game series with our Inter-mountain rivals the Colorado Aggies of Fort Collins, Col., two games at each school, and this winter we invade California for a two-game series with Stanford.

In Intramural Sports our cadet Regimental Athletic Officer and his two Battalion Athletic Officers organize basketball, handball, swimming, wrestling, tennis, golf, and baseball teams, principally from among the freshmen, who compete against teams from other clubs and fraternities on the campus. Last year our teams won for us the Intramural Athletic Championship.

Social activities such as the Military Ball and smaller parties are sponsored by the Cadet Officers' Club to which every member of the Advanced Course automatically belongs, the juniors all being appointed third Lieutenants in order to make them eligible for this and for Scabbard and Blade. This Honorary Military Fraternity usually numbers about half of the cadets in the Advanced Course, and besides the quarterly initiations and banquets holds various dances and entertainments for its members and friends.

One of our most valuable "get togethers" is the annual smoker to acquaint the advanced course cadets with their future comrades, the Field Artillery Reserve Officers of Utah. The Reserve Officers and cadets alternate each year as hosts at this affair.

CAMP

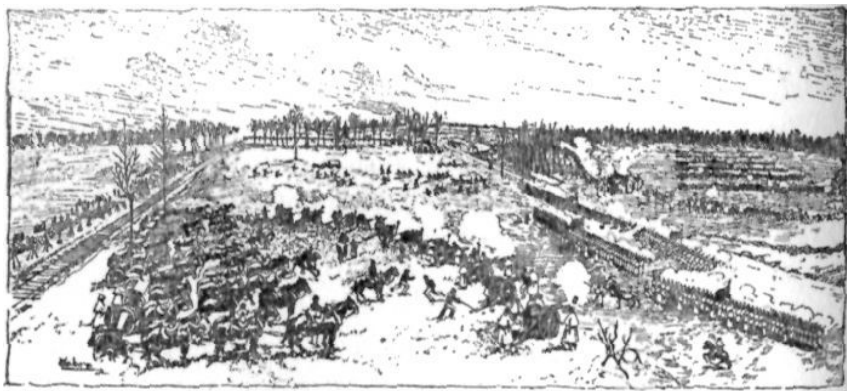
The annual camp is habitually held at Fort Francis E. Warren, Wyoming, in conjunction with the Field Artillery Unit at the Colorado Agricultural College, thus affording both schools the incentives of comparison and competition, not only in technical artillery subjects, but in initiative, leadership, and athletics. The camp organization consists of a fully manned and equipped battery with cadets functioning 100 per cent in every capacity and rotated every three days. Efficiency is rewarded by selection to function in the higher grades on the week's practice march and

THE FIELD ARTILLERY JOURNAL

the maneuver at the end of camp. It is worthy of note that these rewards distribute themselves very evenly between the two schools indicating uniform quality of student personnel and uniformly parallel preparation in the way of instruction.

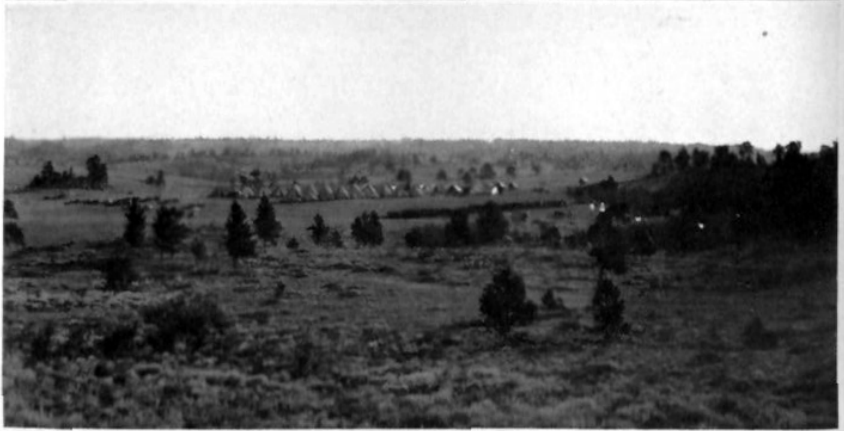
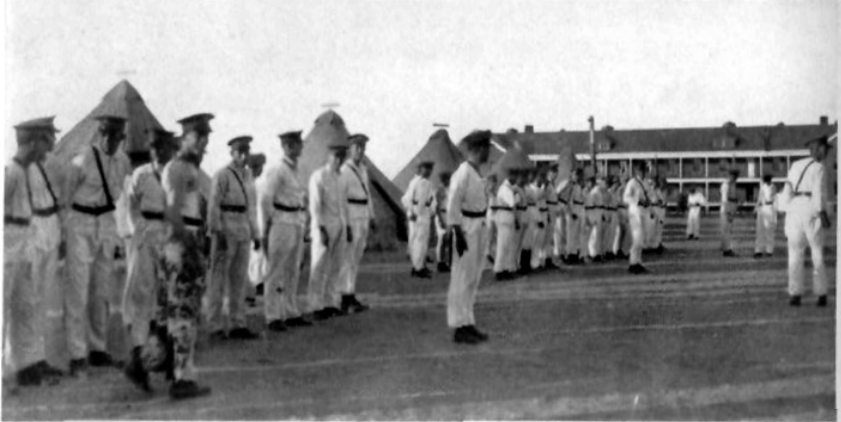
CONCLUSION

Experience at Utah indicates that, given an adequate plant and reasonable support from the institutional authorities, a voluntary military unit can be developed which will appeal to an average cross section of the male students up to from one-third or one-half of their number. Enrollment being voluntary, the atmosphere is cleared of all objections and knocking; everyone in the unit is interested in the work to a reasonable extent, and the dividends in reserve officers commissioned are about equal in percentage of total enrollment commissioned to those obtained in a compulsory unit.





THE STABLE AREA OF UTAH R. O. T. C. IN WINTER

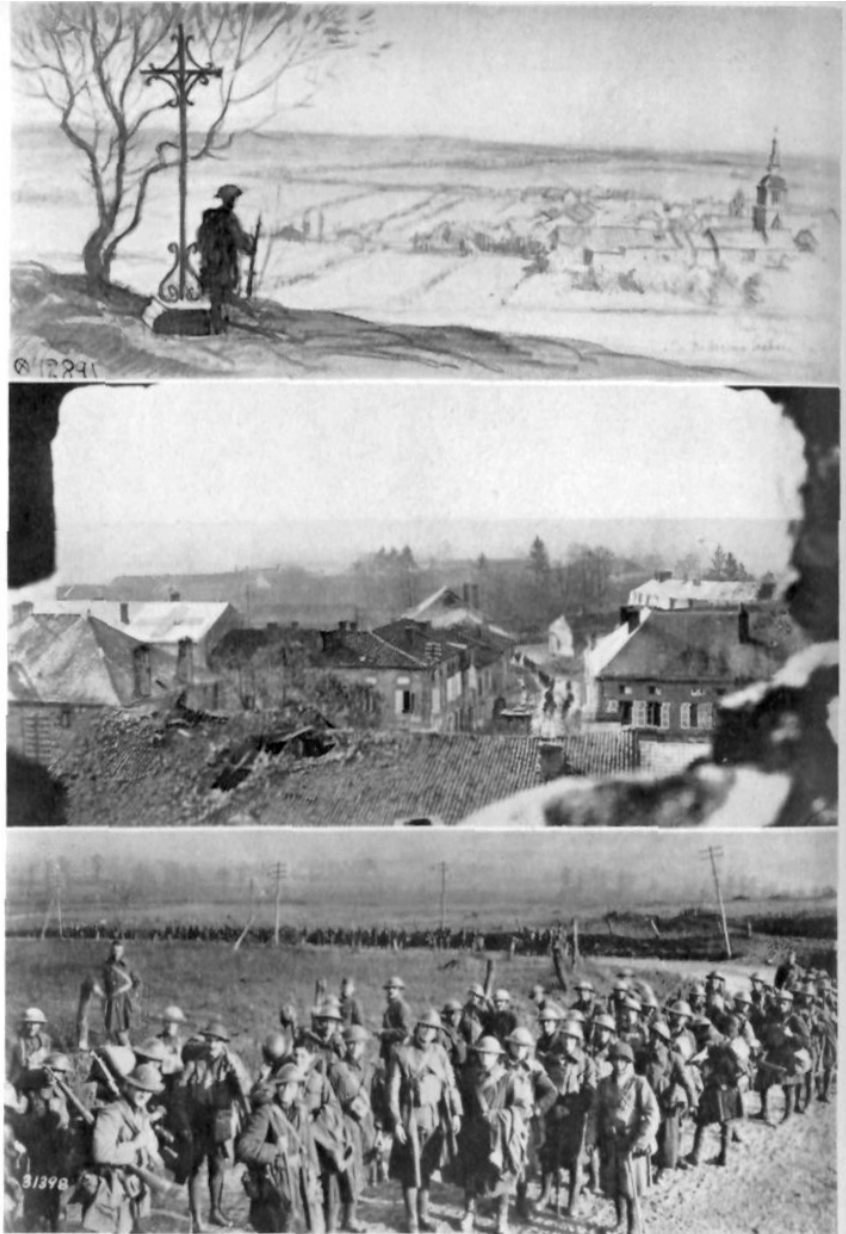


CAMP VIEWS, UTAH R. O. T. C. CENTER—PEJAMA PERADE



UTAH R. O. T. C. MARCHING AND SHOOTING
AT FORT FRANCIS E. WARREN, WYOMING

THE FIELD ARTILLERY JOURNAL



THE ARGONNE COUNTRY

TOP: LOOKING NORTH FROM NEAR BUZANCY; CENTER BUZANCY;
BOTTOM: 77TH DIVISION ADVANCING ON BUZANCY.

NOTE ON THE ARTILLERY IN THE BATTLE OF BUZANCY* November 1, 1918

The following discussion of the employment of artillery in the Battle of Buzancy was submitted for publication in the *Field Artillery Journal* by Colonel Conrad H. Lanza, F. A., who was Chief of Operations for the Army Artillery of the First Army when the battle was fought. General Summerall was the Commanding General of the V Corps of the First Army at that time.—EDITOR.

In an able article by General C. P. Summerall, on *Organisation, Armament and Employment of Field Artillery*, appearing in the *FIELD ARTILLERY JOURNAL* for September-October, 1931, there is discussed in part (pages 508-509), the employment of artillery on November 1, 1918, in connection with the attack of our V Corps. As this was one of the greatest battles fought by Americans, an amplification of the brief remarks in the article referred to may be of value.

The artillery plan *used* was not prepared by the Corps. There had been a corps plan, but disapproved by higher authority an army plan was substituted. How this came about has been explained in the *Infantry Journal*, in an article entitled *Army Artillery in the Meuse-Argonne*, by Major General E. F. McGlachlin, in November, 1923. This article seems to have escaped General Summerall's notice, and he may never have known that there was more than one plan.

The plan *used* left only near protection of the assaulting infantry to the corps. Distant protection was by army artillery, and in no way under control of the corps. The army directed the corps how to employ their artillery, not the reverse. The 84 155mm guns shown in table at bottom of page 508, of General Summerall's article as with the V Corps, were independent of that Corps, part of 277 heavy guns under the First Army. As the V Corps was the center one of three corps, each attacking on a narrow front, almost all the fire of these 277 heavy guns could be concentrated in front of the V Corps.

The army plan was based not only on the principle explained by General Summerall (page 512), that the infantry advance must be protected by a deep barrage, which "must, at every moment

*This battle is officially called the Battle of Buzancy in French accounts. This might well be adopted as the American name.

THE FIELD ARTILLERY JOURNAL

of the advance, embrace all positions from which hostile machine guns can fire upon our infantry," but also that the infantry should be protected from the fire of any hostile batteries within effective range. Protection against machine guns was secured by a deep barrage covering areas within view, and within 2,000 meters, of the infantry. General Summerall fully covers this barrage in his article.

Protection against artillery fire was not provided by assigning hostile batteries to our batteries for counter-battery. Desirable, but it was impracticable. Open, not stabilized, warfare existed.** Nobody knew where the hostile batteries were. They were mobile, changed position frequently, and there was no certainty where they would be on any one day. Every place where they could be, within 7,000 meters of our infantry was covered by heavy artillery fire. This seems to have required an enormous expenditure of ammunition. But large areas were not fired on. This included areas near our lines; the area, 2,000 meters deep covered by the corps barrage; areas within view, where it could be seen there was no artillery; impossible, or improbable positions, such as swamps, steep slopes, etc. With few exceptions this fire was carried out by the army artillery, and was extremely successful. The two ideas, complete neutralization of all areas capable of containing enemy machine guns or artillery, was first presented to our army, in the plan for the battle of November 1, 1918.

Heavy artillery, 155mm GPFs and 8" howitzers, also fired the rolling barrage through woods, and over parts of the advance beyond range of the division and corps artillery, including the Bois de Barricourt, the final objective of the V Corps, and the dominant position of the battle field.

In this battle, it was the artillery plan that determined the rate of advance of the infantry. Instead of a uniform rate, the advance was worked out graphically adjusted to the terrain, varying from 100 meters in 10 minutes in difficult places, to the same distance in 3 or 4 minutes over easy terrain. Divisions, or parts of divisions encountered serious obstacles at different times. In general the enemy's strongest positions were close to our I Corps'

**Air photographs of the German positions, showing absence of trenches, wire, battery positions, etc., exist. The enemy infantry avoided ridge lines, streams, edges of woods, and other place on which artillery could observe fire.

BATTLE OF BUZANCY

line of departure, far from it opposite the V Corps, and at medium distances opposite our III Corps. The army heavy artillery fire was concentrated successively against each of these hostile positions.

Except where terrain is absolutely uniform, resistance met during the course of a major battle, will vary both as to time and place. The artillery must meet these conditions. If artillery is assigned to a corps to meet its most urgent needs, arising but at one phase of a battle, that artillery will not be available to maximum advantage during other phases. By concentrating the artillery in a central command, where its fire can be shifted from one front to another to meet changing conditions, the best use of artillery is had. This policy has produced results ever since the concentrated use of artillery fire was initiated by Napoleon, and it produced excellent results on November 1, 1918.

How successful the army plan was in this battle can be determined by a few quotations. General Summerall's V Corps, at 4.05 P. M., November 1, sent the following message:

"V Corps has taken Bois de Barricourt; the heavy artillery barrage was a great success, and took all of the fight out of the Germans; more prisoners being captured than there were Americans that attacked."

In the report of the 23rd Infantry (2nd Division, V Corps) for this battle, it is stated:

"the resistance of the enemy was shattered by the intensity and rapidity of the barrage fire."

The best evidence of the effects of our fire, is from the enemy himself, against whom this fire was directed. The writer has examined the German reports on this battle in the archives at Potsdam, Germany. All agreed that our heavy artillery barrage completely wiped out all resistance. Nobody reported any serious losses from light artillery barrages, fired by our divisions. The latter had their uses in marking the line for the infantry, covering it from view, and increasing morale, but there are no reports that these light barrages seriously affected the defense. On the other hand, no one who experienced our heavy artillery barrage, and lived through it to report, failed to state that it broke the defense. The following is a sample report from the War Diary of the

THE FIELD ARTILLERY JOURNAL

LVIII German Corps, which defended the Bois de Barricourt against our V Corps:

Toward the middle of the day, the severest enemy artillery fire fell on the south edge of the Bois de Barricourt. Our battalions, which at this hour, were in positions of readiness, suffered severe losses, so much so that the enemy were able to enter the wood. The regimental commander personally tried to rally his men. But the great strength of the enemy and the placing by them of three barrages on the north edge of the woods made it no longer possible to hold our line, and it went back to Belval.

The fire directed against the Bois de Barricourt was that of the army artillery 155mm GPFs.* Doubled where necessary, this barrage killed the enemy, opened passages in obstacles in the few places where these existed, and enabled our infantry to advance without severe losses.

As long as corps operate on narrow fronts of from 5 to 10 kilometers, long range artillery can be concentrated under higher commanders to fire over several corps fronts to meet changing requirements of an advance. To adopt any other course means furnishing each corps with every kind of artillery to the maximum amount needed at any one time. Even if the terrain were ever so uniform that divisions could advance all at the same rate, and all arrive opposite critical areas at the same time, it would always be possible to vary rates of advance so that this would not occur.

It may be urged that two could play the same game, and that the enemy could do the same thing; that is, concentrate his artillery fire successively against our divisions. He could; did do it, with great effect, and stopped our advance along the Ourcq in the summer of 1918, in this very manner, and with great loss to us. But in that battle we made no real attempt to silence his artillery, as we did on November 1, and explained above. Only by neutralizing all enemy fire can we hope to overcome major armies. Given sufficient guns and ammunition, we can neutralize hostile artillery and machine guns, for the time needed to assault a designated position.

*Principally fired by the 66th Field Artillery Brigade.

JOHN PELHAM

BY MAJOR JOSEPH MILLS HANSON, F. A., O. R. C.
ILLUSTRATIONS BY CAPT. JOHN W. THOMASON, JR.*

IS THE present biographical practice of lavishing attention only upon the lives of the already famous entirely justifiable? Year after year the careers of certain personages who have impressed themselves on the popular imagination come up for review by commentators who bring to a familiar subject a realignment of known facts, a novel view of characters or events, or perhaps through research, a handful of fresh data.

From the point of view of both readers and writers there is much to be said for such practice. Whatever his special claim to genius, the individual of preeminent accomplishments stands, by right of success, as an ideal and a pattern. Yet both genius and success are comparative, and both are strongly influenced by opportunity. The lives of many to whom fate has given only brief or limited favors have revealed qualities of genius as brilliant as shown in others whose abilities found wider play. Perhaps the achievements of the less famous are more worthy of study since in this imperfect world the average man is obliged to be content with limited opportunities and qualified success.

To no group of individuals do such considerations apply with greater force than to the military profession, which has given more names of gifted men to history than any other, and consigned more to oblivion. In our own army, officers are subject to the restrictive rules of seniority and it has been only in periods of war that the fetters of usage have somewhat relaxed, giving to native ability occasions for asserting itself. 1861-1865 afforded such occasions. Had this not been true, a number of men who loomed large in the public eye during the Civil War and the succeeding generation would have passed into respectable obscurity. Among them it is quite certain that John Pelham would never have left his stirring record of what ardent youth can do when it gives itself to purpose rather than to caprice.

Such was the meteoric career of John Pelham, "Galahad of Confederate Artillerists." Born near Alexandria, Alabama, in

*Capt. Thomason, U. S. Marine Corps, now on duty in China, is the author and illustrator of "Jeb Stuart" (Scribner's).

THE FIELD ARTILLERY JOURNAL

1838, he was the son of a country doctor and the third in a family of six brothers and one sister. The Pelhams descended from an ancient Norman family which lived in England since the Conquest, and its blood first reached America in Peter Pelham, a portrait painter and engraver of reputation who emigrated to Boston in 1726. Perhaps the best portrait of that arch Puritan, Cotton Mather, was painted by this first American Pelham, direct ancestor of the ideal Cavalier—the "boy artillerist" of the Confederacy.

From Peter, the Pelham blood passed through succeeding generations to Virginia, Kentucky, North Carolina and finally to Alabama, when Doctor Atkinson Pelham moved to Calhoun (then Benton) County in 1837. John's grandfather, Charles Pelham, was a major in Washington's army during the Revolution. The origin of his deep sense of duty is easily determined. Doctor Pelham was sixty-four years old at the outbreak of the Civil War. Though profoundly opposed to secession, when Alabama went, he accepted the people's verdict and saw to it that all six of his sons entered the Confederate service. Not until 1880, seventeen years after the death of the most famous of them, did Doctor Pelham himself pass away. Then at the age of eighty-three the end came one day when he was on a sick call.

