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# BATTLE FIRE TRAINING

CAPT. G. S. TURNER  
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# BATTLE FIRE TRAINING

*By*  
CAPTAIN G. S. TURNER  
AND  
CAPTAIN J. J. FULMER  
U. S. ARMY.



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*by*

*CAPTAIN G. S. TURNER*

*and*

*CAPTAIN J. J. FULMER*

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## PREFACE

A necessity exists for the adoption throughout our army of a uniform system of collective training in battle fire. A system, by means of which, the highly skilled individual shots we regularly develop in time of peace may produce the greatest possible collective effect in time of war. If given time and opportunity our School of Musketry, which has such a system, will supply this necessity. The present exigencies of the service, however, prevent the operation of this school. Meanwhile time goes on and *we adopt no uniform system.*

This book is offered in the hope that it may assist towards the adoption of a uniform system and thus aid, even though it be in a small way, the furthering of the work so necessary for success on the field of battle.

The system outlined herein is based upon the principles laid down in the various manuals upon the subject of fire and fire tactics published by the War Department. The practical application of these principles to concrete cases, and the method by which they are embodied in terrain exercises are largely derived from a series of "Musketry Bulletins" written by a board of officers. Also from a personal observation, in a supervisory capacity, of forty-eight companies of infantry during four

months' training devoted almost exclusively to "musketry." The system of indoor training by means of landscape targets and the complete development of the various methods of target designation and distribution are the results of some three years' work, by one of the writers, with the Disciplinary Battalion at the Fort Leavenworth Disciplinary Barracks.

Few of the methods outlined for control, communication, designation, distribution, etc., have received the test of actual war. They have, however, all been applied by a number of independent organizations over an extended period of time, and with uniformly excellent results. In the light of this knowledge and with the lessons of military history as a guide, it may be stated as a fact that this, or some other similar system, is not only applicable in war but necessary to its successful prosecution.

By permission of the authorities of the School of Musketry the pamphlets issued by that school have been freely drawn upon and acknowledgment is here offered.

To Colonel Sedgwick Rice, Commandant, United States Disciplinary Barracks, Fort Leavenworth, Kansas, whose interest, help, and support made possible the application to indoor work of many of the principles herein contained; to Major H. E. Eames and Captains W. A. Kent and C. H. Mason, who, with one of the writers composed the board referred to

above, and to Captain James D. Taylor and F. B. Davis our sincere thanks are due.

The following books have been consulted: Eames' *Rifle in War*; Morrison's *Training Infantry*; *Technique of Modern Tactics*, Bond and McDonough; *Fire Problems*, Pilcher; *Musketry Bulletins*, Twelfth U. S. Infantry; *Studies in Minor Tactics and Problems in Troop Leading*, Military Art Department, Leavenworth; and the manuals bearing upon the subject published by the War Department.

Fort Leavenworth, Kansas.

Fort Bayard, New Mexico.

April, 1907.





## INTRODUCTION

The broad doctrine that only with the aid of superior fire is it possible to carry through a successful attack, has been confirmed on every battlefield of the present great war. Given a superiority of fire, infantry can advance and suffer only losses that can be borne; without superiority of fire, the finest troops will be stopped by the ruinous losses they receive. The opposing lines in western Europe have remained for many months practically stationary, and consequently embody every refinement of the engineer's art. In the preparation of such elaborate entrenchments for assault, the havoc of the artillery becomes, therefore, more important than that of the rifle. Yet, with all of its tremendous modern power, artillery alone is not able to drive the enemy from his trenches. To do this, even in the war of position in France today, requires the attack of infantry; and for infantry, notwithstanding the extensive use of machine guns and grenades which this stationary war permits, the rifle remains the paramount weapon.

There is little chance of the employment in the United States of masses sufficiently large ever to rest both flanks on impassable obstacles. Consequently, we are not likely to find warfare in the United States reduced to a standstill as

is now the case in western Europe. Our campaigns will be campaigns of maneuver, in which events will follow with too little intermission to permit the emplacement and use of almost unlimited masses of artillery and machine guns. In such mobile operations, the infantry rifle, properly used, will always furnish the great majority of casualties, and is, therefore, the supreme weapon for the attainment of victory.

The effective use of the rifle requires that the men shall individually be good shots; that, in action, ranges shall be determined with considerable accuracy; that the targets shall be so clearly designated that the men recognize them and aim as desired; and that their fire is so distributed as to cause all parts of the hostile line to suffer therefrom. In other words, to produce effective results in the aggregate, the fire of good shots must be so directed and controlled by their officers that all will act together as members of a highly trained team in the application of fire against a common objective.

The work of our Army on the target range produces a high average of good individual target shots and fulfills, accordingly, the first requisite for effective fire. But the methods used in training for direction and control of the collective fire of organizations differ rather widely in the several regiments, with the result that our companies and battalions do not have the uniformly excellent teamwork that is necessary today in an army for successful action.

The musketry training at Galveston in 1913 produced a high and very uniform standard in field firing in the organizations of the 5th Brigade. The authors have put in this book a concise description of the methods that gave the best results in the long series of outdoor exercises and problems of the 5th Brigade, and have made the text readily understood by numerous and excellent drawings. They have also embodied the methods for indoor instruction that have given excellent results with a wide variety of men at the Fort Leavenworth Disciplinary Barracks. In the chapters on Determination of Ranges, Target Designation, Fire Distribution, Communications, Signals, Fire Discipline, Application of Fire, Supply of Ammunition, and Conduct of Fire, the text describes the means and methods that should be applied on the battlefield, and then gives detailed suggestions for peace-time training in all of these important musketry functions. Finally, the text describes several company and battalion problems for unknown ground that were found highly satisfactory in the work of the 5th Brigade, and that will frequently be easily adapted to terrain which permits any kind of ball practice.

The musketry training of the Army needs standardizing to produce a more uniform excellence. This text furnishes a clear statement of methods, which in practical application, have

proven their efficiency; it should, therefore, constitute a splendid manual of musketry training for the attainment of the desired standard.

H. B. FISKE,

*Major of Infantry*

# CHAPTER I

## MUSKETRY

Musketry is understood in some of the foreign armies to embrace any instruction, individual or collective, pertaining to the use of the rifle. In our service the term "Musketry" is looked upon as embracing the principles relating to collective fire and it is so treated in these pages.

Perfecting the individual in rifle shooting is but the primary step in our instruction, the next and final is the binding of individuals into a flexible, controlled, and dependable fire unit in which each individual plays his own part in adding strength to the whole. The ability to do this *naturally rests on the degree to which a man has been trained both individually and collectively.*

The process of perfecting the units of a machine is but the first stage, to be followed by the perfect assembling, to insure the functioning of the parts as a whole. An automobile has its gears, bearings, and parts perfectly made, but without an intelligent joining of the parts and careful adjustment of all of its bearings and elements, a machine results <sup>which is</sup> incapable of proper functioning. How many goals would be scored by a football team in which each unit

represented the last word in training in his own particular work and nothing more? A tackle for instance, who could down a man without failure, a man who could punt the length of the field, one who could land on a ball from the quarter with such unerring accuracy as to ever preclude his missing? What would happen on the day of contest, when for the first time, these perfectly trained parts are put together to perform the work of a team? Can any more results be expected relatively on the field of battle with an organization trained until every man is an individual expert but not trained to act as a part of an harmonious whole? What about the rate of fire, the control, the centering of fire on a particular target, the distribution of fire, and the many other elements of musketry which are indisputably necessary to obtain the *sine qua non* of success in battle—*fire superiority*?

It might be assumed that the necessity and value of musketry training are admitted by all. Such, unfortunately, is not the case. This is due largely to the fact that we have no definite doctrine of musketry throughout the service and, also, to the fact that the unquestionable results produced by the School of Musketry have not become generally known. When the excellent course now contemplated at the School becomes available to the Army, it may

be confidently hoped that such benighted conditions will rapidly disappear, but until such time we must present some facts to sustain our contentions as to the value of musketry in general.

If, as has been stated, musketry training produces such valuable results, why has it been, until quite recently, so generally neglected in the Army? It is not for us to answer this question beyond pointing out the fact that certainly it is not because writers of authority in the Service have failed to emphasize the necessity and value of this training. Could anything be more plain than General Morrison's *Training Infantry* in this regard? Does not Eames in *The Rifle in War* show results to be expected from improperly controlled shots? And finally, among many others, see the stress laid by Major Fiske and the Military Art Department of Leavenworth upon control and distribution of fire in the officially published *Minor Tactics*, 1915, and *Problems in Troop Leading*, 1916.

So much for the authorities. Now examine the results of one or two problems actually fired on the target range.

A company of Expert Riflemen, properly trained to fire collectively but improperly led as to fire control, shot a given problem. They were immediately followed on the range by a

company composed of men who, while they were trained on the gallery range in individual fire, had never fired a service charge. The third phase of this problem was the firing of the company of Expert Riflemen properly controlled and directed. The results are tabulated below:

	<i>Hits</i>	<i>Figures Hit</i>
Company of Expert Riflemen—		
1st firing .....	7	7
Untrained Company, 1st firing ....	47	31
Company of Expert Riflemen—		
2d firing .....	122	76
Untrained Company, 2nd firing ....	71	48

This problem was in defense; the main points involved were: Correct determination of the initial range and its transmission to the firing line; accurate and quick sight setting; the maintenance of the correct range during the problem, and its rapid and accurate transmission while firing. All these points may well be considered under one single head of the subject of musketry in general, i. e., Range. A system of training, one phase of which can produce results as far-reaching as those given above, is certainly valuable, to say the least.

Take a second problem, one in which practically the whole subject of musketry, as far as it pertains to a company acting alone, was covered.



**Problem:** To advance from about 1,200 yards to assaulting position. Time, 30 minutes. Rounds, 90 per man. Rate of advance to be governed by hits and distribution made each minute. Data being signaled from the pit to the firing line.

In this problem comparisons will be made of the positions at the end of thirty minutes of the following: a company of selected shots from the Militia; a company of selected shots from a Regular regiment; and the average of forty-eight companies of Regular Infantry. The two companies of selected shots had not been especially trained for collective firing, while the forty-eight regular companies had completed a course in musketry. About thirty per cent of each of the latter companies were qualified marksmen; many contained a percentage of five months' recruits.

Militia company, 24% reaches 1075 yds.; 76% reaches 975 yds.

Selected company, U. S. A., 100% reaches 700 yds.

Average 48 Co's, U. S. A., 100% reaches 500 yds. (with 5 to 25 rounds of ammunition in each belt).

There were many regular companies which in from twenty to twenty-five minutes progressed to about 300 yards from the target at which point they were stopped by an impassable stream. These companies had from five to ten rounds of ammunition per man remaining

and under the conditions of the problem could easily have advanced to the target itself. Certainly there can be no gainsaying the value of training which can produce such results as these.

The opinion is so often expressed that in battle any system of fire control, target designation, and musketry in general will fail to produce expected results. Undoubtedly war will furnish many instances where the character of the engagement or tactical requirements will be such as to preclude the possibility of preliminary target designation; on the other hand there will be frequent occasions when all the details of designation may be well cared for before fire is opened. So, also, with all the other elements of musketry there will be times when they will be reduced to a minimum or disappear altogether and times when they may be fully applied. However, admitting that the principles of musketry are not always applicable on the field of battle in no way warrants the omission from our instruction schedules of a thorough training in these principles, for a study of the results produced in peace firing by such training indicates a wonderful increase in fire efficiency, and a study of the details of military history will disclose many instances where the full effect of such training might

have been reaped in battle. We state, as an indisputable fact, that a battle unit untrained in musketry is a unit in name only.

The phases of musketry instruction will be treated of under the following heads:—

- (1) Determination of Ranges.
- (2) Designation of Targets and Sectors.
- (3) Distribution.
- (4) Communication, Signals, and Transmission of Fire Data.
- (5) Fire Discipline.
- (6) The Application of Fire.
- (7) The Supply of Ammunition to the Firing Line.
- (8) Conduct of Fire.
- (9) Combat Practice.

#### *Determination of Ranges:—*

The necessity for correct sight setting and methods for determining ranges is pointed out in the authorized manuals.

#### *Means of Determining Ranges:—*

1. Estimation by eye.
2. By observation of fire and trial volleys.
3. From other troops.
4. By instruments.
5. From maps.
6. By sound.
7. Measuring distance on the ground.

*Estimation by Eye:—*

While estimation by eye, until mechanical range finders are more liberally issued, will probably be the method most generally used, it must be borne in mind that many thousands of estimates by this method have proved that it results in an average error of 12½ per cent. Such an error will at times be fatal to good fire effect (see table); therefore, no opportunity should be neglected to apply other methods in conjunction with estimation by eye. There should be a constant and never failing effort to verify and correct the range.

The average of a number of estimates will, of course, give more nearly correct results than an individual estimate. Advantage of this fact should be taken whenever possible, in the company, in the battalion, and even at times in the regiment. Individual estimates in the company should be averaged by the first sergeant, company estimates in the battalion by the adjutant, and battalion commanders of adjacent battalions might well take means to ascertain ranges from the battalions on the right and left.

In addition to the usual method, the following, which is sometimes called the over and short method, will be found to give good results but like any other character of work requires

practice to produce proficiency. It has often been known to result in errors of less than ten per cent and within a time limit which has been set at about thirty seconds.

*Method:—*

Assuming a company in fire position with the objective announced by the fire director (captain). In each platoon are two selected range estimators, one having been trained to assume the over or maximum range as, for example, the objective cannot be beyond a certain number of yards; the other, the shorter or minimum of that range; in other words, that the objective cannot be under a certain number of yards. When they have *decided their own estimates*, either one, according to previous designation, calls on the other for his estimate, which he adds to his own, and halves the sum; the result he gives or signals to his platoon leader, who in turn gives or signals it to the first sergeant. The latter takes the estimate of all the range estimators, averages them and reports the result to the captain. This same system should be used when each estimator simply estimates the range without the over and short method. It may be advantageous to assemble the range finders while the captain is absent receiving the attack order, then upon his return they will

be immediately available. Whatever method is used it should be borne in mind that the results sought for are accuracy and speed.

*Estimation Exercises:—*

No. 1: An officer, accompanied by several markers, may be sent to the vicinity of the range a short time before target practice. When he arrives at a point previously designated he sends out his markers in different directions with instructions to move toward selected points a certain number of yards, to halt, and remain under cover until signaled to kneel or rise.

The company arrives at the position and is faced in the direction of one group of markers which is signaled to make itself visible. Each man estimates the range and announces it to his corporal. In similar manner the estimates are determined to the other markers; the true ranges then announced to each group; comparisons made; the men given time to figure their errors; and the company moved on to the range having been halted about fifteen minutes. It is, of course, necessary that the markers be instructed in pacing and understand the relation their paces bear to 100 yards. Attention may be called to the appearance of men, objects, or animals, at different distances.

No. 2: If a range-finding instrument is available, considerable practice can be given in a limited period of time; as many as twenty estimates in ten minutes.

- (1) A company can estimate ranges to moving or stationary objects and within a certain time limit of, say thirty seconds; range is announced as indicated by instrument.
- (2) After several drills, of about twenty minutes daily, have been devoted to company instruction as indicated in preceding paragraph, the company should be divided into squads, the ranges estimated by the men, recorded by their corporal, and compared with the instrumental finding.

The use of an instrument of the contained base type affords the utilization of any object in view for this practice and records distance with so small an error and in so brief a period of time that *interest*—the big factor—can be held without difficulty.

*Attack:—*

The foregoing exercises and discussion refer mainly to the determination of the initial range. The question of the maintenance of the range throughout an action must now be

considered. After fire has been opened, the commander of the attack unit which first establishes a new firing position is especially charged with the duty of making an accurate estimate of the distance covered by his rush. This he does either by counting his own paces, delegating this duty to an assistant, or by estimation. Each unit of a company, as it arrives on the line, takes its range by signal from the portion already established in the new position. The captain, also by signal, must after each advance assure himself that the ranges used by the several platoons are as desired. In battalion, each company maintains its own range. Reënforcing companies not previously participating in the fire fight take their range from the nearest unit. It is the duty of the battalion commander to harmonize the ranges of the several companies.

It is necessary, during the progress of the advance, to check the range being used by all of the several methods which are applicable at the time and to use the system of check outlined above. If these precautions are not taken one of two things will invariably result, either an original error in the initial range will be maintained or a correct initial range will be lost.



Estimation Exercise No. 3: A company or larger force deployed facing a similar force at as great a range up to 1,600 yards, as the terrain will permit. The companies to be invisible one from the other at the initial deployment. At a signal, either by bugle or flag, both lines advance simultaneously. After the advance is continued for a short distance both lines are halted and thirty to forty-five seconds allowed for an estimate of the distance to the opposing line. The exercise is continued by a simultaneous advancing and halting of the lines. The exercise will run smoothly if the director takes post midway between the two lines in a conspicuous position. He should by a system of preconcerted signals indicate the moment for advancing and halting but the actual commands should be given by the company commanders themselves. Stakes should be driven at each halt for subsequent checking of the ranges. This exercise may be varied by using only company commanders and range estimators, or any part of a unit up to a brigade. Part of the advance may be in double time or the regular method of advance by rushes may be used. The results produced by an organization on its first attempt at this kind of work will be amply indicative of the necessity for further training.

*Defense:—*

In the attack each platoon will probably cover for its target all or half of the company objective, depending upon the size of the organization. They will, consequently, usually maintain the same elevation. On the defensive, however, the initial distribution will be quite different due to the necessity for covering the various fractions of the enemy's rushes. Here the platoon objectives will usually be dependent upon the character of the opposing rushes. After fire has once been opened it becomes necessary, therefore, for each fraction of a company having a separate objective to maintain a system of estimation of the length of the enemy's rushes or his present range. This is usually accomplished by the file closers. The captain with the first sergeant and the company buglers maintains a check and harmonizes the ranges. In the battalion the major must, as far as practicable, take advantage of every opportunity to keep his battalion working as a unit. Variations of Exercise No. 3, to cover the defense, will produce results commensurate with the effort expended.

*Observation of Fire:—*

Range may be determined by observing the simultaneous strike of a number of bullets, i. e.,

*volleys*; by observing irregular firing, or *fire at will*; and by observing the strike of shots fired by several expert riflemen.

The volley will give, under similar conditions, better indications than will the same number of shots which are not fired simultaneously. It is, therefore, desirable when possible to use the volley for ranging. In order that this method may produce results commensurate with the effort made there are certain conditions which must be fulfilled:—

1. The target must be stationary.
2. The ground must be of such character that the strike of bullets may be seen.
3. The target must be so situated that the ground in its vicinity is visible.

The application of this method is usually about as follows:

Having estimated the range, two platoons are selected to fire, the first with an elevation about 200 yards over the estimated range; the second with one about 200 yards under. The second platoon should fire a few seconds after the first. The target should be included between these shot groups and the range may be estimated from the relative position of the three points. If the target is not included within the shot groups, changes in elevation should be made *so that it will be included*, bear-

ing in mind that positive changes will produce quicker results than a slight shifting of the sight leaves. No more than two volleys should usually be necessary to adjust the fire. (Selected shots give a smaller shot group which is more easily located.)

In order that the strike of the bullets may be properly interpreted it is necessary that the form of the shot group on various kinds of ground be thoroughly understood, so that the center of impact may be quickly recognized. On horizontal ground the form of the shot group is somewhat that of an ellipse with its longer axis in the direction of the line of fire. Ground rising at the target shortens the ellipse. The length of the ellipse, of course, varies with the different ranges from 300 yards at 100 yards to 64 at 2,000 for the mean or fifty per cent zone, that is, the zone in which half the hits will be found.

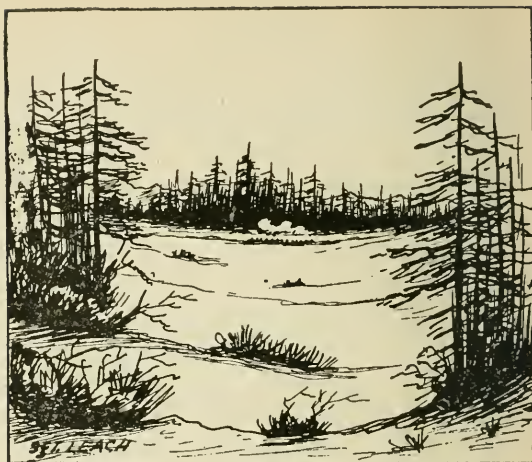
The table of dispersion given in the S. A. F. M. should be studied in this connection so that allowance may be made for wild and scattered shots which will always occur.

In war it will frequently be difficult, if not impossible, for commanders to distinguish indication of their own fire from that of other troops. Tactical situations will not often admit of trial volleys. Troops firing volleys

should not themselves be under fire. For these reasons and for those previously given it is apparent that the opportunities for the use of volleys for ranging are limited; however, this fact does not detract from the value of the method and practice in it should be given in order that, when applicable, it may be used. To interpret properly the range from a group fired at will is, of course, more difficult than with the volley and it is from the former class of fire that we will in battle be obliged to deduce our fire effect. We have, however, in addition to the indications given by the strike of the bullets the effect of fire upon the enemy as a basis for estimation. Good glasses, training, and constant, keen observation for indications which may be interpreted into terms of range are requisite before results of any value can be obtained from observation of fire.

Taking into consideration that hits on the target will pass through and afford indications in rear, it may be taken as an approximation that fire directed at a stationary target is adjusted properly when about one-third of the shots appear to strike in front of it.

If circumstances will permit, perhaps one of the most favorable methods of finding the range is by the fire of expert riflemen who, with an estimated range, fire at a prominent object.



1



2.

The fire of the company is adjusted from the strike of their bullets.

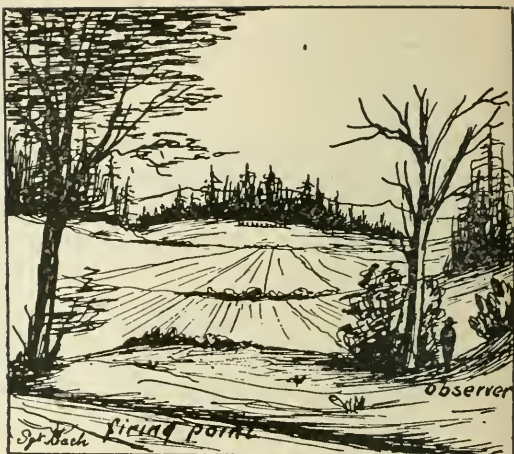
The following plates give an approximation of the appearance of fire when viewed from different points in relation to the firing line:

PLATE 1. Observing fire from in rear of firing point, dust will appear somewhat above actual point of impact.

PLATE 2. If observation is made from rear of firing point, hits appear on the side opposite to the direction of the wind (wind from the right). The best position from which to observe fire is in rear of and above the firing point, but it must be remembered that from this position bullets which fall short will be more easily seen and consequently will appear to strike further from the objective than bullets which strike an equal distance beyond.

PLATE 3. If observation is made on or beyond the flank, shots which pass over the objective will appear to fall toward the side on which posted and those which fall short toward the opposite side. The first view is from the position of the firing line, the second view from the position of the observer, of hits over and short of the objective.







*From Other Troops:—*

The artillery by the nature of its fire quickly determines ranges and from it, at times, this valuable information can be obtained.

*By Instruments:—*

The use of the "contained base instruments" will largely eliminate difficulties but there are two points to be borne in mind in this connection. First, we can never hope to supply all units with the mechanical range finders. Patrols, subdivisions of covering forces, and individual soldiers will frequently be called upon to estimate ranges, and therefore, the issue of instruments should not be the signal for omitting instruction in the other methods. Second, range finders make errors and in addition the distance to the target is not always the best elevation to use; hence we must not cease to correct by observation. On some foreign ranges the range for the day is announced not from the reading of the instruments but from the results obtained by specially selected shots. It is obvious that where range finders are issued for only a portion of a command arrangements should be made for the transmission throughout the unit of the data obtained by these valuable adjuncts. Considerable practice is necessary even with the simplest form of range finder to obtain accuracy and speed.

USE OF THE MIL SCALE FOR RANGE DETERMINATION  
(From *Infantry Journal*—Article by Capt. H. E. Eames,  
28th Infantry)

1.

$$R = \frac{W \times 1,000}{M} \quad R = \text{Range in yds.}$$

.....

2.

$$W = \frac{R \times M}{1,000} \quad W = \text{Width or height in yds.}$$

.....

3.

$$M = \frac{W \times 1,000}{R} \quad M = \text{Number of mils.}$$

.....

The following examples of the application of these formulæ indicate their practical use:  
Example 1: (Estimation of range)

A certain tree is estimated to be 45 feet high (15 yds.). It covers 15 mils of the scale. It is therefore (estimated) 1,000 yards away, for:

$$R = \frac{W \times 1,000}{M} = \frac{15 \text{ yards} \times 1,000}{15 \text{ mils}} = \frac{15,000}{15} = 1,000 \text{ yards.}$$

The telegraph poles seen on a distant railroad are known (from previous measurement of such poles) to be 44 yards apart; the distance between two adjacent poles is 40 mils; the range to the railroad is therefore 1,100 yards, for:

$$R = \frac{W \times 1,000}{M} = \frac{44 \text{ yards} \times 1,000}{40 \text{ mils}} = \frac{44,000}{40} = 1,100 \text{ yds.}$$

Example 2: (Estimation of fronts)

A line of skirmishers at about one man per yard of front covers 40 mils of the scale; the range is known to be 800 yards. How many men are there in the skirmish line?

$$W = \frac{R \times M}{1,000} = \frac{800 \text{ yards} \times 40 \text{ mils}}{40 \text{ mils}} = \frac{32,000}{1,000} \left\{ \begin{array}{l} 32 \text{ yards} \\ \text{(or men).} \end{array} \right.$$

A column of infantry in "fours" is seen by a patrol at a range of 1,200 yards. It covers 120 mils from head to rear of column. How many men are in the column?

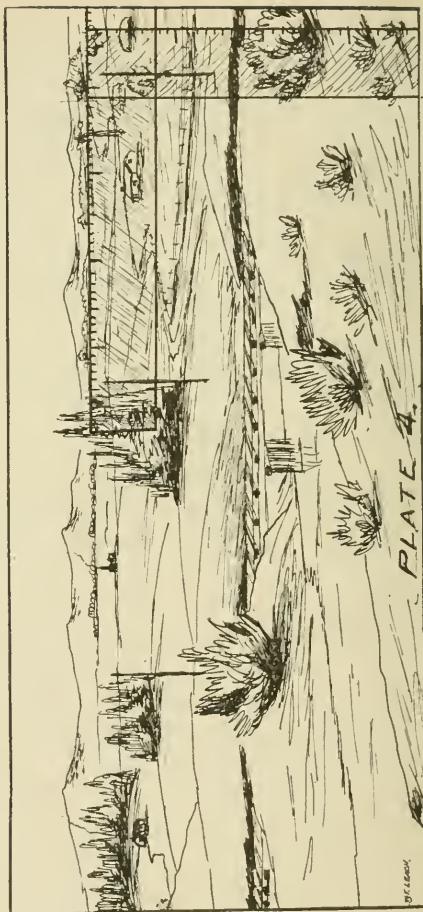
$$W = \frac{R \times M}{1,000} = \frac{1,200 \text{ yards} \times 120 \text{ mils}}{1,000} = \frac{144,000}{1,000} = \left\{ \begin{array}{l} 144 \text{ yds.} \\ \text{or} \\ 288 \text{ men.} \end{array} \right.$$

Example 3: (Determination of mils—in distributing fire)

A hostile force known to contain about 100 men is deployed in position 1,000 yards away but so concealed that its flanks cannot be seen or determined definitely. The company commander decides to cover a front of 200 yards with his fire, 100 yards each side of a visible group of heads in the battle line. How many mils or "sights" should be covered?

$$M = \frac{W \times 1,000}{R} = \frac{200 \text{ yards} \times 1,000}{1,000} = \frac{200,000}{1,000} \left\{ \begin{array}{l} 200 \text{ mils or} \\ 4 \text{ sights.} \end{array} \right.$$

A machine gun platoon known to contain two guns is concealed at a range of 900 yards with one of its guns visible through glasses near a small bush. The company commander decides to cover a front of 50 yards on each side of the



visible gun. How many mils or "sights" should be covered?

$$M = \frac{W \times 1,000}{R} = \frac{100 \times 1,000}{900} = \frac{100,000}{900} = \begin{cases} 111 \text{ mils or} \\ 2.2 \text{ sights.} \end{cases}$$

*By Maps:—*

It is to be expected that the use of maps for range finding will be limited by the very nature of campaign, except in prolonged engagements, or when time and opportunity affords the making of reliable data, as in defensive positions.