When in 1856, having secured an appointment as cadet at the United States Military Academy, he set out for New York, the journey took the eighteen-year-old lad for the first time out of his native South. It is doubtful if John Pelham was ever unhappy anywhere, but certainly at West Point his spirits were high. Under the disciplined routine which some found irksome, he flourished contentedly. On occasion his studies gave him concern, especially at examination time for, as in his school days, he did not stand above the average in his classes.

No book worm, though fond of good literature and interested in oratory, young Pelham's enthusiasms ran to the theory and practice of the military art. Oddly enough, however, it does not appear that the Field Artillery particularly attracted him. On the contrary, in one letter to his mother he wrote: "In the forenoon we have parade and artillery drill, one hour and a half. Practical engineering, two hours. In the afternoon we have

JOHN PELHAM

riding I have changed my mind about the dragoons. I am now inclined to prefer the infantry." This in August, 1860, when he had accomplished more than four years of the then five-year course and was looking forward to the selection of an arm in which to serve as a regular officer.

In a remarkable way Pelham possessed those gifts of personality



MAJOR JOHN PELHAM, STUART HORSE ARTILLERY, C. S. A.
(Courtesy of Scribner's, Copyright Owners)

THE FIELD ARTILLERY JOURNAL

and presence that captivate people. He was strikingly handsome in person, of light build, with blue eyes, golden hair and clean-cut boyish features.

In November, 1860, with the triumph of the Republican Party in the presidential election, it became evident that the crisis had been reached and nothing short of secession would satisfy most of the Southern states. In that day and under the political doctrines long current in the South, it was natural for Southern cadets at West Point to stand loyal to their states.

He unburdened himself in a letter to his father, the good doctor: "I had hoped, fondly hoped, to graduate here . . . But Fate seems to have willed it otherwise. I don't see any honorable course other than tendering my resignation when Alabama leaves the Union, and offering my services to her."

We cannot imagine Pelham, after this decision was over, ever again experiencing any pangs of doubt. But he waited until April 22, ten days after Fort Sumter had been fired upon, before departing from West Point, vainly hoping that in some unforeseen way he might be able to graduate. Then, when the possibility arose that Southern cadets might be detained as prisoners of war, he resigned and left. Although in those days sectional feeling ran high at West Point, General Ames has witnessed that "as a rule, political convictions were mutually respected, even to the same extent as were religious principles."

It was no easy matter for the young cadet to make his way home, for along the borders Southerners were being closely scrutinized and often arrested. He finally reached Jeffersonville, Indiana, where he was confronted with the baffling problem of getting across the Ohio to Louisville, Kentucky. For once, perforce, he had to take advantage of his devastating way with women. The story goes that he scraped up an acquaintance with a pretty Northern girl and, making no secret of his identity or intentions, he asked her to get him across the river. At first she implored him to stand by the Union, but he was obdurate. So finally, completely melted by his charm and eloquence, she procured a boat and took him for a pleasure trip which ended on the Kentucky shore. The rest was easy and he was soon greeting his family and friends in Alabama.

JOHN PELHAM

For a few brief weeks he remained at home drilling volunteer troops in the neighboring county seat. Then, late in May, he was commissioned a lieutenant in the army of the new Confederate States and ordered to report to General Joseph E. Johnston, whose forces were gathering in the Shenandoah Valley.

Here, either of his own choice or because officers were needed in that arm, he was assigned to the Field Artillery and was immediately hard at work drilling the raw recruits of Alburtis' Virginia Battery. But this routine service ended abruptly when the Federal Army under General McDowell moved south from Washington and on July 21 fought the battle of Bull Run with the united armies of Generals Beauregard and Johnston. Accompanying the forces of the latter, Lieutenant Pelham here received his baptism of fire in some very severe fighting, acquitting himself with distinction in a subordinate capacity.

Whatever else he may have learned at Bull Run, Pelham undoubtedly learned, in common with everyone else in both armies, that a battle, even one between raw troops, was a very strenuous affair exacting in an amazing degree all the physical, moral and mental stamina of the combatants. The indispensable necessity of training and discipline had made itself manifest to every thoughtful participant and the leaders of neither army were anxious to invite another general engagement until their fighting machines had been thoroughly overhauled and seasoned. In Virginia, eight months passed before the opposing armies again faced one another with the serious intention of giving battle. When they did, both were quite different in form and quality from the fumbling aggregation of volunteers which had clashed at Bull Run.

Among other changes effected in the organization of the Confederate Army was the creation of a cavalry brigade. The Manassas campaign had been carried out with less than 350 mounted troops. But Colonel J. E. B. Stuart, their commander, had proved himself a thoroughly competent cavalry leader and he was now promoted Brigadier General and commissioned to organize a cavalry brigade. Stuart requested artillery to serve therein and was authorized to form a battery of horse artillery. Out of a whole galaxy of promising artillery officers Stuart designated John Pelham for commander of the new battery and procured his promotion to the grade of captain.

THE FIELD ARTILLERY JOURNAL

The cavalry chief had probably observed Pelham's conduct in the Manassas fight, as Jackson certainly did; at all events he had gauged the young artillerist's character and abilities with profound understanding. "Jeb" Stuart unerringly recognized those congenial spirits in whom he could inspire devotion and enthusiasm. The men he picked for his personal staff were usually as young as himself or younger—Stuart was only twenty-nine in 1862. Unique personalities were in that company, from the serious-minded Chief of Staff, Major H. B. McClellan, and the gigantic, roaring, tender-hearted Major Heros von Borcke, Prussian soldier of fortune, to the merry-andrew, Joseph Sweeney, who has a niche in history because he was Stuart's banjo player. Consorting with them were always some of those wonderfully capable field and line officers whom Stuart drew about him; W. H. F. Lee and Fitzhugh Lee, among others; Tom Rosser and Wade Hampton and Beverly Robertson. But among them all the young brigadier probably loved most deeply his still younger chief of artillery, John Pelham. Of them it is recorded: "Two more congenial companions did not exist in the Army of Northern Virginia and in their military association they were as hand and glove. Both were born soldiers and on the field of battle they were frequently together, their minds working in perfect accord. In camp they were close friends, bound together by the strong ties of an intense, loving comradeship. So highly did Stuart regard the memory of the beloved leader of his artillery that in October, 1863, he gave the name of Virginia Pelham to his new born daughter."

In organizing his battery, the "Stuart Horse Artillery," Pelham drew a number of the original 141 men from his own state of Alabama. Others came from Virginia and Maryland and not a few were foreign born, Englishmen, Frenchmen and Germans. Major von Borcke, a close friend of Pelham's says of them: "Many of these men had not brought to the standard under which they served an immaculate reputation, but they distinguished themselves on every field of battle and established such an enviable character for daring and good conduct that the body was soon regarded as a *corps d'elite* by the whole army . . . I have often seen these men serving their pieces in the hottest of the fight,

JOHN PELHAM

laughing, singing and joking each other, utterly regardless of the destruction which cannon-shot and musket-ball were making in their ranks." Many reminiscences, too, survive of Pelham's pet detachment, composed of French-speaking volunteers from Mobile who wildly chanted the Marseillaise when a particularly hot fight reached the last extremity of desperation.



MAJOR GENERAL J. E. H. STUART, C. S. A.
Comdg. Cav. Corps, Army of North Virginia
(Courtesy of Scribner's, Copyright Owners)

The whole winter of 1861-62 was vouchsafed to Pelham for whipping his new command into shape and he profited to the full by his opportunities. At length, in March, General McClellan, the creator of the Army of the Potomac, moved by water to Fortress Monroe, some eighty miles below Richmond, with his splendidly organized and equipped army of nearly 100,000 men, drawing Johnston after him with little more than half his numbers, for the protection of the Confederate capital.

After an all-morning struggle in pouring rain with stubborn

THE FIELD ARTILLERY JOURNAL

Longstreet and the squadrons of Stuart on the roads into Williamsburg, Hooker's Federal division pressed forward to the edge of the woods in front of Fort Magruder, the principal Confederate field work. General Stuart himself was at this point, eager to advance his cavalry, when at about 2:00 p. m. Pelham arrived on the field with two 12-pounder howitzers and a 12-pound Blakely rifle. His chief welcomed him joyfully and instructed him to stop in the edge of a piece of timber until the cavalry passed ahead. But in a moment a blast of rifle fire from Federal infantry concealed in the woods near the Yorktown road slapped the horsemen and sent them scampering. For Pelham, it was the cue. An order was sent to him to go into action, but as Stuart later proudly declared in his report: "before it could be given, Pelham's battery was speaking to the enemy in thunder tones of defiance, its maiden effort on the field, thus fulfilling its function of unexpected arrival with instantaneous execution, and sustaining in gallant style the fortunes of the day, keeping up a destructive fire upon the enemy until our infantry, having reformed, rushed onward, masking the pieces."

After the furious seven days' battles before Richmond, in which the cavalry brigade repeatedly distinguished itself, Stuart was raised to the grade of Major General and his mounted contingent increased to fourteen regiments, divided among three brigades, while Pelham received a richly deserved promotion to major, with two horse batteries under him. Stuart, "the yellow jacket," who was "no sooner brushed off than he lit back," thus became endowed with trebled strength, while Pelham held in his own grip a greater volume of fire power, to be used like a blow torch in blasting a way forward against resistance.

Together, Pelham and his black-plumed, merry-hearted chief rode northward in August around Pope's flank, to the exuberant looting of the Union supply base at Manassas.

They fought with Jackson by the old railroad grade near Groveton through three thunderous days of battle which finally sent Pope staggering back into the defenses of Washington. To every part of the field Pelham galloped with his guns at one time or another to engage in valorous and important action but never with more characteristic vigor than about dusk of the first day

JOHN PELHAM

when using two three-inch rifles, he attacked King's massed division on the Warrenton Turnpike beyond Jackson's right flank. With double charges of canister at a range of two hundred yards he fought until after dark, disobeying an order to fall back "owing," he patiently explained, "to the pole of one of my guns being broken," an



MAJOR HEROS VON BORCKE
Adjutant and Inspector, Cavalry Corps, A. N. Va.
(Courtesy of Scribner's, Copyright Owners)

excuse which so soothed his conscience that he "continued firing until the enemy was driven back."

Marching north into Maryland in the September campaign which ended at Sharpsburg, on the field of that "artillery hell" Pelham, backed by Stuart's squadrons, handled a grouping of horse and field batteries on the extreme Confederate left with such surpassing skill that they undoubtedly saved Jackson's corps from defeat and caused "Stonewall" to declare, "With a Pelham on each flank, I believe I could whip the world!" In a head-on collision between the main armies, it was such flank positions that

THE FIELD ARTILLERY JOURNAL

both Pelham and Stuart coveted, for they loved better than anything else to be the lash on the end of the thin, flexible whip of the Confederate battle line.

From the ravaged field of Antietam the cavalry retired with the army across the Potomac, only to recross it again immediately for a demonstration against McClellan's right rear at Hagerstown.

Early in October Stuart again crossed the Potomac, more formidably, for his memorable raid on Chambersburg. Then it was 1,800 hard-bitten rebel troopers and Pelham's four rumbling guns trotted and walked almost day and night through startled Pennsylvania towns and farming regions, gathering 1,200 sleek horses, jocularly paid for by receipts drawn on Washington. Regiments, brigades and divisions of Federal troops, marching and counter-marching in breathless haste across Maryland, searched vainly for the elusive invaders; and on one golden afternoon, eighty miles out of Chambersburg, Stuart's dog-tired men and their herd of captured animals splashed home across the Potomac while Pelham's guns hurled canister into the faces of the baffled blue columns, closing down, too late, from both flanks and the rear.

Then for a few weeks, following months of march and battle, there came rest among the autumn splendors of the Shenandoah valley,—for Pelham probably the most pleasant weeks of the war. Stuart's headquarters were hard by the stately country mansion of Colonel Dandridge, "The Bower," and there were many "Ladies' Days" in camp, dancing and merrymaking while Pelham and his friend Von Borcke enjoyed themselves hugely at times, bouncing about the country in an old army wagon, captured from the enemy.

But before the end of October the happy days of leisure were cut short as the Army of the Potomac began advancing slowly southward toward the Rappahannock, paralleled, step for step, by the watchful columns of the Army of Northern Virginia. For the infantry, it was a period of hiking with no fighting far into November. But for the cavalry, scouting and guarding, it was a long nightmare of sudden encounters and violent combats, terminating at length when the rival armies sat down along the

JOHN PELHAM

Rappahannock, by Fredericksburg. Here, December 13th, Burnside marched his splendid army across the river to be slashed to ribbon, before the flaming slopes of Marye's Heights and Lee's Hill, while John Pelham, down by Hamilton's Crossing fought his greatest battle—and his last.

Winter now closed over the sere hills of the Rappahannock and for a few months the armies settled into a state of semi-truce inevitable in the season. Somehow the shivering, warm-blooded Southerners whiled away the cold winter, with religious revivals and snowball fights and amateur theatricals and, for a favored few, social activities. Part of the cavalry division camped near Culpeper Court House where Pelham, with Von Borcke and others, sometimes including Stuart, passed parts of the winter. In Culpeper the young Alabamian met Miss Bessie Shackelford, the attractive daughter of Judge Shackelford of that place, to whom he immediately became devoted.

But if this was the dawn of a life's romance, it was doomed to an early and tragic ending. On March 17, 1863, Averell's Federal cavalry division broke across the Rapidan at Kelly's Ford intent on crushing Fitz Lee's brigade in its camps at Culpeper. Lee met them more than half way and was accompanied into battle by Stuart and Pelham, who, being in the neighborhood by chance, rode without command. Local tradition says that Pelham waved goodbye to Bessie Shackelford, standing on the porch of her father's house, as they galloped away. A few hours later, radiant as a boy with excitement, he galloped into a charge with the 3rd Virginia Cavalry, waving his hat and shouting encouragement to the rear files. A shell burst near him and a long splinter of steel tore into the base of his skull. Though he was borne back to Culpeper and into the Shackelford house, he never regained consciousness. His sweetheart helped to care for him and was holding his hands when, about one o'clock the following morning, he died. Shortly after he had drawn his last breath, General Stuart, just returned from the battlefield, entered the room, his black-plumed hat in hand. With great tears streaming down his bearded cheeks, he gazed long and silently at the lifeless form and pallid face. Bending down, he pressed a tender kiss upon the noble brow of his dead comrade-in-arms, and shaking with

THE FIELD ARTILLERY JOURNAL

profound grief and sobbing he departed, uttering as he went the word, "Farewell!"

In the course of his three score battles Pelham, at different times, commanded Field Artillery under about every condition possible with the weapons of the day, and in numbers from one piece to masses of thirty or more guns. He pitted his light howitzers and 3-inch rifles unhesitatingly against every type of opposing ordnance up to 11-inch naval guns mounted on large gunboats, and the fact that he never lost a gun in action provides a measure of his uniform success. Such success was his because to a sound appreciation of the powers and limitations of his arm he added absolute fearlessness in the execution of a mission; and to fearlessness he added cold judgment which enabled him instantly to appraise the essential elements of a situation and to appropriate from them all the advantages possible for his own forces. His eye was especially acute for positions affording minimum exposure of his own guns to enemy fire and maximum opportunities for their own. In this particular, his intelligence and adroitness was strikingly illustrated at Sharpsburg.

In this battle Lee aligned his army along the ridge forming the watershed between the Potomac river and Antietam creek. Jackson's corps held the left, but most of his troops were still on the march from Harper's Ferry, so he lacked men to occupy his entire sector in strength and an interval of nearly a mile existed between his open left flank and the Potomac. Stuart, with Fitz Lee's cavalry brigade, occupied this dangerous gap, while for its further protection Jackson placed about fifteen guns under the orders of Pelham, who posted them along a high lateral ridge reaching toward the river, on the left rear of Jackson's line.

At daybreak of September 17th, Hooker's Corps heavily assaulted Jackson's open flank, which might easily have been turned had not Pelham made such ostentatious use of his group of artillery as to deceive the Federal command into believing that the Confederate line was held in force all the way to the Potomac. The Federal assault was supported by an array of guns far exceeding those of their opponents, both in number and in caliber and range of pieces. The batteries of Hunt's artillery reserve which were posted beyond Antietam creek, so effectively swept

JOHN PELHAM

the whole field that the Confederate divisional batteries could support their infantry at critical moments only by disregarding the hostile fire and taking heavy losses. But Pelham had disposed his guns out of reach of this fire and raking and lashing Hooker's flank, decisively aided Jackson's rapidly diminishing brigades in repulsing their assailants.

At about 7:30 a. m. when Mansfield's 12th Corps advanced through Hooker's shattered ranks to renew the attack, Pelham moved thirteen guns forward to a position so well chosen that they could sweep the entire Federal front for three-quarters of a mile, from the Nicodemus House to the Dunkard Church, though at the same time the Confederate batteries themselves still enjoyed complete immunity from Hunt's fire. Thereafter every hostile effort was defeated, and the battle in this quarter came to a standstill by 10:30 a. m. "With ready perception he (Pelham) had grasped the key-point of Jackson's whole line. No one movement on either side bore a greater influence upon the final issue of the battle than did the advancement of Pelham's group."

At Fredericksburg, in December, 1862, Pelham again protected a flank of the main army in an aggressive defensive with about thirty guns assigned to him by Stonewall Jackson, and did it so well that Jackson's chief of artillery officially reported that these guns "were admirably managed and bravely fought, and perfectly accomplished their mission," which was that of repulsing all the enemy attacks in this quarter. But Pelham's action at Fredericksburg which most redounded to his glory came earlier in the day, being in fact, the opening act of this bloody battle in which Burnside's army of 100,000 men was roundly defeated when it attacked Lee's 70,000 in strong defensive positions, reaching from Mary's Heights to Hamilton's Crossing. Jackson held the Confederate right while Stuart and Pelham guarded his flank by occupying a line at right angles to it from Hamilton's Crossing across the valley to the Rappahannock. Pelham sited his batteries well forward with the front line of dismounted cavalry, east of Hamilton's Crossing. Early on December 13th, under cover of a heavy morning fog, the three divisions of Reynolds' 1st Corps, constituting the left on the Federal Army, got into battle formation in the river valley for the purpose of assaulting

THE FIELD ARTILLERY JOURNAL

Jackson's front. The attack troops were accompanied by an ample number of divisional batteries and were covered by overhead fire from a large proportion of the 147 guns of Hunt's army artillery posted along the crest of Stafford Heights, beyond the Rappahannock. As the fog lifted, about 9:00 o'clock, Pelham saw before him the thick lines of battle of Meade's division, with Gibbon's, similarly formed, on his right, and Doubleday's in reserve, advancing across the valley upon Jackson's position. Instantly comprehending the opportunity presented by Meade's exposed flank, the horse artillery chief took two 12-pounder Napoleon guns and galloped forward under cover of ditches and hedges to a position in the tangled undergrowth of a ravine less than 400 yards from the Federal left and well upon its rear.

From this point he opened a rapid fire on the startled blue infantry which at once began to break and seek cover. In a few moments six batteries on the immediate field and many heavy pieces on Stafford Heights were raining their shots upon Pelham's two guns. One of the latter was quickly disabled, but the other, manned by part of the "French Detachment," continued to fire with all possible rapidity consistent with changing position often in the thickets so that the enemy could not locate it. Occasionally, when the storm of projectiles fell too thickly about it, the cannoneers would lie down for a moment, but throughout the engagement their young commander sat on his horse, cheerful and unexcited. Out in front, Meade's 4,500 infantrymen remained paralyzed and Doubleday's reserve division moved over and faced to the left to protect the flank. General Stuart, keenly watching the combat from a distance, twice ordered his subordinate to retire, but Pelham replied to the messenger, "Tell the general I can hold my ground" and in truth so skilfully was his gun placed that he was suffering hardly any losses. At length Stuart sent him the peremptory command, "Get back from destruction, you infernal, gallant fool, John Pelham!" At this, or more probably because he had exhausted his ammunition, he limbered up and retired, after having exerted, with his one smooth-bore, perhaps a more potent influence upon the course of a great battle than has ever been exerted elsewhere by a single gun. One of the most distinguished of American military critics has said: "Stuart's

JOHN PELHAM

(that is, Pelham's) guns not only checked Meade's charge for an hour, but his threatening position kept Doubleday's division out of the main fight at that end of the line." Thus Pelham opened the battle of Fredericksburg by immobilizing for some time about 10,000 good troops and when later in the day Meade actually penetrated Jackson's flank to its line of supports, he was unable to hold his gains because Doubleday's division was no longer at hand to reinforce him.

It was perhaps when Pelham was fighting in a close corner with only his own original battery under his hand that he rose to his greatest heights. In the series of fierce cavalry combats along the base of the Blue Ridge in the fall of '62, it was usually as battery commander that Pelham fought. At Fleetwood, on November 2nd, he opened suddenly from a concealed position on some bodies of enemy cavalry which fled in confusion. Thereupon Pelham led his horse artillery in pursuit and, charging among the panic-stricken men, took prisoners, horses and standard, without losing a gunner or horse of his own. Day after day he fought back the pressing brigades of Pleasonton, dashing with his guns from place to place wherever the situation became most critical. "His dispositions were always such in retiring" declared Stuart, "as to render it impossible for the enemy to press us without being severely punished for his temerity." A soldier of a supporting organization who saw him in one of these combats has left this description:

"Pelham was mounted on a black horse, long and rakish, with keen legs, beautiful neck and fiery eyes—every now and then he would put out one foot pawing the earth, then the other. Pelham was dressed in high top boots, a close-fitting gray overcoat with bright brass buttons, and buckskin gauntlets; a small sword hung by his side. His cheeks were as rosy as a maiden's, with every appearance of a boy about sixteen years old. Shells were bursting, round shot whizzing, shrapnel ringing, his men falling about him killed and wounded. He leaped from his horse, aimed a gun and fought with his men. Sometimes, when the Federal batteries would fire, I would throw my face to the ground, expecting when I looked up, to see Major Pelham shot into fragments."

At Markham, in front of Manassas Gap, Pelham, with dashing

THE FIELD ARTILLERY JOURNAL

Rosser, fought Averell on November 4th to hold him back from sight of Jackson's columns marching beyond the Blue Ridge. During the confused cavalry battle Pelham's horse battery of four guns, stationed on a hill, got into one of those tight corners in which its qualities were most admirably revealed. The rear guard had just been driven in by a heavy force of Union cavalry, Pelham had repulsed the attack with double charges of canister and was awaiting another rush, when suddenly a loud cheer rolled up directly in rear of the guns and a Federal regiment, which had circled round through a clump of woods charged the battery.

"Action rear!" Pelham shouted, darting to his guns; and two pieces were whirled about, and opened upon the charging column. At the same moment the line of sharpshooters in front charged at a run, right up to the muzzles of the guns. We were surrounded, and from that moment the fight became desperate. Pelham was everywhere, cheering on the men, with his drawn saber flashing in the last rays of sunlight—and countenance all ablaze with the fire of battle, his appearance was grand. The boy-artillerist was in his proper sphere—fighting his guns to the very muzzle, determined to die where he stood, or drive the enemy back.

"Suddenly above the thunder of the guns resounded the loud, Marseillaise sung with a ferocious roar by the men of the "Napoleon detachment" as they worked the guns, driving back the charge upon the rear. There was something in the voices of these men inexpressibly defiant and determined—the martial chorus rang out splendid and triumphant; it seemed to say 'Come! We will die here, where we stand!'"

"Above them, on his horse, towered the form of Pelham, and his voice made the men grow wild. Never have I seen such a fight. It was an episode from the war of the Titans—the conflict of the giants and the thunderbolts.

"The force in front was swept back, decimated, and completely routed. As they gave way, Gordon charged and drove them with the saber. At the same moment the force in rear was seen to recoil.

"Pelham bade me farewell with a laugh. 'Tell General Jackson

JOHN PELHAM

that we are all right,' he said, 'and come and see me soon.' With a pressure of the hand I parted with the brave boy, and he rode on.

"As the horse artillery took up the line of march, I heard the cannoneers again strike up the lilting chorus:

Ain't you—ain't you—happy?

Anchor by-and-by!

Stand the storm, it won't be long!

Anchor by-and-by!"

That was the very spirit of John Pelham. Too young to have excited envy, too modest to have learned vanity, too successful to have suffered the stings of criticism, he lived briefly, intensely, joyously. He never tasted either pain or defeat, and when death reached him it was with a swift and merciful finger, in one of those exalted moments of victory he knew so well.

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TYPE PROBLEMS

Time Bracket Lateral Problem

(Small T)

Target description: Infantry in a shallow trench 30 mils long firing on our troops. *Mission:* Neutralize. *Matériel:* French 75mm guns, Model 1897. *Visibility:* Excellent. *Wind direction:* Right to left. *Initial data obtained:* Deflection shift. BC telescope. *Range:* Range finder. BC on the left.

T=170, R=3400, r=3000.

S=17/3.4=5.

r/R=3/3.4=.9.

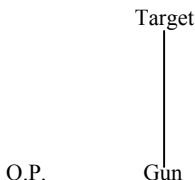
Initial commands:

Base Deflection Right 140.

Site 0.

Corrector 40.

No. 2 one round.



Commands	Range	Deviations as viewed from OP	Sensings Rn. Def.	Remarks
	3400	23 —x	G ?	23×.9=20.7. Initial corrector based on previous firing. Under these conditions it is usually better not to change corrector on the first round.
	—30—			
L 30	3400	10 0— ————	A +	A better command would have been L 20 to put the burst in line with its part of the target. 10×9=R 9 to get on line. 5×2=L 10 to stay on line when making 200 yard range change.
Btry Left	3200	x 0 x x	G - G - A ? G -	- BC known at this point that 3300 is going to be one limit of bracket and makes his sheaf fit the target.
R 5 On No. 2 Op 4 Up 5	3300	0 x 0 0	A ? A + G + A ?	
L 3 Btry one round Zone 3300- 3200				+ C. F. end of problems.

SUMMARY

Error in initial data: Deflection 28 mils; range 150 yards or 4.6%. Time from identification of target to announcement of first range: 1:22 sec. (Fair) Average sensings and commands 9½ seconds (excellent). Total time of problem, 4 minutes, 48 seconds (excellent). Ammunition expended, 10 rounds. Classification: Satisfactory. General comments: With an accurate range finder it is better to make the sheaf fit the target in the initial commands rather than wait until the range bracket has been established.

TYPE PROBLEMS

Due to the nature of the target the error in shifting on the second round causes no delay because it was sensed on another part of the target, but with a narrower target it is essential that deflection shifts be accurate of many doubtful sensings will result.

Time Bracket Lateral Problem (Small T)

Target Description: Machine guns in vicinity of a small rock pile. *Mission:* Neutralize. *Matériel:* French 75mm gun, Model 1897. *Visibility:* Good. *Wind Direction:* Left to right. *Initial data obtained:* Deflection, shift, BC telescope. *Range:* Estimated. BC on the left.

T=150, R=3000, r=3000.

r/R=1, S=15/3=5.

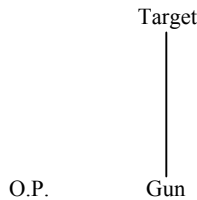
Initial commands:

Base deflection, Left 240.

Site, 5.

Corrector, 35.

Number 2 one round.



Commands	Range	Deviations as viewed from OP	Sensings Rn.	Def.	Remarks
	3000	30 ———0	A ?		30×1=30
L 30 D 5	3000	Δ Δ x	G -	-	5×4=20
R 20 Up 3	3400	Δ ———x	G -		L 5 to get on line S changes to 4 (20—5=15 15/4=4) 4×4=R 16+L 5=R
R 10	3800	0 5 Δ	A +	+	11 BC used R 10
L 8 Btry Rt	3600	x x Δ 0 0	A ? G + A - G ?	} Correct	
Up 3 Btry 1 round Zone 3700- 3500					Sheaft should have been opened 4 mils when starting fire for effect.

SUMMARY

Error in initial data: Deflection, 8 mils. Range: 600 yards or 17%. Time from identification of target to announcement of first range, 45 seconds (good). Average sensings and commands, 17 seconds (fair). Total time of problem, 5 minutes, 30 seconds (good). Ammunition expended, 11 rounds. Classification: Satisfactory.

General comments: The initial estimate of range was poor especially as previous firing near the same target had established the range. The deflection was handled exceptionally well. The most serious error was not opening the sheaf to cover 100 yards when passing into effect.

THE FIELD ARTILLERY JOURNAL

Percussion Bracket Lateral Problem (Small T)

(See Par. 87, T. R. 430-85)

Target Description: Enemy infantry in the vicinity of a small clump of bushes. *Mission:* To neutralize. *Matériel:* French 75mm Guns, Model 1897. *Visibility:* Good. *Initial Data Obtained:* Deflection with Prismatic Compass; *Range:* Estimated.

T=200, R=3000, r=3200.

Initial commands:

Compass 780.

Site 0. $r/R=1.1.$

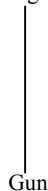
Shell Mark 1. $S=20/3=7.$

Fuze Long.

No. 3.

1 Rd.

Target



Gun

O.P.

Commands	Range	Deviations as Viewed from OP	Sensings Rn.	Def.	Remarks
	3000	—55— x	Doubtful	Doubtful	
R 60	3000	Δ Δ x	Short	Short	
L 30	3400	—16— x	Doubtful	Doubtful	Could have been sensed over on terrain.
R 15	3400	—4— x	Over	Doubtful	Should have been sensed over for deflection.
R 10 BR	3200	—15— —8— x x Δ x x	Doubtful Over Over Doubtful	Over	The officer sensed the salvo as over for deflection. He based his sensing on No. 3. The salvo was actually doubtful for deflection.
On No. 2 Open 3 R 5, Btry 1 Rd, Zone 3000-3200					Improper sequence. On No. 4 Open 3 would accomplish what he wanted. Should have opened 4. Fire for effect properly started at that limit of the bracket at which only one range sensing was obtained.

SUMMARY

Error in initial data: Deflection 55 mils. Time from identification of target to announcement of first range 1.00 minute. Average sensing and command 12.8 seconds. Total time for problem 3 minutes, 40 seconds. Ammunition expended, 8 rounds. Classification: Satisfactory.

General Comments: Important to get fire on this type target promptly, which this officer accomplished. His failure to take a good terrain sensing, making an erroneous deflection sensing, and not opening quite enough are the main faults of the adjustment.

TYPE PROBLEMS

Percussion Bracket Lateral Problem (Small T)

(See Par. 87, T. R. 430-85)

Target Description: Battery in position. *Mission:* Neutralize. *Matériel:* French 75mm Guns, Model 1897. *Visibility:* Good. *Initial Data Obtained:* Deflection obtained from previous firing; Range estimated. BC on the right.

T=225, R=4200, r=3800.

Width of target, 17 mils.

Initial Commands:

Compass 640.

Site 0.

Shell Mark 1.

Fuze Long.

No. 2,
1 Rd.

$$\frac{r}{R} = 9.$$

$$S = \frac{22}{4.2} = 5.$$

Target

Gun

Commands	Range	Deviations as viewed from the OP	Rn.	Sensings	Def.	Remarks
	4200	—25— x ΔΔΔΔ	Doubtful	Over	25×.9=22	
R 30	4200	—10— ΔΔΔΔ x	Over	Over		Rt 20 a better command. The terrain did not warrant the over deflection sensing. It was doubtful.
R 15	3800	Δ Δ Δ Δ	Short x	Doubtful		Deflection was obviously short on No. 1 Section of the Target. Firing No. 2 gun deflection sensing should have been taken. With an S. of 5, R 10 would have been better.
L 10	4000	Not fired x x x x				
BR	4000	Δ Δ Δ Δ	Over Over Over Over	Over		No deflection sensing should have been taken since none could be had with any gun on its part of target.
L 5	3900	Δ Δ Δ Δ x x x x	Short Short Short Doubtful	Short		Same criticism about deflection sensing. The line shots were confusing the officer. The L 5 was uncalled for.

THE FIELD ARTILLERY JOURNAL

R 5 On No. 2
Open 3 Btry 1
Rd, Zone
3900-4000

On No. 4 open 3 would
accomplish what he
wanted. According to his
sensing the shift should
have been L 5 instead of
R 5.

SUMMARY

Error in initial data: Deflection 35 mils. Time from identification of target to announcement of first range, 32 seconds. Average sensing and command, 18 seconds. Total time for problem, 3 minutes, 31 seconds. Ammunition expended, 11 rounds. Classification: Satisfactory.

General Comments: This was the first lateral problem fired by the officer firing, and the deflection confused him. Failure to sense each gun for deflection on its own part of the target led him to make erroneous deflection sensings. He knew something was wrong about them, however, and in every case shifted in the right direction. In spite of his confusion which slowed down the time for average sensing and command he secured a quick and effective adjustment.

PREPARATION OF TEXTS AT FIELD ARTILLERY SCHOOL

Texts for Field Artillery instruction, both for resident instruction at the Field Artillery School and for general use throughout the Field Artillery, are being printed at Fort Sill. These texts and the special texts for the Extension Courses, as revised, will be merged in a single series which will include all texts of whatever nature prepared by the Field Artillery School. The designation will be Field Artillery Book No. The books will be 6" × 9", the same size as the Field Artillery special texts of the Army Extension Courses. The special texts prepared last year for use in the Extension Courses are being used also for resident instruction with very satisfactory results. Such use serves an incidental purpose of developing faults and deficiencies which might not come to light otherwise.

The following Field Artillery books are now being printed:

- Field Artillery Book 101—Ammunition. It replaces chapter III, Book IV, Field Artillery Notes.
- Field Artillery Book 123—Marches, Shelter and Field Equipment (Motorized). Replaces Special Text 91, Army Extension Courses.
- Field Artillery Book 142—Marches, Shelter and Field Equipment (Horse-drawn). Replaces Special Text 90, Army Extension Courses.
- Field Artillery Book 162—The Firing Battery. Replaces Training Regulations 430-70.

THE EFFECTS OF ARTILLERY FIRE

[General Faugeron, of the French Army, last year delivered the following lecture to the officers of the Nancy garrison. It cannot fail to interest all Field Artillerymen who will find in it valuable food for thought on the effects and method of employment of their arm. This translation is published with the kind permission of the *Revue d'Artillerie* and the author. The first part of this lecture appeared in the last issue of *THE FIELD ARTILLERY JOURNAL*. This is the second and concluding part.]

NOW let us pass to fire on personnel.

Is artillery fire capable of destroying completely, through its own effect, a force of some importance? To this question, I shall not hesitate to answer: Yes. Proof is furnished in the examples of the German battalions at Cornillet, and the one at Mont Spin.

But nothing must be exaggerated.

A destruction such as that of the battalions at Cornillet is the rarest thing. It is perhaps unique in the history of the war, and as to the battalion at Mont Spin, reservations must be taken with respect to the absolute degree of its destruction.

Taking everything into consideration in both cases, in order to obtain the results achieved an extraordinary group of exceptional circumstances was necessary.

At Cornillet, in the first place, it was the unbelievably lucky heavy caliber shell which crashed through one of the ventilating shafts forming the only vulnerable points of a shelter of such strength that the German command did not fear to assemble there two reserve battalions.

Then, there was that unbelievably lucky chance that the ventilating shaft was so located that not only did the explosion of the shell penetrating it cause a part of the vault to crash, but a mass of earth also blocked the entrance of the tunnel. The occupants of the shelter were imprisoned. Without being able to make a single move for their safety or defense, they saw the initial hole gradually widened by the continued bombardment, and finally found themselves buried under the very masses of earth which they had counted on for their protection.

At Mont Spin the enemy had faulty dispositions during the approach march of their battalion which was hastily engaged and on our side there was an entire series of excellent observation posts from which no movement could escape undetected. Then

THE FIELD ARTILLERY JOURNAL

instantly a formidable concentration was let loose. Under this sudden and unexpected deluge of shells of all calibers, the command was surprised and the men scattered. Very probably the men threw themselves right and left into the shelters which were along the fire and communication trenches where they happened to be. Possibly they might have been gathered together that night or the next day, but, for the time being, the gap had been made, the battalion had been virtually destroyed and except for a few bodies left on the ground, no trace of it was found by the battalion which came to replace it.

But, leaving aside these two absolutely accidental cases, if we examine closely the ordinary course of all our attacks, we shall agree to the fact that the most intense and best adjusted bombardments never resulted in the destruction of the personnel facing us.

Almost always the first assault waves following closely on our final rounds of artillery fire reached trenches empty of defenders. But behind them, from dug-outs which had been passed unnoticed, which had been believed destroyed, but whose entrances only had been obstructed, sprang machine gunners, grenade riflemen, hand grenade throwers, all fully armed and fit for combat. It was necessary to resort to special detachments which, marching with the first wave, leaped into the captured trenches instead of passing beyond them, ran to the entrances of the dug-outs and attacked the enemy with grenades, destroying him or forcing him to surrender.

With bombardments heavier even than ours, especially in shell of large caliber, the Germans were unsuccessful in obtaining more decisive results.

When, on the afternoon of February 21, 1916, after ten hours of hellish bombardment, the German infantry approached the Bois de Caures, they were fully convinced that they would encounter no resistance. They were not long in realizing their deception, and soon their losses were so heavy that they had to fall back. The bombardment was then renewed and lasted the whole night and the following morning. In spite of this, several hours of further desperate combat were required to capture the French positions. On the evening of the 22nd, only 117 men of the original 1,200 answered the roll call.

THE EFFECTS OF ARTILLERY FIRE

If we consider that before any preparation for the attack the proportion of the opposing forces was eight Germans to one Frenchman, we are forced to admit that the defense would have been incapable of showing the vigor which it displayed if the percentage of its losses due solely to German artillery fire had been considerable. These losses therefore only form a small portion of the total losses of more than 90% suffered by the Driant troops on February 21 and 22, 1916.

The engagement of the 3rd Battalion of the 146th at Douaumont gives us more definite information on the effects of artillery fire. Out of a total strength of about 900 men, the losses on the evening of February 26th, amounted to 26 killed, 92 wounded and 5 missing, a total of 123 losses, or 13.75% for a day which included eight hours of terrific bombardment, a bayonet fight and another two-hour bombardment less intense than the first.

On the 27th, another bombardment lasted the entire day. Losses, 14 men; less than 2%.

On the 28th, a bombardment lasting about four hours, followed by an attack, instantly stopped by a 75mm barrage. Losses, 39 men, or 4%.

We see that we are far from the percentages determined in peace times in our fires for effect carried out at our firing schools.

Why? Because the silhouettes used for targets receive stoically and immovably the rain of shells; but it is entirely different with combatants on the field of battle.

"We must learn," said Ardant des Picq, "to beware of mathematics and material dynamics as applied to things in battle; to beware to the illusions of target ranges and maneuver grounds where experiments are made with calm, composed, unfatigued, attentive and obedient soldiers, in a word, with men who are intelligent and docile instruments as contrasted with the nervous, impressionable, emotional, troubled, distracted, overexcited, mobile beings, escaping from their own self-control, who, from the leader down to the private go to make up the combatants (except for the strong—but they are few)."