If time permits a sketch, which is always a valuable supplement to a report or for use as a fire chart, can be made. Supposing a landscape, as Plate 4, is under consideration; rule off on a paper with a mil scale horizontal and vertical lines as shown in Plate 5.

Hold the mil scale, as indicated in Plate 4, a suitable distance from the eye with the button on the string held in the mouth and obtain the horizon, the location of prominent landmarks and features of terrain covered by the scale which is sketched in the corresponding squares on the ruled paper; proceed along the width of the proposed sketch in a similar manner. Then hold the rule vertically and locate the boundaries and by a series of horizontal and vertical intercepts data is obtained for filling out the sketch. Thus far the sketch, as shown

[illegible]

PLATE 5.

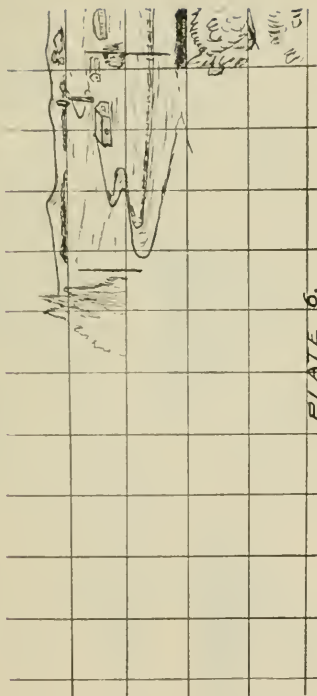
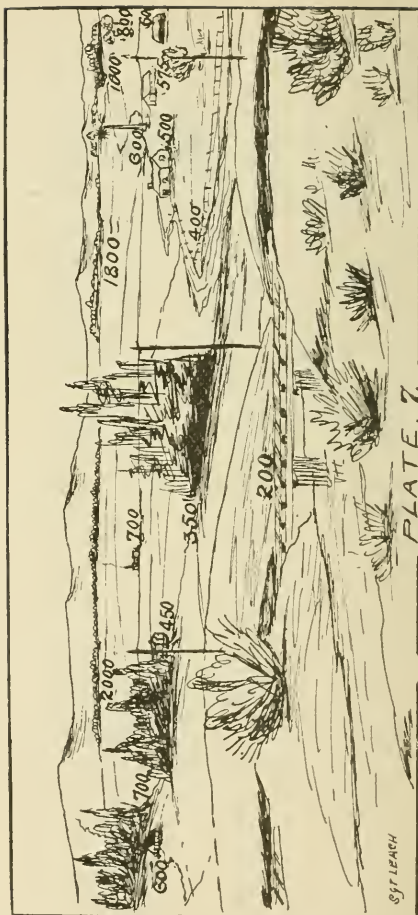


PLATE 6.





in Plate 6, has been completed. The value of a transparent material for a mil scale is apparent in this work.

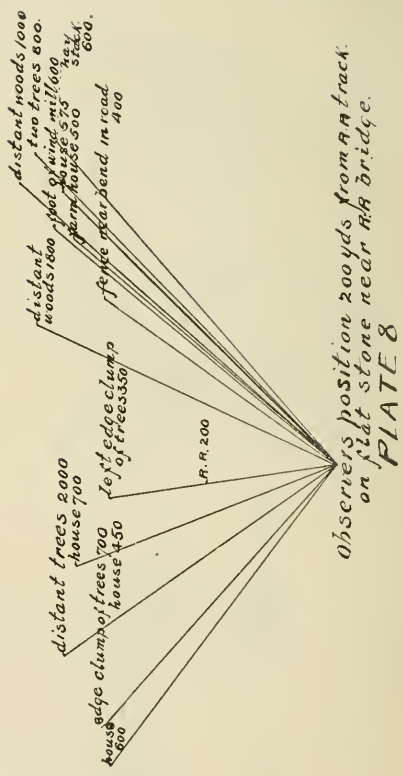
When completed the sketch should approximate that shown in Plate 7.

On the completed sketch, as in Plate 7, mark the ranges to the prominent points and turn it over to the troops occupying the position, and the matter of transmission of ranges is simplified. If opportunity does not afford time for the above method, a valuable range card can be made by the following method (applying to landscape of Plate 7), which would be of great value in defense work.

In making this range card, first locate the position of observer, then a reference point, and mark them plainly. Any one using such a card, sights on the reference point and orients the card. (Plate 8)

*By Sound:—*

Sound travels at the rate of 1,100 feet, or 366 yards, per second. If the number of seconds between the flash or smoke and the report is taken and multiplied by 366 the result will closely approximate the range. A stop watch is the best means for determining this time interval, but a little practice in counting will produce very good results by adding some syllable or sound that will about make up the



difference in time when counting numbers as, 1, ah, 2, ah, 3, ah, 4, ah, 5, ah, 6, ah, etc.

*By Measuring Distance on the Ground:—*

This method is applicable on the defense only. Range cards should be made and furnished to all company commanders. Distance should be measured to prominent objects; if there are none, artificial marks should be constructed. The application of this method should not be left until the battle field is reached.

From *Musketry Bulletin*:—

TABLE

ILLUSTRATING THE INFLUENCE OF AN INCORRECT ESTIMATE  
THE RANGE

Range Used	Error in Yards								
	0	50	100	150	200	250	300	350	400
400 ....	100	96	83	67	49	32	21	12	8
450 ....	100	95	81	62	43	27	16	9	6
500 ....	100	93	78	57	36	21	10	6	3
550 ....	100	92	74	50	30	15	7	4	1
600 ....	100	91	69	43	23	9	4	2	0
650 ....	100	90	64	38	18	7	3	0	
700 ....	100	88	59	32	13	5	1	0	
750 ....	100	86	55	27	10	3	0		
800 ....	100	84	50	22	6	1	0		
850 ....	100	82	46	18	5	1	0		
900 ....	100	80	41	13	3	0			
950 ....	100	78	37	11	2	0			
1,000 ....	100	75	32	8	1	0			
1,050 ....	100	73	30	7	1	0			
1,100 ....	100	70	27	5	0				
1,150 ....	100	69	24	5	0				
1,200 ....	100	67	20	4	0				
1,250 ....	100	65	18	3	0				
1,300 ....	100	63	15	2	0				
1,350 ....	100	59	13	1					
1,400 ....	100	55	10	1					
1,450 ....	100	54	9	1					

1,500	....	100	53	8	1
1,550	....	100	51	8	1
1,600	....	100	49	7	0
1,650	....	100	47	6	0
1,700	....	100	45	5	0
1,750	....	100	43	4	0
1,800	....	100	40	3	0
1,850	....	100	39	3	0
1,900	....	100	38	3	
1,950	....	100	37	2	
2,000	....	100	36	2	

NOTE: The above table is based on the result of experimental firing at the School of Musketry by a class of riflemen who were regarded as slightly above the average company in individual proficiency, all of the men being either expert riflemen or sharpshooters.

If "good marksmen" shooting at .... yards with sights set correctly make 100 hits by firing a certain number of rounds, then the same men firing at the same target and range and the same number of rounds but with a sight setting .... yards in error will make .... hits. To illustrate "Good" marksmen at 800 yards with a correct sight setting will make 100 hits (the number of rounds necessary to make the 100 hits is immaterial), but if the sights are set at 900 yards, or 100 yards in error, they will make but 41 hits, as will be seen from the table by looking along the "900 yard" line until the 100 yard error column is reached, where the figure 41 will be found.

## CHAPTER II

### TARGET DESIGNATION

“Under this head are included the ability of commanders to describe the objectives to be attacked or the sectors to be defended and the ability of the individual soldier to understand and transmit to other soldiers such descriptions. This implies a uniformity in the method of designating targets throughout those units which may become mixed in battle, such as battalion, regiment, and brigade.”

“*Within the regiment*, it implies an ability on the part of the regimental commander to describe an objective and its subdivisions from the map as well as from the ground, and such training on the part of his subordinates as will insure a correct translation of his map designation into terms of actual terrain.”

“*Within the battalion*, it implies not only an ability on the part of the battalion commander to describe an objective without ambiguity but, also, a uniformity of training throughout the battalion, which will enable the men of one company to describe intelligently to men of other companies of the battalion both targets and fronts in language and by methods with which both are familiar.”

“*Within the company*, it implies an ability on the part of the company commander to describe the objectives for his platoons within the limits assigned to the company. It also implies an ability to cover the whole target of the company during a forward movement of part of the company.”

“*Within the platoon*, it implies an ability on the part of the platoon leaders to understand the company commander’s designation of the target and to transmit that information to their platoons in such a manner as to insure an equal distribution of their fire within the front assigned them as objectives, not slighting the less visible parts.” (*Musketry Bulletin*)

Targets in the field will be either—

- (1) Visible throughout entire extent.
- (2) Partly visible.
- (3) No portion visible.

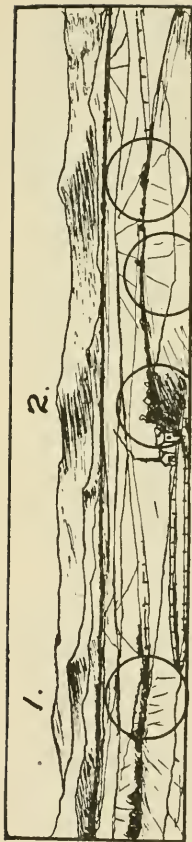
When a target is visible throughout its entire extent, or partly visible, no elaborate system of designation is necessary for its location; when partly visible its extent may be estimated by some medium of intercept measurement, and when no portion is visible its location may be determined as described in the following pages.

Before taking up instruction in target designation, men should become thoroughly acquainted with the following, wherein lies the basis of all description:

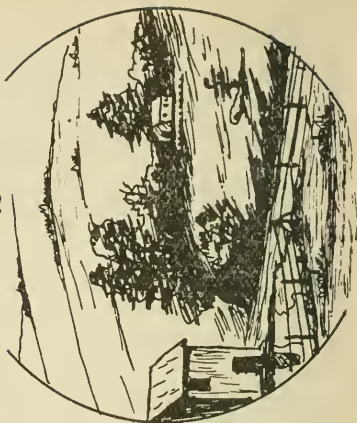
1. Familiarity with military and topographical terms so as to recognize all features of military importance.
2. Ability to point out on a landscape target or actual terrain, features, as—  
skyline, valley, gentle slope, steep slope, dense cover, crest, military crest, ridge, hill, peak, saddle, etc.
3. Ability to determine different kinds of trees, their shape and size, undergrowth, color of crops, etc.
4. Ability to approximate size of objects—  
if large or small  
if of moderate size  
if tall, short, wide, or narrow.
5. Ability to understand changing aspect of terrain during an advance (Paragraph 157, I. D. R.).

In action, the target, as a rule, will not be visible to the individual soldier and there must be some quick and fairly accurate method of conveying to every man on the firing line its location and extent.

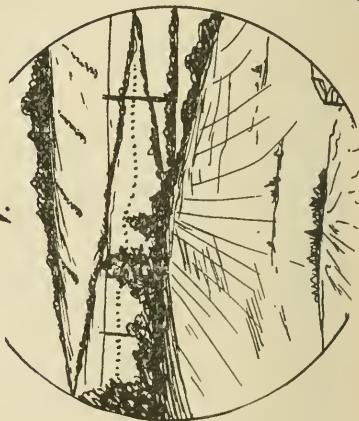
The description of targets in such manner as to enable the quick understanding of what is intended, can be appreciated only by those who on the firing line have given commands, entirely satisfactory and apparently clear and simple to themselves, but, in reality, so vague



2



1.

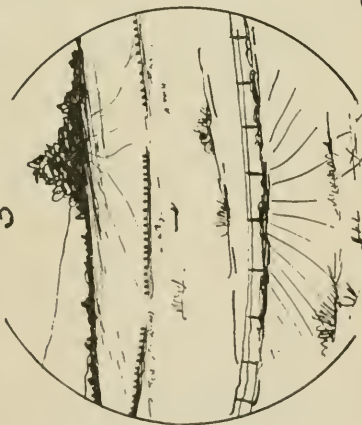


9A

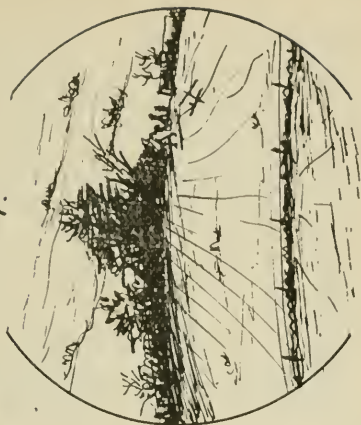




3



4.



that only a small portion of their organization seemed to understand.

It becomes the duty, therefore, of unit commanders to give fire orders properly, clearly, and in simple language, which will stand the test—"do the men understand?"

"It has been reported that in the South African War at least 75% of the shots fired were wasted owing to bad indication and the men, therefore, had no recognition of targets."

It should be noted here that in giving location, terms should be used which describe the *appearance of a landscape without glasses*. Use field glasses to become acquainted with all the details of terrain and target, then make the description as it appears to the eye unaided.

The top portion of Plates 9-A and 9-B illustrates the appearance of a landscape to unaided vision; the lower portion, how a particular section appears when using field glasses.

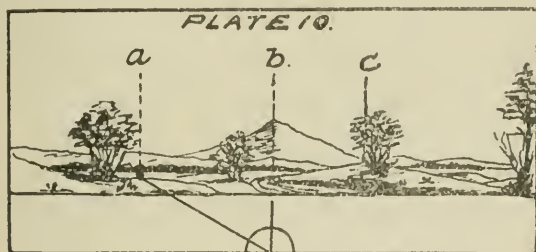
With glasses—No. 1 shows a line of men with supports in rear.

With glasses—No. 2 shows a small house to the right of the mill with a small trench in its front.

With glasses—No. 3 shows a line of intrenchments.

With glasses—No. 4 shows a machine gun at fence opening.

Details are usually not visible to the naked eye; therefore all target description should be so given as to afford a ready understanding from the appearance of the landscape itself, based upon the detail as shown by glasses.



If in a section of terrain, as shown in Plate 10, a machine gun is located at A, or a hostile line at B - - - C, it seems perfectly clear to say:

(1) "A machine gun to the right of that clump of trees"—(pointing to the clump of trees). This would probably give sufficient data were it not for the fact that there are three clumps of trees and such command *received under fire* might easily be understood to mean any of the three clumps of trees; or—

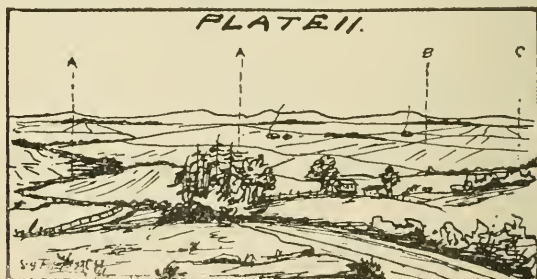
(2) "A hostile line on ridge from that clump of trees to the road." Again the same objections. Such description will fit any one of the clumps of trees.

If some system is used that permits of the designation of a reference point, if possible before the time for *action arrives*, when all are more receptive for instruction, a point may be established from which positions may be located with reasonable accuracy as they develop. In the above case, before or after arrival on the firing line the high peak is impressed on all—"That is Reference Point." With this start, a simple command given later:

(1) "At 10 o'clock, near side, of clump of trees, machine gun," conveys the idea of the *proper clump of trees*, and no other clump of trees fits this description.

(2) "Hostile line, on ridge, extends 1 sight right."

It will be noted that according to the various systems used, a reference point in one case means a point; in another, a point through which a line to the observer is imagined, and



targets are then located to the right or left of this imaginary line.

On a landscape the difficulty of locating a target might be further appreciated when we look at Plate 11 and are told that machine guns are located at A, or a hostile line extended from B to C.

Of the methods of target designation given herein, each has its limitations, defects, and advantages under various conditions of terrain, fire, etc., but a wise selection of one, modified by part of another, or a combination of two or more will prove a material factor in efficiency.

#### UNITS OF MEASURE

A common term should be applied to mil, finger, and sight leaf, such as "sight," and throughout our service such a term should convey one meaning; for example, a sector  $1/20$  of the range = 50 mils = 1 sight leaf = 1 finger measurement.

A MIL is an angular measurement (approximately 3 minutes of arc) whose tangent is  $1/1000$  of the radius. In other words, 1 mil will cover at 1,000 yards 1 yard intercept; 50 mils will cover 50 yards or  $1/20$  of range. If a 50 yard trench is placed perpendicular to a position at a point of 1,000 yards away and a mil scale held up, 50 mils will just cover the trench. A mil scale can easily be made by

reproducing the graduations of a ruler, showing inches divided into tenths and held 20 inches from the *eye*.

THE SIGHT LEAF equals the intercept of  $1/20$  of range, as 50 yards at 1,000 yards (when eye is held  $13\frac{3}{4}$  inches from sight leaf or about one inch in rear of small of stock). The position of the eye relative to the stock can be temporarily marked with a pencil or permanently with a file. If intercept is made with lowered sight leaf, the notch of open sight affords a means of obtaining half "sights."

A FINGER so held as to intercept  $1/20$  of the range or 50 yards at 1,000 yards. Finger widths differ in individuals, hence the distance from the eye to the finger must be ascertained in each case. The finger position can be determined by holding a mil scale as indicated above, on an object, wall, or landscape, noting the intercept and adjusting the finger to cover such intercept: or take a sight leaf intercept with a rifle on the landscape or wall and adjust the finger position so as to cover the intercept; or measure one foot on an object, move twenty feet away, and cover the measurement by a finger.

In using the finger measurement, teach men to cover a sector as indicated in the foregoing, and when accurately covered to swing the arm,

using only the shoulder joint, until the hand reaches the side of the body and note position of hand relative to belt, pocket, etc. Require them, after a few moments, to try this method of obtaining arm position.

To improvise a rule quickly, a pencil or stick can be notched at intervals to obtain the proportions of 1/20 as indicated below:

<i>Width of Measuring Medium</i>	<i>Distance from Eye</i>	
50 mils	20"	} :: 1 : 20
Sight Leaf 11/16"	13 3/4"	
Finger Width	(to be determined)	

<i>Notched Pencil or Stick</i>	<i>Distance from Eye</i>	
1"	20"	} :: 1 : 20
3/4"	15"	
1/2"	10"	

With the above, there are three methods of measuring. "Why three methods?" A man has his rifle and the sight leaf is naturally the normal measuring medium for him to use, as he can use it while in a prone position with only a slight change in the position of his head, or he can use the finger measurement. A fire director has only his rule with which he speaks in the same terms as the man with the sight leaf. Suppose the rule is lost, he can at once resort to the finger measurement. All officers from battalion commanders down should be supplied with some means for measuring sectors.

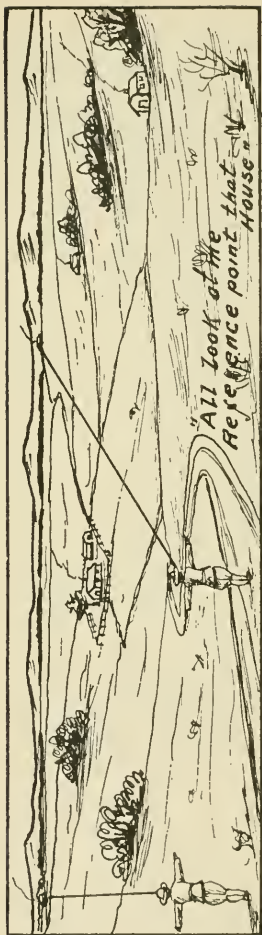


PLATE 12.

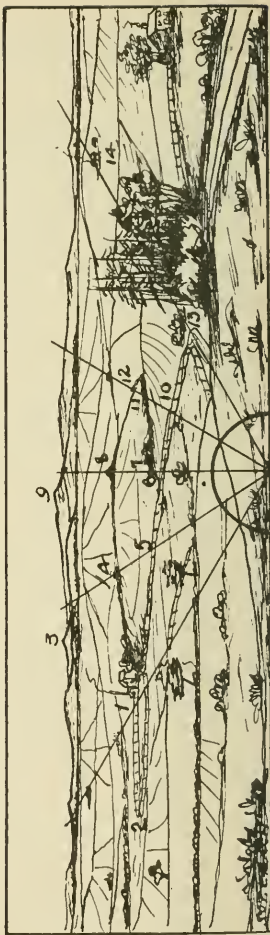


PLATE 12 A.



In announcing a reference point a good plan during practice, if conditions warrant the exposed position, is to stand as illustrated in Plate 12, looking directly towards the reference point, with the arms in a plane perpendicular to the line of the reference point. Reference point (control or initial point) may be defined as some prominent, very distinct object on the landscape, near the target or where the target is expected to be, easily described and quickly seen, upon which the attention of the men can be centered, and from which targets are located by some means of measurement.

Abbreviations sometimes used in explaining the following systems:—

Horizontal Clock Face . . . . . H. C. F.

Vertical Clock Face . . . . . V. C. F.

Right Angle System . . . . . R. A. S.

Sight System . . . . . S. S.

In announcing reference points the use of the horizontal clock system will be an aid when first establishing its direction. In Plate 12 A—

1. First establish direction of 12 o'clock—as high trees on ridge to our front (pointing).
2. Using the following o'clock lines—
  - at 10 o'clock 1. left edge of mill.
  2. west end of fence enclosing mill.
  - 11 o'clock 3. distant peak  $\frac{1}{2}$  sight west.
  4. ridge, east of mill.
  5. road.

- |            |   |
|------------|---|
| 12 o'clock | 6. road.                                  |
|            | 7. trees, near road.                      |
|            | 8. top of ridge.                          |
|            | 9. distant peak $\frac{1}{4}$ sight west. |
| 1 o'clock  | 10. road.                                 |
|            | 11. line of trees.                        |
|            | 12. ridge.                                |
| 2 o'clock  | 13. road.                                 |
|            | 14. house.                                |

An advance moving forward from a position indicated by the clock in Plate 12 A, would have the trees on the ridge to their front as a reference point; if moving in the direction of 10 o'clock, as appears from the picture, the mill; towards 1 o'clock, the end of the ridge; towards 2 o'clock, a house.

The distant horizon in this case is so uniform that to give any one of the small peaks as a reference point would very likely result in a misunderstanding. Again, during an advance towards 12 o'clock, the small ridge would completely obscure the horizon as soon as the foot of the hill was reached.

*Measuring with Mil Scale:—* (Plate 13)

Reference point—end of road.

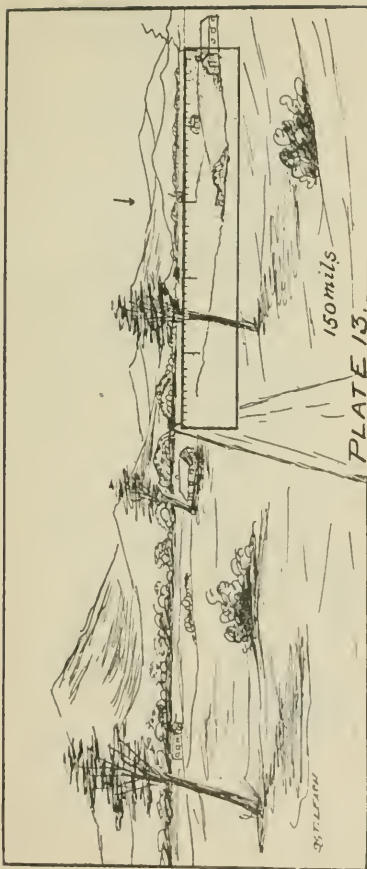
3 "sights" right—that house.

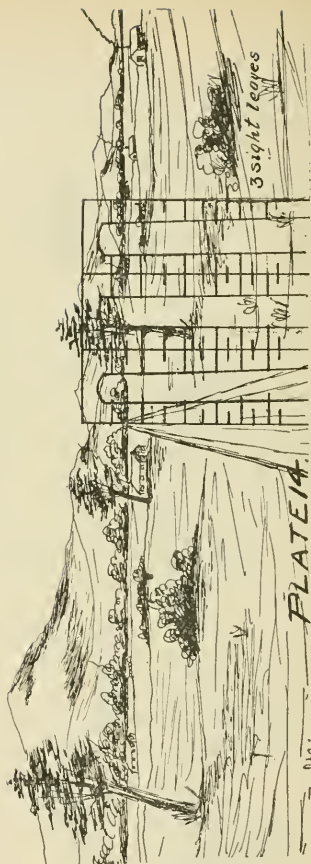
*Measuring with Sight Leaf:—* (Plate 14)

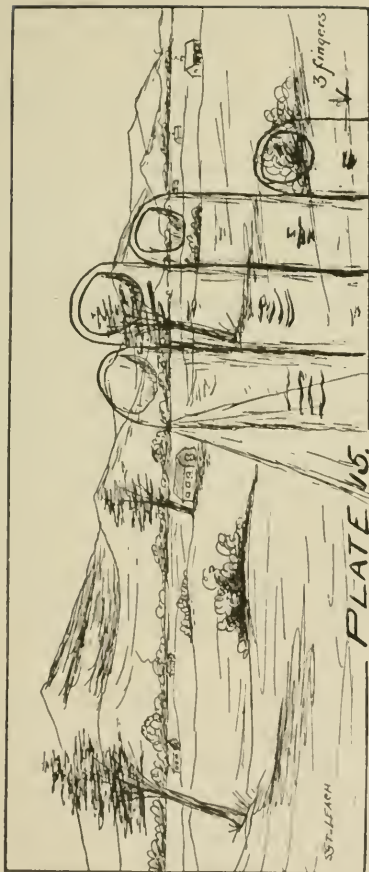
Reference point—same.

3 "sights" right—that house.

*Measuring with Finger:—* (Plate 15)







Reference point—same. (Some men prefer to turn back of hand towards object.)

3 “sights” right—that house.

*Exercise:—*

*Purpose:—*To accustom men to take measurements properly from a reference point. A target such as Plate 30 is of great value for this exercise or, in its absence, a wall, side of tent, or any surface will answer the purpose.

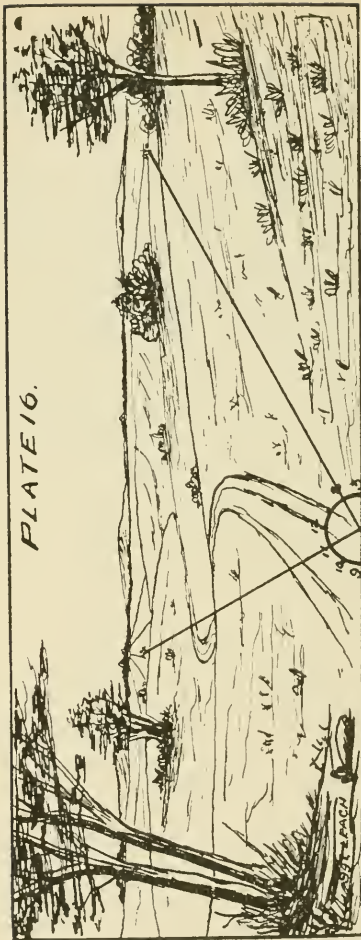
*Situation:—*Men step to the testing point when called. Position for the testing point should be determined by the sector widths. If a twelve inch sector is intended on the target the position should be twenty feet away. After a reference point is indicated the man is told to take one, two, or any number (including halves) of sights—right or left. The estimate is indicated and corrections made.

This exercise may be adapted to the terrain in the following manner:—(A) Select any prominent object on or near the horizon. Call the men to the testing point one at a time and require each individual to apply his sight any given number of times to the right or left of the selected object and describe accurately the point upon which the last intercept falls. (B)

Select two prominent objects and require each man to state the number of sight widths between them.

In the use of the sight leaf during the first exercises, considerable variance will be noted by reason of the inability of the men to determine where the leaf width ends when moving the rifle and to know where to begin the next measurement. Often no object affords a tie-in point for the successive leaf measurements and a little practice will be necessary to correct this error. Some men are able to get a better and more accurate reading by sighting along the top of the leaf.

# PLATE 16.



## HORIZONTAL CLOCK FACE SYSTEM

(Used when targets are visible)

### SYSTEM

1. Announce range.
2. Announce direction.
3. Announce objective.

### EXAMPLE

1. Range 1,000.
2. At 2 o'clock.
3. A machine gun.

### EXAMPLE

1. Range 900.
2. At 11 o'clock.
3. A hostile patrol.



This system possesses value only when designating a visible target. On account of the usual error made in angular estimation, a target or object should stand alone with no other similar object within about 15 degrees to its right or left.

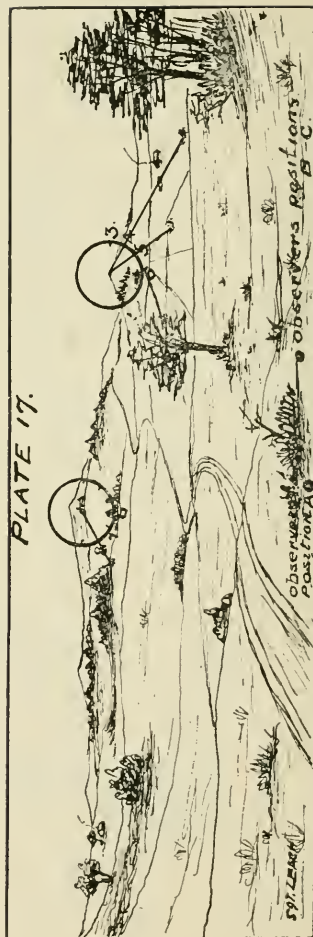
When the range is announced first, in giving fire orders, it permits of sight setting and the commencement of fire without taking the eyes from the target.

1. Fix sights at 1,000 (or 900) yards.

2. All look along the line pointing towards 2 (or 11) o'clock of a horizontal clock whose center is at the firing point and whose 12 o'clock mark is on a line perpendicular to the front of the firing line and find the objective.

NOTE: The clock here represented must be considered as horizontal, not vertical, as shown. For the purpose of illustration, perspective was not considered; the observer occupies the center of the clock.

PLATE 17.



## VERTICAL CLOCK FACE SYSTEM

(Used when targets are small and indistinct)

### SYSTEM

- |  | EXAMPLE A                          | EXAMPLE B              | OF | EXAMPLE C            |
|--|------------------------------------|------------------------|----|----------------------|
| 1. Announce range.   | 1. Range 1,000.                    | 1. Range 900.          |    | 1. Range 800.        |
| 2. Announce the general direction of the reference point.                          | 2. At 12 o'clock.                  | 2. To our right front. |    | 2. Same.             |
| 3. Designate as a reference point the most prominent object in the zone indicated. | 3. Single house with two chimneys. | 3. High peak.          |    | 3. Same.             |
| 4. Announce position of target with respect to reference point.                    | 4. At 8 o'clock.                   | 4. At 5 o'clock.       |    | 4. At 4 o'clock.     |
| 5. Announce objective.   | 5. Machine gun.                    | 5. A hostile patrol.   |    | 5. A hostile patrol. |

Set sights at indicated range (1).

All men look in the indicated direction as (2).

Reference point is located as (3).

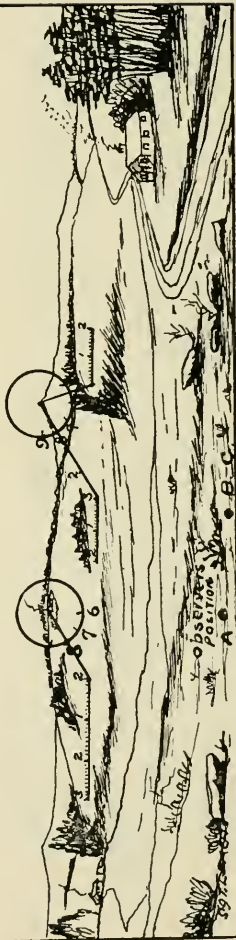
A clock face (vertical) is imagined centered on reference point and a line drawn through the o'clock to a point . . . yards from firing point.

Find objective.

Under this system, No. 2—The general direction is announced by using the H. C. F. System.

No. 3—Reference point is designated near objective.

# PLATE 18.



## SIGHT LEAF, FINGER, OR MIL SYSTEM AND OBJECTIVES

(Used when targets are indistinct or invisible and to define sectors)

SYSTEM	EXAMPLE A	EXAMPLE B	EXAMPLE C
1. Announce range.	1. Range 900.	1. Range 800.	1. Range 1,000.
2. Announce direction of reference point as in vertical clock face system.	2. At 12 o'clock.	2. At 1 o'clock.	2. Same.

- |  |   |                             |                             |
|--|---|-----------------------------|-----------------------------|
| 3. Announce reference point.   | 3. House with fence around it, on hill. | 3. Distant hill.            | 3. Same.                    |
| 4. Announce angular distance and direction from reference point to target. | 4. 8 o'clock, 2 sights.                 | 4. 8 o'clock, 3 sights.     | 4. 5:30 o'clock. 2 sights.  |
| 5. Announce objective.   | 5. Line of intrenchments, 3 sights.     | 5. Skirmish line, 2 sights. | 5. Skirmish line, 2 sights. |

NOTE: It is usual to indicate (in 4) nearest point of target.

Under this system, No. 4—The direction line should ordinarily end at some object from which the extent of the target can be measured. For example, if under A—(4) 2 sights on the 8 o'clock line ended on a small tree or object, the extent of target could be more easily determined.

This leads to a slight variation in the use of this system. If the near end of a target is always intended in (4) it should be so understood. In this same case, to give (8:30 o'clock) if the line ended on some object easily seen, followed by (5) line of intrenchments, extends 2 sights right, 1 sight left, a point is indicated in the line of targets which extends on both sides.

# PLATE 19.



## RIGHT ANGLE SYSTEM (Used when targets are indistinct)

### SYSTEM

1. Announce range.
2. Announce a point through which a reference line is drawn to the observer.
3. Announce (on or near the reference line) a point through which a right line to the target will form a right angle with the reference line.
4. Target:—Sector measurements to target and sector width of target.

### EXAMPLE A

1. Range 700.
2. Right edge of house, on left of road.
3. Underbrush this side of house.

4. Skirmish line.  
Left 2—3.

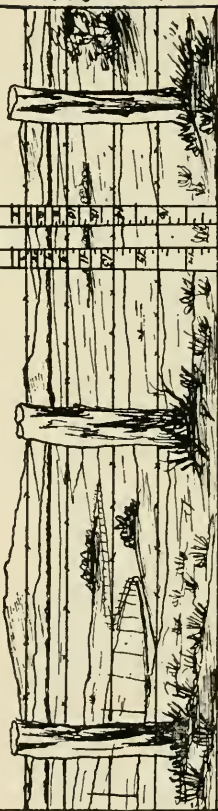
### EXAMPLE B

1. Range 750.
2. Same.
3. Half way between house and underbrush.

4. Skirmish line.  
Right 3—3.

In this illustration it would be natural to use the road as a reference line, but here it was intended to show the use of the system by the employment of some other point. This system, when marching along a road, path, or trail, which has some straight stretches, enables a quick location of objectives.

PLATE 20.



S. L. LEACH.

A B C D E

PLATE 20 A



S. L. LEACH.



## AUXILIARY AIMING POINT SYSTEM

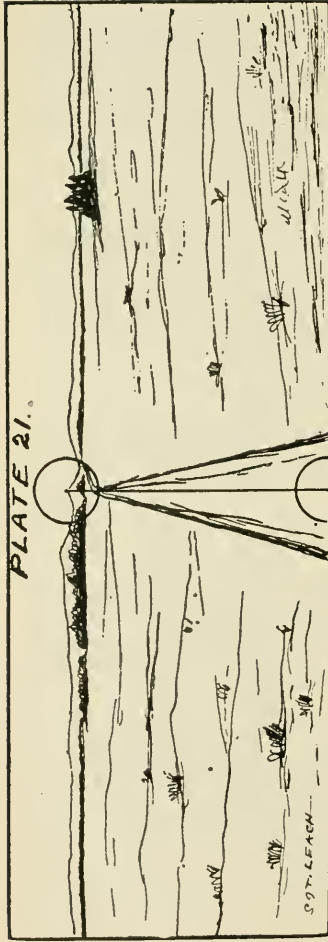
1. Suppose a rifle is placed in a vise, clamped, and sighted on target "C" with a range 1,200 yards (correct range).
2. Now if the target becomes so indistinct that it is possible to locate it only with glasses, no aiming point remains for the men. A well-defined line is apparent, such as the base of hills A or wires B—D—E or in picture 20 A a well-defined fence F. It is desired to use any one of these as aiming points with the necessary sight correction which leaves the rifle clamped as before so that shots from it drop on the target at "C." If the line of sight is on line "A," it will be necessary to move the slide of the rear sight down, if on D—E the slide must be moved up to coördinate the rear sight, front sight, and target. With the vise this would be simple, but in practice to hold the rifle on the target during the slide adjustment would give no results of value.

3. If a sight leaf inverted is held 22.12 in. (sighting base) from the eye, with 1,200 yard mark on target "C," the sight correction can be read at once for any of the aiming points. As—A, 800; B, 1,000; D, 1,400; E, 1,600. With any of these aiming points, and elevations it is possible to get the same results as if aiming on the target with the true range.

NOTE: This system can be used only by fire controllers. The sight leaf must be held at the height at which the rifles will be held when firing on the target. To avoid a possible negative sight setting, the aiming point should, if possible, be selected below the target or between it and the firing point.

From *Infantry Drill Regulations*: "If the target cannot be seen with the naked eye, platoon leaders select an object in front of or behind it, designate this as the aiming point, and direct a sight setting which will carry the cone of fire into the target."

If an extra sight leaf is available it can be employed for this use by the addition of an extra slide attached to the leaf. The first operation is to clamp *one slide* on the graduation of the true range. Hold the leaf in an inverted position, 22.12" from the eye, and move the second slide to cover the aiming point. The auxiliary sight setting can then be read from the bottom of the second slide.



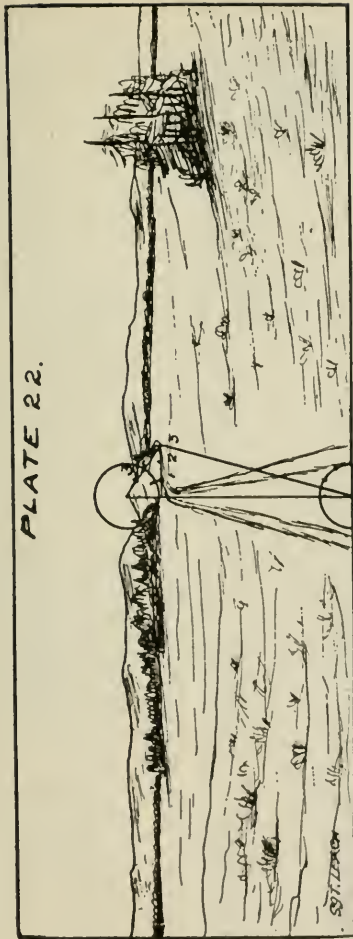
# APPLICATION OF SYSTEMS DURING AN ADVANCE OF AN ORGANIZATION

## ALONG THE ROAD

(Directions by company commander)

- |                   |                                     |                  |
|-------------------|-------------------------------------|------------------|
| H. C. F.—Low peak | (between higher ones to our front). | 12 o'clock.      |
| V. C. F.—Low peak | (between higher ones to our front). | Reference point. |
| S. S.—Low peak    | (between higher ones to our front). | Reference point. |
| R. A. S.—Low peak | (between higher ones to our front). | Reference point. |

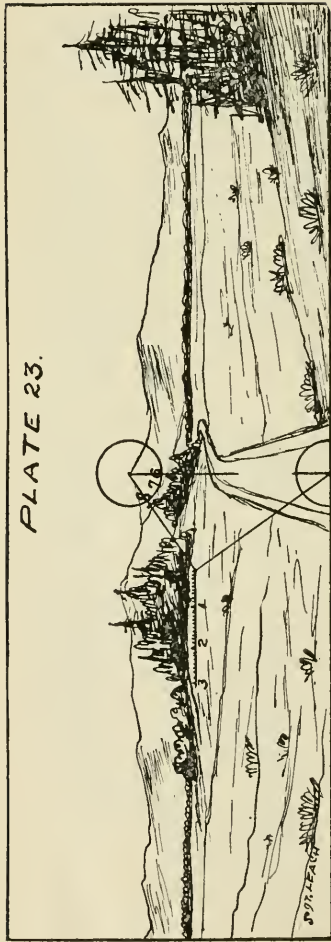
# PLATE 22.



## FIRE DEVELOPES (FROM HOSTILE PATROL)

- H. C. F.—Range 900. At 1 o'clock—hostile patrol.
- V. C. F.—Range 900. At 4 o'clock—hostile patrol.
- S. S.—Range 900. At 4 o'clock, 3½ sights—hostile patrol.
- R. A. S.—Range 900. First bend in road. Right 3 sights—hostile patrol.

# PLATE 23.



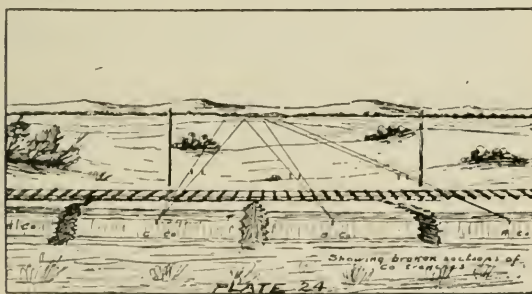
## AS THE ADVANCE IS PUSHED ON, FIRING BEGINS FROM ANOTHER POINT (INTRENCHED POSITION)

- H. C. F.—Range 600. At 11 o'clock, line of trenches, 100 yds. long.
- V. C. F.—Range 600. At 8 o'clock, line of trenches, 100 yds. long.
- S. S.—Range 600. At 8 o'clock (3 sights), line of trenches, 3 (sights).
- R. A. S.—Range 600. Base, first group of trees, 3 (sights) left, line of trenches, 3 (sights).

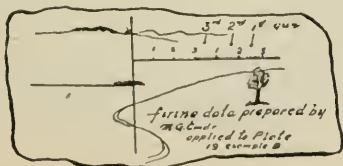
At some time during the march a reference point is announced, which is usually the road. As the advance progresses and positions develop, the necessary fire data are given. It might be easier in Plates 22 and 23 to locate the targets by direct means, but the illustration is intended to show the systems applied.

**Trench Data:**—It is to be noted in this connection that our target regulations provide no course of training in firing standing from a trench or from loop holes. Such training, in view of the developments in the European War, is deemed most necessary.

To further facilitate the assignment of company sectors in each trench a small board may be placed similar to Plate 8 showing ranges. In front of each company trench, stakes may be driven which from a common point of observation serve to give a definite apportionment of sectors to the men, as shown in Plate 24.



A machine gun commander must reach his gun pointers only with fire data. Plate 25



illustrates a small strip of paper which the machine gun commander makes to conform to the reading of his mil scale, with sectors and targets marked, passes it on to each gun, and from it sectors are easily obtained. This can be applied in a limited way, in defense, to the transmission of fire data to platoon commanders. Plate 25 applies to Example B in Plate 19.

The following exercises are offered as suggestions for training in target designation and range finding. As will be seen, they are also adapted to training in distribution.

### *Exercise 1.*

*Purpose:*—To train officers and noncommissioned officers in concise, accurate, and clear description of targets, and to train men to interpret such descriptions quickly and correctly.

*Situation:*—The squad is deployed facing to the rear. The corporal is at the firing point, where rests have been provided for seven rifles.

*Action:*—At a signal from the instructor the target is outlined by the display of a flag at each flank. When the corporal states he understands the position of the target, the flags are withdrawn. The squad is then brought to the firing point, placed in a prone position, and each man required to estimate

the range, set his sight, and to sight his rifle on the target as he understands it from the description of the corporal. The corporal's errors may be checked from the actual terrain. Those of the men are pointed out by requiring each man to rise and leave his rifle, properly pointed, on the rest provided.

In this exercise the time allowed the corporal to locate his target should be reduced as proficiency is acquired. The time allowed the men should also be reduced as instruction progresses. The period required to balance the rifle accurately on the sand bag rest will be found to vary to such an extent with the different rests that it is hardly practicable to make this exercise competitive as far as time is concerned. The exercise is suitable for larger units than the squad. The width of the target and the distance thereto should vary with the size of the unit undergoing instruction.

### *Exercise 2.*

*Purpose:*—To train officers and noncommissioned officers as in Exercise 1, and to train the individual soldier to locate a target solely from a description thereof.

*Situation:*—The men are placed so as not to be able to see the target. Rests are provided as in the preceding exercise. For individuals the target should be a rock, a bush, or

some other suitable feature of the landscape; for a unit, a line whose flanks, in the earlier stages of instruction, should be clearly defined.

*Action:*—The instructor indicates the target to the commander who, having described it, causes the unit or individual to move so as to see the target, locate it, estimate the range, set sight, and place the rifle on the rest properly directed.

After some instruction with plainly discernable targets, more indistinct ones should be selected.

*Illustration:* Reference point, rocky hill top  
at 10 o'clock.

Target, right, three sights,  
dark green bush.



## CHAPTER III

### FIRE DISTRIBUTION

"In a decisive battle success depends upon gaining and maintaining fire superiority."—I. D. R.

To gain and hold this fire superiority certain things are necessary,\* among which is a proper distribution of fire upon the target. What is meant by a *proper* distribution of fire will be explained later. It is apparent, however, that no regular distribution of *any kind* can be expected unless the objective is divided into sectors and these sectors assigned to the various units taking part in the action. In this connection a pamphlet issued by the School of Musketry says: "Commanders of all degrees assign that part of the general objective given them to their commands in such manner that there will be none of the target that is not receiving its proportional part of the fire." The pamphlet then continues, showing the evil results which follow a disregard of this principle, which, of course, are in addition to the loss of a proper distribution of fire: "The division of the objective into parts and the assignment to units must be made with great care. If the adjacent flanks of two organizations advancing from slightly different directions guide on the same point in

\*(Balk's *Infantry Tactics*, 370.)

the enemy's line during the advance, they will arrive in a continuous line upon its front. If the point is in advance of the line there will be crowding or overlapping. This is objectionable as it causes confusion and may subject a portion of one line to the fire of the other. Casualties during the advance may tend to reduce the difficulty. If the guiding point is in rear of the enemy's line, there may be a gap between the two organizations, which, however, may be filled if that is desirable." . . . .

Maps for the purpose of subdividing the objective will not always be available, nor, if available, will their use always be desirable. In the absence of maps the methods by which commanders may accomplish this subdivision are explained in the chapter on Target Designation. While the text refers mainly to the company and the subdivisions thereof, the principles are applicable to larger units, and should be applied. It must be borne in mind that while the brigade and regiment may be able to include the divisions of the objective in their initial order, such will rarely be the case in the battalion. The battalion commander must usually pass through the zone of artillery fire for a mile or more before he can pick out his first firing position and assign objectives. If possible the company reference point should not be selected

until one can be picked up in the enemy's line. The necessity for as early an assignment of objectives as is expedient is discussed under the battalion attack problem in Chapter 8.

The critiques which follow were given by the Musketry Board of the Fifth Brigade in connection with the problems in target designation on the defense and in the attack. They indicate not only the errors which occur through improper methods of division but also emphasize the necessity for a uniform system of angular measurement such as the "Sight."

### THE DEFENSE

(a) The front was described as extending "200 yards north from the reference point."

(b) As extending 4 (5 or 6) fingers north from the reference point.

(c) As extending from the reference point northward for a definite distance "to that tall windmill."

"The first is objectionable as being indefinite. In practice it leads to misunderstandings as to the width of the front, to the adoption of a front narrower than that ordered by the colonel, and gaps in the center of the line which were assumed by no company, or an excessive overlapping at that point with a consequent loss of fire effect on each front. *Had the*

*company commanders been versed in readily translating the yard measure into some known standard, as a mil scale, or had it been given in mils, it would have been satisfactory."*

*"The second is objectionable unless the expression 'finger' is a definite width, known and recognized by all, or, if the men are trained to use the rear sight leaf as a measure of width, it should be so used in designating targets."*

*"The third is considered the best method of the three because it leaves no doubt as to the target's width, indicates a definite intention on the part of the battalion commander, but it presumes an ability on the part of the battalion commander to recognize his front from the colonel's order and to transform that order into terms appropriate to the concrete problems presented to the battalion."*

*"It is to be understood that rarely will two physical points be present."*

### THE ATTACK

*"In apportioning the battalion target to the companies on the firing line, the difference between the battalion in defense and in attack should be noted. In defense, the division of the battalion sector should be made by a reference to physical objects as has been stated in a previous critique."*

In the attack, however, this will often not be practicable and seldom desirable because of the changing aspect of the sector or target as the battalion advances.

Generally it will be sufficient with trained troops to acquaint them with the width of the battalion sector or part of the target, the direction line, and the apportionment of this whole line which the battalion commander wishes to make, assuming that he desires to depart from some prearranged and obvious system of apportionment, such as where each company takes its proportion of the whole target depending upon the number of companies in the line."

It is clear from the foregoing that without a uniform system of angular measurement a clear designation of targets is a difficult matter. In training, therefore, great stress should be laid upon the exercises and principles given under Target Designation.

The assignment of sectors is usually made from a central point where the commanders of the subdivisions are assembled for orders.

In this connection it is to be noted by all commanders that a target once assigned must be kept under observation when changing position. This is to guard against the apparent shifting of the objective when viewed from

different angles. For example, the battalion sector and the subdivision thereof will appear different when viewed from the position of the major and when viewed from the positions of the several companies.

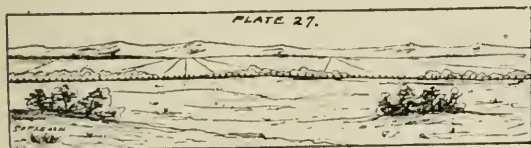
Referring to a *proper* distribution of fire, spoken of above, the *Infantry Drill Regulations* states: "The purpose of fire superiority is to get hits whenever possible, but at all events to keep down the enemy's fire and render it harmless. To accomplish this, the target *must be covered with fire throughout its whole extent*. . . . No part of the target is neglected . . . ."

By covering all parts of the target with fire and only by covering all parts, is *proper* distribution obtained. The methods by which the companies in the battalion and the platoons in the company are assigned sectors so as to accomplish this, will be explained in the chapter on Application of Fire.



In Plate 26 a position appears apparently occupied at intervals. The tendency among untrained troops is to fire at prominent objects or toward the center of a hostile line. It is to be expected, therefore, that under the condi-

tions shown in the plate, the visible targets will be hit. If, however, the concealment afforded by the brush is by some means removed, a line might be confronted, as in Plate 27, of which



a large portion is receiving no hits. The necessity for covering all parts of the line with fire thus becomes apparent, for, from the portions not covered a deadly, uninterrupted, and undisturbed fire is being delivered.

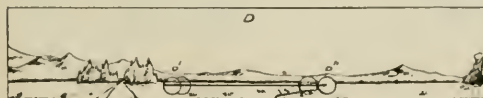
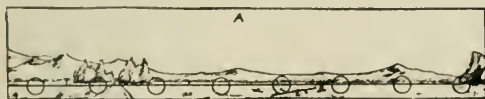
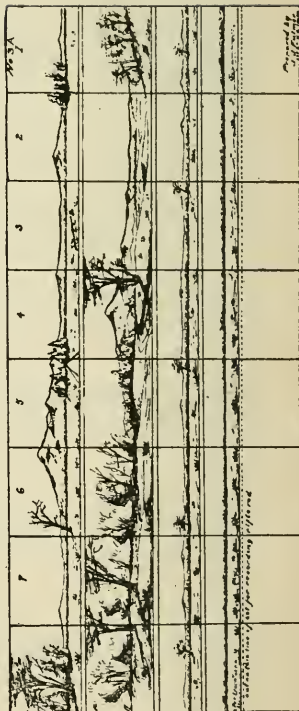
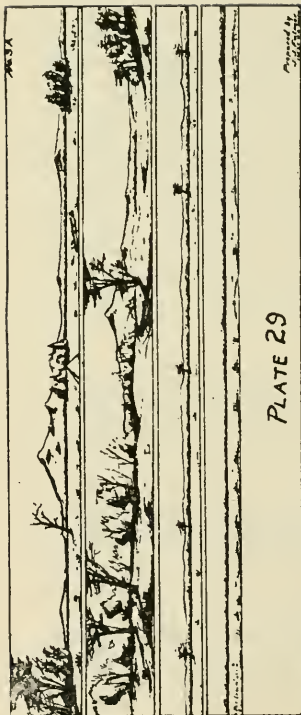


PLATE 28





When first instructing men in *collective distribution* a large extent of target or landscape should be presented for division. Figure A, Plate 28, indicates a landscape divided by a squad in such a manner that the centers of impact are equally distributed along the entire front. Such distribution over a large front in the first stages of instruction permits of the correction of errors. After the idea of apportionment of a target is learned, then practice should be given on smaller fronts until such as Figure B can be properly divided, for it must be understood that a company might have a target of apparently less extent than in Figure C.

In some field problems, when the flanks of a target are located, the methods of closing the center of impact of the flank fire unit as in Figure D,  $d'$  may be adopted. For a fire problem, it no doubt adds a trifle to the number of hits as compared to  $d''$ , where a certain portion of a shot group falls without the target.

In action the advantage of covering thoroughly the apparent flank and a little more extent as in  $d''$ , seems the better plan, for the flanks are favorable positions for observers and others aiding in fire direction, and their exact location is difficult to determine.

Plate 29 shows a target which, or something similar to serve the purpose, may be easily

drawn on a card and a duplicate, Figure 29 A, of same placed underneath and used in the following manner:

With a pin or other sharp instrument, make a hole in the target to indicate your point of aim, assuming for example the following problem: "Your squad will cover a hostile skirmish line extending on the top (or other) target, from right to left. You are No. 4 (or 1, 2, 3, 5, 6, 7, 8)."

The extent of the target can be changed to cover half or a small portion of target, or the problem can embrace the following:

"Your company of 8 squads cover, on top (or other) target from . . . . to . . . . . Indicate the center of impact of the 7th squad, of the 5th squad, of the 3d squad, etc."

Variations of the above will suggest themselves as the target is used.

A landscape target of about the size 36" x 14' placed indoors or in the company street in camp will afford an excellent means for not only teaching distribution but many of the principles of musketry. Plate 30 represents such a landscape, and at about 30 feet from it are lined a number of sand bags. Any other kind of suitable rests may be improvised for rifles or sighting bars for the following exercises:—

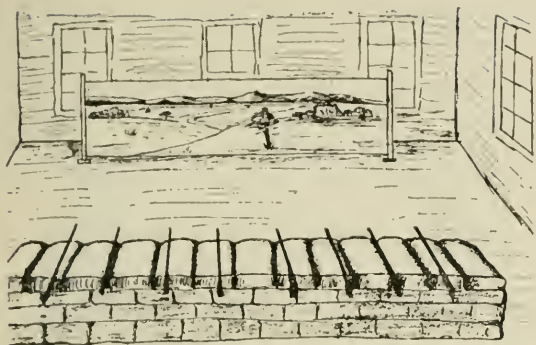


PLATE 30.

*1st Exercise—individually (without rifles)*

A hostile line begins at . . . and ends at . . . . You are the 3d man from the right in your squad; indicate your point of aim and say “hold” when I move this small bull’s eye along target to the point you determine.

*2d Exercise—In Distribution (for a squad)*

A hostile line begins at . . . and ends at . . . . Each man is instructed to align his rifle on the target at a point he understands to be his point of aim. Each rifle is verified and errors pointed out.

*3d Exercise—For squad leaders*

Each corporal with two rifles, sight and indicate the limits of your squad sectors. Your platoon of 4 squads covers the target from . . . . to . . . . .

*4th Exercise—For platoon leaders (in similar manner as for corporals)*

After the principles of distribution are thoroughly learned a practical application can be given with gallery rifles on a target similar to

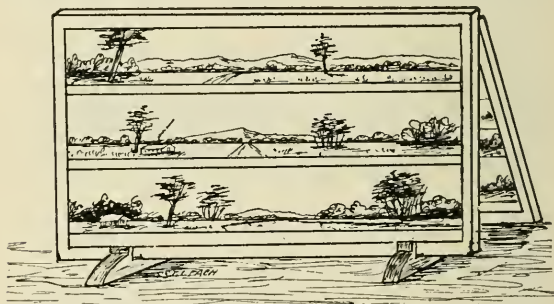


PLATE 31

Plate 31, which consists of two frames, with the same landscape on each. The one in rear has the sector lines drawn as shown in Plate 32.

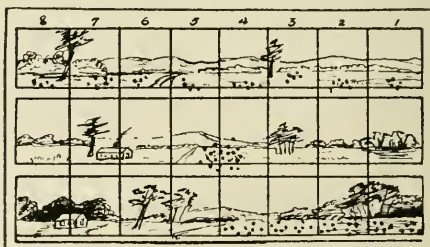


PLATE 32.

Plate 32 shows the result of three problems fired by a squad with gallery rifles at a distance

of 60 feet, target aimed at similar to 31—and recorded by target 32.