If present formations had the rigidity of former days, if the

THE FIELD ARTILLERY JOURNAL

attack were made with closed ranks and in cadenced step, like that of the Cissey Division on the Plateau of Saint Privat, assuredly there would now be no need of taking it under fire four times as was done on August 18, 1870, by the artillery of Prince Hohenlohe, in order to halt and break its attack. Our peace time firing results would regain their full value and a single concentration would suffice to annihilate any troops insane enough to attempt to march erect against the rafales of our 75s.

But means of defense and protection always have kept pace with those of the attack, and, in order to avoid annihilation, infantry tactics have given to the individual an ability to maneuver with which you are familiar. Hence, it becomes easy for a force to escape, more or less completely, the effects of our fire. The mere fact of a man lying prone decreases materially his vulnerability. A small mound of earth protects him from fragments; a ditch or shell hole gives him valuable shelter, and beneath a layer of logs, covered with earth, he has only heavy artillery to fear.

For this reason, the true effectiveness of artillery fire on a body of troops differs greatly from its possible theoretical effectiveness. Under these conditions the real method of action of artillery against personnel is not destruction, but the threat of destruction, which results in neutralization.

This does not date from today, and we find the same idea expressed in the writings of Voltaire, drawn probably from remarks made by his illustrious host Frederick the Great in the course of their conversations at Potsdam: "It is not so much the number of dead that wins battles as the fear put into the living."

What I shall translate for you, Gentlemen, in a form which perhaps may appear paradoxical, is nevertheless the exact expression of a truth which, in my opinion, the artilleryman should take as a guide in planning and organizing every fire which he must execute in combat: "During the course of battle,"—I emphasize these words—"during the course of battle," the useful effect of artillery fire on personnel is not so much the effect produced on those hit, but the effect produced on those who are not.

This leads us to avoid dispersing our fire over the whole enemy front, which certainly would be the way to hit the greatest number of enemy personnel, but rather to concentrate on relatively narrow

THE EFFECTS OF ARTILLERY FIRE

fronts where the total losses will perhaps be less, but where the density of fire will be such that those who are not hit will neither be able to march nor to fight.

Evidently, some results are obtained when there are dead and wounded, but experience shows the impossibility, with rare exceptions, of killing or wounding everyone. Therefore, during a battle, what does it matter if the enemy effective strength is reduced 50 or 60 per cent, if the survivors are capable of preventing us from doing what we want and if they still have the means and will to do it?

Numbers alone are not everything, especially in our days with the power of modern weapons. Look at Driant's chasseurs!

On the other hand, what does it matter if no one is hit, provided no one has the ability or will to fight? Let us also note that against personnel, the best executed fires are not always the most destructive.

For example: On August 27, 1914, south of Frenois, near Sedan, German riflemen had debouched from the woods, marching and maneuvering to deploy to the right. They were spotted from the observation post of a battalion of 75's in position at a range of 5,000 meters. The battalion commander registered his terrain and ordered fire opened by one of his batteries which immediately did so with fire for effect using shrapnel. The first salvo struck squarely in the midst of the objective, the bursts were at a good height, men were seen falling. But there was also seen a man, no doubt their officer, who raised his arm vertically and signaled: Forward, and under the salvos that continued to fall, took up the double time in the indicated direction. All his platoon followed him and disappeared in a fold of ground, while the ensuing salvos fell harmlessly. Ammunition was too scarce in those days to admit of pursuing an invisible enemy who had certainly changed his direction of march in the ravine where he had sought cover.

Some moments later, at the same place, more Germans appeared. Undoubtedly they were the support of the others.

Taking advantage of what he had seen, the battalion commander ordered the range reduced by 200 meters. The salvos struck plainly short as could be seen by the dust raised, and

THE FIELD ARTILLERY JOURNAL

no one fell; but as if by common agreement, in complete unison, the enemy unit did an about and rushed back full speed into the woods.

Alas! Again (and oh! How he wished he had!) the battalion commander did not have enough ammunition in his caissons to pursue the fugitives.

Gentlemen, which was the better of those two shoots? I leave you to judge and shall not insist on a reply.

Should we say that losses sustained by the enemy are merely a side issue of the shoot and a factor to be disregarded? Certainly not. It is evident that if artillery did not kill, it would cease to inspire fear. But it should not be thought that losses inflicted on the enemy are an absolute proof of the real effectiveness of an artillery shoot.

"Except for feigned attacks and for strategical reasons," wrote General Guibert in 1773, "every cannonade whose sole object is the chance killing some few men at a heavy cost in ammunition, is miserable and ridiculous."

And he further added: "If one knows how to employ artillery, one accomplishes not the small task of disabling a gun or killing a few men at a given point, but an important mission, a decisive mission, which should be to cover, to sweep with fire, the terrain occupied by the enemy, and, above all, the ground over which he would like to advance to attack. Executed thus, artillery fire is truly formidable."

The losses suffered by the enemy should not, therefore, be considered by the artilleryman as being an end in themselves. They are merely one of the means, in fact the strongest, of allowing the artillery to inspire terror and thus attain the tactical result, which in itself, is the true purpose of the fire. Moreover, it is well to note that the influence of losses on the troops sustaining them is not always immediate.

The influence of losses, in fact, can only be exercised as long as the extent of the losses can be realized.

Now, under present conditions of infantry combat, a force engaged assumes, under fire, a formation of small groups, isolated from each other, moving by bounds from cover to cover while advancing, and while halted, when merely holding a position, they

THE EFFECTS OF ARTILLERY FIRE

are hidden in some shelters or shell holes, mutually united by a common leader or by the same mission.

In each group, the men see one another and can count their losses, but they are more or less ignorant, at times completely, of what the neighboring groups have suffered. While advancing they have no time during their rapid bound, to notice whether their comrades in sight a short way off are the same and as numerous as during the preceding bound.

While remaining in place awaiting an attack they bury themselves in the bottom of their holes, improving little by little and without cessation their conditions of safety, linked only with the outside world by a lookout, who from time to time may pass on some information. But even this lookout, when a sudden respite in the firing permits him to cast a rapid glance over the ground, can only see, except for the enemy, should he be advancing, a head here and there appearing and immediately disappearing,—another lookout on watch.

The extent of the damage done during this time by all the shells which whistle and fall close by, shaking the earth, deafening and blinding, hurling mud and fragments, no one knows or can find out. It will be learned when everything is over.

When the bombardment ends, when emerging more or less completely from their holes, the men can count their numbers and then judge their losses, and when some days or moments later the same thing recurs, the anxiety and the anguish which they undergo are results of the losses previously sustained.

Therefore one is led to utter this aphorism, which at first may seem somewhat paradoxical, but which, upon reflection, fixes itself as an absolute truth:

"On infantry in action, the influence of the devastating effects of fire is felt primarily as a result of former fires."

However, this is not always to the advantage of the artillery. For example, there is the case of the 3rd Battalion of the 146th. On the 26th of February at about 4:30 P. M., when the German infantry attacked, everyone, and above all the battalion commander, was happily surprised to see the large numbers of men rise at the call of the lookouts. The morale of the force was instantly raised and the bombardments which continued on that day and on ensuing days were more easily borne than the first.

THE FIELD ARTILLERY JOURNAL

From this there is a valuable lesson to be learned for us artillerymen, namely, that the simplest fire always is worthy of planning and demands study.

In fact, what could be more simple, beforehand, than a prolonged bombardment of a force in open country, situated as was the 3rd Battalion of the 146th in the Douaumont region?

However, the fact should have been considered that the slightest fold of earth stops the fragments of percussion shell, that each shell hole forms a veritable shelter, and in consequence, on the terrain fired upon, softened by rains, every shell creates another shelter, the larger the shell, the better the shelter.

The only effective hits were those falling very close to the men they sought to reach; hence the number of shells was of greater importance than their caliber. The advantage therefore, from the standpoint of losses to be caused, was with the smaller calibres which fired more than the larger.

On the other hand, folds of earth and shell holes do not protect, or at least protect poorly, against the burst of time shell and shrapnel balls. Therefore, it would have been advantageous to intersperse the percussion fire with time fire, keeping in mind, however, that time fuzes always require a precise adjustment of the height of burst.

Matters become entirely different when the fire is against a force whose formations, for some reason, permit the men to see each other, and where everyone can see those who are falling.

This is the case of such targets as artillery in action, reserves, and columns on the march.

In such cases, it becomes of prime importance to produce the greatest losses possible and to do so rapidly, in order that everybody, seeing their extent and suddenness, will believe himself lost.

If the force fired upon has shelters close at hand, it is important that the first salvos should fall on it with the greatest possible density. After the first rounds, all who can will rush for their shelters and the following salvos will have no effect further than to prevent their exit.

On the contrary, if the force is in open country, one may be sure that it will endeavor to extricate itself immediately from the effects of artillery fire. Those who happen to be caught by the fire will lie down instantly; the others, under direction of their leaders

THE EFFECTS OF ARTILLERY FIRE

or perhaps on their own initiative will move as rapidly as possible to some point where their safety will be assured without abandoning their mission.

So it is important that the first rounds be so placed that it will be manifest to everyone that no possibility of escape exists except by passing through the fire. After this, the trajectories should be so shifted as to sweep the terrain in a sufficiently methodical manner to prevent a soul from escaping from the beaten zone without having felt the very breath of death from our shells.

This is the purpose of our scissors sweeping and double scissors sweeping, from which, when well executed, it is exceptional for a force to escape without leaving behind, along with its morale, a good portion of its combat value.

In any event, a force subjected to artillery fire of sufficient density takes cover. Having done this, it ceases to be able to act or fight. It is neutralized.

Naturally this neutralization lasts as long as the fire, but the form it takes when the fire is prolonged varies with the situation of the force and the duration of the fire.

A force without shelter cannot hold out under a prolonged fire. Therefore, as soon as it comes under artillery fire, or even as soon as it begins to fear that contingency, it immediately utilizes all the natural shelter available, improving it progressively. Then it creates additional shelter, in the form of individual holes, joining them up later to form a trench.

Until this trench is built and, we might even say, until this trench has covered shelters, the risk of destruction is never entirely eliminated. It is just a matter of time. The force recognizes this fact, which manifests itself in a certain nervousness. The men are jumpy and their conduct under fire may hinge on the slightest incident.

Face down, hidden behind a mound of earth or in the bottom of a hole, every man is more or less given over to himself. His reflexes make him act. In order for him to hold on, these reflexes must be controlled, first by a sense of duty, but also and above all by faith in the leader, by affection for him and by the inner feeling that the best thing to do is to obey him. This is why the leader is so important, and no infantryman will deny my statement

THE FIELD ARTILLERY JOURNAL

that the men should know their leader and have confidence in him.

This is also why it is not enough just to bring together a certain number of officers, non-commissioned officers and soldiers in order to form a company. With leaders and men who do not know each other, the formation of an administrative unit is possible, but never a fighting unit.

"Four brave men," said Ardant du Picq, "who do not know each other will not go out boldly to attack a lion. But four less brave, who know each other well and are sure of their solidarity and mutual support, will go resolutely. This is the basis of the organization of armies."

In covered shelters, a unit naturally experiences a certain quiet which facilitates command, and therefore renders it more fit, at the leader's first call, to resume its full combat value.

To increase the effectiveness of his fire, the artilleryman should therefore seek to decrease the enemy's confidence in his leaders and to destroy all feeling of security.

This last result may be obtained more or less completely by adding to the shells of light artillery a number of shells which are heavy and powerful enough to crush and destroy the dugouts.

In the matter of shaking the enemy's confidence in their leaders, recourse must be had to some kind of stratagem. By unexpected lulls in the fire, by its increased intensity, either in violence or in its entirely methodical execution, by feigned accompanying fires, interspersed occasionally with the rattle of rifle fire or the tick-tack of machine guns, the enemy is disturbed, induced to emerge from his dugouts in order to occupy his combat posts, in short, to become for a time vulnerable. If all measures are taken to strike him at this time with a heavy concentration of very short duration, executed at the maximum rate so as to obtain great density, he will perhaps suffer severe losses, at least unexpected ones, which will lower his morale all the more as he realizes that they have served no purpose.

If this procedure is repeated in different forms, it is to be expected that the confidence of the men in their leaders, whose fallibility has been proved at the men's expense, will gradually diminish.

A similar procedure should be restored to in counter battery.

THE EFFECTS OF ARTILLERY FIRE

Undoubtedly, it would be advantageous to keep, by a continuous fire, the cannoneers of all enemy batteries in their shelters during the entire duration of the combat.

But the enemy batteries are too numerous and too distant. In order for fire to be maintained on the objective in sufficient density to obtain the desired result, it would be necessary to keep the continuous fire of several of our batteries on one of theirs. That is impossible.

It is therefore better to cease firing entirely as soon as the enemy artillerymen has had time to take cover. We know, we are certain, that after a few minutes they will come out again to get into action. If at that moment, or a few moments later, another concentration strikes them and adds to their losses, if this is repeated several times, and if, in each instance, the fire is sufficiently dense to make them really feel it, and they know it can be readily renewed, it will create among the personnel of the hostile battery an atmosphere of unrest which may prevent its firing, or at least prevent it from firing well.

This is the normal result obtained in counter-battery. It is what we obtained and experienced at Verdun, during the attack of October 24, 1916, when the German batteries, ordinarily very active and firing remarkably well, seemed to be disoriented, firing at random, raggedly, without any precision.

Moreover you will form an idea of the results to be had by neutralization in counter-battery when you learn that on the 22nd of October, during a feigned attack in the area where we were actually to attack on the 24th, 158 German batteries were disclosed in a few moments and on the 24th, only 90 German batteries were found in action during the entire course of the day.

By way of comparison, I shall tell you that on December 14, a feigned attack disclosed 150 batteries and the actual attack on the 15th only disclosed 110.

The proportion of batteries actually neutralized was therefore 43% in October and only 27% in December. We find the reason for this rather marked difference in the atmospheric conditions which varied appreciably between the two attacks. Yet we shall draw the conclusion that with well executed counter-battery under normal conditions we may count on an effective neutralization of 30% to 40% of the batteries taken under fire.

THE FIELD ARTILLERY JOURNAL

Finally, among the effects produced by fire on personnel, we cannot fail to mention the impression produced by the ceaseless whistling of shells, the flashes of the bursts, the din of the explosions and the steady rumbling which constantly fills the air.

All this forms a depressing, maddening mixture, in which it is hard to discern clearly what causes the deepest impression; so that, apart from the losses produced, whose influence, as we have seen, is only felt later, it is difficult to state what type of bombardment is most demoralizing for men without shelter, that of the 75s, which on a front of 100 meters gives in one minute 12 kilograms of melinite borne by sixteen shells, that of the 155s, with 40 kilograms borne by four, or that of the 220s, with 60 kilograms borne by only two.

Each of you, perhaps, will have his own opinion on this question and will support me with some personal recollection. Whatever you think, do not be certain that you have hit on the truth. After all, it might not be absolute and might differ with individuals. Remember that at the beginning of the war, our 75s put terror into the Germans, who called them "the black butchers"; that at that same period, their 210s terrified our men, and that on both sides alike, the infantry praised the enemy artillery and found fault with its own.

What I can assert, and witness all who were in a position to make the comparison, is that of two bombardments to which one might be subjected, one from German 210s, the other from French 155 longs, the latter is actually preferable, if preferable is the proper word to express it. My reason lies in the fact that bursts of the 155 are far sharper than those of the 210.

The result of all this is, in my opinion, that a neutralization, when prolonged, should include not only shell capable of crushing in the type of shelters present, but also shell of large capacity, in order to shake the earth, produce deafening reports, give forth great flames and much smoke. The enemy should be made to believe that verily he is in the vestibule of hell.

As time goes by during such a bombardment, its depressing effect becomes accentuated, and if it lasts for several days the effect is redoubled as a result of physical suffering.

In brains to which sleep has ceased to bring rest, the detonations

THE EFFECTS OF ARTILLERY FIRE

produce painful shocks, and the intense flashes of the explosions cause a burning sensation.

"Nerves are stretched to the limit," says Ludendorff.

The human machine is at the breaking point. A trifle may snap its last springs. This is the time of most unexpected collapses.

This explains how in March, 1916, in the Cumières area, our infantry saw a group of Germans arriving within our lines, led by their non-commissioned officer, coming over to surrender. Constantly shaken, cut off from all communication with the rear by ceaseless fire, without rations or sleep, they had lost every notion of duty, every idea of fighting, and driven by the single instinct of self-preservation, they were coming to a place where they knew they could again eat, drink and sleep.

Artillery, you see, even makes prisoners.

All these bombardments, no matter what their nature or duration, would not be sufficient to assure the neutralization of the enemy under all circumstances.

During the war German machine guns frequently sprung up in front of us, beneath steel or reinforced concrete turrets, against which the means I have described had proven ineffective.

We have seen how transient is the effect of destroying such works, especially when they are numerous, and moreover, they always afford sufficient security and quiet, no matter what kind of fire or stratagem is used against them, to result in their neutralization ceasing immediately with the arrival of our last shell.

It is therefore necessary to devise something different to prevent an enemy with such cover from getting into action, and for this purpose we have smoke shell.

Unquestionably, smoke will not prevent his firing, but it will prevent his seeing, and when, by ruses such as those previously mentioned, we have succeeded in inducing the enemy to fire uselessly a number of times, the fear of a continuous and wasteful expenditure of ammunition will result in his opening fire only with great caution, and when he does fire, he will fire too late.

In spite of everything, no matter what the form, intensity or duration of a bombardment, no matter what the important results are obtained through the neutralization, the effects in themselves are only temporary. After the last shell has fallen, after

THE FIELD ARTILLERY JOURNAL

an elapse of time which, with good troops is never long, calm reigns anew. Losses are counted, and if they are not too severe, the men quickly regain all their combat value. Even confidence in the leader, if it wavered for a moment, is redoubled through remorse for having doubted him.

This reconstruction, this putting things back in order, may require a few minutes or a few seconds. Sometimes it is even accomplished instantly. It depends on the value of the men and the quality of their leader.

This explains how at Verdun, after hours of terrific bombardment on February 21, 1916, the time required for the Germans to cross the 400 or 500 meters separating them from our lines was sufficient to enable our marvelous men to get hold of themselves and, though muddy, slimy, bloody, haggard and exhausted, yet furious and terrible, to regain in a moment their fighting power and to give their assailants the reception you well know. And this was not the least of the surprises awaiting our adversaries.

This also explains why, in our attacks of 1915, after leaping from our trenches at the exact moment when the last rounds of the preparation were fired, we always reached without difficulty the first German lines located 50 to 100 meters beyond ours, but we were always stopped in front of the second positions. Between leaving our trenches and our arrival at the first lines, the Germans had insufficient time to respond to the call of their lookouts and when they came out of their dugouts, we had already passed over them.

On the second positions they were alerted much longer in advance and we found them at their combat posts.

To prevent the Germans from coming out and firing from their first line trenches into the backs of our first waves, it was necessary to devise, as you know, the trench moppers.

To prevent them from firing too soon from their supporting positions we devised the rolling barrage.

With this procedure, no matter where the enemy may be hidden throughout the whole depth of the zone of attack, he has no more time available to get into action than it takes our infantry to cover the distance at which it is marching behind the points of fall of our projectiles.

THE EFFECTS OF ARTILLERY FIRE

The closer our infantry follows these points of fall, the greater its chances to beat the enemy to his firing positions, and this is why I say that good infantry must be able, during an attack, to accept losses from its own artillery. The few casualties it may suffer will pay for the assurance that the enemy will not be allowed time enough to set up his machine guns, those weapons which would pile up heaps of dead.