At *top target* (following fire commands were given):

1. A hostile line extends across entire target.
2. Fire 5 rounds.

At *middle target*

1. Reference point, right edge of *frame*.
2. 1 sight left.
3. A hostile machine gun.

At *lower target*

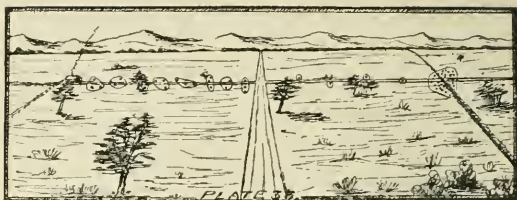
1. Reference point—same.
2. A hostile line.
3. Extends 1 sight left.\*

The following problem may be worked out on a landscape target such as is shown in Figure 33. Its use requires a system of recording somewhat different from the small gallery target

---

\*NOTE: A target such as is described in Plates 31 and 32 can be made in the following manner:—Two frames made of  $\frac{3}{4}$ " x  $1\frac{1}{2}$ " material about 4' x  $2\frac{1}{2}$ '; the rear frame just small enough to fit in the other, or, the two frames can be made the same size.

The frames are covered with target cloth on which is pasted ordinary wrapping paper. If the ability is not at hand to make the necessary landscapes, three heavy, rough lines will answer the same purpose. The rear target should have the sector lines drawn upon it.



just described. The rear side is marked with squares and numbered. When a problem is given, a small frame with a strip of paper tacked upon it, is hung on the rear side covering the section that will be fired upon as indicated by the squares. By placing a new strip of paper on the rear frame for each problem an accurate record may be kept of the firing and the front target can be almost cut to pieces with shots before it need be replaced.

Example of the use of target, Plate 33:—A patrol was formed, inspected, deployed, and moved along a road at the side of which was placed this target in such manner that the point would come upon it unexpectedly. The patrol was given the usual orders and in addition was instructed to return any fire.

When the *point* reached the target he was told “You are being fired upon from there”—(indicating target 90 feet distant).

Reference point—Cross roads.

Hostile line extends along road, 1 sight left  
(which extended target near the house).

The point signaled "Enemy," the patrol assembled, the fire data was transmitted by him to the corporal when he arrived, and by the corporal to the remainder of the patrol. Fire was opened with the results as indicated on Plate 33.

The second problem was conducted in a similar manner, except that the target was indicated.

"Extends 1 sight right" (which extended target to stone fence).

As fire opened it was desired to swing to a new target. Several men had fired, each one shot when the signal was given.

1. "Machine gun 1 sight right."

The results of both problems are indicated on the target.

It will be noticed that the patrol

1. Went through the initial steps of patrolling.
2. Fire opened on it requiring its assembly.
3. *Fire data transmitted.*
4. Fire was controlled.

Such problems may be conducted indoors by eliminating the patrol dispositions and many valuable principles learned equally as well as on the actual terrain.

The following problem, while given here primarily as an exercise in target designation

and distribution, contains many other valuable features of musketry training. Many of the possibilities are pointed out at this time both to avoid repetition later and to illustrate the practicability of combining several of the principles of musketry training in a single problem, thus saving much time and labor in arranging for this form of exercise.

*Company Problem on Terrain:—*

*Object:* To train company commanders and all other company officers in target designation and target distribution and the company estimators in estimating the range.

If troops are used the other elements of fire control and direction and fire discipline are included.

*Situation:* The enemy is in a defensive position, visible in part. Two rifles with rests are provided for the company commander and set up a distance apart equal to the front of the company when deployed.

Similarly, rifles are provided for each platoon leader and set up opposite the points where the flanks of their platoons would rest upon the company front.

*Action:* The company commander, the platoon leaders, and the estimators are called up and assigned their appropriate positions.



A problem is then given the company commanders along these lines:

A hostile company has just deployed with its right opposite . . . . (some suitable landmark), about 200 yards in front of . . . . (some suitable landmark). Cover it with the fire of your company.

The company commander locates the position of the target, calls upon the estimators for the distance, determines the width of the target, and gives the appropriate commands to his platoon leaders.

He then directs the rifles assigned him upon what he believes to be the flanks of the target, sights properly set.

The platoon leaders in a like manner direct their rifles upon the flanks of their targets with the sights correctly set. If auxiliary aiming points are used the platoon rifles should be directed at these points opposite the flanks of the platoon target, and the platoon leaders required to describe the aiming points as they would to their platoons.

If combined sights are used, one sight should be set at each range.

The target may vary from one wholly visible to one wholly invisible; the latter should be located by reference to features of the terrain.

Concealed markers, provided with flags, should be stationed at each flank of the company target. When all rifles are laid, the flags should be signalled into a visible position for the purpose of checking and pointing out errors.

This exercise may also be given to the platoons of the company only, or simultaneously to the four companies of a battalion. In the latter case the distance between rifles may be reduced to facilitate supervision.

The director should assure himself of the following:

(a) Were the rifles of the company commander laid on the correct target with sights properly set?

(b) Were the platoon commanders' rifles laid as directed and with the ordered elevations?

(c) Was the target properly covered?

(d) Did the company commander calculate the front of the hostile unit correctly?

(e) Were the platoon rifles covering the proper portion of the target as ordered or according to a prearranged method in the company?

(f) Was the range correct?

(g) Was the proper sight used, i. e., single elevation or combined sights?

(h) Was the time consumed in giving orders, etc., satisfactory?

(i) Should auxiliary aiming points have been given by the platoon commanders and, if so, were they properly selected and properly described?

(j) If the target was indistinct or invisible was the zone beaten by fire, wider and deeper than the target, so as to assuredly cover it?

(k) Were all commands properly given?

The training of troops may be included in this exercise by having the units actually present in strength and checking the targets, aiming points, and ranges used by the men. This may be done by providing a number of rests scattered along the company front or by an inspection of the rifles of the men while they are in the act of simulating fire.

If troops are used in this problem the director should assure himself of the following, in addition to the points given above:

(a) Did the platoon guides watch the firing line and assist in fire control?

(b) Did squad leaders transmit commands and properly supervise their squads?

(c) Were sights set as ordered?

(d) Did the men fire as ordered?

(e) Was prompt attention given to orders?

(f) Was the rate of fire correct?

The following example of commands and action is given as a satisfactory solution of the problem. The example departs from the exact forms given under Target Designation to emphasize the fact that there is no set rule which is applicable to all problems, but a system which must be adapted to meet the requirements of the case in hand. Every problem has several solutions which would be satisfactory and the example is but one of these. The details of the landscape which are used in the following example to describe the target are taken from an actual solution of the problem on the terrain.

*The Company Commander:—*

On receiving his instructions from the director the company commander returns to his company, keeping track of the changing aspect of the target as he does so. Arriving at the center of his company, he is met by his platoon leaders and range estimators who have assembled in his absence, and says:

Target: The target is a line of skirmishers visible in part. It may be seen between us and that long line of green bushes which begins one finger to the right of that red water tower at 11 o'clock, and it extends well beyond the bushes to the right and left.

(At this point the range estimators begin their estimations and the captain pauses until the first sergeant or other designated person automatically announces the average estimate of the range, saying, "Range 1100." The captain calculates mentally  $1/20$  of 1100 equals 55, therefore each "sight" is 55 yards. My target is a company or 150 yards, 3 sights will cover it.)

The captain then resumes, saying: The sector assigned to this company is three fingers long and extends from that group one finger to the right of the water tank to a point four fingers to the right of the water tank. Range 1050 and 1150. Fire at will at my signal. Posts.

*Platoon Leaders:—*

The platoon leaders then hasten to the center of their platoons and "Put into execution the commands and directions of the captain, having first taken such precautions to insure a correct sight setting and clear description of the aiming point as the situation permits or requires." (Par. 251, I. D. R.) by saying:

"Range 1050 and 1150.

Target: The target is a line of skirmishers about 1100 yards to our front, only part of which is visible.

Reference Point: That long line of bushes about 1300 yards to left front. The company sector is three fingers long and lies between us and that reference point, extending one-half finger beyond each end of the bushes.

Aiming Point: The bottom of the line of bushes."

As soon as the range is announced each front rank man sets his sight at 1050 and each rear rank man at 1150. Squad leaders, from their position in rear of their squads, assure themselves that sights are set and that the men of their squads understand the aiming point and sector and then signal "I am ready." Similarly the platoon leaders signal "I am ready." When the captain sees that all of his platoons are ready he gives the signal to commence firing. At the captain's signal, each platoon leader commands: Fire at will.

Firing then begins at a rate of about three shots per minute. (Par. 147, I. D. R.)

## CHAPTER IV

### COMMUNICATION, SIGNALS, AND TRANSMISSION OF FIRE DATA

The subject of communication is of such importance that a brief review of the general scheme is desirable in order to grasp the relation of the whole service to that which relates particularly to the transmission of firing data.

When the Signal Corps with its means of electrical communication and its special equipment has properly fulfilled its functions, the units of an army are linked together by lines of communication down to and including brigade headquarters.\* Between the regiments of a brigade and between the subdivisions of these regiments (except artillery which is provided with equipment for electrical lines) visual communication must be maintained. This is accomplished by a personnel detailed directly from the combatant troops.

Ample provisions are made in the regulations for training signal men with both the signal and semaphore flags. Specific provisions

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\*NOTE: The so-called "Outpost Company," proposed by the Signal Corps but not yet organized, is intended to furnish wire communication down to and including regimental headquarters.

exist also for the detail at brigade headquarters of mounted orderlies from each regiment, and these orderlies, under existing orders, must be trained as signalists. In a similar manner signal men are detailed at regimental, battalion, and squadron headquarters. Companies and troops furnish their own trained personnel.

This network of visual signalists, which spreads over an army from brigade headquarters to its smallest tactical unit, is charged with the maintenance of communication between the units to which it is assigned under all conditions of field service. On the march and in bivouac it supplements the lines of communication established by the Signal Corps between the main body and its covering detachments and between parts of these units. In battle it opens communication throughout the command in the initial stages and continues it to the conclusion of the action.

The Tables of Organization provide for the several headquarters the following personnel, which may be used as agents of communications and which should be trained as signalists.

**Brigade Headquarters:**

Two mounted orderlies from each regiment.



**Regimental Headquarters:**

Regimental adjutant, sergeant major, trumpeter sergeant, and six mounted orderlies.

**Battalion Headquarters:**

Battalion adjutant, sergeant major, and two mounted orderlies.

**Company Headquarters:**

First Sergeant (when not commanding a platoon).

Platoon guides (when not commanding a platoon).

Company buglers.

It is obvious that some of these men must at times be used as horse holders, but the greater number will usually be available.

Communication on the march is usually confined to the use of flags and the drill signals. In battle the flags are used in the earlier stages and in those localities where protection from the enemy's fire and observation may be obtained. As the action progresses, to avoid undue losses, the use of the flag must be discontinued. In the latter stages of an engagement while the maneuvering of troops is usually reduced to advances and retreats there yet remains much control which must be exercised and which necessitates the transmission of information and orders. The use of messengers

and staff officers carrying verbal messages is impossible, for no matter what their qualifications they will be unable to move in the fire swept zone with any reasonable degree of assurance that they will arrive at their destination.

The means now used are the arm signals and the letter codes prescribed in the drill regulations of the several arms, the bugle, the whistle, and the voice. The noise accompanying an action precludes the possibility of using the voice except by squad leaders to the individuals of their units. The whistle may be used to attract attention, but its principal function is to cause a cessation of fire. Its use for any other purpose should be reduced to a minimum; if this is not done the soldier will rapidly become indifferent to its note. If the system of communication is properly established there should be little occasion for the use of the whistle to attract attention except by the platoon leader to his squad leaders. The bugle, like the whistle, is limited by regulations to certain specific signals. Bugle signals ordinarily will be ordered only by regimental and higher commanders.

It will thus be seen that units in battle are necessarily deprived of any means of communication except with the hands and arms. By a proper use of agents of communication at each

headquarters and by thorough instruction and training, these signals may be made to supply means of communication which, under the circumstances, will be equalled only by electrical equipment.

After drill and training, the next most important requisite to perfect this means of communication is constant observation under all conditions of action. As before stated, neither the whistle nor the bugle should be used to attract attention; the voice is often impossible; therefore, in order that information and orders may pass rapidly through the necessary channels, observers must be detailed with each headquarters to insure a constant lookout for signals. As the lines of communication run both to and from each headquarters, observation of both higher and lower units is necessary; nor must adjoining units on the line be neglected. By such a system only, can free and prompt communication along its prescribed channels be assured. In the absence of continuous observation no assurance exists that in the roar and confusion of battle information or orders can be either obtained or transmitted when desired, and therefore complete failure of the system at the most critical stage will most certainly result.

In this connection the following authorities are quoted:

I. D. R.: "The voice is generally inadequate for giving commands during fire and must be replaced by signals of such character that proper fire direction and control is assured."

"Officers and men behind the firing line cannot ordinarily move freely along the line, but must depend upon mutual watchfulness and the proper use of the prescribed signals."

General Morrison in his *Training Infantry* speaking of communication in battle says: "The method by signals given in our I. D. R. answers the requirements. The text of it can be learned in a few minutes but to train a battalion so that it will fully respond under danger *requires hours of practice.*"

The arrangements of the agents of communication at the several headquarters will, of course, vary with different tactical situations, but the following may be taken as a guide to be adjusted to suit the particular requirements of each occasion.

#### Regimental Headquarters:

Sergeant major in immediate charge of the details of communication. Orderlies, dismounted, to watch each battalion headquarters and brigade headquarters, one for each unit. Two orderlies, dismounted, to carry verbal or written messages. Two orderlies, mounted, near at hand, to carry

messages where mounted delivery is practicable.

**Battalion Headquarters:**

The adjutant to observe the enemy and the companies on the firing line. The sergeant major to observe regimental headquarters. An orderly, dismounted, observing the support or flanking patrols.

**Company Headquarters:**

The first sergeant observing the enemy and the company. One bugler observing battalion headquarters. One bugler observing the platoon leaders.

**Platoon Headquarters:**

The platoon guide or a private taken from the line observing the company headquarters.

In attack, these agents of communication are usually deployed at each headquarters (on one line). In defense their positions will, of course, be regulated by the requirements of the situation. The privates sometimes taken from the firing line in lieu of the platoon guides may be returned to their proper places in ranks during the latter stages of the action. It is believed that the first sergeant should act as the captain's adjutant, so to speak. In this position he will be able to render more valuable service than while commanding a platoon.

There is one point vital in the whole system of communication by visual signaling which must be touched upon with emphasis, and that is the absolute necessity for all agents of communication not only to be proficient in the several codes but to be *experts* therein. While certain agents of communication have been specially mentioned it is not intended to convey the idea that they are all the individuals in a company who should be proficient in signaling; indeed, those mentioned are but a small part of the number who should be so equipped in a well trained organization. Officers below the grade of lieutenant colonel should be expert in the semaphore code and hand and arm signals.

*Exercise 1.*

*Purpose:* To acquaint men with the use of signals.

*Situation:* A company in line, during rest period when waiting for assembly before formation, or any time when a few minutes are available.

*Procedure:* The captain, platoon or squad leaders give a signal and call on a man for the interpretation of it. The entire list of signals can be given and interpretation made within two minutes.

*Example 1:* The captain signals—

Range 900 yards,

or,

Change 50 yards,

or,

As skirmishers guide center,

or,

Suspend firing,

or,

What range are you using?, etc.

“Jones (or the man indicated), what did that signal mean?”

*Example 2:* The captain by *command* gives examples as above, and says—

“Smith, give the proper signal for that command.”

It is better first to have the squad, then the platoon leaders work with their men, when all are reported proficient, the above exercises. A failure by a man, in front of his company, to call a signal properly after reasonable instruction, is not so likely to be repeated, for squad and platoon pride will take a hand to correct the deficiency. No opportunity should be lost during extended order drills for practice in signalling with hand and arm.

The exercises outlined below may all be ordered by means of the signals now in use, adding one signal for “Company.” The following signal has been used over an extended period of time and has been found satisfactory; palms of the hands held towards the person to

receive the signal, fingers extended and joined, and pointing upward, thumbs interlocked, arms elevated sufficiently to insure clear observation.

*Exercise 2.*

*Purpose:* To train officers and units to observe and execute quickly and correctly all signals.

*Situation:* Company or battalion at drill.

*Example 1:* Company deployed, advancing, captain signals—

To first and fourth platoons; halt and assemble.

To second and third platoons; platoon columns.

To first platoon; squads left.

To fourth platoon; squads right.

When heads of platoons about to meet.

To first platoon; squads right, platoon column.

To fourth platoon; squads left, platoon column.

To all platoons; as skirmishers.

To first platoon; reënforce right of line.

To fourth platoon; reënforce in intervals.

*Example 2:* Battalion in column at route step. major signals—

Squads left.

To first and fourth companies; halt.

To second and third companies; platoon columns.

When some distance has been gained:

To second and third companies; as skirmishers.

To first and fourth companies; squad columns.



To second and third companies; halt, lie down, range 800, commence firing. (captains to designate targets, etc.)

To first and fourth companies; as skirmishers, halt, lie down.

To second and third companies; elevate 100, shift fire two sights to right, fire faster.

To fourth company; change direction to left, double time, fix bayonets, battle sight, commence firing.

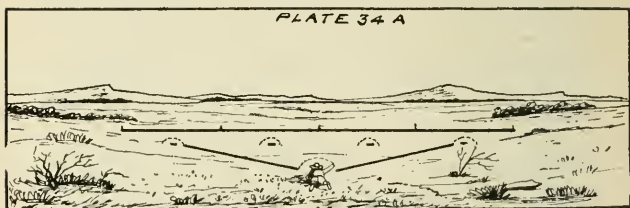
To first company; reënforce right of line.

To fourth company; cease firing, reënforce in intervals.

To battalion, with interval between signals; fix bayonets, fire faster, cease firing, forward double time, charge, halt, assemble, squads right.

While these combinations of movements or others like them have no direct application on the battle field, it has been found that drill and training in them does much to cause the unit while deployed to act quickly in obedience to the will of the commander. As General Morrison has pointed out, a large amount of training is necessary to produce the desired effect, and this is particularly true in the battalion where so often the command for deployment creates four units where there should be but one.

Company commanders in giving signals to the entire company, as range, change to range, etc., must swing the arm in a horizontal arc to enable its interpretation by the flank platoon leaders, as Plate 34 A.



Battalion commanders must particularly observe this when giving signals. If they occupy a position about 150 yards or greater in rear of a battalion with three companies in the line, the distance is sufficient to make the understanding of signals difficult unless properly given. When in a prone position, depending upon the background, sometimes the hand must be held above the head to be readily understood.

The system of company communication is illustrated in Plate 34 B.\*

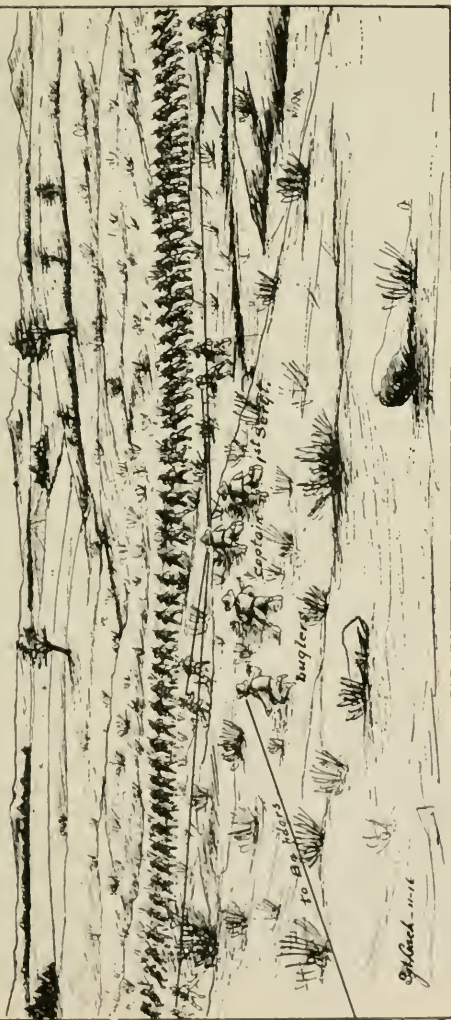
#### *Transmission of Fire Data:*

I. D. R.:—"In the training of men in the mechanism of the firing line, they should be

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\*NOTE: Better control results if the squad leaders remain in rear of their squads until the latter stages of an action or until their fire is needed.

Plate 34 B.



practiced in repeating to one another, target and aiming point designation."

Men should be trained in the transmission of fire data without it appreciably affecting the rate of fire.

*Exercise:*

*Purpose:* To accustom men to properly transmit and receive fire data.

*Situation:* A company in prone position facing a landscape which affords suitable targets for designation, or a number of men facing a target indoors, as illustrated in Plate 30.

*Procedure:* Give certain elevation or deflection; certain apportionment of target; certain rate of fire; or certain target data and make a *change* in *same*, known to one or a few men, which requires transmission by them to the remainder of the men not so informed.

*Example 1:* A unit having been given a certain aiming point on which with a certain range they are simulating fire—Reënforcements are sent forward and deployed in the intervals on the line. The original line is withdrawn after thirty seconds. The men who joined as reënforcements are inspected as to sight setting and target designation. In

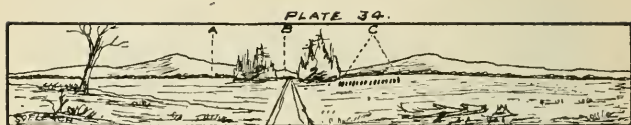
obtaining sight setting, men will be aided in addition to the signal by looking at leaf of man nearest him. Data which requires transmission by voice should be obtained by each man placing his ear as near as possible to the mouth of the man giving the data.

In similar manner, exercises covering the apportionment of sectors, rate of fire, etc., can be given.

*Example 2:* A unit in position having received and put into effect certain fire data—A change of same is given the flank man requiring transmission along the entire front. After a minute, in case of a squad, verify the result.

Verification is facilitated if the problem is so arranged that a rest is provided for each rifle and the men are caused to withdraw, leaving their rifles in position to indicate their point of aim, sight setting, sectors, etc.

Rests of this character should not be of a permanent nature or variations in the terrain which are necessary to proper training will not be possible. Temporary rests may be provided by placing sacks of earth on the tripods used for pyramidal tents or more easily by carrying empty sacks to the drill ground and there filling them with earth, using the company intrenching tools for this purpose.



*Example 3:* On landscape, as Plate 34, or terrain, is given a target sector, A——B. The right and left being covered by other troops. As the reënforcements move forward as in Example No. 1; above cited, to the line, a signal causes a body of troops at C to advance into view in another company's sector. In the first exercise of this nature it will be safe to say the rifles of the reënforcements will be on line at C, instead of their own sector, A——B.

It must be remembered in this connection that, unless under very exceptional circumstances, neither an individual nor a unit should direct its fire outside of the assigned sector without orders from the immediate commander.

*Example 4:* A unit in position as in Example 2—Changes in firing data given to the corporal and transmitted as outlined in Exercise No. 1 under sight setting in chapter FIRE DISCIPLINE.

# CHAPTER V

## FIRE DISCIPLINE

Fire discipline may be defined as that condition of the personnel of a fire unit, resulting from training and practice, which enables the commander to obtain an orderly and efficient delivery of fire.

That the individual obeys is not sufficient; together with obedience must be the ability to use initiative for the accomplishment of a common end, all of which embraces—

1. Constant attention to orders. Care as to position and extent of target, sight setting, and delivery of fire.
2. Economy of ammunition.
3. Use of ground to advantage.
4. Ability of men to command units whose leaders are lost in action.
5. Observation of enemy.
6. That if separated from leaders—
  - (a) Men will direct effective fire on target.
  - (b) Men will increase fire when target is favorable.
  - (c) Men will cease fire when enemy disappears.
7. Thorough knowledge of capabilities, nomenclature, and limitation of the rifle. Jams or failure in loading should be cor-

rected without removing the eyes from the target.

1—*Attention to Orders*:—

The various exercises outlined under “Communications” will be an aid in instilling the habit of attention in our men, without which success is impossible.

2—*Care in Sight Setting*:—

Exercise 1:

*Purpose*: To train men to set sights quickly and accurately.

*Situation*: The company is formed in single rank, at the ready, with the rear sight set at zero.

*How Executed*: The range is announced by command or signal, sights are set, and each man comes to port arms or steps four paces to the front, upon completion of operation.

*Time*: Is taken from last word of command or signal and should be within 15 seconds.

Example 1: *By Command*: Range 500; sight setting, verified.

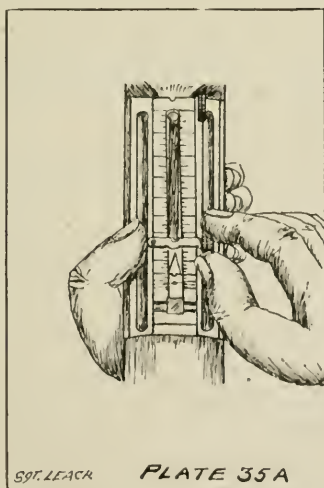
2: *By Command*: Range 500, 2 points left windage; verification of sight setting.

3: *By Signal*: Range 500, verification.



4: By Command or Signal to platoon commanders; by them to corporals; by corporals to men; the verification.

Interest may be held in these exercises by making them competitive in the squad and platoon. Time may be recorded either for the period consumed by the entire unit or for the sum of the individual requirements. The former method is much the quicker, but the latter stimulates individual effort. Penalties, in terms of seconds, should be added for errors.



An aid to sight setting is to operate the thumb screw with the thumb and forefinger of

the right hand while the slide is moved by the thumb of the left hand by slight pressure against the side of slide, as Plate 35 A.

One of the requisites of effective fire is that its volume should be uniform; that is, the rate of fire should not rise or fall except by will of the commander. With this in mind, it will be seen that training in some system of sight setting is necessary, or a marked decrease, even a cessation of fire, will occur when changes of elevation are made during the fire fight.

There are several methods of accomplishing this end—

(a) At command, first odd numbers, then even numbers; or, first front rank and then rear rank, fix the sights.

(b) Beginning with two men on each side of the corporal, sights are set by pairs working towards the flank in each squad.

Under (a) half the unit ceases fire at one time and sights are set by alternate men. This is the more rapid method of the two, but causes a marked decrease in the volume of fire and increases the difficulties in the transmission of data. Under (b) the time required to accomplish the change is increased, but only two men per squad cease firing at once and the transmission of data is facilitated, easily supervised by

the corporal. Both methods have their application. At times, it may even be advantageous to suspend firing altogether, while sights are changed. By this latter method fire at the new range can be opened more quickly than by any other means but the loss of fire effect is a factor which must be given consideration. Whether it is advisable to change sights quickly with the attendant loss of fire, or more slowly while the volume of fire is maintained, is a matter which rests not with the individual soldier but with the company commander. The latter should decide the question, basing his decision upon the tactical situation, the size and actions of the target, and the effectiveness of the enemy's fire.

The following exercise and modifications thereof are recommended—

Exercise 1:

*Purpose:* To train men to set sights quickly and accurately without cessation of fire.

*Situation:* The squad or platoon deployed, lying down, firing.

*How Executed:* Range is announced by command or signal. Each corporal causes sights to be set beginning with the men on his right and left and working towards the flank in each squad. As each man

finishes setting his sight, he holds his rifle upright, butt resting on the ground.

*Time:* From last word of command, or from signal until all sights are changed. Additions in seconds should be added to the total time for errors in elevation.

*Rate of Fire:—*

Effective rifle fire in battle is gauged by the number of men disabled in a *unit of time* and is dependent upon—

1. Percentage of hits, which depends upon dispersion, which in turn depends upon—

- (a) Precision of arm.
- (b) Designation of target.
- (c) Estimation of range.
- (d) Distance of target.
- (e) Visibility of target.
- (f) Prevailing atmospheric conditions.
- (g) Fire discipline, training and instructions of troops, their physical and normal state at the time.

2. Number of targets hit.

3. Time of execution.

4. Number of rifles employed.

5. Number of shots fired.

6. Rate of fire.

The question of rate of battle fire has received considerable discussion and it is neces-

sary to consider many factors before arriving at a conclusion. It is well to note here that a high rate of fire resulting from *excitement* is not the high rate developed by systematic training, or as a direct result of control and discipline.

I. D. R.:—"Men are taught that the rate of fire will depend upon the visibility, proximity, and size of the target and that the proper rate will ordinarily suggest itself to each *trained* man, usually rendering cautions and commands unnecessary."

Practice in peace time inculcates habits which are prominent in action. Men might then be accustomed to look upon each round of ammunition in such manner as to scarcely admit of any monetary comparison, and it should be a cardinal principle that one of the first things all must appreciate upon entering into action is "To weigh the value of each round of ammunition they fire."

When the situation will admit, the suspension of fire by units for brief periods during an advance is one of the best ways of retaining fire control.

Our Firing Regulations give the following on the rate of fire:—

"The time of execution is important in that the gaining of fire superiority is dependent less

upon obtaining high *percentage of hits* than upon making an absolutely *large number of hits in a unit of time*. There is necessarily a limit to the rapidity of fire which, if exceeded, will result in some loss of accuracy. With targets of a fair degree of visibility, the following may be taken as standard rates of fire for troops who have been given suitable training in target practice—

200 yards	}	. . . . 10 shots per minute.
300 yards		
400 yards		
500 yards	}	. . . . 7.5 shots per minute.
600 yards		
700 yards		
800 yards	}	. . . . 5 shots per minute.
900 yards		
1000 yards		

Greater ranges—3 shots per minute.

The rates given should not exclude higher rates of fire in case of large and conspicuous targets. On the other hand, when objectives, or marks used as aiming points, are very indistinct, the requirement of correct aiming imposes rates of fire somewhat lower than the standard rates given, even for well-instructed men."

The following is a table showing the results of a firing experiment at the musketry school, and will give a comparison of hits in different units of time.

Rate of Fire per minute	Number of Shots	Number of Hits	Number of Figures Hit	Accuracy in %	Distribution in %	Hits per minute by 100 men	Figures hit per minute by 100 men
3	2,500	330	98	13.2	78	39	11.7
5	2,500	394	99	15.7	78	79	19.8
7½	2,500	290	98	11.6	78	87	28.4
10	2,500	257	84	10.2	67	102	33.6

From which it is found that the time necessary to obtain the above hits is—

3 shot rate.....	8 1/3 minutes
5 shot rate.....	5 minutes
7½ shot rate.....	3 1/3 minutes
10 shot rate.....	2 1/2 minutes

Make a comparison, with this as a basis, of four different organizations beginning fire at the same moment, firing with the same comparative results and each at the different rates mentioned, with 25 rounds per man. At the end of 21½ minutes we have—

Rate	Shots Fired	Hits	Figures Hit	Remaining Ammunition
3	750	97	29	1,750
5	1,250	197	49	1,250
7½	1,875	217	71	625
10	2,500	255	84	0

To which apply the probability of hits under battle conditions by arbitrarily assuming the loss to be 9/10 of peace time results and we have—

<i>Rate per Minute</i>	<i>Figures Hit</i>
3 .....	2.9
5 .....	4.9
7½ .....	7.1
10 .....	8.4

If these different organizations had started an advance against the enemy from a common fire point it may be assumed, considering no other factors, that the effective fire directed against them was reduced an amount equal to the above losses. The organization using the low rate of fire has reduced the enemy's effectiveness three men, with an expenditure of 750 rounds and in the same time, the one employing the high rate, 8 men, with an expenditure of 2,500 rounds.

In defense the question of the supply of ammunition is ordinarily not serious, but it is



during an advance, when the firing line pushes forward to successive fire positions, that the consideration of supply affecting the rate of fire becomes a big factor.

Fighting, such as might be expected judging from the past, will cover a period of from a few hours to several days for the determination of the outcome of an advance. Let it be assumed for discussion an engagement covering ten hours, from the initial advance at a range of under 1,000 yards to where the bayonet takes the place of the bullet for decision. In that ten hours it is placing rather a low estimate to consider, say, an hour of continuous firing which will result in the following expenditure of ammunition:—

<i>Rate</i>	<i>Rounds</i>
3 .....	180
5 .....	300
7½ ....	450
10 .....	600

Where are we to get the ammunition and how, if we have it, are we to get it to the firing line? Even at the slow rate one belt 100 rounds, and one and one-third bandoleers have been expended. It will be seen, therefore, that the question of ammunition supply is one which must receive serious consideration by all commanders. It would seem that in the absence of

some means of readily supplying the firing line with ammunition the only other alternative is to push the line much further forward before opening fire than is now contemplated by the drill regulations, say four or five hundred yards.

If ammunition is plentiful and can be supplied to the firing line, then, without question, the highest rate of fire consistent with good shooting should be employed. If an attack appears to have the possibilities of a drawn out affair and ammunition is not over plentiful and difficult to supply to the firing line, a rate of fire somewhat more conserved must be adopted. It appears that the rate of fire is largely dependent, as are so many military problems, on local conditions.

### Exercise 1:

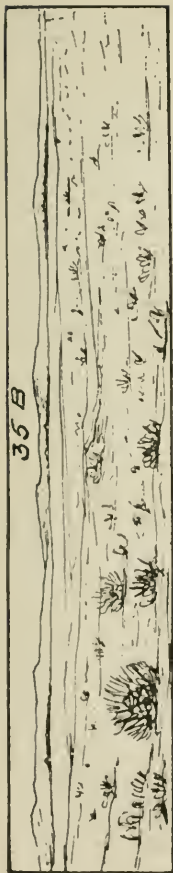
*Purpose:* To accustom men to aimed fire and proper rate of fire.

*Situation:* A company in prone position at "ready."

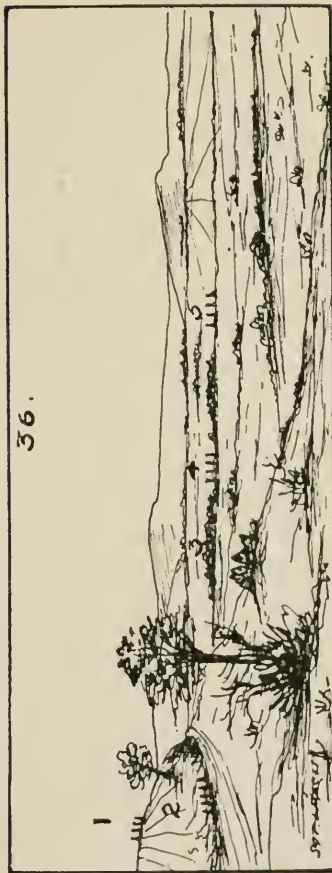
*How Executed:* By command—the objective and number of shots (to be simulated) is given. When each man completes the designated number he indicates the fact by holding the rifle upright, butt resting on the ground.

*Time:* Is kept by a stop watch or ordinary watch.

35 B



36.



Example:

Range 800.

That house.

Fire 10 rounds.

If the rate of fire is proper according to the table given in our Firing Regulations the time for execution should be two minutes. The tendency of untrained men even in peace time is to fire much too rapidly. Impress on the men the fact that *aimed* fire is necessary, that they must aim on the objective as if they were firing to get a bull's eye.

## 2—*Taking Advantage of Ground Advancing upon a Position:—*

1. Make use of all cover.
2. Seek hidden lines of approach.
3. If possible, avoid ground upon which projectiles are seen to fall.
4. Make use of pack as cover when necessary to halt on exposed ground.

Anything which distorts or partly eliminates the familiar outlines of an object in the field tends to add to its concealment from view. A small bush or bunch of grass might, as in Plate 35 B, give no concealment at about 100 yards, but beyond that distance concealment is complete.

Points to be considered in making an advance—

## Plate 36:

1. Group of men on the sky line.
2. Group of men nearer but having darker background.
3. Group of men scarcely visible by reason of dark background.
4. Group of men partially visible by reason of background.
5. Group of men apparently at closer ranges by reason of light background.

Making a trench during advance under fire.

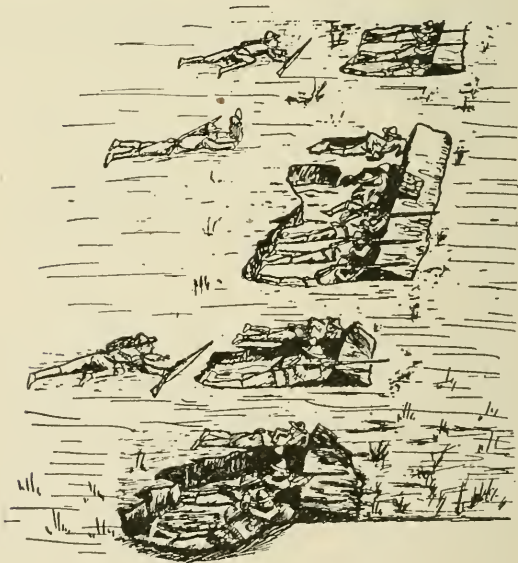
*"They dig because forced to halt."*

One squad or platoon suspends fire and makes advance, under protection of the fire of another squad or platoon, in the following manner:

By crawling a man works forward to a favorable position, where he makes a small, shallow trench on his right, being protected by his pack and the earth obtained from the trench. If in pairs, the one continues firing while the other digs, as in Plate 37 A. The remainder of the squad crawls forward and enlarges the trench until cover is provided. As soon as the advanced squad is able to provide sufficient fire, the rear squads begin their advance to the new position (Plate 37 B) until cover is provided for the entire organization.



A



B.

PLATE 37.

3—*To Provide for Leaders:—*

Each company, platoon, or squad should have a number of substitutes to take the place of the regular leaders.

Exercises: For a company, platoon, or squad.

*Purpose:* To accustom men to step in and fill the places of leaders killed or wounded in action.

*Situation:* A company in skirmish order. The captain places the command under a subaltern and constitutes himself an observer or umpire. Assuming that an advance is about to be made and the preparatory commands given. The umpire causes the squad leader, platoon or company commander, to "*play dead*" in such a manner as to attract the least attention.

The next in command of the unit or units should *immediately note the fact*, take command, carry out the orders, push on the advance, and continue in such capacity until the completion of the problem. This procedure is carried out during an advance until each unit has had several changes in leaders.

A squad should have, at least, three substitute leaders: a platoon would naturally have its guide and, say, four corporals. For practice it might be well to work a few

privates up to the point where they could lead platoons.

Example: Company, platoon, and squad leaders are instructed that when the crowns of their hats are touched by a messenger of the umpire it is indicative of immediate incapacitation and they should at once assume a position indicating that fact by falling prone and making no further movement (any other system will answer but it has been found that this method works well without attracting attention).

*Situation:* The company had begun an advance by squad rushes from the right. As the third squad corporal was about to spring through the line he received a touch on the crown of his hat. The appointed substitute must note the fact of his leader's incapacitation without being told and immediately advance the squad.

Success depends largely upon the ability of the umpire to, first, select or by his messengers designate men so as to attract no attention; otherwise it becomes an easy matter for each substitute to note the position of the umpire and expect the usual results. Second, a leader should be put out of action just before he gives



a command or just after he has given one. He may also be directed to drop out after covering 50 yards of the next rush, etc. The different leaders, during the critical phases of the advance, are eliminated and other men immediately take their places and carry out the movement.

### *Fixing Bayonets:—*

What has been said regarding simultaneous sight setting is also largely applicable to fixing bayonets. It should be remembered, however, that the moment for fixing bayonets will usually arrive at the height of the fire fight when a marked cessation of fire might have serious consequences, hence the method recommended under (b) above should be used for this purpose. Competitive exercises by squad and platoon will facilitate training in this particular.

### *The Rush:—*

It is not always possible to wholly separate fire and battle tactics. Such is the case with regard to the rush. Recollecting that the volume of fire should be uniform it is apparent that the cessation of fire by a fraction of the line preparatory to and during a rush is, no matter how necessary, a positive disadvantage. While a fraction of the line is rushing forward something of value is actually being accomplished by gaining ground to the front. True,

the all important fire effect suffers a loss but that is a necessary evil. The same is not true, however, of the period from the suspension of fire preparatory to a rush until the rush, or of the time that elapses from the instant the rushing fraction reaches the new position until fire is opened. It is upon these periods, when the unit is neither gaining ground to the front nor firing, that training must be concentrated in order to reduce them to the minimum.

Rushing units should be trained to suspend firing and move forward in a minimum of time; to halt instantly and simultaneously at signal; and to open fire without loss of time. Proper rushes cannot be made without a great amount of drill in which painstaking care is given to details.

Our regulations recognize another expedient also for minimizing the effect of the loss of the fire of the rushing unit.

This plan calls for an increase in the rate of fire of those portions of the line not moving forward which are *covering the same target* as the rushing unit. It has been stated that the rush should halt simultaneously. While a discussion of this point might not be considered to lie within the purview of "musketry," it is so intimately related to training in rushes that it is taken up here. A straggling halt in which

the men arrive one at a time upon the new line serves to accentuate that line to the enemy and so increase his fire effect. A line which disappears quickly and simultaneously into cover offers the minimum of opportunity for target designation. A few practical exercises with this point in view will be convincing. The rush should be at top speed, consistent with the terrain and distance covered. As the rush leader throws himself upon the ground the entire fraction does likewise, inequalities in the line being rectified by those in rear of the line crawling to their proper places. It requires time, patience, and good judgment to properly train men in this particular.

## CHAPTER VI

### APPLICATION OF FIRE

Our system of individual target practice, while not perfect, results in producing a large number of excellent shots. To gain the full effect in battle of the great amount of time and effort we expend annually on this class of training, the men must not only be taught to fire collectively but officers must have a thorough knowledge of the proper application of this fire and of the means of applying it under the varying conditions of service.

Fire superiority is the goal; for without it, success is beyond reach. Fire superiority does not mean the killing or disabling of all the enemy, but that fire is so accurate the enemy's morale is shaken and he is shooting wildly. With the knowledge of peace firing, this, at first glance, looks easy; but when it is remembered that fire efficiency in battle is estimated to be reduced from  $1/10$  to  $1/80$  of that expected under peace conditions, the difficulty of reaching the goal is apparent. There will be times in battle when the firing of a unit will closely approach peace time accuracy and others when it will differ widely therefrom. After passing a certain point, the variance from the peace

standard will be in direct proportion to the training of the unit. The excuse for these remarks lies in the desire to emphasize, as strongly as possible, the necessity for thorough, intelligent, and uniform training in all features of battle fire which we are liable to be called upon to use in the face of the enemy.

Under the head of Application of Fire the following will be discussed:—

Adjustment of Fire.

Effect of Ground.

Employment of Fire Units.

Kinds of Fire.

Time of Opening Fire.

Combined Sights.

Night Firing.

Indirect Fire.

Fire of Position.

Vulnerability.

#### *Adjustment of Fire:—*

Stationary Targets: The ever present problem in combat firing and in service is to place the center of impact of the collective group on the center of the target, thus insuring the greatest possible number of hits. Two elements enter into this; (a) the troops, (b) the commander.

Troops: When troops have aimed correctly at the indicated target with distribution and

elevation as ordered and have fired steadily and at the proper rate, they have solved their share of the problem. These requirements are matters of training.

Commander: The commander, assuming that he has chosen the proper target, given the proper distribution and rate of fire, and seen to the assignments of aiming points, must bring the shot group upon the center of the target. This is primarily a matter of determination of range. Battle ranges, except in prepared defensive positions will usually be in error. The degree of error depends upon the ability to estimate range and the range finding appliance furnished. With a modern "contained base" range finder, with which our troops should be furnished, the error is reduced to a minimum. By estimation it often approaches a maximum. In either case we are quite safe in assuming that some error will exist. As the shot group grows smaller with the degree of perfection of the individuals in the group, it will be seen that the better the shots the greater the effect produced by errors in elevation. Therefore, no degree of perfection in individuals will compensate for errors in adjustment; on the contrary it but magnifies them. In instances of misplacement poor shots with great dispersion will many times get hits where good shots with

small dispersion will get none. It is thus made plain how important the correct placement of the center of impact becomes and how dependent it is on the ability of the commander to determine the range.

If, as is probable, instruments and estimation result in initial errors, some other means must be used in conjunction with them. These are found in "observation of fire" and "observation of the enemy." Peace offers no examples of the latter, but a little thought will show what actions indicate a well-placed center of impact. No opportunity should be lost to become familiar with the appearance of shot groups under different conditions of ground, light, and range.

It must be constantly borne in mind that a simple error in range, and frequently a small one, will utterly waste the effect of years of excellent training in the individual. With the captain, and with him alone, rests the burden of this responsibility.

**Moving Targets:** A correct placement of the center of impact is just as important with moving targets as with stationary ones, but, unfortunately, it is much more difficult to obtain. Changes in the position of the target, of course, make it impossible to maintain a correct placement with a single sight setting.

Changes in sight setting cause a loss of time and multiply the opportunities of error. Here two conflicting conditions are confronted. The answer is, of course, a compromise. A change of sight setting is necessary, but the number of these changes is reduced to the minimum consistent with effective fire. Against a steadily advancing target (not one that advances by leaps as do the simulated advances on the target range) an initial setting must be selected well within the estimated range, fire opened, *and continued while the target moves into the center of impact.* As the target approaches and leaves this center the fire effect will be less than when exactly in it, and, of course, diminishes as the distance becomes greater. Outside the 75% zone (reference to table S. A. F. M., page 123) the effect falls off to such an extent that a change in elevation is necessary. The change must be large enough to obviate the necessity of frequent sight manipulation and not so large as to remove fire effect completely from the target. Experience and a study of dispersion have shown that a change of about 200 yards is satisfactory. This change should be made while the target is stationary and offers its least area. When it is in motion and presents its greatest front and when in the center of impact, the firing should reach its



maximum volume. Against rapidly approaching targets, as cavalry, the battle sight should be used at all ranges. Against retreating targets fire should be opened at the estimated range and sight settings of 200 yards difference, set off as the distance is increased. Against targets moving perpendicular to the line of fire some allowance must be made for their rate of advance. Fire upon the head of a column produces a greater effect than at any other point.

Training along these lines should be conducted accordingly.

*Effect of Ground:—*

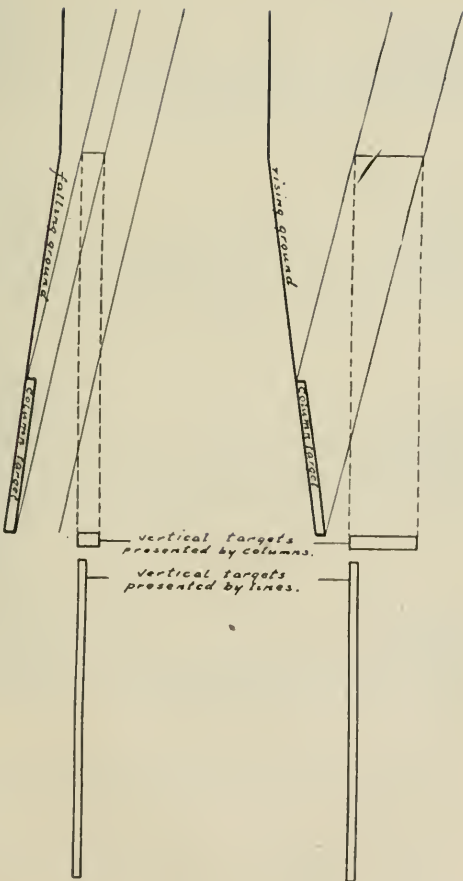
A method which proves valuable in illustrating the effects of a cone of shots on different slopes of ground is to take a hand mirror and throw the sun's rays on a surface held at different angles. A small hand electric lamp with a cylindrical roll of paper, such as a rolled calling card, pushed over the bulb to center the rays of light and prevent diffusion, will work equally as well.

If, in the foregoing experiment, it is assumed the sun's rays, as they are received on the surface held at different angles, to be the zone beaten by a cone of fire, it is seen at once that the depth of this zone is decreased when the surface of reception inclines upward and is

increased when the surface inclines downward. So also does the ground rising and falling with respect to the line of sight increase and decrease the width of a fire beaten zone. If, therefore, the space in rear of a firing line is considered which is swept by fire, from practically the same level as the line, it is found that where this space slopes upward the beaten zone is decreased and where it slopes downward the beaten zone is increased. The practical application of this knowledge lies in the ability to use it in reference to the positions of the supports and reserves. Upon ground rising in rear of the firing line and in respect to the line of sight, the supports may be brought much closer to the firing line than upon ground which slopes away from the firing line and from the line of sight. Defiladed spaces in rear of the line are, of course, not considered. For those who care to pursue this subject further a reference to the table on page 128, S. A. F. M., is made. This table gives the effects upon the beaten zone of different degrees of slope at various ranges.

There is another effect of sloping ground which must be considered and that is its effect upon the position of the target. A column on ground rising in rear of the firing line is, so to speak, tipped up to receive the fire; that is, the rear of the column is elevated and thus offers

# PLATE 38



vertical targets  
presented by columns.

vertical targets  
presented by lines.

a vertical target which will not be present upon level or falling ground. A reference to Plate 38, in which is shown a cone of fire directed upon a column target, both on rising and falling ground, will make this clear. It is plain that a line on rising ground will offer no increase in vertical target over one on level or falling ground.

From the foregoing it is seen that upon rising ground *line* formations and *not column* should be taken. Ground which falls with reference to the line of sight, lowers, so to speak, the rear of the column and presents as a target the front and not the depth. Columns present less front than lines and are desirable formations for falling ground. The practical application of this second effect of ground is found in the formations for supports and reserves. Upon ground rising in rear of the firing line and in respect to the line of sight, *line formations* should be adopted. Upon ground falling in rear of the firing line and in respect to the line of sight, *small column formations* should obtain.

*\*Employment of Fire Units:—*

*In Defense*, sectors are assigned. The proper employment of a unit is accomplished when the

*\*NOTE:* A *section* is a portion of the line occupied by defending troops and *sector* an area over which they fire. These terms are frequently taken as interchangeable but not properly so.

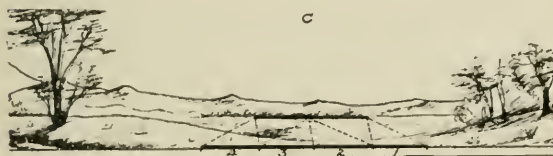


PLATE 39.

entire target is covered by the fire of that unit as shown in A (Plate 39). Each man fires at that part of the target directly opposite him. Any of the following assignments of platoons will work equally as well, but the necessity therefor in defense is not so apparent.

*In Attack*, objectives are assigned. Differing from defense where a unit remains in position and delivers fire, in attack either individuals, squads, platoons, or entire companies, push forward to successive fire positions. If a company covers a section of the enemy's line from which a fire is being delivered capable of making a certain number of hits, then when the fire ceases on that portion of the enemy's line their fire increases in quality and volume, resulting in more hits on the attacking lines.

A force advancing against a hostile position thoroughly covered by its own fire, moves forward with the best possible protection. If a unit depends upon its own fire for protection then some method must be adopted which will permit of an advance of a portion of the unit, at the same time keeping up, if possible, a fire along the entire position of the enemy.

1. Switch Method: Figure B. A target assigned to a four platoon company is divided into three parts and assigned to three platoons,

the fourth acting as a switch to cover the portion of the target on which fire has been temporarily suspended by reason of an element making an advance.

A disadvantage: This requires a high degree of training and control on the part of the switch platoon to cover properly in turn each vacated part of the objective.

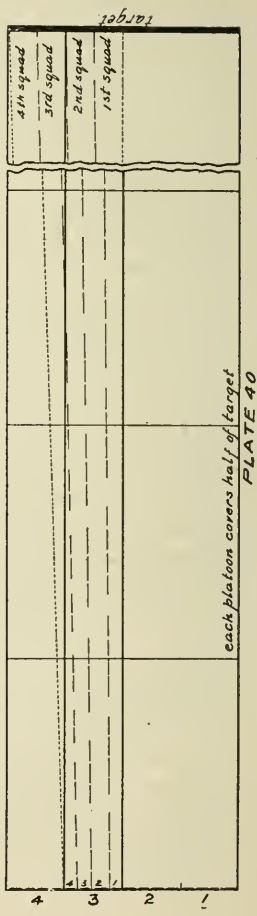
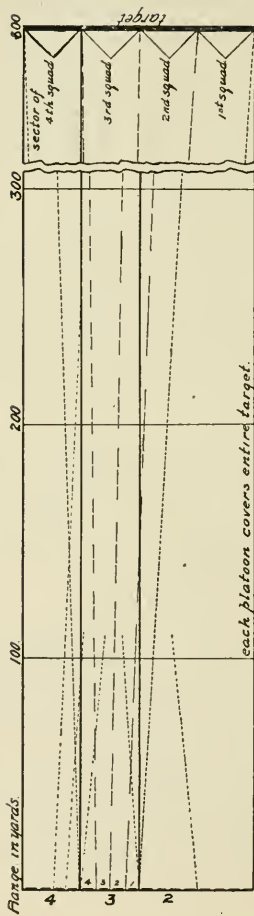
2. By assigning two adjoining platoons to each half of the target, Figure C. This method permits of the advance of a platoon while the fire on that half of the target is reduced one-half in volume. In Plate 40 it will be noticed in the lower illustration that the fire on the left element, 4th squad, 3d platoon, crosses the line of advance of the 4th platoon and would endanger the flank of that platoon during an advance. The fire of the right element parallels the advance of the 2d platoon.

To provide against this either:

(1) A squad or portion of squad must temporarily suspend fire or shift their fire, as 4th squad on 1st squad target, 1st squad on 4th squad target. The advisability of such shifting is questionable. Or

(2) Intervals must be kept between platoons of about 6 yards, or

(3) Platoons must, during advance, slightly incline to the flank.





Considering the fire of the 3d platoon during advance of the 4th, the suspension of fire of the 4th squad causes the fire of the 3d squad to cross the line of advance at about 250 yards. If the 3d squad's fire is suspended, the fire of the 2d squad meets the line of advance of 4th platoon at the target.

3. Assignment of each platoon to the entire target, Figure C. The advantages appearing with this assignment are:

(1) Easier for the elements to distribute their fire.

(2) If, as often happens, some platoons contain a greater number of good shots, the distribution over the whole target is improved.

(3) During an advance of a platoon the entire target remains under fire, reduced only in volume by the suspended fire of the platoon making the advance, plus a slight addition explained later.

(4) No change of target results during the advance and fire should possess greater efficiency.

(5) If, during an advance, it should on rare occasions become necessary to cover with fire, a portion not in the assigned sector, a flank platoon is always available without affecting the fire of the unit except its reduction in volume.

## Disadvantages:

(1) When a hostile line is located on rolling ground it will be often impossible for the interior element of a flank platoon to see its portion of the target, as example—Plate 40, 4th squad 1st platoon on section of 4th squad target.

(2) In the initial advance no doubt this disposition will work satisfactorily. As the advance closes with the enemy the tendency will be to switch to the method shown in A, Plate 39, in which each man fires at the target directly to his front.

(3) Top illustration, Plate 40: Considering the left element of a platoon's fire together with the danger to the advance of adjoining platoon we have the following:—

<i>Platoon Firing</i>	<i>Crosses near flank of advancing platoon</i>			
	4	3	2	1
1 . . . . .	525 yards	270 yards	nr. fg. point	.....
2 . . . . .	415 yards	nr. fg. point	.....	nr. fg. point
3 . . . . .	nr. fg. point	.....	nr. fg. point	415 yards
4 . . . . .	.....	nr. fg. point	270 yards	525 yards

The greatest danger of hits from our own fire shows up in this formation, when a flank platoon is still in rear the remainder having made their advance to the new position. Assuming that the 1st, 2nd, and 3d platoons have advanced 100 yards, the right of the 4th

platoon's fire at 100 yards crosses a point about 10 yards in from the left flank of the 3d platoon; the right of the 3d squad, 4th platoon, 1 yard from the left flank of the 3d platoon; the right of the 2d squad, 4th platoon, crosses the left flank of the 3d platoon's line of advance at 250 yards. This is the maximum cross fire resulting from this formation. When no intervals exist between platoons and when they advance straight to the front and not slightly to the flank, the flank platoons firing from a position in rear must suspend the fire of two squads. However, this suspension takes place for a brief period, for the 4th platoon will start its advance as soon as the 3d reaches its position and begins fire.

Another method is to cause the flank platoons to move ahead of the line to be established by the other platoons. This results in an echelon formation and reduces the danger of our own fire as above explained. For example, an advance of about 60 yards is about to be made beginning on the right. The 1st platoon advances about 90 yards, the 2d and 3d—60 yards, and the 4th—90 yards. This resulting echelon formation affords in a small degree a poorer target to the hostile fire, but is more difficult to control.

Whatever the method used, it is the duty of the platoon leaders to see that proper steps are

taken to prevent their fire from endangering their comrades.