Our old soldiers at the end of the war were well aware of this and shoved up right under our shells.

In such cases, it is never to be feared that the morale of the men will be impaired. As evidence, think of the wounded of the 3rd Zouaves, about thirty in number, who, at about 8:00 A. M. on August 8, 1918, at the village of Fouencamp, when questioned by their divisional artillery commander as to what caused their wounds, answered smilingly: "Our 75s," and who, when they heard the order given to lengthen the fire, immediately protested, saying: "No, Colonel. Don't say a thing to your artillerymen. Their shooting is good. It is our fault for going too fast."

The rolling barrage, even though it gives real service, is not, however, a universal remedy. It is a rich man's fire and moreover it leaves every infantryman who has let himself be outstripped by our shells, completely isolated, without any possible support, even for a moment. So we mention it, not as a model to be followed under all circumstances, but as the procedure utilized at the end of the war to insure the neutralization of the enemy until the last moment over the entire ground of the attack.

The fact must be remembered that no matter what we artillerymen do, all our efforts will be in vain and our greatest successes without result if every measure is not taken on our part as well as the infantryman's to insure the coordination of the two arms, the artillery-infantry liaison preached by General Percin since 1907.

This liaison, Gentlemen, is not limited, as at times some seem to think, to the establishment of excellent telephone communications, or even the highest degree of comradeship between colonels, majors and captains of the two arms; nor is it limited to sending liaison agents, nor to seeing these agents are pushed up to the first line and getting themselves called "hostages." It consists

THE FIELD ARTILLERY JOURNAL

in insuring the simultaneous arrival of the last round of the artilleryman and the first grenade of the infantryman.

It is the eternal problem to which we always come back the moment we take up the study of a battle operation.

Gentlemen, we have seen in a hasty glance the effects which the artilleryman can produce and should seek when firing on troops.

It is by the judicious, simultaneous or successive application of the various principles which we have just discussed that he will attain the triple end for which he should constantly strive.

First. To neutralize the enemy.

Second. To keep him neutralized during the entire duration of the fire.

Third. To make the neutralization persist for a certain time beyond the cessation of fire in order that the infantry, when the occasion demands, may be able to reach the position before the enemy can fight.

In ending, I make my excuses for having inflicted you, during the latter part of my lecture, with a veritable course in psychology. However, I do not regret it. It is necessary, and if I have succeeded in convincing a few of you that in order to obtain effect on the field of battle it is necessary even for artillery, a so-called learned branch, in any case a technical branch, to resort to psychology, I shall not have wasted my time.

"The combatant," wrote Ardant du Picq, "considered as a reasoning being, an impassive entity, functioning in the combinations of the battlefield, is not a real man, but is the man of theoretical speculations. The real man is of flesh and bone, he is body and soul; and no matter how brave his soul, it cannot master the body to the extent of preventing revolt of flesh and trouble of spirit when facing destruction.

"The human heart, to use the words of the Marshall of Saxony, is the starting point of all warlike things; in order to understand this, the heart must be studied."

Regardless of the progress of science, or the arms placed at his disposal, the man on the field of battle fights with his heart. It is a saying as old as the world which will be true as long as the world lasts.

"The art of war," continues Ardant due Picq, "undergoes

THE EFFECTS OF ARTILLERY FIRE

many changes in the course of scientific and industrial progress, etc. But one thing does not change—the human heart. In the final analysis, combat is a matter of morale. In all the modifications made in an army—in organization, discipline, tactics—the result of all these modifications on the human heart at a given moment, at the supreme moment of battle, is always the essential question.

"We rarely take this into consideration and hence strange errors result."

So you will not obtain definite results unless you study the human heart, and if we consult Larousse, we shall see that psychology is precisely that part of philosophy which treats of the mind and its faculties. Is not what we call the heart of man actually his mind?

Everyone on the field of battle should strive to be a psychologist and to divine what is taking place in the minds of others. But the psychology of the infantryman relates principally to the minds of those whom he commands, while that of the artilleryman relates to the minds of those with whom he engages in battle. That is the difference.

Between the artilleryman and the one on whom he fires there exists more or less the same relationship as between the hunter and his game, and battle for the artillerymen would be intensely amusing were it not for the fact that he, as well as his infantrymen, are game for the opposing artilleryman.

Do not believe, however, that the psychology of the artilleryman embraces exclusively the enemy. The artilleryman must also concern himself with the state of mind of his friend, the infantryman.

Now, I shall not be saying anything new by stating that whenever the infantryman suffers he appeals to the artilleryman. Sometimes he has nothing to tell him; often he is incapable of indicating to him the cause of his trouble or of telling him where to shoot. But he needs to assure himself that the artilleryman is there, to hear the voice of his cannon, to be certain that he stands ready to support him.

And the artilleryman should reassure him, telling him: "Here I am." As General Franiatte states, this is expressed sometimes in the form of fictitious fires, and he adds: "Frequently they are

THE FIELD ARTILLERY JOURNAL

none the less effective." But often it is expressed in the form of real fires, for at times it is necessary for the infantry to actually hear some friendly shells whistling over his head, the exact destination of which may be unknown to him, but at least they are going toward the enemy.

This is the reality of the battlefield. It has been so all the time and will continue so forever. We must take advantage of it. Nevertheless for the most part it is ammunition lost; and, as you know, we lacked ammunition and will still lack it.

Therefore, I shall say to my artillery comrades: "If such a case arises, fire; fire in moderation, but fire. Reduce the request made on you to its eighty-thousandth part, but fire!"

In retaliation, I shall say to my infantry comrades:

Reflect! Every shell which you cause to be fired uselessly today may be sorely needed by you tomorrow. Train your reflexes—during periods of calm and above all in peace time—to react against this instinct which urges you to call on the artillery when it is not actually necessary and when you cannot even show it where to shoot. Say to yourselves that if you want to maintain its full power of action intact for the moment of battle, you must avoid wasting its ammunition, inconsiderately demanding of it what have been called "fright fires."



THE STOKES-BRANDT 81MM MORTAR

BY MAJOR J. M. WALLACE, FIELD ARTILLERY

THE World War closed with the problem of close support of infantry by artillery still unsolved. The Caliber Board included in its report:

"In connection with the support of the division infantry by the division artillery the war has intensified the old question of accompanying guns for Infantry. A solution of this question by the assignment of batteries of Field Artillery has been tried, but the general opinion is that the Field Artillery gun is not satisfactory for this purpose; it is too vulnerable a target in motion; the ammunition supply is difficult; it is not sufficiently mobile because it cannot be man-handled; and from the division artillery standpoint the loss of the control of these batteries breaks down the power of the division artillery. One of the most serious obstacles to the advance of Infantry is the enemy's machine guns. If the machine gun nest is isolated it is relatively simple to maneuver in such a way as to neutralize it. If, however, there is a line of machine gun nests it becomes necessary to destroy a certain number in order to out-maneuver the others. The Infantry rifles, machine guns and 37mm guns are not sufficient for the latter mission. It is not always easy to obtain promptly the action of the division artillery, usually some distance in the rear, and it is difficult to indicate to the artillery the exact location of the machine gun nests. For the above reasons it seems proper that a special gun, designed for the destruction of machine gun nests and other light forms of enemy resistance, should be provided. This gun should have such mobility that it can be man-handled as a unit, that is, dragged along on a low wheeled mount; it should be accurate for its purpose up to 2,500 yards and use a large capacity high explosive shell. Its carriage should also admit of ready adaptation for use in trenches."

It recommended as the ideal Infantry accompanying gun, one with the following characteristics:

Caliber: about 2.5 inches.

Limits of elevation: minus five to plus fifty degrees.

Field of fire: not less than six degrees, effective for direct fire at 2,500 yards.

THE FIELD ARTILLERY JOURNAL

Ammunition: projectile of about 10 pounds weight, high explosive shell with maximum capacity and instantaneous fuze.

Carriage: divisible into loads of not to exceed 100 pounds each; total weight about 300 pounds.

It was contemplated that this ideal gun would replace the Infantry mortar and the 37mm gun.

In school problems and tactical exercises the Field Artillery is expected to come in immediately with an overwhelming fire that will wipe away hostile machine guns or other obstacles to the steady advance of our leading Infantry elements. For such purposes we know that the 75mm guns, or pack howitzers are inadequate; that liaison lines seldom survive in peace-time maneuvers and almost never in war-time.

In the fall of 1918 from the Meuse to the Argonne liaison officers and detachments struggled unsuccessfully to keep communication with their battalions and to assist the advance of the infantry by artillery fire. It is interesting to read in the *Revue d'Artillerie* in a series of articles by Commandant Schneider, beginning in the September, 1922, issue, how the infantry just to the west of the Argonne was furnished this close supporting fire in warfare of movement. A few quotations from these articles are rather striking:

"It must be noted that the fire of this artillery undoubtedly reduced the casualties in our infantry."

"Total advance: 42 kilometers in six days."

"The battery took position 200 meters from our leading elements . . . The infantry having been stopped by heavy fire from machine guns and by a 75mm minenwerfer, the battery commander located his observation post in the front line, placed a concentration of 80 rounds upon these objectives, enabling the infantry to move forward easily."

"The battery fired 50 rounds upon the designated point. At the end of this fire the squads from eight machine rifles and two machine guns in position on the hill surrendered. Moreover, according to the infantry one obstructing machine gun was destroyed by the fire."

"At 10:00 A. M. seventy-five rounds were fired upon this point. Immediately after the close of the fire the infantry bounded forward and took possession of Montdignon."

THE STOKES-BRANDT 81MM MORTAR

"40 rounds were fired upon the machine guns on hill 203. This was occupied by the infantry immediately after this fire."

The artillery that accomplished this support was armed with the 150mm Fabry mortar. The author discusses the difficulties of transport of the mortar and its ammunition and concludes with a statement that a lighter mortar would have been much more satisfactory. Throughout the advance the battery commanders were associated with the infantry battalion commanders and within 200 or 300 meters of their battery positions.

Our Infantry has been pushing the development of its mortar and the Ordnance Department has brought out in accordance with their desires the 75mm Mortar M1. However, they are not willing to relieve the Field Artillery of its mission of close supporting fires. The Field Artillery has found all of our present weapons unsatisfactory for this mission in warfare of movement.

The appearance of the 81mm Stokes-Brandt Mortar 1930 at Aberdeen Proving Ground has aroused a great deal of interest because of the solution it offers to the problem of the accompanying weapon. This mortar and its ammunition are produced by the E. Brandt Company of Paris and it has been adopted by the French Army as its infantry mortar. The mortar consists of a tube, base plate and bipod, each weighing about 45 pounds and provided with carrying straps, so that they may be carried as pack loads on men's backs. In emplacing, the base plate and bipod are placed on the ground. A round knob with two flat sides on the breech of the tube is inserted in a seat on the base plate and locked to it by turning 90 degrees. The tube is then fastened by a metal strap to the bipod and the piece is emplaced. On the top of the bipod is placed a laying device carrying a small collimator sight graduated 0 to 6,400 mils, a quadrant allowing 40 to 90 degrees elevation, and a cross-level bubble. Means for cross-leveling is provided on the left leg of the bipod. A spring shock absorber is provided between the bipod and tube, to permit the sight remaining in position during fire. The mortar is smoothbore and muzzle-loaded. It is not necessary to dig in the base plate, although it is preferable to do so if more than a few rounds are to be fired at the longer ranges. The mortar has a traverse of about 146 mils. A large shift is accomplished by moving the bipod. There are two high explosive shells and a practice shell

THE FIELD ARTILLERY JOURNAL

designed for the mortar. The smaller shell weighs about $7\frac{1}{2}$ pounds, carrying about 1 1-3 pounds of high explosive. It has a fixed fin, in the base of which is inserted a cartridge similar to a shot gun cartridge. It takes one to six increments. The mortar fired this shell at the Proving Ground at ranges varying from 40 yards to 3,300 yards with surprising accuracy.

The large shell weighs about $14\frac{1}{2}$ pounds and carries $4\frac{1}{3}$ pounds of high explosive. It is provided with four pairs of fins which are held folded by shear wires. On firing, these wires are broken and under the action of springs the fins are opened out to a diameter of about seven inches. This increased diameter of fins gives the projectile stability in flight. The range attained by this projectile using four increments was a little over 1,300 yards. The increments used are the same as those used for the lighter projectile.

The firings served to corroborate the claims of the manufacturer that the probable errors are approximately $\frac{1}{200}$ of the range in range, and $\frac{1}{400}$ of the range in deflection.

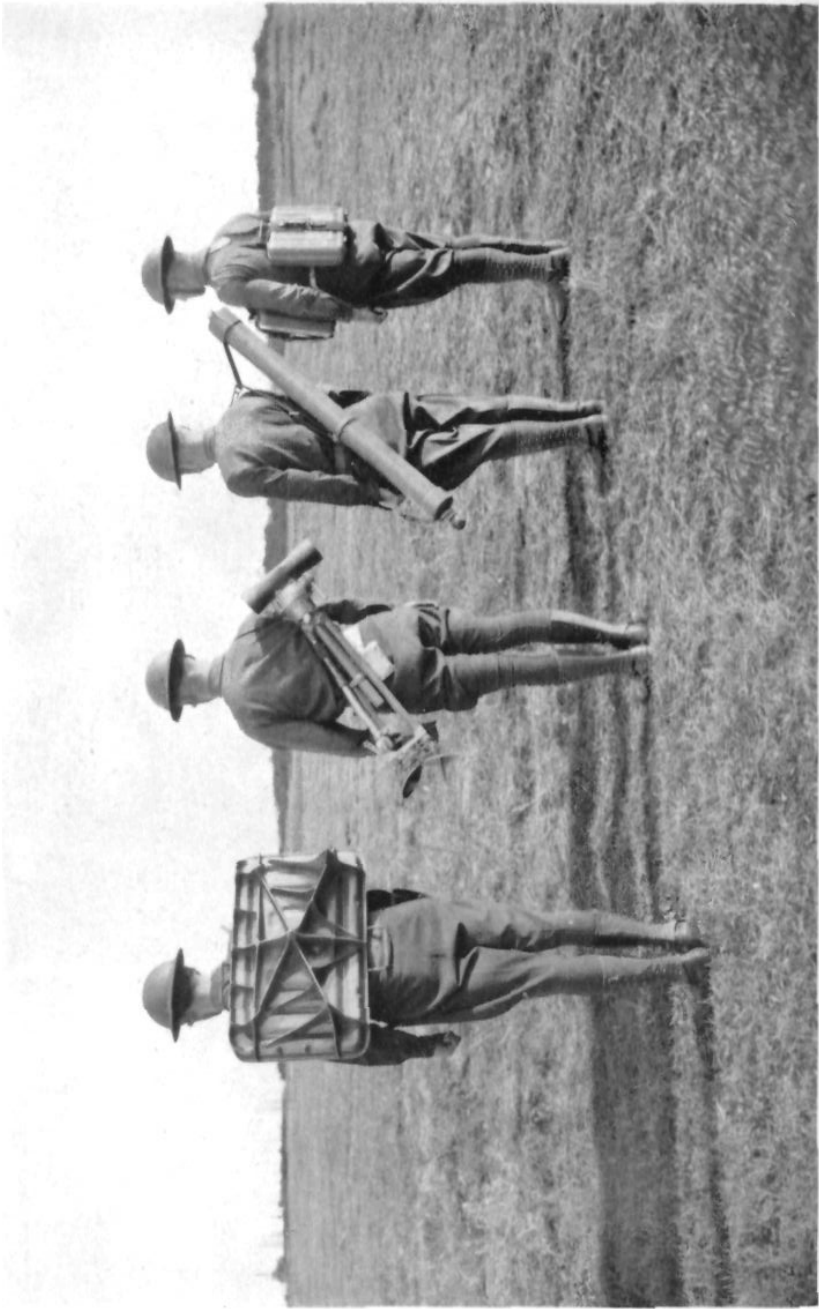
There are two point fuzes used, an instantaneous and a short delay. With the delay fuze the smaller projectile gave craters about four feet in diameter and one foot deep and appeared to be equal in effect to that of the 75mm shell. The larger projectile gave craters about six feet in diameter and two feet deep and was practically equivalent in effectiveness to a 105mm shell. With the instantaneous fuze the small shell swept a circle about nine feet in diameter clear of vegetation and, in the silhouette field, indicated that a circular area of about forty yards in diameter was covered effectively by fragments. Similarly, the large shell swept a circle twelve feet in diameter clear of vegetation but covered effectively an area only slightly larger than did the small shell.

The plan for transport of ammunition devised consists of boxes carrying three complete rounds each. A box of the lighter projectiles weighs twenty-six pounds, and of the large projectiles forty-five pounds. With web cross belts and waist belt three boxes of the lighter projectiles can be carried easily by one man.

The Field Artillery Board is giving this mortar an exhaustive field test at present.



STOKES-BRANDT 81MM MORTAR AND AMMUNITION



STOKES-BRANDT 81MM MORTAR AND NINE ROUNDS OF AMMUNITION

1932 NATIONAL GUARD FIELD OFFICERS CLASS AT F. A. SCHOOL



SITTING, LEFT TO RIGHT: MAJOR EDGAR S. MONTAGUE, 111TH F. A., VA. N. G.; MAJOR GENERAL WM. M. CRUIKSHANK, COMMANDANT, F. A. SCHOOL; MAJOR GENERAL HARRY G. BISHOP, CHIEF OF F. A.; COLONEL L. J. McNAIR, ASSISTANT COMMANDANT, F. A. SCHOOL; MAJOR MATTHEW C. FENTON, JR., 110TH F. A., MD. N. G. STANDING, LEFT TO RIGHT: MAJOR HUGH ASKEW, 189TH F. A., OKLA. N. G.; MAJOR KIERNAN HARFORD, 3RD BN, 192ND F. A., CONN. N. G.; MAJOR HERBERT W. SMITH 218TH F. A., ORE. N. G.; MAJOR WALTER F. WRIGHT, 63RD F. A. BRIG., KY. N. G.; MAJOR JOHN F. CHOATE, 152ND F. A., MAINE N. G.

THE FIELD ARTILLERY JOURNAL



TOP: "BRONCHO CHARLEY" (CHARLES W. MILLER) ASTRIDE POLESTAR RIDING FROM NEW YORK TO CALIFORNIA. OLD FORT SILL GUARD HOUSE IN BACKGROUND. IN 1871 MILLER CARRIED DISPATCHES FROM FORT DODGE THROUGH TO FORT SILL. BOTTOM: 5TH F. A. POLO TEAM, WINNERS OF FORT BRAGG WINTER TOURNAMENT. LEFT TO RIGHT: COL. A. U. FAULKNER; CAPT. SAMUEL WHITE; CAPT. WALTER L. KLUSS; 1ST LIEUT. CHARLES C. WHITMORE (CATCHING FLIES); 2ND LIEUT. ALVA R. FITCH.

EVOLUTION OF FIELD ARTILLERY TACTICS DURING AND AS A RESULT OF THE WORLD WAR

BY MAJOR VINCENT MEYER

TO attempt even a brief discussion of the evolution of Field Artillery tactics during and after the World War is considerable undertaking. A logical treatment will include not only the employment of the arm, but also its matériel and its organization, since they are inseparably allied with its tactics: neither can the methods of fire be neglected. Furthermore, the study must deal with the French and German artillery tactical development in some detail, since, with all due respect to our own artillery, it was only by a careful study of the tactical methods of the greatest artillerists of Europe—in fact of the world—the French and the Germans, that the American Artillery was able to enter the war in 1917 with sound tactical doctrines and with untarnished credit to itself. Nor is it possible to get complete information on the handling of the German Artillery. The treatises which have been translated from the German into English are none too numerous and leave many unavoidable gaps. The doctrine of the French artillery was well known to us since we, as allies, were very close to the French and patterned our artillery tactics in large measure after theirs. But the opposite being the case with respect to the Germans, an entirely parallel and completely balanced discussion is difficult to attain.