The initial assignment of the companies of a battalion and the battalions of a regiment to sectors in defense and targets in attack has been mentioned in the chapter on Distribution of Fire. In defense as well as in attack the cardinal principle is that the whole target must be covered with fire. In attack it is usually not advisable or practicable to assign the same target to different companies in a battalion. In the regiment the case would be rare indeed where different battalions were given the same objective. We may assume, therefore, that the target both in the battalion and regiment will be subdivided into parts; the number of which will depend upon the number of units placed in the firing line upon the initial deployment. In the regiment the order for attack should always include the assignment of objectives to the battalions. In the battalion a prearranged method of distribution is recommended. This obviates the necessity for including it in the battalion commander's order, saves time and assures that in an emergency, without orders, the target will be properly covered. Each company in the firing line, upon initial deployment, takes its proportionate share of the battalion target; that is, if there are two companies they share

the target equally, if three each takes one-third, and so on. Supporting companies if deployed in the intervals between skirmishers take the target of the company which they support. If they are deployed on the flank they should cover that portion of the target which, in the judgment of their captains, is the most dangerous; or orders must be issued to them. In this connection it may be arranged in the battalion that companies reënforcing on the flanks take the same target as the company with which they connect.

By this method the battalion commander is able without verbal orders to distribute the fire of supporting companies over the whole target or place it on either flank, as he may desire.

The following abbreviations have been found to work well and to be easily memorized:—

R R A—Reënforce right of “A” company.

R L B—Reënforce left of “B” company.

R A—Reënforce “A” company intervals.

R W L—Reënforce whole line in intervals.

### *Kinds of Fire:—*

There are three classes of fire used in our service; Volley, At Will, and Clip.

*Volley Firing* should be used for ranging; it also has a limited application in Fire of Position.

*At Will* is the only class of fire which need be given much consideration. It is this class of fire which will usually be applied in battle. It is *the* fire for almost every situation. To reap its full effects, however, there must be a high state of fire discipline and fire control which results only from thorough training.

*Clip Fire* is an expedient resorted to with the idea of limiting the number of rounds fired without a pause in the firing.

With proper fire discipline clip fire is not necessary; without proper fire discipline it cannot be delivered with success.

There is another class of fire, which, while it is not advocated in our army, has been recommended abroad; that is, *Rolling Fire*. This fire is executed about as follows; the front rank runs forward about fifteen paces and opens fire, the rear rank in the meantime advancing at quick time. As the rear rank passes the front rank the latter ceases firing while the former takes up the double time for about fifteen paces, when it halts and opens fire. The advance thus continues without pauses and fire is continuous. It requires much training to execute this class of fire even in peace time. Its application in war will probably be limited to occasions upon which the enemy is completely demoralized. This class of fire, it is reported, has been fre-

quently used on the French front during the past two years.

*Time of Opening Fire:—*

In the attack the firing lines must be pushed close to the enemy's position before fire is opened. The attack which halts to fire at long ranges is lost. On the defense, however, where ammunition is very easily supplied, ranges more nearly correct, and the target larger, fire may be opened at greater range with chance of success. In attack, fire should not be opened beyond 800 yards unless absolutely necessary. Reports from the present war indicate that attacks have frequently been pushed to within four or five hundred yards of the enemy's position before fire was opened. In defense, unless particularly favorable targets are presented, fire should not be opened until heavy losses can be inflicted. This will as a rule be between 1,200 and 800 yards.

Long range fire usually fails to produce hits in proportion to the ammunition expended; it uses the strength of the firers without commensurate results; and it increases the morale of the enemy and decreases that of the firers, the one breeding a contempt for the ability of the defenders, the other by raising doubts as to the possibility of stopping the attack.

Long range fire is permissible in pursuits and should be resorted to in holding and delaying actions which are not intended to be fought to a finish.

Fire to be effective must be so from its beginning. A ragged, scattered opening will almost certainly insure a grave loss of effect. Men will fire before they have their sights set, before they have the target, will fire nervously and excitedly, if fire is not opened simultaneously throughout a unit. In the problems given herein attention has been called to the methods by which fire may be so opened. Throughout instruction and training care and attention must be given to this point.

#### *Combined Sights:—*

When the exact determination of ranges is not possible, and other means fail in giving correct data for fire adjustment, an expedient known as combined sights may be used. A greater depth of beaten zone is created and a loss of concentration results. Our regulations prescribe that "this expedient will not usually be employed by bodies of less strength than a battalion."

Error in range estimation varies greatly. The average error is  $12\frac{1}{2}\%$ . Assuming an error of 10%, then at 1,000 yards a sight setting might be 900 or 1,100 yards. How near



to the target will a beaten zone fall in either case? By reference to the following table:—

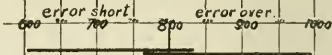
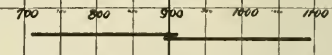
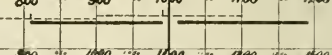
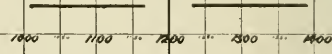
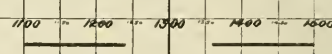
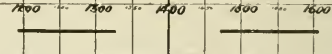
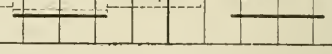
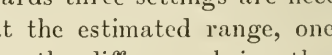
TABLE OF DISPERSION

AVERAGE SHOTS

<i>Range</i>	<i>Longitudinal 75% Zone</i>
500 yards .....	373 yards
600 yards .....	315 yards
700 yards .....	266 yards
800 yards .....	229 yards
900 yards .....	201 yards
1,000 yards .....	180 yards
1,100 yards .....	163 yards
1,200 yards .....	152 yards
1,300 yards .....	143 yards
1,400 yards .....	136 yards
1,500 yards .....	129 yards

It is seen the beaten zone is 180 yards, or if the estimate is 900 yards, extending from range 810 to 990 yards; if 1,100 yards, from 1,010 to 1,190 yards. The target, therefore, suffers from nothing but a few ricochets if the estimation is short and if over the fire is very poorly centered. "*If the probable error of estimation does not exceed one half of the zone considered (75% of zone) then the objective must be somewhere within that zone.*" Our error is 100 yards and one half of the 75% zone (180) is 90. This does not fulfill the above requirement and it is apparent we require another sight setting to bring the shots on the target. (The heavy black lines in Plate 41 indicate the limits of the beaten zone.) Two sight settings differing from each other by the width of the beaten zone

(180 yards), with an estimate of 900 yards, result in the elevations 810 and 990 creating a beaten zone extending from 720 to 1,080 yards.

Range			PLATE 41. TARGET.										Sight Settings.		
Longitudinal dispersion.	10% error in estimation	error short      error over.													
1	800	229	80												1
2	900	200	90												1
3	1000	180	100												2
4	1100	165	110												2
5	1200	152	120												2
6	1300	143	130												2
7	1400	136	140												2
8	1500	129	150												3

At 1,500 yards three settings are necessary, one setting at the estimated range, one over, and one under, the difference being the *depth of the zone at that range*.

In practice the two points which arise with respect to combined sights are: At what range should these sights first be used? What should be the difference between the elevations set off?

The first question can be decided only after a consideration of the combined effect of probable errors in range, the size of the cone of dispersion produced by the various classes of marksmen, and the width of the zone beaten by one sight and that by two. Without going into the details by which a conclusion is reached, it may be stated that with our present methods of range estimation the average company should use combined sights at ranges of 1,000 yards and over on level ground. On ground rising with respect to the line of sight combined sights should be used at 800 yards and over. The second question is answered by stating that in practice it has been found satisfactory to set the sights fifty yards over and fifty yards under the estimated range. *Do not use combined sights if the range is known.*

Considering (*under*) estimation (range 1,500)

Range would be . . . . . 1,350

Beaten zone at 1,500 yards . . . 130 yards

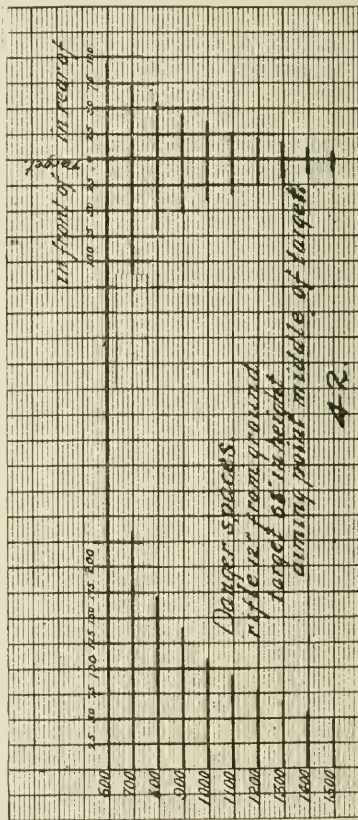
Sight settings . . . . . 1,225

1,350

1,480

### *Night Firing:—*

In the attack recourse should be had to the bayonet. In the defense, where rests or other expedients are constructed so that aimed fire may sweep the front of a position, night firing



may be resorted to with good results. Artificial illumination also will afford opportunities for this kind of fire. Night firing will be effective only at short ranges.

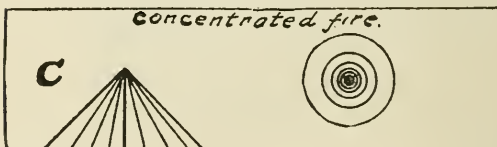
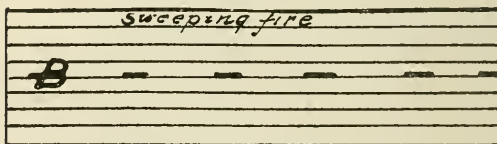
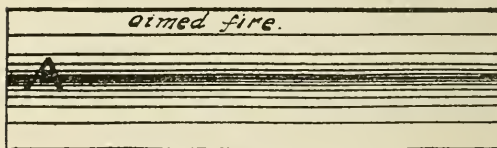
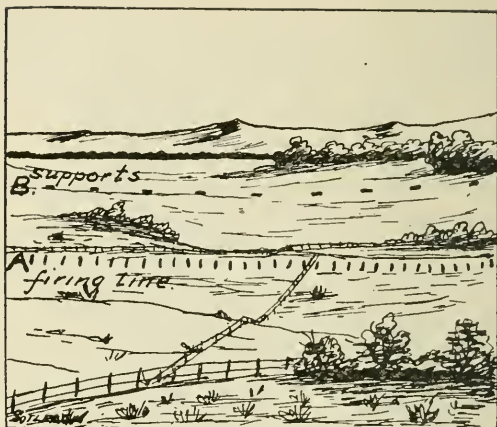
*Indirect Fire:—*

By this is meant fire which is directed over an intervening obstacle which screens the target from the firers. It will require a particularly fortuitous combination of circumstances to render such fire possible. If such a combination exists this kind of fire may be delivered by the use of auxiliary aiming points. Plate 20.

*Fire of Position:—*

In the attack, selected bodies of troops may be posted on the flanks or on high ground from which they can fire over the firing line to assist in its advance. Fire delivered by such troops is known as "fire of position" and sometimes as "covering fire."

As the range remains the same, the troops stationary and outside the zone of the enemy's fire, the effect produced by this fire will usually be sufficient to warrant its application when circumstances permit. In the application of fire of position and indirect fire it must be remembered that infantry must not attempt to usurp the functions of machine guns and artillery.



*Vulnerability of Formations:—*

The vulnerability to fire of any formation is dependent upon:—

1. The kind of fire directed against it.
2. The formation.
3. The character of ground.

In top portion of Plate 43 is shown a firing line "A" and in rear the supports or reënforcements "B." Fire directed at "A" will be aimed and the centers of impact closely located along the target line as shown by the shaded lines "A" (lower portion Plate 43). When the shots reach the point occupied by troops at "B" (top), dispersion results creating a shot group more or less uniformly distributed as shown by "B" (lower), which might be called sweeping or unaimed fire. Another kind of fire to be considered is concentrated fire as shown in "C" where a number of rifles are directed against a common point.

*Unaimed Fire:*

Unaimed, or sweeping, fire is met with in rear of a firing line, which misses it and hits objects beyond. Assuming that this fire is uniformly distributed over a given area, then it appears that objects will receive hits in proportion to the square area of target surface presented.

Plate 44 shows relative vertical targets afforded, considering *only the target fronts*,

company of 12 squads  
line of skirmishers

squad columns

platoon columns

column of squads.

4



of a line of skirmishers, squad columns, platoon columns, and a column of squads. If a man presents 6/10 of a square yard of target surface, then in the following formations we have the following sized targets (not considering column leaders and file closers in column of squads):

	<i>Targets</i>	<i>Men Fronts</i>	
Line of skirmishers..	96	96	57.6 sq. yds.
Squad column .....	12	12	7.2 sq. yds.
Platoon column .....	4	8	4.8 sq. yds.
Column of squads...	1	4	2.4 sq. yds.

To which must be added the danger space occurring in targets having depth, as columns. Without going into the mathematics of the factors involved it may be safely concluded that under the assumptions made, formations are the least vulnerable in the following order:\*

1. Column of squads.
2. Platoon columns.
3. Squad columns.
4. Line of skirmishers.

### *Under Aimed Fire.*

Assuming that the fire is not directed against the heads of columns, but equally distributed along the whole line, as lower A, Plate 43, a slightly different result is obtained. Here fire is laterally distributed, but vertically the shots are clustered around the line running through the centers of impact. A column of sufficient

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\*NOTE: Consider the targets as shown in Plate 44 as applied to lower A and B, Plate 43.

depth to lie wholly within this portion of the shot group will receive proportionately more hits than when the formation against unaimed fire is considered. The order of vulnerability of formations under these conditions appears below, beginning with the least vulnerable:\*

1. Platoon column.
2. Squad column.
3. Column of squads.
4. Line of skirmishers.

*Concentrated Fire.* Plate C-43.

The full effects of concentrated fire can only be expected at the shorter ranges, under 600 yards, or against machine guns. Assuming the fire is efficient and concentrated the following comparisons may be made:—

Fire capable of a hit per yard, per unit of time, on a lineal target 100 yards long, when distributed, would expose 100 men to 60% of hits. The same fire effectively concentrated on 12 squad columns would result in  $8\frac{1}{3}$  hits per yard of target front per minute, or five hits per man front.

On platoon columns the result would be 15 hits per head of each platoon,  $12\frac{1}{2}$  per yard, or  $7\frac{1}{2}$  per man front.

On column of squads, 60 hits per head of column, 25 per yard, or 15 per man front.

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\*NOTE: Consider the targets as shown in Plate 44 as applied to lower A and B, Plate 43.

## CHAPTER VII

### SUPPLY OF AMMUNITION

How often has the word from the firing line been sent to the rear—"Out of Ammunition," and how often has the supply of ammunition determined the result of an engagement?

Usually a man enters into an engagement with 100 rounds in his belt (of which 30 is for emergency and never fired without an officer's order); 120 or 180 rounds in two or three bandoleers; total of 220 or 280 rounds.

Provided for each man in the field is the following:—

<i>Base</i> or intermediate station . . . .	680
<i>Ammunition Column</i> at or near advance depot . . . . .	340
<i>Ammunition Train</i> . . . . .	120
<i>Combat Train</i> . . . . .	120
<i>In the Belt</i> . . . . .	100

making a total of 1,360 rounds.

The number of rounds carried into action depends on local supply, nature of engagement, and carrying capacity. One round of ammunition weighs approximately  $\frac{9}{10}$  of an ounce. Considering the ammunition alone, the weight of 280 rounds is about *16 pounds*. We might at this point, consider the firing capacity of a

man. Although the "kick" of our present "springfield" is not the vicious one of the old "45," yet few can fire any number of rounds beyond 50 without it leaving a noticeable effect on their muscles and nervous system. True, the excitement of battle will postpone the realization of this fact, but beyond the 50 round point firing will begin to show loss in accuracy. As to the limit of the number of rounds which the average man can fire with reasonable effect, it might be placed between two and three hundred.

It has been frequently noticed that after an engagement lasting part of a day in which men fired approximately this number of rounds, without any great amount of fatigue before the engagement, complete exhaustion was evident, due not only to the strain incident to battle, but in a large measure to the shock of gun recoil.

Taking 220 rounds as an average amount to carry into action as previously noted, considering the three round per minute rate there results 1 and 1/5 hours of potential firing, that more ammunition will be needed can be put down as a certainty in nearly every case, and the question naturally arises how will the firing line be supplied after it is once launched into action and separated from the ammunition supply by a fire swept zone.

In a battalion the supply is governed by the major. The ways afforded for replenishment are—

1. From wounded.
2. From reënforcements.
3. From improvised means, in limited cases.

We should look upon the following rules governing ammunition as of the greatest importance:—

1. *Appreciation of the value of each round of ammunition.*

2. That reënforcements are always sent forward with an extra amount of ammunition.

3. That ammunition should be sent, if possible, to an indicated unit so as to provide for its proper distribution.

4. That if ammunition is delivered to a unit, the commander himself will provide for proper distribution in that unit.

(a) In a platoon or company, several men crawling or rolling along in rear of the line giving out ammunition results in better distribution than passing or throwing it along the line, which affects the rate and volume of fire and poor distribution of ammunition.

(b) That if occasion arises where ammunition can be delivered only at one point on an extended line, it is the duty of the immediate commanders to see that a proper por-

tion thereof is passed on to the next organization.

5. Squad, platoon, and company commanders should provide for the utilization of the ammunition of the wounded and dead.

Orders to the commander of a line of reënforcements should clearly point out the portion of the line needing ammunition and reënforcements, and instructions should clearly state—"Reënforce that portion of the line beginning and ending there." Before starting forward, several men of the line of reënforcements should be selected and instructed "upon arrival on the firing line to collect extra ammunition carried forward by reënforcements and distribute to the men low in ammunition." This, of course, under direction of the unit commander already on the line.

In cases where the supporting units are to be placed in intervals between units of the firing line, men should be detailed as ammunition carriers and deployed on the flanks of the support in rear of the troops they are to supply. This does away with the necessity of moving along the firing line, which creates confusion and is both difficult and dangerous.

Whatever the method of absorbing the supports or reënforcements in the firing line, whether by intervals between men or intervals

between groups, the distribution of ammunition is better accomplished as before mentioned by men crawling or rolling along in rear of the line than by passing or throwing it along the line. Ammunition should be distributed without affecting the rate of fire delivery. As before stated one solution of this question lies in withholding fire until a position close to the enemy is reached.

*Exercise:*

*Object:* Training in the supply of ammunition to the firing line.

*Situation:* Two companies of the battalion deployed, firing; two companies some distance to the rear in support.

*Action:* Orders are issued, by signal, for one supporting company to reënforce the left company in the intervals between skirmishers and the second supporting company to reënforce the left of the line. The supporting companies should be supplied with at least two bandoleers per man. Firing may be simulated.

The *Field Service Regulations* under the head of Ammunition Service and the *Infantry Drill Regulations* under the head of Ammunition Supply cover the proper use of the divisional ammunition train and the combat trains. These instructions make it mandatory for the bat-

talion commander, unless he himself be the commander, to direct the issue of ammunition from the battalion combat train "upon separating from it to enter an engagement." If the regimental commander or higher commander does not desire an issue of ammunition from the trains he must so order. In making his decision upon this point he will take into consideration the following:

(a) Probable duration of impending action.

(b) Probable amount of ammunition which will be expended.

(c) Whether or not he is able to immediately replace ammunition expended.

In this connection the Military Art Department of the Army Service Schools says that in making his decision the higher commander will be assisted by a consideration of the following:

(a) "If ammunition is plentiful, better lose a wagon load than that a single company on the firing line should lack a bandoleer."

(b) "Marching with extra bandoleers on the person is much slower and more fatiguing."

(c) "Ammunition discarded may be recovered in an advance but not so readily in retreat."

(d) "Resupplying is easier in a retreat (not a route) than in an advance, as the



required ammunition may be dropped by the wagons in sheltered spots and picked up by the passing troops."

(e) "Think carefully before you allow issues to go on prior to short advance guard and rear guard actions, or in positions in readiness. In the latter there may be no combat or you may march again, and some majors may issue, particularly if they are ordered to occupy a tentative line."

(f) "The cream of the discussion is that the foot soldier carries on his person one hundred rounds. Is that enough for his purpose in carrying out your orders and can you quickly resupply the amount he expends thereafter?"

*Exercise:*

*Purpose:* To train the battalion to draw and issue ammunition from its combat train.

*Situation:* The battalion in route march followed by its combat train properly loaded.

*Action:* Upon the order from the battalion commander "Issue Ammunition," the first and third companies halt and clear the road. The second and fourth companies continue to march until their heads are opposite the first and third companies respectively, when they halt and clear the road. The battalion is then in double column with the roadway

clear between the columns. The ammunition wagons are driven between the columns; the first to near the head of the first two companies, the second to opposite the intervals between the companies, and the third to opposite the tail of the rear companies.

A detail of one noncommissioned officer and two privates, previously made, enter each wagon, let down the tail gate, and throw the ammunition on the ground at the rate of about three boxes per platoon. The sergeant in charge of the wagons, should there be one, supervises the issue, otherwise a detail should be made for this purpose.

Each squad leader reports to his platoon commander as soon as his squad is supplied, the platoon commanders similarly report to the company commander, who in turn reports to the battalion commander.

Under direction of the first sergeant, ammunition is issued to the file closers, guides, and company buglers.

The company officers should also be supplied.

The issue should not require over ten minutes.

## CHAPTER VIII

### CONDUCT OF FIRE

Conduct of fire is the performance of those duties by the individuals of a unit which enable that unit to develop its maximum efficiency in battle. They comprise not only those which arise in connection with the actual fire fight, but many which are necessary prior to an action to insure a systematic and orderly entrance into battle with the greatest possible chance of success.

In a study of this subject the fact is emphasized that the dividing line between fire and maneuver tactics is often so indistinct that the two subjects appear to merge one into the other. For this reason, therefore, a thorough knowledge of fire tactics includes some understanding of its relation to maneuver tactics. With this idea in view it has been thought necessary to broaden the scope of this chapter and in a few instances to mention subjects which ordinarily are not included under fire tactics proper.

It has been stated that the conduct of fire consists in the performance of certain duties by the individuals of a unit. Exactly what the duties are may be determined by a study of fire

direction, fire control, and fire discipline; for in meeting the requirements of these three factors certain duties are made obligatory upon the individuals of a command. The coördination and performance of these duties constitutes "Conduct of Fire."

Fire direction is exercised mainly by the company commander, but really includes certain functions of the several commanders from the captain to the brigadier. Above the grade of captain, as we shall see, the direction is mainly tactical.

Fire control is the function of the commander of the fire unit; the platoon.

Fire discipline, of course, applies to the individual soldier.

Fire direction and control are thoroughly explained in the Infantry Drill Regulations. Fire discipline has been defined in a previous chapter.

There remains, therefore, only the necessity for pointing out in detail the duties of the individuals of a unit which are necessary for proper conduct of fire. These, as has been stated, are determined by a study of fire direction, control, and discipline.

It would possibly have been more attractive to the general reader to present the subject-matter of this chapter in more or less of a

narrative form, but to the student, who wants facts, the arrangement adopted is thought more suitable.\*

### THE COLONEL

*Independent Commander:* Upon serious contact with the enemy the colonel should take position well towards the front of his command so that he may receive information promptly, and personally reconnoiter. This enables him to issue his order intelligently and without delay. Such a position, also, permits him to control the situation with regards to his own troops, and to begin the action, if such is his desire, strictly in accordance with his own wishes.

*Subordinate Commander:* After receiving his orders the colonel should precede his command as stated above and for the same reasons. He should direct the advance of his regiment until the time arrives for issuing the regimental order. The formation adopted depending upon requirements of the situation, usually column, or line of columns.

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\*NOTE: The arrangement and the details of this chapter have been taken almost wholly from a compilation on the subject by the School of Musketry. This compilation is based with few exceptions upon the provisions of the Infantry Drill Regulations and the Field Service Regulations.

*General Duties:*

a. Assign targets and sectors or tasks to battalions and special units.

b. Provide for the necessary reconnaissance to the front and flanks.

c. Announce his position and that of the next higher commander.

d. Control the reserve as the tactical situation demands.

e. Regulate ammunition supply.

f. Establish communication with next higher commander.

g. Use his regimental staff to assist him in the performance of his duties.

h. During the progress of an action take a position from which he can observe the progress of events, receive and transmit messages and orders, and be in constant, direct, and easy communication with the reserve.

### THE MAJOR

*Independent Commander:* The general rules for a colonel apply.

*Subordinate Commander:* When an action is imminent the major should take position where he can best observe the progress of events and still retain control of his unit.

After an action has opened the major should be where he can best direct the reënforcing of

the firing line, and maintain contact with regimental headquarters.

After the supports have joined the firing line he should be with that line.

*General Duties:*

a. Conducts his battalion according to the mission assigned him.

b. By tactical orders directs initial deployment of the battalion.

c. Controls support and sends forward reinforcements from it to the firing line

d. Controls movements of the battalion subsequent to its initial deployment.

e. Regulates ammunition supply.

f. Maintains contact with adjoining troops.

g. May harmonize ranges used by the companies on the firing line.

h. Determines when bayonets shall be fixed.

i. Subject to orders from higher authority determines the point from which the charge is to be made.

j. Orders the charge.

*Special Duties: In Attack.*

a. May select formation in which companies advance.

b. Designates:

1. The direction of the objective.

2. The companies for the firing line.

3. The companies for the support.

4. The order and front of the companies in the firing line.

5. The right or left company of the firing line as the base company.

### *In Defense*

- a. Describes front of each company.
- b. Assigns sector of fire.
- c. Locates fire, communicating, and cover trenches.
- d. Directs preparation of obstacles.
- e. Assigns companies to construct trenches and obstacles.
- f. Details troops to occupy trenches.
- g. Causes firing line and supports to fix bayonets when a charge by the enemy is imminent.
- h. Seeks opportunities for counter attack.

### BATTALION STAFF

In action the battalion adjutant and sergeant major are with the major. In attack, usually on the same line with some interval. In defense, where they can best perform the duties assigned them. One orderly is usually a horse holder, the other is with the major. The major divides the following duties among his staff according to their qualifications:

- a. Reconnaissance.
- b. Observation of the firing line.
- c. Maintaining contact with regimental headquarters.



- d. Maintaining contact with the support.
- e. Maintaining contact with adjoining units.
- f. Receiving, communicating, and sending visual signals from and to front and rear.
- g. Observing fire effect and progress of events.
- h. Keeping copies of all orders, messages, and other data necessary for his war diary.
- i. Determination of ranges, if the battalion is equipped with only one instrument for this purpose.

All members of the battalion staff should understand all signals and the semaphore code. The orderlies and the sergeant major, the International Code as well.

A sergeant should be temporarily added to the battalion staff, who, under the direction of the major:—

- a. Conducts combat train as far to the front with the battalion as directed.
- b. Supervises issues of ammunition to the battalion.
- c. Takes combat train to rendezvous for refilling, under the direction of the regimental commander.
- d. Rejoins battalion, if it is not in action, or, if it be engaged, joins or establishes communication with the regimental reserve.

## CAPTAIN

In action the captain is where he can best control his platoons, observe fire effect, see the major and platoon chiefs.

*Duties:*

a. Conducts his company to place of deployment assigned by the major's orders in the best manner.

b. Designates the target, and allots part to each platoon.

c. Determines the range.

d. Announces the sight setting.

e. Indicates class of fire.

f. Indicates time to open fire.

g. Informs his subordinates as to the location of the battalion commander, and, when necessary, announces his own position.

h. Observes fire effect and maintains a check on the rate of fire.

i. Maintains a check on the range, harmonizes ranges in the platoons, and corrects material errors in elevations.

j. Maintains communication with battalion headquarters and when necessary with adjoining units.

k. Prevents exhaustion of ammunition supply.

l. Distributes ammunition received from rear.

m. Provides for the collection and distribution of the ammunition of the dead and wounded.

n. In the absence of express directions from the major, if commanding a flank company, determines when advances by rushes shall be attempted.

o. Indicates size of fractions to rush.

p. Leads a rush by the entire company.

q. Leads the charge.

r. When necessary, designates new platoon leaders and sees that new squads are organized and new leaders designated to replace those disabled.

s. Must understand all signals and semaphore code.

#### BUGLERS

The captain divides the following duties between the two buglers:

a. Join the captain when the company deploys. (Both)

b. Watch platoon leaders for signals.

c. Transmit signals to platoon leaders.

d. Watch the major for signals and repeat them back.

e. Transmit information to the major.

f. Act as messenger.

g. Repeat bugle signal "Charge." (Both)

h. Must understand all signals, semaphore, and International codes.

## RANGE ESTIMATORS

Range estimators, as we have seen, are trained in the several methods of determining range. They may or may not be assembled when making their estimates. In either case they transmit the result of their individual estimates to the first sergeant either by signal or verbally. Having once been given the target they should be prepared at any time to announce their estimate of the distance thereto.

## FIRST SERGEANT

*Duties:*

- a. Joins the captain when the company deploys.
- b. Observes the enemy.
- c. Observes the target.
- d. Observes fire effect.
- e. Observes firing line and progress of events.
- f. Averages estimates of estimators.
- g. Keeps check on range.
- h. Keeps copies of all orders, messages, and other data necessary for rendering proper reports.
- i. Must understand all signals and semaphore code.

## THE PLATOON LEADER

In action the platoon leader is where he can best control his platoon, observe the target and

fire effect, and observe the company commander for signals or commands.

*Duties:*

1. Receives his orders from the company commander.

2. If necessary, may indicate the fire position that has been ordered.

3. Announces sight setting.

4. Points out designated target to his platoon, if practicable, otherwise to his corporals only.

5. When the target cannot be seen indicates an aiming target.

6. Assigns targets so as to insure that the entire front or sector given him by the company commander will be covered with fire.

7. Gives class of fire.

8. Announces rate of fire.

9. If commanding a flank platoon, details a man to watch for signals from the combat patrols.

10. When his platoon is ready to open fire, signals "I am ready."

11. Repeats captain's signal to commence firing to the corporals.

12. Observes fire effect.

13. When platoon is not firing, provides for constant observation for movements of the enemy.

14. Changes sight setting of his platoon when necessary.

15. Regulates rate of fire.

16. Increases rate of fire when large and distinct targets appear and decreases it when the target becomes small and indistinct.

17. Prevents decrease in rate of fire when:

a. Changing sight setting.

b. Preparing for rushes.

c. Fixing bayonets.

d. Transmitting firing data.

e. Distributing ammunition.

18. Increases rate of fire to cover advances of adjoining units.

19. Sees that the fire from the flanks of his platoon does not endanger a rushing unit.

20. Is on the alert for signals from the captain; for this purpose he may use his platoon guide, but it is preferable to detail a private for this purpose. See Communication.

21. Must understand all signals and semaphore code.

22. Leads his platoon in advancing and charging.

23. Prevents changing fire to unauthorized targets.

24. Insures distribution of ammunition from rear and from dead and wounded.

25. In coming up with reënforcements, he takes over the duties of disabled platoon leaders of the platoon which he joins, or if some other section of the line needs his services he goes there.

26. Endeavors to preserve the integrity of the squads by designating leaders to replace those lost, and placing each man in a squad.

27. Causes his platoon to rush with a minimum loss of time after suspending fire, and to open fire immediately upon halting or after a minimum of time for fixing sights.

28. In "Advancing by thin lines," leads odd numbered line.

29. If platoon is leading unit in a rush, must select point of terminating such, with a view to its use as a new firing position for company or battalion.

### PLATOON GUIDES

Behind the firing line the platoon guides are on the left of the platoon leader, advancing "By thin lines" leading even numbered lines.

#### *Duties:*

1. The platoon leaders' assistant; may be assigned any duty under him.

2. Keeps adjoining units under observation, particularly those having the same target.

3. Watches firing line.
4. Checks every breach of fire discipline.
5. Prevents skulking of men leaving the ranks to care for the wounded.
6. Insures prompt and orderly advance.
7. On joining firing line from support takes over duties of disabled sergeants.
8. If the platoon leader is disabled, he takes over his duties, hence he should be in touch with the progress of events and understand the mission of the platoon commander and his plans for accomplishing it.
9. Assists the platoon leader in maintaining the integrity of the squads.
10. If called out of line to act as platoon leader, notifies senior corporal.
11. Must understand all signals and semaphore code.

#### CORPORAL

When marching as skirmishers the corporal is the center skirmisher of his squad, when the line is halted he is immediately in rear of his squad. While this latter position is not yet definitely prescribed it is so obviously the correct one that we may expect it to receive definite authorization in a short time.

#### *Duties:*

1. Receives his instructions from the platoon leader.



2. Points out indicated objective to his squad.

3. Takes as his target that portion of the platoon target which corresponds to the position of his squad in the platoon.

4. Announces sight setting and sees that it is set correctly by each man.

5. Announces class and rate of fire.

6. When his squad is ready to open fire signals "I am ready."

7. Makes all fire carefully.

8. Makes all use ordered rate of fire.

9. Insures that his squad fires at the designated objective.

10. Prevents slighting of invisible portions of the target for more visible parts.

11. Prevents men from changing to unauthorized targets.

12. Maintains constant observation to the front; when the squad is firing, for fire effect—when squad is not firing, for movements of the enemy.

13. Insures prompt obedience to orders to suspend and cease firing.

14. Causes men to utilize full effect of ground as cover.

15. Sees that the fire of his squad does not fall off when: changing sight settings; preparing for rushes; fixing bayonets; transmitting fire data; and distributing ammunition.

16. Prevents increase of vulnerability in squad when preparing for a rush, rushes as soon after cease firing as possible, and opens fire after rush with greatest possible celerity.

17. Increases the rate of fire in his squad when other units which have the same target are rushing.

18. In rushing causes all men to spring to their feet to run at full speed, all men drop to the ground at the same time, and those who are in rear to crawl up to the line.

19. When reënforcing he takes over the duties of disabled squad leaders, moving to the right or left if this is necessary. If there are no vacancies he enters the line and assists the squad leaders in his vicinity.

20. Prevents waste of ammunition.

21. Prevents use without orders of 30 rounds of ammunition in right pocket section of belt.

22. Distributes extra ammunition received from all sources.

23. Looks to the rear only when the platoon leader calls him with his whistle.

24. Adds the fire of his rifle to his squad only when control is lost at the shorter ranges or he is ordered in by the platoon commander to increase fire effect at latter stages.

25. To control his squad he rolls along behind the line and keeps down.

26. Takes advantage of every opportunity to reorganize his squad and increase his control.

27. Checks every breach of fire discipline, abates excitement, and prevents men from going to the rear for any purpose.

28. If called out of line to act as guide, notifies private designated to act in his place. His entire squad is informed of this designation.

29. Leads his squad in moving to front or rear. If squad is leading unit in a rush selects halting point with a view to its use as a new firing position.

30. Must know all signals and semaphore code and have a good practical knowledge of the theory of fire.

31. In rushing, prevents his squad from blanketing fire of units in rear and sees that his fire does not endanger other units.

### THE PRIVATE

When possible each enlisted man should be thoroughly trained in the duties of the next higher grade. A squad of 8 corporals is more efficient than a squad of one corporal and 7 privates.

*The individual soldier must be trained:—*

1. To quickly recognize targets from description.

2. To describe and define targets.

3. To use rear sight in describing targets.
4. To use systems of target designations given herein either singly or in combination.
5. To set sights quickly and accurately as ordered.
6. To aim carefully and deliberately from habit and to reload quickly.
7. To fire at the ordered rate.
8. To fire at his proper place on the target as determined by correct distribution.
9. Not to change his fire from designated target unless ordered.
10. Not to slight invisible parts of target.
11. To maintain constant observation to the front.
12. To utilize accidents of ground as cover.
13. To select firing positions.
14. To fire from all positions, from behind hillocks, trees, etc., ditches, doorways, windows, etc.
15. To obey orders immediately to suspend and cease firing.
16. To ignore all whistle signals except suspend firing.
17. To watch closely for reappearance of expected target after a suspension of fire.
18. To obey promptly all orders from his squad leader.

19. When reënforcing in the intervals between skirmishers to obey the orders of the nearest corporal.

20. To transmit firing data rapidly and accurately without decreasing his rate of fire.

21. To call for range and target when reënforcing.

22. To have confidence in his ability to hit.

23. Set sights, fix bayonets without delay, and by a system to avoid decrease of volume of fire in the unit.

24. To prepare for rushes with the minimum loss of fire.

25. To rush as described under 18, The Corporal.

26. To avoid bunching in rushes.

27. To make his rush directly to the front so as not to blanket fire.

28. To remain with his company but if accidentally detached from company or squad to join the nearest one.

29. To maintain silence except when transmitting data and charging.

30. To retain presence of mind.

31. Not to waste ammunition.

32. To use his reserve 30 rounds only upon the order of an officer.

33. To remain with the firing line after bringing up ammunition.

34. Never attempt to attend to dead or wounded in action.

35. To have confidence in his ability with the bayonet.

36. To have a firm determination and desire to close with the enemy.

37. To preserve the line in charging.

38. To understand that the charge should be slow and steady.

39. To form immediately after the charge and take up pursuing fire.

40. To recognize service targets.

41. To count distant groups of objects or beings.

42. To understand that it is suicidal to turn his back to an enemy, if he cannot advance to dig in and wait for darkness while holding his position.

43. NEVER TO FIRE UNTIL HE UNDERSTANDS WHAT THE TARGET IS, AT WHAT PART HE IS TO FIRE, AND WITH WHAT SIGHT SETTING.

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The following problems are given in the hope that they will serve as guides or examples in framing combat drill problems. They were drawn to fit a particular piece of terrain. It is hardly probable that ground will be found which will permit of their application without modification, however, if the general idea is carried out, much excellent training will result.

It is to be noted that the number of companies deployed in the problems, three in attack and two in defense, is the reverse of the usual procedure. The method followed was adopted with the idea that it would better illustrate certain features of training and is not intended to suggest, in any way, a change in the form of deployment recommended by the *Infantry Drill Regulations*.

#### BATTALION EXERCISE—IN ATTACK

(Time: about 11¼ hours)

In the following problem the advance to near the initial firing position is simulated, and the order for the movement is not given to the commander until the battalion is deployed in the selected position. This is done in order to eliminate features which do not relate directly to the fire of the unit, and to save time. It is perfectly feasible, of course, to include the entire advance in the attack, or to begin the attack at any point, the stage being set accordingly. It is desirable, as this is a terrain exercise, that the situation and orders for the commander be withheld until his unit is deployed upon the ground and everything ready to begin the action.

#### *Object:*

To train the battalion in the details of the attack.

*Situation:*

The battalion is assumed to be the center of the regiment deployed in attack.

After a simulated advance, during which time the reference point or the direction of advance has been known but the target has been invisible, it arrives at a position, from which the target is visible. There are three companies deployed in the first line and one in support. The supporting company is a suitable distance to the rear in platoon columns. The scouts are out some distance to the front. In this position the firing line is receiving some fire, but while prone is well covered by a rise in the ground to its immediate front. The line occupied by the scouts should be chosen so that a correct solution of the problem requires an advance to that point before fire is opened and the features of the ground, either real or imaginary, make such an advance possible. All orders should be given to the battalion commander by the director in person.

Each soldier on the firing line carries 5 rounds of blank ammunition in the belt. The supporting company carries 20 rounds of blank ammunition per man in belt and 60 in bandoleers. It is assumed that the battalion is equipped with a range finder.

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*Targets:*

The targets should extend beyond both flanks of the front assigned to the battalion. They may be the ordinary cardboard silhouettes, some of the prone figures and some of the kneeling. An irregular arrangement of these figures will give the appearance of a line occupied with intervals, and will afford an excellent opportunity to test the distribution of the companies. When using the silhouettes, however, unless a particularly favorable piece of ground is available, they will probably become visible to the attack before it is desired that they should. Thus opportunities will be afforded for obtaining information and making adjustments which are not contemplated in the problem. The most desirable target consists of a coöperating battalion, under cover at the desired point, or moved forward to it from a concealed position at the proper time. If the men composing the target are allowed to rest by assuming at will a kneeling, sitting, or prone position the irregular appearance spoken of above will be produced.

As it is desirable to furnish the attacking battalion with a target at least visible in part, the posture and arrangement of the figures or men composing it, will depend upon

the amount of cover at the selected position with some regard to an assumed necessity for a free field of fire.

### *First Phase*

#### *Action:*

After the battalion has been placed as indicated above, the problem is handed the battalion commander and he is given time to study it. Meanwhile, the situation is being explained to the companies. When this is accomplished the targets appear and it is assumed that fire is being received. Thereafter dangerous grouping and undue exposure is penalized by "killing" the offenders. About 30% to 40% of casualties should be assessed during the exercise to test the arrangements for succession of command.

The problem should include:

- (a) A description of the tactical situation. This should demand an attack.
- (b) The direction of advance.
- (c) The width of the battalion target.
- (d) The character of the position occupied by the scouts, if such is not plainly discernable.
- (e) The character of the fire received at initial position. This should be designed to demand an advance by thin lines.

(f) A requirement for the battalion commander to proceed with the exercise under the orders received.

### *Second Phase*

After simulated fire has been opened and continued a sufficient length of time to permit of determining the character of fire direction, control, and discipline, the battalion commander is directed to begin the advance by rushes. This phase is continued until ample opportunity is afforded the umpires for observation of the conduct of fire throughout the battalion.

### *Third Phase*

When the advance by rushes, in the opinion of the director, has progressed sufficiently, the battalion commander is directed to reënforce, with the fourth company, in the intervals between skirmishers. Fire is then opened by the firing line with blank cartridges. It should reach its maximum volume as the supports join the line. This phase is continued until extra ammunition is distributed, and at least one rush made by the battalion to test the ability to control the reënforcements absorbed in the line. Bayonets are fixed during the completion of the last rush.\*

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\*NOTE: In order that the 60 rounds of ammunition suggested may be sufficient for this exercise, the rush after reënforcement should be by company, and should be started promptly and be continued as rapidly as possible. Preliminary practice in this particular will indicate what is desirable.

*Fourth Phase*

Before the supply of blank ammunition is exhausted, the "charge" should be sounded. The point from which the charge is launched should not be the conventional 200 yards, so that the battalion may be tested, without previous warning, as to its ability to cease firing promptly, and immediately move forward, smoothly, as a unit. The exercise may be terminated with the charge, or the battalion may be again halted and pursuing fire opened until the remaining ammunition is expended.

The following are suggested as among the most important details which the director and his assistant should have in mind during the exercise:—Each officer acting as umpire should have these points, and others thought necessary, arranged in a systematic manner in his notebook. If this is not done it will be found at the conclusion of the exercise that the umpiring in the several companies has proceeded along quite different lines. It is desirable, of course, to retain as much of the competitive feature as possible, and for this reason a uniform system of checking is necessary. In addition, if some such method is not adopted, many points will be overlooked in the confusion and rush of the problem. The critique following the exercise is a most impor-

tant feature. A comprehensive critique cannot be held unless the umpiring is complete and uniform. The director in charge should be with the battalion commander, and there should be at least one umpire with each company.

### *First Phase*

Battalion Commander:

1. Did he have a definite idea of what he wanted to do, and did his order express clearly that idea?

2. Did he describe the battalion target clearly and correctly?

3. Was he able to give his order promptly, and without dangerous grouping and unnecessary exposure?

4. Did he issue orders to the support?

5. Did he designate the initial firing position?

6. Did he allow sufficient time to the companies for obtaining and disseminating initial firing data?

7. Did the battalion move forward, and open fire, as a unit?

8. Did he order an advance by thin lines?

Companies:

1. 1, 2, 3, above, as applied to a company.

2. Was there a satisfactory system in the company for obtaining and disseminating initial firing data?

3. Was the company target described clearly and correctly by the platoon commanders, guides, and corporals?

4. Was the advance by thin lines correctly made, and were there sufficient subordinate commanders with the first line to insure against premature opening of fire?

5. Were combined sights desirable? If so, were they used?

### *Second Phase*

Battalion Commander:

1. Was the first rush started when he desired, and by the designated unit?

2. Was he able to change the size of the rushing unit, change the rushes from the right to the left flank, and make a slight change in the direction of the advance? Was this done by means of signals and without confusion?

3. Was he in a correct position?

Companies:

1. Same as 1 above.

2. Were the rushes correctly made, to include opening of fire at the conclusion?

3. Did the unit inaugurating the rush select for its halting place a point suitable for a fire position for the battalion?

4. Was the target properly covered during rushes: i. e., was the fire withdrawn by the rushing unit replaced by increase of fire in adjacent units having the same target?

5. Did the supporting company follow in correct formation at a suitable distance, taking advantage of cover?

### *Third Phase*

Battalion Commander:

1. Was he able to place the supporting company in the line promptly and without confusion?

2. Did he himself then join the line?

3. Was he able to cause bayonets to be fixed promptly?

Companies:

1. Was the firing data asked for and received by the support, including officers and noncommissioned officers?

2. Were new squads formed, and did supporting leaders take over the duties of those lost through casualties?

3. Was ammunition promptly and evenly distributed?

### *Fourth Phase*

Battalion Commander:

1. Was he able to cause a prompt cessation of fire followed *immediately* by an even, simultaneous, and spirited charge?

2. Did he lead the charge?

Companies:

1. Did all the officers coöperate to produce the greatest possible cohesion in the charge?

*In General*

1. Was the battalion target covered?
2. Were the company targets covered?
3. Was the fire in the correct sector at all times?
4. Was the direction line of attack adhered to?
5. Was there an interruption of fire while:
  - (a) Changing sight setting?
  - (b) Fixing bayonets?
  - (c) Transmitting fire data to supports?
  - (d) Distributing ammunition?
6. Was the rate of fire correct at the various ranges?
7. Was the initial range correct, and was the range finder used to the best advantage throughout the action?
8. Were the ranges harmonized, throughout the action, in the company and by the battalion commander?
9. During rushes, were the sight settings changed and was there a system in the companies for maintaining the range during the advance?
10. Was the system of communication throughout the battalion capable of transmitting information at all times without delays due to inattention or faulty arrangements and were signals used when under service conditions the voice would have been inadequate?



11. Were there proper arrangements for succession of command?

12. Did the battalion staff occupy its proper position, and function correctly?

13. Did the musicians and first sergeant assist the captain, and the platoon guides the platoon commander?

14. Did the platoon commanders exercise proper fire control?

15. Did the squad leaders control and command their squads?

16. Was there unnecessary exposure?

17. Did the men aim carefully and deliberately, and load quickly?

18. Were there at any time, confusion, loss of control, or avoidable delays?

The following is offered as one of several satisfactory solutions of the foregoing exercise:

After a study of his order the battalion commander estimates the situation and arrives at a decision. (This must be to attack, under the terms of the problem.) He then moves forward to a point just in rear of the crest which is protecting his firing line, accompanied by the adjutant and the sergeant major, the latter carrying the battalion range finder. The company commanders at the same time being signaled to join him. Upon being assembled the battalion commander says: "Do you under-

stand the conditions of the problem? The battalion will attack upon its present front. Company 'D' in support will follow in rear of the center at 400 yards. Signal me when firing data has been transmitted and you are ready to advance; then at my signal move forward in thin lines, to the line now occupied by the scouts. Signal me from that line when you are ready to fire, but await my order to commence." He then moves forward cautiously to the crest, accompanied by the company commanders and adjutant. Upon reaching the hill top the sergeant major, who in the meantime had been taking the range, says: "Range to hostile line at 12 o'clock 1100." The battalion commander continues: "Reference point . . . at . . . o'clock. Range 1100. Target four sights right and five left. Divide the target." The captains, beginning with the commander of the base company, after studying the front with their glasses, define their targets thus:

"Company 'A' begins four sights right at edge of hill, extends three sights left to fence post."

"Company 'B' begins one sight right at fence post, extends three sights left to small bush."

"Company 'C' begins two sights left at small bush, extends three sights left, no mark."

These limits are verified by the battalion commander as they are being made. If satis-

fied, he continues: "Correct. Any questions? (There being none) I will be between the firing line and the support. Posts." He then directs the adjutant: "When the firing line advances, signal the support forward. Wait here and give the support the order, then join me."

### *A Company Commander*

At the command "Posts" the company commander places himself at the crest line in front of his company, requiring the first sergeant, platoon commanders, and duty sergeants to join him. He says: "You all understand the problem? The battalion attacks in its present order, moving in thin lines to the line now occupied by the scouts. Fire will be opened from that line at my signal. Firing data here. Signal me when you are ready to advance. Reference point . . . . at . . . . o'clock. Range 1100. Target: Begins four sights right at edge of hill, extends three sights left to fence post. Divide target." The platoon commanders hereupon divide the target as described above for company commanders. They and the sergeants using their glasses meanwhile to the best advantage. After the target is divided, the company commander continues: "Any questions? (There being none) Posts."

The company commander then causes the company to move forward to a position imme-

diately in rear of the crest, to halt and lie down. He then says: "Designate targets," or some other suitable expression. The chiefs of platoons cause their squad leaders to crawl to the crest, and divide the target as heretofore explained. The company commander's orders are repeated to the squad leaders and they are directed to transmit the data to the men. Each squad leader causes his squad to join him by crawling, points out and divides the target, and assures himself that all the men understand. He then withdraws his squad behind the crest and repeats the company commander's order, after which he signals the platoon commander "I am ready." The platoon commander, when his platoon is ready, repeats the signal to the company commander. The company commander similarly signals to the battalion commander.

The first sergeant explains the situation and orders to the buglers.

All men are cautioned not to expose themselves unnecessarily on the crest, and to withdraw a few paces as soon as they have received their instructions.

When the three companies are ready, the battalion commander signals: "Forward, by thin lines." As each man arrives on the new line, he is cautioned by the nearest noncommissioned officer to locate his target and take

cover. As the squads are formed, the corporals signal as before indicated, and when all are ready, the battalion commander signals: "Commence Firing."

Further details on conduct of fire have been included in previous exercises.

### *Discussion*

It will be noted that the designation of the base company is omitted from the order. This is allowable when standing orders exist, that in the absence of instructions, the right company of the firing line is the base company. There is no division of the target by the battalion commander for it is assumed that a prearranged plan exists for dividing it equally among the companies of the firing line. It is to be noted also, that the battalion commander might himself have indicated the limits of the company targets and required the captains to check as he proceeded. The method adopted, however, is thought to be more rapid and to afford more positive assurance that the target is fully covered. A captain receiving information from the battalion commander might think he understood thoroughly, when, as a matter of fact, he did not. As the battalion commander follows the description from right to left, he can assure himself positively that no part of his

target is neglected. He can not otherwise be certain of this, unless he requires the captains to repeat back his description. This repetition would, of course, increase the time consumed.

While the method given above is a very deliberate opening of fire it will be found that the time spent in this manner, unless carried to an extreme, will be fully justified by results. A careful and detailed method of distributing and dividing targets should be followed whenever possible and should only be omitted when the exigencies of the service make it imperative.

The advance by thin lines has been incorporated in the exercise for it is believed that this formation brings out more clearly than any other certain features of the attack which must not be neglected in instruction.

In the gradual building up of a firing line close to the enemy's position and under his fire, as is done by thin lines, the danger of a premature opening of fire by the individual soldier is emphasized. This is an ever present danger in any formation, and must be guarded against. The remedy lies in a high class of fire discipline; in maintaining with the advance unit, whatever its form, a sufficient number of leaders to insure strict control; and in certain cases in the opening of fire by the commander, even though it be at variance with his order for

attack. Of these remedies the first two are plain, the third requires some explanation.

The thin line formation again comes to our aid, for it lends itself readily to presenting situations under which the commander would be justified in departing from his original plan. If the battalion in the exercise, during its advance by thin lines, suffers such losses that the lines in rear cannot be moved forward, then, as a last resort, the commander might order the part of the line already in position to open fire, and under cover of that fire assemble his unit at the advanced position. Similarly, if, for any reason during the advance the men already on the line show signs of demoralization it might become imperative to allow them to "shoot up their pluck." In general terms then, the commander would be justified in departing from his original plan in regard to fire, when his line has reached a point from which it can not advance without protection of its own fire, or when, due to severe losses or other causes, the individual soldiers are becoming demoralized and it is apparent that if not ordered to fire they will presently do so of their own accord.

It is plain from the above that, in spite of all precautions, when within a reasonable distance of the enemy control of the situation may be taken from the commander at any time and he

be forced to choose between opening fire before he had planned or a demoralization of his unit. A little thought will make it clear that, if such conditions exist, little or nothing can be expected in the way of target distribution and designation at that time. Fire opened under these conditions without firing data will be wild, ineffectual, and demoralizing. Knowing the conditions, then, which he may be obliged to face, there is no excuse for the commander permitting himself to be drawn into a position which may require fire and be unprepared to deliver it. He must, therefore, seize an early opportunity for the transmission of initial firing data. With the target clearly defined and carefully divided he is prepared for eventualities, and if the initiative be taken from him and he be obliged to open fire against his will, then, at least, he will have done all that lies in his power to lay the foundation for a well-directed, well-distributed, and hence effective fire.

#### BATTALION EXERCISE—IN DEFENSE

(Time: about 50 minutes)

##### *Object:*

To train the battalion in certain details of the defensive.

##### *Situation:*

In a meeting engagement the battalion has taken up a defensive position with two com-



panies in the firing line and two companies in support. The supporting companies are occupying a position, about 200 yards in rear of the firing line, from which the targets are not visible. Other troops are assumed to be on the right and left. The enemy is expected in about ten minutes. He will attack. The battalion is equipped with one range finder.

*Targets:*

As it is desired that the targets should appear on signal, and at different times in at least two parts of the sector, they should be furnished by coöperating units. If a large number of silhouette targets are available and arrangements at hand for manipulating them, they may be used. The target should fully cover the battalion sector and may be extended beyond both flanks. It should consist of from 300 to 400 figures and be divided for the purpose of operation, into two parts. Part 1, the smaller, should appear on signal, deployed; advance a short distance, halt, and open fire. Part 2, should appear in column of squads or platoon columns, advance a short distance, deploy, and move forward towards the line occupied by Part 1. If sufficient fire is directed on Part 2, it should, at signal, halt, open fire, and advance by

rushes. Any other similar arrangement and movement will do as well, provided it causes the target to appear at different times in at least two parts of the sector and presents a dense group for a limited period. The idea being, that by a special arrangement of the figures, certain features of fire direction, control, and discipline may be more readily emphasized.

The foregoing arrangement is intended to indicate that Part 1 is stopped by the fire of the defense and must await reënforcements before it can advance. Part 2 is intended to represent these reënforcements and is moved so as to require support for the firing line, switching of fire, and an increase in its rate.

*Action: First Phase*

When the troops have been placed in the position as indicated, the problem is handed the battalion commander. He is allowed a reasonable time in which to estimate the situation and arrive at a decision. Upon his statement that he is ready to proceed, time is taken. Ten minutes is allowed in which to prepare the battalion for action. At the end of the allotted time Part 1 of the target appears. This phase is continued a sufficient length of time to permit observation of the action taken, and such detailed inspection of the troops as is desired.

The problem should include:

1. A statement of the situation which requires the defensive.

2. Information that the enemy is expected to attack in ten minutes.

3. A statement that there are troops on both flanks.

4. An order to occupy the selected position in the desired formation.

5. The width or limits of the sector assigned to the battalion for defense.

6. An order that, upon signal from the director, the original firing line will cease firing, move to the rear, and be considered out of the exercise. This, to satisfy the requirements of the problem. (See Third Phase.)

### *Second Phase*

At the conclusion of the first phase, Part 2 of the target is signaled to appear. It is assumed that the battalion commander will reënforce at the appearance of the second part of the target. If this is not done, orders should be issued requiring it. The second phase is continued, after reënforcements reach the line, until a reasonable period has been allowed for the transmission of firing data, say a minute or a minute and a half.

In order that the battalion may be tested as to its methods of transmitting data to com-

panies reënforcing both on the flank and in the intervals, one company should be placed in a position on the flank and the other required to reënforce in the intervals between skirmishers. The problem is drawn with the idea of inviting this method of reënforcing. Incorrect dispositions by the battalion commander, if they interfere with the essential elements of the exercise, should be modified.

### *Third Phase*

After the time allowed for the transmission of the data has expired, the original line, upon intimation from the director, is marched to the rear. The exercise is continued until the supporting companies have been inspected.' This affords a means of determining the ability of the battalion to transmit data while firing.\*

The details of fire direction, control, and discipline may be examined into by the director and his assistants, as thoroughly as desired. Many of these details and others, have been covered in the previous problem and will not be again noted here. With these exceptions

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\*NOTE: Inspection of many of the most important phases of this exercise will be facilitated, if rests are provided for the rifles. This may be done as heretofore explained, or before the exercise begins the battalion may be permitted to throw up a small parapet. Later, if it is desired to take full advantage of the labor performed, the work may be continued to include the complete trench.

the following are some of the more important points:

*First Phase*

The Battalion Commander:

1. Was he able to meet the requirement of prompt action, and issue his order without depriving the companies of the time necessary to communicate initial firing data?

2. In his desire to be ready did he omit from his order, among other necessary things: statement which would enable the command to grasp the situation; time of opening fire; definition and division of sector, etc.?

3. Did he see that ranges were taken to prominent objects and that they were transmitted to the companies?

4. Did he, in his desire to complete the preparations, assume the duties of his subordinates or instead of indicating *what* should be done indicate *how* things should be done?

5. If his order provided that fire should be opened upon his signal, did he give that signal promptly, upon the appearance of the enemy?