INCREASING IMPORTANCE OF THE ROLE OF ARTILLERY

Prior to 1914, generally speaking, Field Artillery teachings stressed maneuver rather than fire. In the French service, the 75mm gun was the main artillery weapon for field service and was practically the sole armament at the beginning of the World War.

The French taught that artillery was strictly an auxiliary arm and that it supported the infantry. The latter believed implicitly in its own inherent ability to fight the main battle and maintained that its contact alone would bring about a successful conclusion.

In the United States, we held similar convictions and our regulations

THE FIELD ARTILLERY JOURNAL

stressed the opinion that artillery was merely an auxiliary, an assistant to the other arms, especially the Infantry.

It was considered that man power, rather than materiel, brought about the decision in the fight; that man power was after all the only real factor acting in battle. So Infantry received the name of Queen of Battles.

The Germans viewed this matter from a different angle, believing in the efficiency and superiority of artillery fire as something of primary rather than secondary importance. They realized that light artillery in itself was not sufficiently powerful. So they assigned heavier calibers organically to their Corps, in order to get power from their materiel, and stated in their principles of artillery employment that the armies could expect, when battle was joined, to receive reinforcements of 21-cm howitzers and heavy guns.

In our service, we compromised between the French and German viewpoints as to how to obtain power and superior effectiveness of fire. Our reasoning was sound enough in part, but we had neither the imagination nor the experience in war or field maneuvers to go far enough in envisaging the power of fire such as only mass and large calibers could give. Our 1914 Field Service Regulations stated that the artillery should be considered the close supporting arm of the infantry, its duties being inseparably connected with those of the infantry. Its targets should be those units of the enemy, which, from the infantry point of view are most dangerous to its infantry or that hinder infantry success; the greater the difficulties of the infantry, the more powerful the artillery support. This was sound reasoning to be sure but with what artillery materiel would this powerful support be made effective? The same Field Service Regulations gave an answer which in view of modern doctrine is now far from satisfactory: "The use of the heavier types of field artillery presupposes an offensive where reconnaissance of the enemy position has been carefully planned; or a defensive where there has been time to deliberately select and strengthen a position. Until the use of the heavier field artillery under the conditions given can be clearly foreseen, its position is well to the rear of all the combatant units." What a last clause in view of present practice!

FIELD ARTILLERY TACTICS

In 1912, our FIELD ARTILLERY JOURNAL expressed the same idea: "The heavy (so-called) field artillery (i.e., 4.7-inch guns and howitzers and 6-inch howitzers) move slowly and time will be required to get them in position; but in an engagement of any magnitude the occasion for their employment will not ordinarily appear until the action is well developed."

At any rate, we recognized the need of heavier calibers and for our field army organization of three divisions and one auxiliary division* our Tables prescribed 3.8-inch howitzers, 4.7-inch guns and 6-inch howitzer matériel. The idea persisted that mobility would be retarded by heavier materiel, a belief which forbade serious consideration of larger calibers.

Germany's use of heavier calibers at the very beginning of the war rudely awakened these conceptions. Materiel at once came into its own as being equal, if not superior, to manpower in winning battles. General Ludendorff recognized this and throughout his book refers to artillery as a "companion" arm. He states: "the artillery would certainly be right if it contested the suggestion that the infantry is the Queen of Arms. It was by some error that this statement had found its way into an artillery training manual. There is no Queen of Arms. They all have equal right to the title, for all are equally necessary. It is impossible to get on without one of them." Colonel Miquel, a French author writes: "Infantry fire is no longer preponderant: it is artillery fire which today dominates on the battlefield and which alone shows itself effective against a sheltered enemy The artillery role has considerably increased during the last war. Created formerly to reinforce locally and to prolong when needed the then preponderating action of infantry fire, it is today the mistress of all fire One can say that, in so far as execution of fire is concerned, the cannon is king." And our own War Department Annual Report for 1915 frankly asserts: "It appears that although Field Artillery has played an important role in all modern wars, its use has now been extended to the point where it becomes a question as to whether it does not actually make the main attack, which is rendered permanently effective by the infantry advance instead of, as formerly considered, being used to

*There was no Corps organization in the American Army during the pre-war period.

THE FIELD ARTILLERY JOURNAL

prepare the way for the main attack to be made by the infantry."

However we may regard the above eulogies, we still have the old basic idea to tie to, which is that the reason for the existence of Field Artillery is its ability to assist the other branches, especially the Infantry, upon the field of battle. But this role, simple though it appears in statement, has a magnitude in execution undreamed of before 1914.

It might be interesting to know what caused this tremendous increase in the importance of Field Artillery. Among the main contributing factors we find:

(a) Germany forced the issue by starting the World War with high powered cannon and great masses of *Field Artillery*, thus mowing down smaller calibers and wreaking havoc with reserves. It gave the superiority of fire so essential to warfare.

(b) Man power of the nations engaged in combat was drained as it had never been before, with the result that nations realized that man power had to be conserved and materiel substituted therefor.

(c) It was found that Surprise was something that could really be attained by artillery even when large masses of all calibers were concentrated.

(d) The Power of artillery as practically demonstrated during the war had been unthought of prior to that time. Power, which is the ultimate in fire effectiveness, now came to be properly regarded as the number of guns in use plus the tonnage of ammunition consumed. This replaced the teaching of the individual power of the rapid fire gun and of its absolute effectiveness.

(e) The Mobility of heavy calibers was clearly demonstrated, and by means of mechanical traction and motive power, the heaviest calibers could be moved forward in support behind the combat elements. The war showed that their continuing support was entirely possible and it became accepted as an established fact.

INCREASED RANGES FOR DIVISIONAL LIGHT GUN

Very early in the World War there came a demand for greater ranges, an unceasing demand to satisfy tactical needs. The demand for wider traverses naturally followed.

At the outset, the French had planned on using their 75's only between 4,000 and 5,000 yards. An incident cited by General

FIELD ARTILLERY TACTICS

Gascouin shows the remarkable hold this short-range fetish had on some officers: "The 27th August, 1914, in the Meuse Valley, the 8th Battery of the 17th Regiment clearly saw the flashes of some German howitzer batteries and even more clearly saw their shells falling. Meanwhile the Battery Commander, who had measured the range and found it read 6,000 yards, did not consider that he was authorized to fire." This was a typical example, says General Gascouin and he adds that there were numerous analogous cases.

It was believed by the great majority of French officers that, since the essential role of artillery was to support the infantry, while remaining in close liaison with this arm, it would never have occasion to fire beyond a reduced field of action, that is, not much over 4,000 yards. Terrestrial observation was ordinarily not practical at greater distances even with good field glasses, and few in 1914 gave much thought to the possibilities of aerial observation. So, while the French 75's could fire up to 10,000 yards, the carriage and sights were not constructed for use over 6,500 yards. Outraged by the Germans and unable to reach the limit of deployed German artillery, necessity demanded longer ranges; continuity of artillery support was essential to put over an offensive, and continuity could be obtained only by long range and the ability to displace forward quickly, in other words, mobility. But the 100 per cent mobility taught in theory did not always obtain in practice and, to compensate for this, the range of the 75mm carriage was strained to its limit. Toward the end of the war, special boat-tailed shell was manufactured which gave an extreme range of over 10,000 yards. The medium and heavy cannon increased their ranges in like ratio. Nor were the Germans idle in this matter and, following Verdun in 1916, a gun and howitzer of longer range were in course of introduction into their field artillery. Generally speaking, the German material, with the exception of the light gun, outranged the French.

In 1919, the Caliber Board recognized this important evolution and reported that the divisional artillery must have great range because of echelonment in depth, both of its own and the opposing division. And it went on to say: "The consensus of opinion of all artillery officers—French, Italian, English and American—is

THE FIELD ARTILLERY JOURNAL

that the 75mm gun, or approximately this caliber, firing a 15-lb. projectile or a projectile approximately this weight, and having a range of not less than 11,000 yards, is a satisfactory weapon at the present time for use with divisional artillery." The Board then went on to classify an *ideal* light field gun as one "about 3-inch caliber on a carriage permitting a vertical arc of fire of from minus 5 degrees to plus 80 degrees and a horizontal arc of 360 degrees; a projectile weighing not over 20 pounds, shrapnel and high explosive shell of satisfactory man-killing characteristics with maximum range of 15,000 yards."

Such was the ideal! Perhaps these requirements seemed visionary in 1919, but our Ordnance Department took the Board seriously with the result that it has brought out for test a 75mm gun fulfilling these seemingly Utopian requirements, and even going the Board one better by constructing a divisional light field gun that is capable of firing successfully at aircraft! In this connection it is interesting to note that prior to 1914 certain French officers believed their 75 would satisfy the demands for anti-aircraft materiel, but a few trials showed the fallacy of giving such mission to that field gun as it was not constructed for that purpose. Now in 1930, we see the nebulous ideas of 1914 practically worked out. However, with no intention of detracting from this particular model, it might be said in passing that it seems too immobile and too complicated to function as a divisional weapon. Furthermore, it remains to be shown whether ground missions can be successfully performed in conjunction with air missions by the divisional light gun. Certainly it is giving it a large order. After all, the paramount considerations affecting the design of the divisional gun are mobility, simplicity, long range and wide traverse. To paraphrase General Forrest, its mission is to get there first with the most shell. That a complicated and more or less immobile design will enhance its chances of so doing is problematical.

The 105mm howitzer recently adopted as "standard" in our service, with its 33-lb. shell and maximum range of 12,000 yards, is a weapon that may well be considered as ideally combining light gun and howitzer qualities for use as a divisional artillery weapon. Its rate of fire is very little less than the 75mm gun, its

FIELD ARTILLERY TACTICS

weight somewhat lighter, and its traverse 45° as compared with the 6° of the French 75mm. Firing as it does semi-fixed ammunition, the problem of ammunition supply would be little complicated were this weapon substituted for the 75mm gun.

MEDIUM AND HEAVY ARTILLERY

After the first fighting, the French learned to their sorrow that the German heavier calibers not only outranged their light field guns, but completely outclassed them in power. It is all the more strange that the French had no heavy artillery immediately available to combat that of the Germans, inasmuch as many French officers had accurately prophesied in what manner their opponents would employ the heavy calibers accompanying their field forces. They foresaw that the Germans would use this materiel: (1) for delay and interdiction at long ranges; (2) to crush the French artillery; (3) to support the German infantry in preparing the zone of attack for the final assault. But so blind was the faith of the majority of the French officers and of the French War Department in the virtues of the 75mm gun that prophecies availed nothing.

Fortunately for France, she was not devoid of heavy calibers though the materiel she had on hand was mostly the de Bange type—old models. In 1914, France had 308 heavy guns allotted for field service as against 2020 in the German establishment. In addition thereto, France had 380 old model cannon to be furnished by the Foot Artillery,* but for which no field organization existed. The Foot Artillery also had over 11,000 cannon, of which 5,000 were of 80 and 90mm caliber, and 6,000 of caliber 95 and above. This artillery was strictly for the defense of the frontier fortresses, was without transportation and was wholly unable to maneuver. Nevertheless, it was shortly impressed into service and rendered priceless aid throughout the war on missions of counterbattery, interdiction, and destruction of field works. These old-model cannon, built between 1877 and 1882, had high metallurgical qualities and were accurate firing weapons. However, realizing they were only a temporary stop-gap, the French gave immediate priority to their heavy artillery program and speeded up manufacture. But not until 1916 did *modern*

*The Foot Artillery manned the weapons of the frontier fortresses.

THE FIELD ARTILLERY JOURNAL

heavy artillery appear at the French front, and on the Aisne in 1917, only 55% of the howitzers and 25% of the guns were new models. By that time, ranges of 15 and 20 thousand yards, previously undreamed of, had become so common as to cause no comment.

Our army recognized the importance of heavier calibers prior to 1914, and, in 1915, the War Department Annual Report reads: "Heavier calibers have come into much greater prominence than formerly due to their ability to destroy the excellent trenches which it has been found possible to construct in a comparatively short time. It appeared in the beginning that trench warfare in Flanders with its consequent ease of supply, might have unduly thrown the balance in favor of power as against mobility. It later seemed, however, that the German and Austrian armies in their campaigns through Galicia in 1915 used heavy artillery very largely, were able to keep it up with the advancing troops and were able to keep it supplied with ammunition. It consequently appears fairly definite that an increase in the proportion of the heavier calibers over what was formerly considered necessary will generally be adopted."

The French roads were noteworthy for their excellence while the terrain was notorious for its mud. The going, therefore, might be good, bad, or indifferent. However, no gun or howitzer seemed to be too heavy for field operations. The problem of moving heavy cannon around, at least in France, had been largely solved before 1918 by the use of tractors, trucks and the railroads.

The year after the World War, the Caliber Board reported an *ideal* gun for Medium Field Artillery to be of "caliber between 4.7-inch and 5-inch on a carriage permitting a vertical arc of fire of from minus 5 degrees to plus 80 degrees; a horizontal arc of fire of 360 degrees. Shrapnel and shell weighing not over 60 pounds; maximum range 18,000 yards; with semi-fixed or separate loading ammunition permissible. The normal charge should be established for about 12,000 yards. Propelling charge should be smokeless and flashless . . . A maximum rate of fire of six rounds per minute is considered sufficient . . . A normal maximum speed of 8 miles per hour is considered sufficient."

The same Board reported an *ideal* howitzer for Medium Field

FIELD ARTILLERY TACTICS

Artillery to be of "caliber about 155mm on a carriage permitting a vertical arc of fire of from minus 5 degrees to plus 65 degrees; and a horizontal arc of fire of 360 degrees . . . The projectile should weigh not over 100 lbs. and should be interchangeable with projectiles for other guns of this caliber referred to later on. High explosive shell only should be supplied . . . Maximum range should be 16,000 yards . . . The maximum rate of fire should be not less than 5 rounds per minute . . . Maximum road speed the same as that of the Corps gun, viz., 8 miles per hour.

The *ideal* gun for Heavy Field Artillery was recommended as of about 155mm caliber either on a self-propelled mount capable of a speed of 6 miles per hour, or on a rubber tired wheel mount for towing at 12 miles per hour. A maximum range of 25,000 yards was sought. The ideal howitzer for Heavy Field Artillery was considered as of about 8-inch caliber, and weapons of greater power up to the 14-inch railway mounts were recommended.

Since the report of the Caliber Boards was rendered, the Ordnance Department has developed models largely in accordance with the recommendations of the Board, and these models have been tested at Aberdeen Proving Grounds and by the Field Artillery.

COUNTERBATTERY

The World War developed counterbattery to a highly technical degree. The French Regulations of 1913 rejected it, but at the end of 1914 it was acknowledged as an indispensable form of fire. In counterbattery missions, the heavier calibers found a role peculiarly adapted to their power and range. Nevertheless, at various times, the light artillery played an important part in the delivery of counterbattery fires. We are inclined to regard the heavier calibers in the Corps Artillery as performing most, if not all, of the counterbattery missions. But a study of the Riga offensive of 1917, and of the Chemin des Dames offensive of 1918, both conducted by the Germans, opens up perhaps a new line of thought on this subject. In both of these battles, the proportion of types engaged in counterbattery and the preponderance of the light gun over the heavy was the same. About 70% of the counterbattery was performed by the light artillery! This was owing to the fact that *neutralization*, rather than destruction,

THE FIELD ARTILLERY JOURNAL

of the enemy artillery by gas concentrations constituted the principal mission of the German counterbattery artillery. The brevity of the preparation ruled out any attempt at *destruction* of the opposing artillery.

<i>Battle</i>	COUNTERBATTERY (UNDER THE CORPS)				
	<i>Light Gun</i>	<i>Light How.</i>	<i>Med & Hvy. Gun</i>	<i>Med. How.</i>	<i>Hvy. How.</i>
Riga, 1917	70%	0	19%	11%	0
Chemin des Dames, 1918	65%	6%	18%	11%	0
AVERAGE	67.5%	3%	18.5%	11%	0

The divisional light gun is an efficient counterbattery weapon against materiel that is protected by nothing more than hasty parapets.

Our present Field Artillery Training Regulations indicate the possible employment of light artillery on counterbattery missions.

ARTILLERY PREPARATION

At the beginning of the World War very little, if any, artillery preparation was fired. Then during 1915, 1916 and the greater part of 1917, the duration of the artillery preparation ran as high as six days or more. Toward the end of 1917 a few offensives were tried with no preparation at all, and finally the practice during the last year of the War indicated that several hours' preparation was sufficient for the inception of the attack.

During the war of movement in 1914, long artillery preparations were certainly not advisable. Then followed the long period of position warfare and field fortifications developed to such an extent as to necessitate a thorough artillery preparation before the infantry broke through the enemy defensive zone, although the fact remains that in the initial attack on Verdun, 21 February, 1918, the Germans used a preparation lasting only 9 hours.

In 1917, the Germans foresaw a breaking away from this practice and in their operations in Galicia, followed by the Riga offensive in September, 1917, they pruned their artillery preparation to a few hours thus paving the way for a change in this particular phase of tactics in 1918. Topographical preparation of fire combined with the use of accurate meteorological data was the means which enabled them to dispense with all adjustment and to lay down an accurate fire on assigned targets without any preliminary firing. Instead of taking days to fire a great tonnage

FIELD ARTILLERY TACTICS

of metal on a given frontage of attack with a comparatively small number of cannon, it was realized that the same tonnage of metal could be put down in a few hours by concentrating great masses of artillery on the same frontage. Furthermore, practice, if not theory, showed that a cyclone of shells descending in a few minutes on a surprised target was infinitely more effective than protracted fire of the same number of rounds which were dragged out over a long period of time. Better yet, it was found quite possible in a preparation lasting three or four hours to open the necessary lanes for the infantry advance into the enemy position, or at least into the first position of a zone defense which might extend to a depth of 9 or 10 kilometers.

At Cambrai in November, 1917, the British fired no preparation at all, the opening of breaches through the wire being effected by the large masses of tanks.

Our 1911 Field Artillery Drill Regulations recognized the need of a preparation in certain cases, but no one at the time had sufficient imagination to picture the length to which it might go. Some pre-war authors went so far as to state that any artillery preparation whatever was an error in that it prematurely disclosed the impending maneuver and involved a useless expenditure of ammunition.

Our present Field Artillery Regulations and Field Service Regulations agree with the French and German Field Service Regulations that the duration and the intensity of the artillery preparation vary with the desire for surprise and the strength of the enemy defenses; that a prolonged preparation vitiates the surprise effect, giving the enemy time to assemble his reserves and to take other counter measures. The amount of artillery preparation is dependent to a large degree on the extent to which tanks are to participate in the attack and the role assigned to them. The length of the artillery preparation may vary from zero to eight hours according to circumstances. In some cases where the enemy defenses are not extensive or where it is desired to take advantage of the element of surprise to its fullest extent, the attack may be launched without artillery preparation.

A division of the artillery preparation into *phases* will greatly enhance the concentration of effect. The Germans at Chemin des

THE FIELD ARTILLERY JOURNAL

Dames in May, 1918, carefully planned five phases for the preparation of 160 minutes which were divided as follows:

First Phase: 10 minutes. Surprise concentrations by all the groupments on the enemy infantry, artillery, trench mortars, command posts, observation posts, telephone centrals, etc., at the maximum rates of fire. Gas shell was used.

Second Phase: 65 minutes. *Increased* counterbattery fire; fire continued on most important command posts, camps, General Headquarters, etc. Fire on bridges using different kinds of shell. The menenwerfers fired on wire entanglements and front line trenches.

Third, Fourth and Fifth Phases: 85 minutes. Fire to prepare enemy infantry positions for assault; also counterbattery fire according to schedule.

The principle of dividing the artillery preparation into phases is incorporated in our modern artillery teachings. It undoubtedly results in the best coordination of fire on the vital targets at the critical times.

The evolution of the artillery preparation during the World War is shown by the following table.

APPENDIX A
EVOLUTION OF THE ARTILLERY PREPARATIONS DURING THE WORLD WAR

<i>Offensive</i>	<i>Place</i>	<i>Date</i>	<i>Length of Preparation</i>	<i>Authorities</i>
French	Artois	May, 1915	6 days	(Herr, p. 34)
French	Champagne	Sept., 1915	3 days	(Herr, p. 37) (Gascouin, p. 157)
Germans	Verdun	Feb., 1916	9 hours	(Herr, p. 49) (Gascouin says 10 hours, p. 187)
French	Somme	July, 1916	7 days	(Herr, p. 59) (Gascouin says 6 days, p. 170)
French	Aisne	April, 1917	5 days*	(Herr, p. 77) (Gascouin, p. 181)
Germans	Riga	Sept., 1917	5 hours	(Ecole de Guerre, p. 46) (AT 72-p. 6) (Herr says 3 hours, p. 95)
British	Cambrai	Nov., 1917	None	(Herr, p. 95)
Germans	Picardy	March, 1918	5 hours	(Herr, pp. 109, 118) (Ludendorff, Vol. II, p. 229) (Ecole de Guerre, p. 48)
Germans	Champagne	May, 1918	2½ hours** (160 mins.)	(Herr, p. 109) (Ecole de Guerre, p. 48)

FIELD ARTILLERY TACTICS

Franco-American	Soissons	July, 1918	None	(Herr, p. 130) (Miquel, p. 224)
French (Sixth Army)	Chateau-Thierry	July, 1918	None***	(Herr, p. 131)

*This preparation was originally scheduled to last 5 days. At the end of that period the weather was so bad that the troops could not jump off. The preparation therefore continued for 6 days more, or 11 days altogether!

**This preparation of 160 minutes was divided into 5 phases.

***The assault battalions advanced and seized the Line of Outposts without any artillery preparation. These battalions then halted for 1½ hours while the artillery put down fires on the centers of resistance. The assault battalions then went forward.

INTRODUCTION OF METEOROLOGICAL DATA

We have seen how the pendulum swung during the latter part of 1917 from a preparation of several days' length to none at all, or to one lasting but a few hours. The practice had radically changed because of the desire to obtain maximum surprise effect. However, as long as position warfare lasted, or anything that resembled it, the length of the artillery preparation could not have been materially reduced except for two reasons: (1) great masses of artillery were concentrated which allowed a tremendous tonnage of metal to be fired in a few hours; (2) accurate fire was prepared without any previous adjustment by using precise meteorological data. The Germans developed the system and were the first to introduce it in Galicia and Riga in the autumn of 1917. Colonel Bruchmuller was responsible for its introduction, for he realized that abbreviating the artillery preparation would go far toward attaining the tactical surprise that was so much desired. As a result of his success in obtaining maximum tactical surprise and his skill in planning operations for large masses of artillery on the Eastern front, he was sent to the various German Armies in 1918 along the Western Front to prepare the artillery plans for the great offensives of that year. Meanwhile, Captain Pulkowsky conducted a school at Maubeuga for the dissemination of this technical information to the senior artillery officers of the German Armies.

The French were quick to realize the value of meteorological data when used in combination with the topographical preparation of fire and adopted the system during the latter part of 1917. Our army was not far behind in incorporating the method in its artillery teachings, and its use has been continued ever since with but little modification.

THE FIELD ARTILLERY JOURNAL

THE IMPORTANCE OF SURPRISE

Surprise is a strategical and tactical factor which, if ignored, is very likely to bring disaster to any military operation.

In so far as artillery is concerned, surprise can be attained by secret concentration of the artillery on a designated front, by proper defilade and concealment of artillery positions and by firing an abbreviated preparation before the attack.

At Verdun in 1916, Riga in 1917 and Picardy in 1918, the concentration of all the German artillery was executed at night. All precautions were taken to conceal troops and materiel by day, and, when the artillery neared the front, the wheels and metal parts were actually muffled. Surprise was obtained.

Major Beere, F. A., in his conference of May, 1930, at Leavenworth, analyzed seven major offensives in 1918. The results as indicated in the table herewith show that surprise is possible but not easily attainable.

<i>Troops</i>	<i>Offensive</i>	<i>Date</i>	<i>Offensive successful?</i>	<i>Surprise obtained?</i>	<i>Tanks Used?</i>	<i>Defensive Measures</i>
Germans	Picardy	21 March	Yes	Yes	No	Fair
Germans	Champagne	27 May	Yes	Yes	No	Poor
Germans	Oise (battle of Matz)	9 June	No	No	No	Good
Germans	Champagne	15 July	No	No	No	Good
French	Soissons	18 July	Yes	Yes	Yes	Poor
French	Champagne	26 Sept.	No	?	Not initially	Good
French	Montdidier	8 August	Yes	Yes	No	Poor

(NOTE: In reference to the above table the term "successful offensive" has no reference to the success or failure of the exploitation, but refers simply to the penetration of the position.)

LIAISON

Perfect liaison is the 100% coordination of the efforts of the artillery and the infantry in operating against the proper targets at the exact times agreed upon, each arm working with the same purpose in view. Successful liaison must be based not only on continuous maintenance of good communication between the artillery and the infantry, but also on carefully prepared orders and battle plans which designate each task and each mission which requires infantry-artillery cooperation. Its successful operation also depends on the manner in which the artilleryman is imbued with the spirit, methods and ideals of the infantryman. To attain this professionally felicitous state of mind, the artilleryman should live and work with the infantryman and learn to think in

FIELD ARTILLERY TACTICS

his language. This principle is followed out by having the same artillery battalion always support the same infantry regiment and so on up, if possible.

The importance of liaison is illustrated by Colonel Allehaut, who, speaking of an attack early in 1914, attributes its success to the actual and moral liaison of the artillery and the infantry; while, on the other hand, an attack of the 34th French Division in the Artois in May, 1914, failed because among other reasons the liaison was poor and as a result, the artillery did not give proper support. The same author cites another case where lack of good liaison held up an infantry battalion for two and one half hours.

Naturally, if the artillery is insufficient or the liaison poor, there will be many vital parts of the enemy front untouched by our artillery fire. The best liaison, it goes without saying, is obtained when the artillery continually displaces forward and by so doing keeps physically close to its supported infantry.

The French soon learned that the most successful liaison officers were those who were not only well trained in artillery, but who understood the infantry and its problems. Carefully chosen officers, who know their work, will inspire confidence in the infantry headquarters with which they are working.

In 1916, the French instructions prescribed that liaison between the artillery and the infantry should be kept as intimate and continuous as possible to the end that the infantry might never be deprived of artillery support. It was found necessary to create artillery liaison detachments to be sent to supported infantry units. Furthermore, the practice of establishing artillery and infantry command posts close together was strongly advised. Artillery liaison detachments have come to be an important part of our artillery battalion staff. In 1928, at Fort Sill, 2 officers and 32 men out of the 10 officers and 88 men composing the *Experimental* war strength battalion headquarters detail, were assigned to liaison work. There were 2 liaison sections constituted, each of which consisted of 1 officer and 16 men who were to function simultaneously with each of the 2 infantry battalions whenever the infantry regiment put two assault battalions in line.

Despite the many lessons learned during the war, liaison continued

THE FIELD ARTILLERY JOURNAL

and still continues to be a troublesome *practical* proposition. The liaison of the French and the American Division in the Soissons attack, and of the 3d American Division in the Marne defense, was unsatisfactory and the cooperation of the artillery with the infantry materially suffered as a result. There are numerous such examples.

With radio, the vexing question of liaison has one good chance of solution provided it were possible to silence the radio nets in all headquarters above the infantry brigades, at least during the critical stages of the attack. Radio communication, with minimum interference and maximum efficiency, should then be possible between front line infantry units and their supporting artillery.

The lessons of the war in connection with liaison would seem to demonstrate that there should be an interchange by detail of artillery and infantry officers between their respective arms. These duties should in no wise degenerate into staff assignments, but should be solely for duty with actual troops. Furthermore, artillery officers should be sent to the Infantry School at Fort Benning and Infantry officers to the Field Artillery School at Fort Sill. In the writer's class at Fort Sill in 1920, there were four Infantry officers; in his 1928 class there were *none*. From this it might be inferred that the idea is not so well regarded in higher circles. It should, however, afford an excellent opportunity for mutual study and thought on the subject, for the fact remains that, despite wire, radio, runners and visual signalling, and despite all of the practical experience of the World War, the liaison problem is today far from a practical solution.

(To be concluded in the May-June issue)



AT MUKDEN, TOP: JAPANESE BATTERY MARCHING ALONG THE WALLED CITY; CENTER AND BOTTOM: CHINESE 4.7 HOWITZERS (PROBABLY MADE AT THE MUKDEN ARSENAL) WHICH WERE CAPTURED BY THE JAPANESE.

THE FIELD ARTILLERY JOURNAL

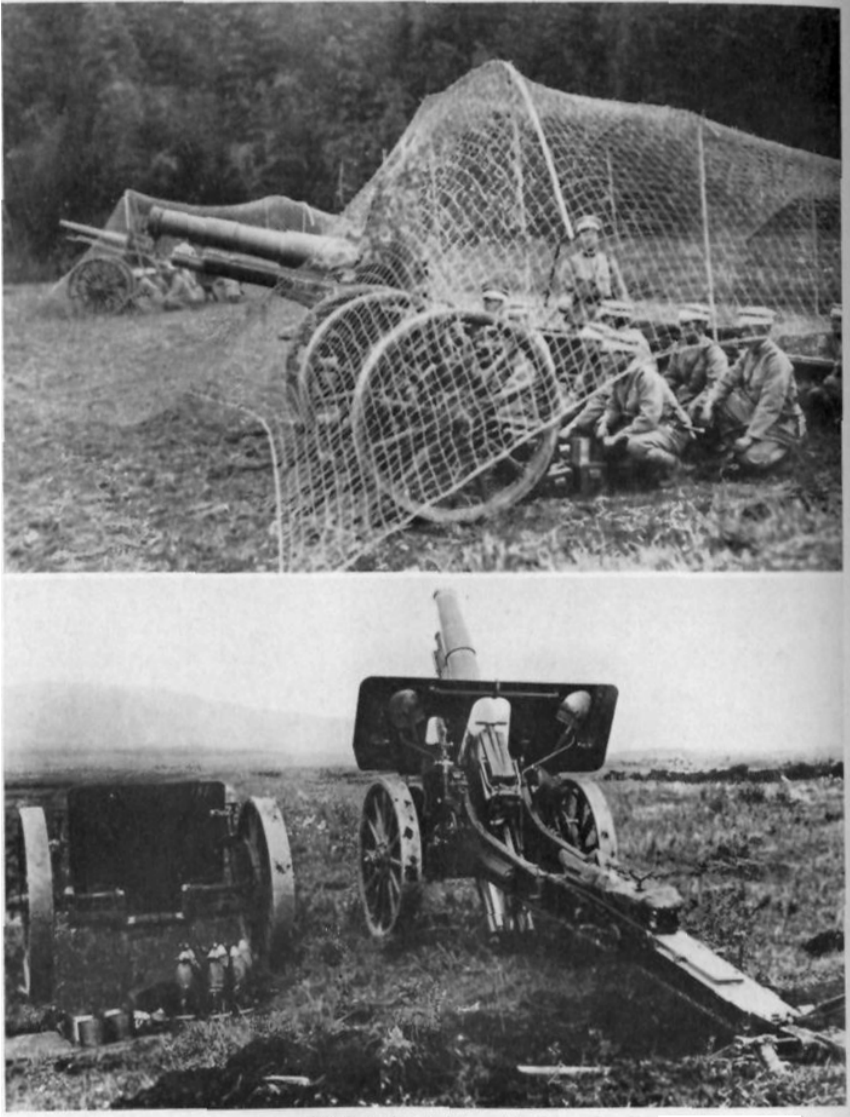


CHINESE LIGHT ARTILLERY



JAPANESE LIGHT ARTILLERY

THE FIELD ARTILLERY JOURNAL



(Courtesy Army, Navy Air Force Gazette—Keystone Photo)
JAPANESE MEDIUM ARTILLERY

THE RUSSIAN ARMY

BY CAPTAIN ABRAHAM R. GINSBURGH, F.A.

THOSE looking for bogeys describe the Soviet force as a great body of several million well disciplined fighters, backed by a powerful reserve, leashed into zealous bolshevism by skillful propaganda, with all men and women recruited into the military force as soldiers or workers, merely marking time, waiting in Hohenzollern fashion for "Der Tag."

Others find in Russia an undernourished, ill-clad and poorly equipped army, lacking in leadership and weapons, possessing but a few highly trained show battalions, brought out on national anniversaries to impress foreign observers—an easy prey to a first class power. Among the Russian emigrés in Paris, this version is particularly strong.

Between these two extremes stands the Russian army of today. Had it been a Leviathan, it never would have stopped at the gates of Warsaw in 1920, and, despite unexcelled French leadership and staff efficiency in developing the Polish army, Trotsky would have overrun Europe in the manner of Genghis Khan.

On the other hand, it must be recognized that it was no pusillanimous mob of weaklings that turned around after the Warsaw defeat, marched down into Crimea and chased Baron Wrangel and his White cohorts into the Black Sea. And it took something more than a disorganized rabble to rid Russia of the hostile White armies of Kolchak, Denikin, Yudenitch and others, all of them supported by superior weapons and more experienced military leaders. Nor can we forget the allied failure in Archangel or the aimless expedition into Siberia, at least as far as Russia was concerned.

In 1917, Russia had no more army. War-weary mujiks, enflamed by socialist and bolshevist propaganda, threw down their arms and swore never to fight again. Their own officers, they killed; all semblance of rank, they abolished. The salute, symbol of military discipline, they discarded. They decided that the officers of the future would emerge from their own numbers.

Today we find an army whose officers are appointed on a basis of merit, not popularity. Observers see no vital difference between the Ivan of 1914 and the Ivan of 1931. Privates still obey

THE FIELD ARTILLERY JOURNAL

orders implicitly, come to attention and salute their superiors. On the other hand, officers no longer can be insolent to their men. They do not strike their subordinates. But they can still court-martial them and in extreme cases mete out the death penalty.

To Leon Trotsky, idol of the Russian soldier of today, goes the chief credit for rebuilding a formidable army. An extreme opportunist, he took advantage of every situation to instill loyalty and patriotism into the ranks. At first he let the soldiers have their way; those who did not want to serve could go home. Then he began to coax them back into the army. While famine and pestilence raged, soldiers in the ranks were fed, clothed and offered many comforts.

Since they came as volunteers, he laid down the rules of the army to them to take or leave. Rather than return to uncertain life outside, thousands preferred to serve with the colors.

The 1918 law of starvation drew no social lines. Officers of the old imperial regime were just as subject to the pangs of hunger as ordinary rear rank privates. Trotsky offered them a job. Would they agree to train, instruct and discipline the new Red army? Had they an alternative? If they refused, they marked themselves as enemies of the new regime. If they accepted, they could continue in the practice of their profession and perhaps as years went by they might regain their position of the pre-war era.

When they accepted employment with the Red Army, they found that Trotsky had surrounded them with political agents to watch over them. As long as these ex-imperial officers talked about rifles, bayonets and maneuvers, their teachings proved acceptable; but with that other realm, morale, where officers take hold of their men, teach them the significance of loyalty, the meaning of the flag and inculcate into them a love for their country, ex-imperialists had nothing to say. In every organization, Trotsky had placed a civilian, a loyal party worker, responsible for instruction and morale in the unit, and an unofficial spy on any subversive activities on the part of the old imperialists.

Trotsky used these old officers to build up his army. In the meantime he established schools of his own and impressed upon the men in the ranks that each man carried a marshal's baton in his knapsack. Though few actually rose to the highest ranks, the fact that the opportunity was theoretically open to all, so

THE RUSSIAN ARMY

contrary to the old practice, won the loyalty of the old noncommissioned officers and encouraged the recruits.

The prominent commanders of Russian forces included Budenny, an ex non-commissioned officer, commanding the cavalry; an ex-lieutenant Tukhachevsky, in charge of the troops on the Russian western front, and one Frunze, a novice in military matters, who had won his spurs on his record.

Napoleon recognized the value of opening to the ranks officer promotions. Not all his choices proved exemplary, but they gave the soldiers hope, courage and ambition and they fought for the glory of promotion.

Despite the equalizing influence of the revolution, Trotsky recognized the value of the uniform as a means of fostering an esprit de corps. Marks of rank soon appeared on the uniforms. Soldiers wore Tatar caps, red trousers, gray jackets with three red stripes across the breast. The cavalry wore blue stripes. Soldiers of all armies take pride in the uniform, strut on parade and use their military position to attract the girls; and the Russian is no exception.

In the laborious petty details of the game of soldiering for the purpose of inculcating discipline which few recruits understand, the Russian army does not differ from other efficient military forces. In the Red Army, Saturday inspections are held in ranks and stables, and punishments are meted out for dirty rifles, unpolished boots, dusty barracks and unkempt manes and tails. Though officers and enlisted men stand on an equal social basis out of ranks, on the streets and in the clubs, yet on parade, drill or maneuver, the Russian soldier pays honor and respect to rank.

Recognizing in the Russian a hunger for knowledge, born of the revolution, Trotsky turned the army into a great school. Under compulsory military service the opportunity is offered every man of acquiring some education. It may not be the equivalent of a college degree, but it is still a great improvement over the pre-war situation and it has become a popular feature in the training.

All the educational work is in the hands of the civilian party workers assigned to each unit and although most of their teaching consists of the bolshevist catechism, preaching love for the

THE FIELD ARTILLERY JOURNAL

dictatorship of the proletariat and hate and contempt for the bourgeoisie, the soldiers are returning home every year with some knowledge of reading and writing.

Despite iconoclasm and atheism, a bolshevist god still rules over the barracks. Recruits still kneel and pledge allegiance to the colors, but they now kiss a red banner instead of an ikon of the Savior and swear as follows:

"I, son of the working class, citizen of the Soviet Republic, accept the title of warrior of the Workers' and Peasants' Party.

"In the presence of the working class of Russia and of the whole world I vow to honor this title, to learn the profession of arms conscientiously and to protect the apple of my eye, the good of the people, from ruin and corruption.

"I swear to obey the stern revolutionary discipline and to carry out without dissent all the commands of those commanders appointed by the Workers' and Peasants' Party.

"I swear to hold myself back from any step and to hold back my comrades from any step, which would lower the worth of a citizen of the Soviet Republic, and to direct all my thoughts to the great goal of liberalism for all workers.

"I swear to be ready at the first call of the Workers' and Peasants' government for the defense of the Soviet Republic against all dangers and attacks from any of its enemies and to spare neither my efforts nor my life in battle for the Russian Soviet Republic, for the cause of Socialism and the brotherhood of all peoples.

"Should I maliciously violate this my solemn pledge, so may I be rewarded by universal contempt and the stern punishment of revolutionary law."

Skeptics maintain that the average conscript does not know to what he is swearing when he joins the colors, but by the time he finishes his service under the instruction given him in barracks he has learned to read and write and comprehend more fully the true significance of his vow.

Not all Russian soldiers are privileged to take this Spartan vow of allegiance. Only workers and peasants may be afforded that honor. After all, the title of the Soviet force is still "The Workmen's and Peasants' Red Army." There is no room in it for petty bourgeoisie, kulaks and remnants of the old regime.

THE RUSSIAN ARMY

All those deprived of electoral or civil right or those who have been deported by an administrative order are ineligible for the Red army in peace. In times of war, Russia intends to put every eligible person into the military machine, but the old intelligentsia will serve as the ditch diggers, latrine orderlies and labor battalions of the future.

Although Russia has compulsory military service for all men—and women, too, in case of war—between the ages of 19 to 40, yet in practice it calls only upon those it trusts. Nor does it give them undivided confidence. The system begun by Trotsky of placing civil agents in every barracks and regiment to scrutinize and pass on the conduct of the army is still in force.

In other words, the Red Army performs a dual role. It defends the country, but it also perpetuates Communist power. Soviet leaders recognize that as long as they keep the army loyal their foundation is safe. Having carefully selected their recruits, they make every effort to keep them in the bolshevist ranks.

As far as observers can find out, the Regular Army of Soviet Russia today is 562,000. Though that represents a force more than five times as large as that of the United States, it must be remembered that the Imperial Army totalled 1,300,000. Russia's regular army represents but .4 per cent of her population. True, the American Army includes but .1 per cent of our population, but our borders are not contiguous to twelve states, most of them hostile to our government. Nor can Soviet Russia remain unmindful of the fact that some of the states bordering on her territory call upon as many as six per cent of their men to serve in the regular army.

Not all those who become of age in the Soviet are called to the colors. Soviet leaders seem to have patterned their military organization largely after our own, except for the compulsory features. Almost exactly like our own, the Russian Army is divided into nine territorial departments. We call them corps areas and we have the same number. The nine headquarters are located at Moscow, Leningrad, Samara, Kharkov, Rostov, Smolensk, Tashkend, Novo Nikolayesk and Tiflis.

At the head of the army stands a Commander-in-Chief called the Commissar for Military and Naval Affairs appointed by the

THE FIELD ARTILLERY JOURNAL

Central Executive Committee. He is in charge of strategy, but he must keep the People's Commissars and the Revolutionary Military Soviet informed of his procedure.

Many critics of the Russian military system point to the inefficiency entailed in the procedure of having a civilian body always at the elbow of the commander to supervise his conduct. While not as rigid in this country, we too do not turn our Chief of Staff loose without civilian supervision to decide matters of military policy. Over him stands a Secretary of War, a civilian, and the amount of freedom our Chief-of-Staff enjoys in the execution of his office depends upon the character and personality of the Secretary. We have had secretaries, notably in the Civil War and a president, too, at the same time, who often decided matters of strategy as well as organization himself and made mere figure heads of his generals in the field. On the other hand, we had a notable example in the World War of a Secretary of War who selected his commander carefully and then gave him full power to carry out his mission.

In a new country with a new party determined to reap the fruits of revolution it is not at all surprising that civil agents have been placed in barracks and headquarters to watch them. The first armies of revolutionary France had a similar system.

The Russian Soviet military organization includes the usual organization for a field army with all accompanying weapons included. Cavalry still plays an important role in the army, but chemical warfare and aviation are far from neglected.

As far as observers have been able to ascertain, the Russian army includes approximately 63 infantry divisions, 12 cavalry divisions and 43 cavalry brigades with the artillery, aviation and pioneer battalions, which usually form part of such a mobile force.

An important feature in the Russian military system is the provision for schools. At the end of their nineteenth year, those called to the colors in the Regular Army are put through a two-year course in the three r's. Those who show the most progress are retained for further training, the rest placed in the reserve. The reserve consists of two lines, the first up to

THE RUSSIAN ARMY

the age of 33, the second 33 to 40. Reservists are subject to call for training for a period of three months.

Almost parallel to our own system of National Guard training, Soviet Russia has adopted a territorial scheme of military service. Those not called for the Regular Army and Navy, Customs Guards or other federal service are subject to call in the territorial group. Naturally, training here is not as intensive or as thorough. Such service lasts five years, part of it on furlough and part with the colors, depending on the branch and technique of the arm in which enrolled.

Besides the schools for illiterates, Russia has training courses for all subalterns ranging to three or four years in duration. Refresher courses are offered, also schools for advance training for both officers and enlisted men. For officers are included not only a military academy, but service schools for the separate arms.

As the number of officers produced in the Red colleges have increased, ex-imperialists have been let out. Having served their purpose in helping create the Red Army of today, many of them have been released in a country where they know no other work and where they can hardly find any job to perform.

The organic units of the Soviet artillery include the regiment, the independent artillery group and the independent artillery battery. In addition, each infantry regiment has attached to it a "regimental artillery group" of two batteries, directly under the infantry regimental command.

The artillery regiment consists of the "command" at the head of which are the regimental commander and the military commissary, the regimental staff and three "groups," corresponding to battalions. Two groups in each artillery regiment are made up of three batteries each and one group includes four batteries. A battery usually consists of three guns.

The 76mm gun is the basic weapon of the Field Artillery. The Red Army also employs howitzers of 122, 144, 205 and 260mm caliber and heavy guns of 107 and 155mm.

There are three groups of military schools: (1) for the training of "middle-grade regimental staff" which include four artillery schools; (2) for specialized study such as the Technical

THE FIELD ARTILLERY JOURNAL

Artillery School, and (3) military colleges for senior officers. The period of study for the artillery schools in the first two groups is 4½ years, in the military colleges from 2 to 5 years. The technical military college at Leningrad attended by artillerymen lasts 4½ years.

Soviet leaders make every effort to keep soldiers happy and contented. No matter how hard times are outside the military establishment, the ration keeps up at the same satisfactory level. Plenty of soup, kasha, a little meat, borscht and black bread—lots of it—can keep any ordinary Russian satisfied. The Russian ration can not be compared with the American because of the difference in standards of living. But if ham and eggs are our national dish, black bread is the Russians' and if to this is added plenty of borscht soup and kasha mush the Russian Army can be depended upon to travel far on its belly at least.

No drinking is allowed in barracks, but beer and wine are available outside. There is little doubt that the average Russian soldier is happier, better fed and better housed than the average Moscow or Leningrad workingman.

The real test of the Russian Army can only come in battle, but from present indications the same strength and weakness evident in the pre-Soviet regime still exist today.

After Napoleon's experiences in the Moscow campaign more than a hundred years ago, and after the futile efforts of the White armies a little more than ten years ago, it may safely be said that Russia is unconquerable. That same vast stretch of unconquered territory looms up as an obstacle which no army or coalition of armies can penetrate. By retreating and burning their bridges behind, Russian military leaders can still play with an invading force drawing it further and further away from its base of supplies, stringing out the lines of communications, carrying on methodical guerilla tactics and finally striking when the opportune moment seems to arise.

On the other hand, Russia cannot undertake an offensive war at this time. By propaganda it can keep alive the vision of an invading force as a means of strengthening its home sectors, but Soviet leaders hardly expect such an invasion. And they realize the futility of beginning an offensive war against border states,

THE RUSSIAN ARMY

most of them lined up with the great western powers by alliance.

But the same problems that bothered Russia in Crimea, Manchuria and the eastern front during the World War still exist to plague its military leaders. Officers and non-commissioned officers are the back-bone of any army. No one ever questioned the bravery of the Russian soldier; his leadership too often was faulty. The officers were brave enough, almost too brave and reckless, but when they died or were wounded there were no others to take their places. What Russia has been able to accomplish in her military schools, where bolshevist teachings take their place along with tactics and strategy as a means of determining a man's suitability to hold a commission or non-commissioned officer's warrant, it is hard to determine.

The old difficulties of supply would continue to annoy and harass an army in the field. The five year industrialization program offers many interesting possibilities. With all the emphasis on the production of tractors and farming implements for economic purposes, perhaps the same factories would be able to convert their plough shares into swords if war should come. The question of transportation is also tied up with the five year program. Until Russia improves its railroad system, develops the possibilities of its river transportation and gets its share of airplanes and air ships, she is not ready to stand out as a first rate fighting power.

Because so much of the situation is in the dark as far as the Russian Army is concerned, it is interesting to note what Major General Haskell, a former Regular Army man of almost thirty years' service and now the commander of the New York State National Guard, has to say about the progress of the Russian military machine. In the *New York Times* of June 21, he said:

"No one knows much about the Red Army, except that it is well treated and that in the last analysis it is the mainstay of the present regime. It seems well equipped, well instructed, well disciplined and loyal to the will of the dictatorship. I saw part of it pass in review before its commander on May Day in the Red Square under the walls of the Kremlin and heard it take the annual oath of fealty—one which sounded like a litany. The review was followed by processions of at least one-half million

THE FIELD ARTILLERY JOURNAL

civilians, including workers, delegates and members of innumerable clubs

"As I watched the troops march by, I was reminded of a similar demonstration which took place several years ago on the same date and in the same place. Then there were but four motor vehicles in the review, whereas this year there were more than 400 including light and heavy tanks, anti-aircraft artillery, scout-cars and tractor-drawn artillery units. Then there was a lack of confidence; now large planes flew overhead while smaller craft stunted continuously.

"The strength of the Red Army has been variously estimated at between 700,000 and 1,000,000 men. It looks more effective than it did five years ago. On its loyalty, and that of the GPU (secret police), depends the continuance of the dictatorship, and the leaders know it better than anybody else.

"Since 1919, when first I cabled Paris from Tiflis that the Soviet government was strongly seated in the saddle, I have maintained that the overthrow of the government by violence from within or without was unlikely, but that Russia would change through evolution. The passage of twelve years has justified that prophecy, which was made on the assumption that the Red Army could be kept loyal."



FIELD ARTILLERY NOTES

Knox Trophy Presentations

On February 6, Major General Frank Parker, the Sixth Corps Area Commander, presented the Knox Trophy to Battery D, 3rd Field Artillery. The event was the occasion of an imposing military ceremony at which all troops stationed at Fort Sheridan, Illinois, were assembled. Colonel William H. Burt, Chief of Staff of the Sixth Corps Area, who is a member of the Massachusetts Chapter of the Sons of the American Revolution, the donors of the Knox Trophy and the Knox Medal, represented the Society and delivered the trophy and medal for presentation. At the same ceremony the Knox Medal was presented to Sergeant Clifton J. Pierce, Headquarters Battery, 2nd Battalion, 3rd Field Artillery. The program was as follows: Overture by the 3rd Field Artillery Band; address by Brigadier General Frank C. Bolles; delivery of trophy and medal by Colonel William H. Burt; presentation of the Knox Medal to Sergeant Pierce by General Parker; reading of letter to Sergeant Pierce by Lieutenant Colonel Brunzell, commanding 2nd Battalion, 3rd Field Artillery; presentation of Knox Trophy to Battery D, 3rd Field Artillery by General Parker; remarks by commanding officer, 2nd Battalion, 3rd Field Artillery; mounted exhibition drill by Battery D, 3rd Field Artillery, and final march by 3rd Field Artillery Band.

On January 19 the Society of the Sons of the Revolution in Massachusetts held its 41st annual dinner in Boston. Brigadier General Daniel H. Needham, 51st F. A. Brig., Mass. N. G., announced the winners of the various Knox trophies and medals awarded annually by the Society to the U. S. Navy and the Field Artillery and Coast Artillery of the Regular Army and the Massachusetts National Guard. The battleship trophy was won by the U. S. S. Idaho and was accepted by Captain H. L. Wyman. The Field Artillery trophy was won by Battery D, 3rd F. A., and the Field Artillery medal was won by Sgt. Clifton J. Pierce. They were accepted by Colonel Oliver L. Spalding, Jr., military instructor at Harvard. The Coast Artillery trophy was won by Battery C, 55th Coast Artillery, Fort Kamehameha, Hawaii, and

THE FIELD ARTILLERY JOURNAL

was accepted by Brig Gen. Alston Hamilton. The Field Artillery trophy for the Massachusetts National Guard was won by Battery C, 102nd F. A., and was accepted by the battery commander, Captain Edward D. Sirois. The Coast Artillery Massachusetts National Guard trophy was won by Battery M, 241st Coast Artillery and was accepted by 1st Lt. E. B. Fantom.

Lieut. Col. John B. Richards, President of the Society, explained the significance of the Knox trophies and General Needham gave a sketch of the life of Henry Knox, the Boston bookseller who brought fifty pieces of artillery to Roxbury Heights from Fort Ticonderoga, was Chief of Artillery under Washington, and later, as Secretary of War under Washington, agitated for a militia.

Professor Robert E. Rogers of Massachusetts Institute of Technology entertained the assembly with a talk on Benjamin Franklin from which the following are quotations:

"A wit spoke the truth when he averred that Franklin was born in Philadelphia at the age of seventeen years. That was just about the fact. He, of course, was born in Boston, but Boston offered him no opportunity. Franklin and his brother James were 'agin' about everything here. While James was in jail for some of his vitriolic attacks on Boston institutions, Benjamin at the age of fourteen years, wrote in James' paper, which was about as red as anything could be in the Boston of those days, vigorous attacks on Harvard College, the Congregational Church and State Street, under the pseudonym of an old lady, Agatha Dogood. He did well to leave Boston. There was no future for him here. Because Pennsylvania was a place where people were allowed to do as they pleased, Franklin prospered there. Boston started the Revolution. Don't forget that. But when discussing Boston and its institutions and habits, Boston allowed no serious criticism."

Project to Improve Accuracy of 155mm G. P. F. Gun

A pilot lot of five 155mm shell, on which the bourrelet was increased in diameter by depositing copper thereon with a spraying process, has been completed. If these five shells are satisfactory as evidenced by recovery firings, a lot of 160 shells will be made in the same manner. The test is part of the project to improve the accuracy of the 155mm gun (G. P. F.)

FIELD ARTILLERY NOTES

90mm Gun-Howitzer

Preliminary proof tests and powder tests have been conducted at Aberdeen Proving Ground for the new 90mm Gun-Howitzer using the heavier weight of projectile (for supercharge velocity). The behavior of the weapon has been entirely satisfactory to date, even up to pressures approaching the maximum allowable.

8-Inch Howitzer

The issue of the 8" Howitzer Matériel, T2, for service test will be somewhat delayed due to a weakness which was found in the trails during proof firing at the Aberdeen Proving Ground. Steps are being taken to correct this trouble and it is hoped to be able to issue this matériel to the Field Artillery Board at Fort Bragg for service test shortly.

Sound and Flash Ranging Equipment

A *flash* ranging plotting board, T3, was manufactured in 1931 and submitted to the Field Artillery Board for service test. The plotting board proved quite satisfactory and was recommended for standardization after certain minor modifications recommended by the Field Artillery Board had been made. Standardization has been postponed, however, until a second flash ranging plotting board T3E1, embodying the recommendations of the Field Artillery Board could be manufactured and tested. This second board is now under manufacture at Frankford Arsenal.

The design of a *sound* ranging plotting board, T3, has been completed and two units are under manufacture at Frankford Arsenal.

Fire Control Apparatus for Field Artillery

Two aiming circles T1 have recently been delivered to Aberdeen Proving Ground for accuracy tests. After short tests at the proving ground to determine the relative accuracy of the new aiming circles as compared with the M1918, and also with a standard theodolite, they will be delivered to the Field Artillery Board for service test. An experimental lighting apparatus has been furnished with these aiming circles which provides illumination for the reticle and for reading the necessary scales. Commercial flashlight equipment is used for the basis of this lighting equipment, and the entire unit, with the exception of the fixture

for illuminating the reticle, can be applied to any other Field Artillery fire control instrument.

75mm Pack Howitzer

The issue of 75mm pack howitzer matériel to the Field Artillery is somewhat delayed due to non-completion of the sighting equipment; however, it is expected to issue four units to Fort Bragg immediately and to issue other units to Field Artillery organizations during the latter part of April. One other 75mm pack howitzer is being shipped to the Field Artillery School, Fort Sill, Oklahoma.

Cavalry Division Howitzer

The design of the 75mm Howitzer carriage T1, which is the new split trail type of carriage equipped with pneumatic tires and which is being designed for test as the weapon to be used by Field Artillery assigned to Cavalry divisions, has been completed in the Office of the Chief of Ordnance and turned over to the Rock Island Arsenal for the manufacture of a pilot model. It is the 75mm pack howitzer modified for high speed draft. The carriage is changed in many essentials and cannot be broken up for pack. It has high speed bearings and a pintle traversing mechanism, which will greatly increase the amount and rapidity of traverse. This mechanism is an improvement even over the traversing mechanism of the 75mm gun M1 as regards ease of traverse.

Centrifugally Cast 75mm Gun

A 75mm Gun T2 (Cast) is being mounted for test at Aberdeen Proving Ground. This is one of the series of centrifugally cast guns that are being tested by the Ordnance Department.

Progress With T2 and T3 75mm Gun Carriages

Studies are being made by the Ordnance Department of 75mm Gun Carriages T2 and T3, with a view to selecting the best type of gun and carriage to be manufactured for issue to the Field Artillery and for test as a battery of so called all-purpose guns. The manufacture of such a battery has already been authorized.

High Speed Bearings for G. P. F. Materiel

One 155mm G. P. F. gun with special high speed bearings has

FIELD ARTILLERY NOTES

been sent overland from Aberdeen Proving Ground, Maryland, to Fort Bragg, North Carolina, for test by the Field Artillery Board. This gun was towed by a standard 8-ton anti-aircraft prime mover (6 wheel-4 wheel drive) which is also being tested by the Field Artillery Board to determine its suitability as a prime mover for heavy artillery.

Direction Controller T1 for Firing on Moving Targets

This instrument is attached to the standard B. C. instrument and follows in principle the design suggested by the Chief of Field Artillery. It is now under manufacture at Frankford Arsenal. It has for its purpose the transmission of gun deflection changes in 5 mil steps, corrected for parallax from the O. P. to the battery when firing at fast moving targets. The parallax correction is accomplished in .1 steps, and the correctness of the data is dependent upon the battery commander's estimate of the proper parallax factor for any given situation. As the target is tracked by the operator of the battery commander's instrument deflection changes are transmitted automatically from O. P. to battery in 5 mil steps by means of a buzzer and a light. A transmitter is provided for the officer conducting the fire which has a provision whereby he can either stop the transmission of 5 mil deflection increments or intersperse additional five mil increments thus enabling him to adjust fire. Receivers are provided for each gun of the battery and for the executive officer. The direction controller is of light weight and can be readily detached from the B. C. instrument. Adjustment in range is accomplished by telephone commands as at present.

Stereoscopic Fire Director T7

The stereoscopic fire director T7 is a complete unit in itself, comprising a 1-meter stereoscopic range finder, or other observing instrument, rigidly attached to the top of the director. Suitable handwheels are provided for elevating, traversing and applying corrections in both vertical and horizontal planes. Corrections both in range and deflection are applied with correction handwheels. Trackers follow the target in both elevation and azimuth and this data is automatically and continuously transmitted and displayed on receivers on the gun mount. Corrections,

THE FIELD ARTILLERY JOURNAL

both lateral and vertical, feed through differentials and automatically correct the data flowing to the gun. The fire director was tested at the Aberdeen Proving Ground in connection with .50 caliber machine guns and 37mm automatic cannon during the the 1930 A. A. Exercises. No parallax feature was incorporated in the original design. For use by the Field Artillery in conducting fire against fast moving ground targets an approximate parallax mechanism has been designed that will function somewhat similarly to the one described for the direction controller. Provision is being made for the interchangeable mounting on the fire director of a 1-meter stereoscopic range finder, a 2-meter stereoscopic range finder and a standard battery commander's telescope. It will be tested with the T2-75mm mount, now at Fort Bragg, N. C.