6. Did he direct the fire of both of his companies upon Part 1 of the target? If so, was he able to do this by signal? (Part 1 appears in the sector of one company only.)

7. Did he select the best available position for himself and staff?

Companies:

1. Were the captains able to complete their preparations in the allotted time? If not, whose fault was it?

2. Did the men know the ranges to at least two prominent objects?

3. Were they familiar with the situation, and did they know from which direction to expect the enemy?

4. Was there constant observation for signs of the enemy, and was his presence made known to the commander?

5. Was every possible means used to prevent exposure of the position while preparing for defense and afterwards?

6. Was the sector properly divided between the platoons of the companies?

7. Was fire opened promptly and with correct data?

8. Was the company, which was directed to open fire outside of its sector able to do this in a reasonable time and with proper adjustment?

### *Second Phase*

Battalion Commander:

1. When Part 2 of the target appeared, did he assure himself that the company in whose sector it advanced opened fire upon it?

2. In the absence of standing orders for reënforcing companies, did he designate the

target for the company, placed on the flank, before it reached the line?

3. Was the greater part of the fire, of the supporting companies directed upon the proper target? i. e., Part 2 (Part 1 being held in its position, unable to advance).

4. Was the range promptly taken to both parts of the target when they appeared, and promptly transmitted to the proper companies? Companies:

1. When Part 2 of the target appeared, did the company in whose sector it advanced, turn its fire upon it with increased rate and without orders? If so, was it able to do this promptly? Was the elevation changed?

2. Did the supporting companies move quickly and in correct formations?

3. Did the supporting companies open fire promptly?

### *Third Phase*

Battalion Commander:

1. Was he able to move the original firing line to the rear promptly and without confusion? (This feature has, of course, no direct connection with the tactics of the occasion, but furnishes an excellent indication of the character of the control exercised by the battalion commander.)

Companies:

1. Did the supporting companies fire at the target ordered and with correct elevations?

*In General*

1. Was there at any time too great haste, loss of time, or confusion?

2. Was there any firing outside the assigned sectors without orders?

3. Were verbal orders and commands given when signals should have been used?

4. Were the changes in sight settings made in conformity with the principles laid down for defense?

5. Excluding those mentioned above, were the requirements of fire direction, control, and discipline complied with, in as far as it was intended to test them in this exercise?

The following is suggested as a possible solution of the foregoing exercise:

When the battalion commander has arrived at his decision, he announces that he is ready to proceed with the exercise. He immediately assembles the captains of the companies on the first line, causing them to move at a double time. While they are assembling he directs the adjutant: "The enemy may be expected in ten minutes, troops are assumed to be on the right and left, the battalion will take up a defensive



position here. Our sector extends from . . . to . . . . Take ranges at once." To the sergeant major: "Take notes of my order as I give it, and when completed transmit it to the captains of the companies of the second line." To the orderly: "Take my glasses, keep a lookout in that direction (pointing) for signs of the enemy." When the officers are assembled he states: "The enemy is expected to attack within ten minutes from that direction (pointing). Troops are assumed to be on our right and left. The battalion assumes the defensive in its present position. A and B companies, firing line; C and D support. Our sector begins at . . . (Do you all see it?) and extends to . . . (Do you all see it?) . . . marks its center. (Do you all see it?) Get ranges from the adjutant. Open fire at my signal." The commander, in order to comply with instructions, should then add: "To satisfy the requirements of the problem, A and B companies will at my signal 'To the rear,' given at any time, cease firing, and move to the rear. Their participation in the exercise terminates at that time. I will be at . . . (pointing). Any questions? Posts." The battalion commander then takes his position, and while the companies are preparing, occupies himself by observing them, and a study of the terrain. When the adjutant joins, he is informed of the order issued.

*Company*

The company commander joins his company, and directs the first sergeant to obtain the ranges from the adjutant. These are transmitted to the platoon commanders as soon as obtained. The first sergeant draws a rough sketch which he exhibits to the platoon commanders. Later, if time permits, the sketch should be copied. After his order to the first sergeant the company commander turns to the buglers and directs: "Observe in that direction (pointing) for signs of the enemy." If conditions are such that he can make himself heard throughout the company from his position in the rear, instructions are given from that point. If such is not the case, the platoon commanders and sergeants must be assembled, having due regard to unnecessary exposure. The company commander then states: "The enemy is expected to attack from that direction (pointing) in . . . minutes." Time consumed by the battalion commander being deducted. "Other troops are assumed to be on our right and left. The battalion assumes the defensive here. The first sergeant will give ranges to the platoon commanders. Our sector begins at . . . and extends to . . . Do you all see these points? Open fire at my signal. The battalion commander is at . . . (pointing). The regimental commander is

at . . . . Any questions? Divide sector simultaneously.”\* If circumstances permit, the company commander will verify this division. He then occupies himself by observing his company and the terrain.

Each platoon leader hurries to the rear of the center of his platoon, and directs the platoon guide to observe the front for indications of the enemy. From his position, he states briefly the situation, and the company commander's orders. He then points out the limits of his sector. The corporals point out the squad sectors. When the first sergeant reaches the platoon with ranges, the platoon commander announces one or two, selecting prominent objects. More might cause confusion: If time permits, more detailed information may be given by means of the rough sketch referred to above. When all is ready, the platoon commanders signal the fact to the company commander, who in turn, repeats it to the battalion commander.

When Part 1 of the target is exposed, the battalion commander signals the company in whose sector it appears (for example, Company “A”) to open fire. The other company (“B”)

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\*NOTE: The word simultaneously is used to indicate that the Captain desires the platoon commanders to divide the sector at the same time, and not in rotation as described in the problem in attack.

does not fire. Observation by the battalion commander indicates that the remainder of the battalion sector is vacant. Thereupon he signals Company "B" to swing its fire into the occupied sector. Upon the appearance of Part 2 of the target, "B" company's commander returns its fire to the company's proper sector, and the platoon leaders increase the rate.

The battalion commander signals to the right company of the support, "D": "D R·R B" ("D" reënforce right of "B"). To left company, "C": "C R W L" ("C" reënforce whole line in intervals).

Upon the signal to swing its fire, "B" company's commander repeats the signal to the platoon commanders who, in turn, repeat it to their squad leaders. The signal should indicate approximately how many "sights" of change are desired. It is obvious that this cannot always be exact. The platoon and squad leaders, therefore, should be trained to meet such situations by instruction in the application of fire. With a good workable knowledge of this subject they should be able to comprehend instantly what is desired. It is plain, in this case, that the company commander desires to cover the enemy's present position. Hence, squad leaders direct their fire at a portion of the target corresponding to their position in the company.

Similarly, when the company is directed to return its fire to its original sector, the platoon and squad leaders should see immediately that a rapid, concentrated fire is required. Later, when Part 2 deploys, the several platoons and squads should cover their proper portion of the target and drop the rate of fire.

When Part 1 of the target appears, the sergeant major, who, in the meantime, has relieved the adjutant of the range finder, immediately determines its distance and signals it to Company "A." It is probable that "B" company, which has not as yet opened fire, will catch this signal and will have the necessary information when ordered to fire. If such is not the case, it is a simple matter for it to obtain the range from Company "A." When Part 2 appears, its distance is similarly signaled to Company "B." The reënforcing companies will, of course, get their elevations from the companies on the line.

With regard to the sectors for the supporting companies, several courses are open.

If there is a prearranged method for division in the battalion, no instructions will be necessary. In this case the company which reënforces in the intervals between skirmishers will obtain its targets from the company or companies it reënforces. The company reënforcing on the flank will take the sector of the company

next to it. In this exercise it has been assumed, in order to make a thorough test of the ability to transmit data under fire, that such action was impossible. For this reason the support was placed where it could not see the targets.

If no prearranged plan exists in the battalion, the men who reënforce in the intervals must be directed to take the target of their next neighbor. The other company must, however, be reached by an order, or the choice of the sector which it will cover, be left to the company commander. Probably the surest means of transmitting the order to the supporting company is to have the orderly work himself to a point in its line of advance, and as it passes, inform the captain: "Take 'B' company's sector." If more detailed instructions are necessary a written order will have to be sent, or signal flags used. In either case, whenever possible, the division of sectors should be explained to the men before they move forward to support, so that a minimum of data is necessary after they reach the line.

### *Discussion*

Referring to the definition and division of sectors by the several commanders in this exercise, it will be noted that there has been a radical departure from the method suggested in the exercise in attack. It has already been stated

that, when circumstances permit, detailed and painstaking care should be used in obtaining and transmitting initial firing data. In the exercise in attack, time was not an important element. In this case, however, time is an important element. Hence, if the battalion is to be ready in the allotted period, it cannot stop for the detailed methods adopted when time is not a factor. To meet the requirements of this particular situation, each commander must state clearly what he desires in the way of division, and trust to his immediate subordinates to carry out his wishes correctly. If practicable, a verification should be made later.

Fortunately it is generally much easier to define and divide sectors on the defense than it is to designate and divide targets in attack. This is true because natural features which provide the easiest means of contrast are usually available in the defense. This latter statement becomes clear when it is remembered, that in attack, the line of the enemy's position must be divided, while in the defensive, any line may be chosen, provided it lies a reasonable distance in the background. The liberty thus accorded the commander on the defensive, usually enables him to select a line containing prominent features.

In this problem it may be necessary for the battalion or other commander to tie in to the

chosen line by means of a reference point. If such is the case, he will, of course, act accordingly.

Nothing has been said about the position of the battalion commander at the time of receipt of the order. It has been assumed that he was near the two advanced companies. For this reason he did not desire to await the arrival of the captains from the companies in the rear to issue his order. If he happened to be mounted at the time, he should have ridden towards the advanced companies. In general, his action should have been such as to facilitate a rapid transmission of his instructions.

If the sergeant major is sufficiently well trained, the duty of taking the ranges might have been left to him and the adjutant directed to deliver the order verbally to the supporting companies. As the taking of the ranges in a defensive position involves more than a single operation of determining the distance to a hostile line, it was left to the adjutant with his superior knowledge and training.

The question is asked whether the battalion commander selected the best available position for himself and staff. His position should have been in rear of the firing line at a point where he could see the enemy, and at the same time be in communication with the support. He



should be under cover if practicable. His staff would ordinarily be with him.

Regarding the direction of the fire of the right company upon the target in the sector of the left company; the commander's immediate mission is to prevent the advance of the enemy. He may best accomplish this by directing all his available fire upon the first serious attempt to advance. This he does. He is temporarily successful, for the enemy remains in position. When in this situation, reënforcements appear. If he can stop these the advance for the present will cease. In other words, he must check this increase in the enemy's force, and at the same time hold the original hostile line in position. He accomplishes this by substituting half the fire of "C" company for the fire of "B" company, the latter being automatically withdrawn and turned on the enemy's reënforcements. Also he puts "D" company on the flank of "B" company with "B" company's target. Had he sent "C" company into the intervals of "A" company and "D" company into the intervals of "B," he would not have placed the greatest volume of fire on the most dangerous target, and he would have lost the value of the "D" company machine by merging it with that of "B." The desired distribution of fire would have been obtained had both reënforcing com-

panies been placed on the flank, giving one the entire battalion sector and the other "B" company's sector. It is believed, however, that the arrangement adopted would produce the greatest possible effect in the shortest period of time.

The arrangements made by all commanders for observation of the front, were temporary in character, and were designed to meet the immediate requirements of the situation. It is the duty of the platoon commanders to provide observation to the front. Had the situation continued for any length of time they should have established a regular system of observation. This would have been supplemented by any further observation which the battalion or company commanders thought necessary. Under normal conditions observation to the front would have been established by the companies upon halting, but, as the situation was not known to them until the battalion commander issued his order this was not done.

It is apparent that a prearranged system of reënforcing solves many difficulties. No disadvantages accrue from its use, for it may always be changed by order. The issuing of orders at such a time is attended with great difficulties, it is true, but without a prearranged plan they must be issued in every case, with such a plan only in exceptional cases.

It has been assumed that the battalion has been trained in the proper application of fire as a unit. If such is not the case, the battalion commander would have been obliged to supplement his order with instructions about as follows: "Each company is responsible for the targets in its sector. It will not fire in any other sector without my order. If so ordered it will return to its own sector when a target appears therein. Companies will provide constant observation to the front and will report the appearance of the enemy to me. Establish signal communication with me."

The small amount of time allowed for preparation makes it impossible to clear the foreground or attempt the construction of obstacles. Time permitting, no well-trained unit will neglect these important aids to effective fire.

## CHAPTER IX

### COMBAT PRACTICE

No system of "musketry" training is complete without combat practice, for in this practice will be found, among other necessary things, the ultimate peace test of the fire efficiency of a unit. The subject, however, has been quite thoroughly covered in official publications accessible to all, such as: *Small Arms Firing Manual*, *Regulations Prescribing Standard for Field Firing and Proficiency Test*, and an excellent bulletin, "Combat Practice," recently issued to the service from the School of Musketry. It is believed that a full repetition of matter which has been thoroughly discussed and explained in official publications would, in this case, be of no particular value, hence this chapter has been considerably curtailed. It will be found that many features have been omitted from the text which at first sight appear necessary to a thorough understanding of the subject. It is hoped, however, that this explanation will satisfactorily account for their absence.

#### *The Object of Combat Practice:*

The object of musketry instruction is to train the soldier in the fundamental principles

of marksmanship, and the unit in the conduct of fire. Combat Practice is the last phase of this training. The *Small Arms Firing Manual* states, that in combat practice “. . . . Individuals learn coöperation, and commanders and leaders how to obtain the maximum efficiency of fire by a judicious coördination of the skill and efforts of all the individuals of the group or unit.” In other words, learn conduct of fire. It is not believed that this statement is meant to be taken literally, for under the present system of instruction, neither sufficient time nor ammunition are available to teach conduct of fire by means of combat practice. It is doubtful if sufficient time can be allotted for this purpose without seriously curtailing other phases of instruction. It is certain that the cost of ammunition will always operate to prevent more than a limited amount of combat practice. However, even if time and ammunition were available, which they are not, combat practice, with its distracting noise, its strain upon the individual, and its possible danger through carelessness, is the poorest possible medium of instruction for most of the elements of conduct of fire. There are exceptions to this, in such subjects as observation and adjustment of fire. These, of course, must be taught principally during combat practice. This prac-

tice then, should not be regarded as a means of teaching conduct of fire, except in a very limited way. Combat practice is the culmination of the season's instruction. It is a means by which units and commanders are taught certain phases of fire direction and control which cannot be fully learned elsewhere, and a means by which they are trained to adhere to previously mastered principles of conduct of fire, under the nearest possible approach to battle conditions.

### *Preliminary Training:*

It is clear from the foregoing, to produce the best results, preliminary training must precede combat practice. This is true, not only because certain phases of conduct of fire are more easily learned before combat practice is reached, but also because this costly and limited form of training should not be used to teach things which may be taught as well elsewhere, lest it be at the expense of things which can only be taught therein.

Preliminary training for combat practice is just as important as preliminary training for individual practice. Without preliminary training the results of individual practice are materially reduced. So also, combat practice without preliminary training, results in but a pleasing departure from routine work, accom-

panied by a great waste of ammunition and a small amount of instruction. Unfortunately the *Small Arms Firing Manual*, which explains at length the importance of preliminary training for individual practice and prescribes a thorough system of instruction therein, contains but one short paragraph on preliminary training for combat practice.

The net result of the manual's explanation of the object of combat practice, and its failure to strongly emphasize the importance of preliminary training therefor, is, that the service has no system of preliminary instruction in this important subject. In consequence of which such instruction is generally neglected.

In addition to the system of preliminary training outlined in the preceding chapters, in order that a command may approach combat practice, equipped to derive the greatest benefit therefrom, it is recommended that commanders of all grades be trained in the preparation and solution of preliminary combat firing exercises.

By preliminary combat firing exercises are meant: combat firing exercises in the form of map problems; in the form of terrain exercises; and in the form of drill exercises. The application of the latter form of exercise has been covered in the preceding chapters. These three forms of exercises are prepared and solved by

an application of the same principles which govern the preparation and solution of the combat firing exercise proper; that is, the exercise with ball ammunition. These forms of exercises are sometimes called combat firing problems, firing problems, or simply combat problems.

*The Combat Firing Exercise Proper:*

Combat practice usually consists in the firing of a number of combat firing exercises. All authorities agree that such exercises are difficult things to prepare. Authorities also agree that, until the ability to prepare good exercises has been acquired, the subject is not mastered. A consideration, then, of their preparation is necessary. This is so, not only for the foregoing reasons, but, as these exercises must be prepared in order to hold combat practice, training therein is necessary. Examples are available in the authorized publications. These examples indicate the form and general nature.

The following outline covers the most important points which must be considered in their preparation.

The exercise should contain:

A definite lesson in fire tactics.

A mission which can be readily determined from the situation.



A tactical principle, the violation of which, if possible, would prevent the accomplishment of the mission.

A tactical situation, which may be any phase of an action, provided it demands fire, and selected with the idea of best presenting the lesson to be learned.

In reference to this latter requirement the School of Musketry says: "While it is true that the fire problem must involve a tactical situation with a definite mission, it must be remembered that the fire feature of the problem, requiring the fire estimate and orders, must be the dominant factor in the situation."

Consideration should be given to:

1. The element of time in: (a) The amount of time required for the entire exercise in order that it may not be excessive. (b) The time necessary to fire the number of rounds required by the situation, based on the proper rate of fire for the various ranges.

2. The amount of ammunition necessary to accomplish the desired mission, deduced from the amount that will probably be necessary to produce the required number of hits. This with a view of obtaining the greatest results from the season's allowance.

3. The number of targets, pits, and men necessary to stage the situation, usually one

target for each man. This with regard to the available supply, and due economy.

4. The terrain available, in order that the situation involved may, as far as possible, be free from imaginary restrictions and limitations, and be new to the commander or at least involve different pits and angles.

5. The possible presence of any factor which might prevent the desired lesson being taught.

6. The desirability of simplicity in all arrangements.

7. The necessity for arrangements to prevent the location of the targets, ranges, situation, etc., from being known in advance by the first organization to fire or any which may follow.

In combat firing exercises, as in tactical problems, the commander must first "estimate the situation" and then issue his order. In such exercises these are called the "Fire Estimate" and the "Fire Order."

The School of Musketry gives the following details as those which must be considered and covered in the fire estimate and fire order.

The Fire Estimate:

Location, strength, and intentions of the enemy.

Observation of Targets both before and during firing.

Determination of Range.

Relative Importance of Targets.

Strength of Firing Line.

Location of Fire Positions.

Class of Fire, i. e., Volley, Clip, or At Will.

Rate of Fire.

Time of Opening Fire.

Formation in Advancing Under Fire.

Ammunition Supply.

The Fire Order:

Designation of Targets.

Assignment of Troops to Targets.

Directions as to Occupation of Fire Positions.

Announcement of Sight Setting.

Rate of Fire.

Class of Fire.

Time of Opening Fire.

Position of Leader During Firing.

In connection with these details of the fire estimate and the fire order the School of Musketry says: "There will be few occasions in which all of the factors enumerated above will have to be thought out in the estimate and announced in the fire orders. In fact the simplicity of most problems, particularly those conducted on 'A' ranges, will make it unnecessary to give any consideration to many of them. Again, it must be remembered that at the moment when the fire orders must be issued

many of the factors embraced in the estimate will have been considered, some of them in an involuntary manner. On some occasions the fire order may be as simple as 'Fire at Will.' "

The methods followed by the School of Musketry in keeping records of combat firing exercises, together with the forms used, are given under "*Records.*"

### *The Critique:*

Every exercise should be followed by a critique. This should be given, if practicable, on the target range and immediately following the exercise, so that the details will be fresh in the minds of all and the features of the ground visible.

The critique is based on the conduct of the exercise and the results obtained in accuracy, distribution, and time, as shown by the umpire's record.

With reference to the critique the *Regulations Prescribing Standard for Field Training* states: "In field firing exercises over unknown ground, the accuracy to be expected from average shots, assuming an error of 5% to have been made in the estimation of the range, is considered to be a proper standard of proficiency in case the performance has been good in other respects.

"It is not admissible, however, merely to say that a command is proficient, or deficient, or to

characterize a firing exercise as 'good,' 'satisfactory,' or 'poor.' If not more than this be said no one will know what faults have been committed or how they should be corrected. The critique should begin with a statement of the exercise, including a description of the targets—kind, number, location, front covered, or intervals between figures, the actual range, the estimated range, the time required for firing, and the computed percentage of hits to be expected by average shots under good leaders, and also by good shots under the same circumstances. This should be followed by a brief outline of the tactical idea involved in the proper execution of the exercise and this in turn followed by comments on the manner in which the idea was actually carried out.

"The accuracy obtained as shown in the actual number of hits made in the exercise should be compared with that to be expected from average and good shots under favorable conditions, and in case of deficiency the reasons therefor should be stated.

"The same course should be followed with the results obtained in distribution and time, which should be taken up in turn.

"The operation which precedes the actual firing may be spoken of as preparation. This phase of a firing exercise has a somewhat remote

bearing on the actual results obtained in firing, but must receive some consideration. Assuming correct tactical procedure, the chief element for consideration is the matter of *time*, and in judging the time consumed prior to opening fire one must consider all the difficulties that have been encountered and then determine whether or not there has been an unreasonable delay which would not have occurred had the leadership been good and the organization properly trained.

"This part of the critique might be worded: 'The preparation was completed with reasonable celerity,' or 'the preparation consumed twelve minutes.' This is considered too long and is mainly due to:

"1. Lack of familiarity with range finding methods.

"2. Lack of training in describing objectives.

"3. Inadequate reconnaissance resulting in several changes of position before the firing line was so placed that the targets could be seen.

"Further training in these subjects would tend towards greater promptness in opening fire.

"It will usually be sufficient merely to comment on minor errors committed in the course

of the preparation, but in case of serious and unnecessary delays in opening fire, which in combat would give an active enemy a decided advantage, weight should be given in proportion to the faults committed. It should be borne in mind, however, that in passing judgment as to proficiency and deficiency the actual results obtained in firing by a detachment or organization must remain the chief basis, however much this judgment may need to be modified through faults committed in the preparation."

The critique is a means of instruction. It should not be in the nature of a reprimand, but to produce the greatest results, should be in the nature of a tactical summing up of the errors committed, with comments upon features particularly well performed. It should point out the means of correcting errors made and the lines along which further training is necessary.

### *Umpire's Duties:*

In addition to delivering the critique, the umpire has general charge of the exercise from the time of arrival of the troops near the target grounds until the exercise is completed. Sufficient assistants should be furnished him to permit of complete observation of all features of importance connected with the exercise. The

umpire is generally charged also with the duty of making known to the commander the assumed character and effectiveness of the enemy's fire and the results of its effect upon the firing unit. That is, he must inform the commander, for instance, "The enemy has fire superiority and you cannot advance," or "a certain part of your unit may advance, the enemy's fire at will being somewhat wild."

*Suggestions:*

Except in the earlier stages of instruction, when a combat firing exercise is once started it should be allowed to proceed without interruption, except to prevent accidents. It should be conducted by the usual signals and commands and in a manner laid down in Drill Regulations. This is true, not only because it is the prescribed way, but, because this is the only means provided for training in these necessary features while firing.

The position of the targets, the intervals between targets, and their form should, as a rule, conform to service conditions. At the beginning of an exercise the targets should be either pointed out or their location made known by the firing of blank ammunition in their vicinity. If targets are well hidden and no means provided for indicating their location little will be accomplished except an irritation



of the firing unit. Combat practice is not the place to teach the location of indistinct targets.

In attack exercises the greatest possible benefit will be derived if the information, relative to fire effect transmitted by the umpire, is based upon the actual result of the fire being delivered at the time. This entails the necessity for some arrangement by means of which hits may be recorded and their number transmitted to the umpire from time to time, without interrupting the firing. If this is done, then by a table previously prepared, it may be determined what fraction, if any, of a unit may advance, assuming that the more accurate the enemy's fire, the smaller the fraction which may advance. The length of time which the advance may be continued may also be determined, and if desired the probable number of casualties which would result. If such an arrangement is undertaken, then, in the preparation of the table the probable number of hits which should be made by average marksmen at the various ranges must be used as the basis for determining whether or not the fire superiority, in any degree, has been obtained. Thus, if with average marksmen and with the number of targets exposed, at the range used  $X$  number of men should make  $Y$  number of hits on  $Z$  number of targets and the unit firing falls

below this standard, complete fire superiority is not obtained. A sliding scale downward may be arranged, if desired, upon which to base decision as to whether or not the hits made are sufficient to enable a fraction of the unit to advance. As it is impossible to determine the probable number of hits, for every possible distance from the target the target ground should be divided into a number of zones, and the range to the extreme limits of each zone used as the basis for calculation. In this class of exercise, in arriving at a general figure of proficiency, values may be assigned to the distances covered in advances. This is illustrated in the Casey problem given herein.

The arrangements necessary to provide means by which hits may be read while firing is in progress may be difficult to obtain, but it is believed any efforts made with this idea in view will be more than repaid by the excellent effect upon the firing unit, the splendid opportunity it affords commanders to actually adjust their fire by its true effect, and to learn by observing fire when it is in adjustment. If some such method as this is not adopted the rulings of the umpire regarding the effect of the fire being delivered, both by the enemy and the firing unit, must be in the nature of a guess and may possibly be entirely erroneous. Hence the com-

mander may assume that a certain appearance of the shot group on the ground indicates that his fire is adjusted, when as a matter of fact it is not. He may assume that his range finding methods are correct, when they are not. He may assume that his rate of fire is correct, when it is not. In fact he may make any number of assumptions connected with conduct of fire, based on the rulings of the umpire, and all these assumptions may be drawn from false premises. There are firing exercises, of course, in which this arrangement is not necessary or desirable. For any exercise, however, which purports to be a means of training in those features of conduct of fire which can only be taught by fire, which attempts to emphasize emphatically the advantage of effective fire, and to teach commanders to draw conclusions from correct premises, this plan is necessary. In other words, by means of such arrangements the nearest possible approach to actual conditions in battle is obtained. The situation is clear to the commander and he can base his actions on the tangible results of his fire. Without these arrangements a commander is surrounded with a haze of doubt which may or may not be dispelled by the rulings of the umpire.

The amount of ammunition available for combat practice is necessarily limited; there-

fore it should be expended in exercises which provide the greatest amount of training. Too often the limited supply of ammunition leads to the selection of a number of exercises of short duration, rather than a few exercises of long duration. It must be remembered that combat practice has two main objects; to teach certain features of conduct of fire which cannot be taught elsewhere, and to train a unit to function true to its training while firing ball ammunition. The short exercise is suitable to train noncommissioned officers and small units in parts of their duties, but as a rule it is not a suitable means of training platoons, companies, or battalions in the larger and more important phases of conduct of fire. In the short exercise it is impossible for a commander to observe his fire a sufficient length of time to deduce anything from it. Even if he were able to arrive at some conclusion, which he is not, there will be no time available to apply the information obtained in a practical way. When only five or ten rounds are fired, how is it possible to observe and adjust fire? Unfortunately this hit or miss variety of firing problem is all too common; a hasty estimate of the range, a hasty designation of targets, a few brief seconds of fire, and the succeeding organization takes its place on the range to blaze away costly ammunition.

A few long exercises are much better than a number of short ones. In the problem of considerable duration the commander is given an opportunity to judge his fire effect, to correct errors therein, and to actually control his fire. Opportunity is afforded to train the company and battalion machinery to function while in the midst of a noisy and disconcerting fire; to see the errors of individuals, to correct them, and to see the corrections put into effect; to actually transmit firing data while firing, to fix bayonets, to control fire, to advance, and, finally to charge. How otherwise can a unit learn to perform these things instinctively in battle? Training, before the class (B) range is reached, is not sufficient. The firing of short exercises covering one small phase and designed to illustrate one principle is not sufficient. The solution of fire problems in which artificial features are dominant is not sufficient. There is no short cut to success here. There is no means of training an organization to function while firing except by training it to function while firing. To accomplish this, fire problems must be of sufficient duration to permit of drill therein. Moreover, a greater amount of instruction may be imparted in a given period of time with less expenditure of ammunition if, in these problems, the action of the unit is con-

trolled by its actual fire effect, determined while firing is in progress.

The problem which follows is along the lines of one prepared by the board of officers heretofore mentioned. It is given here because it contains features which have been emphasized in the foregoing discussion. This exercise in one season was fired by 48 companies and 12 battalions and in every instance its value was unmistakable.

If in order to meet local conditions, as was true in the foregoing instance, it is necessary to use one locality for both company and battalion training, the exercise may be made continuous and include the fire of both units. If this is done many points of maneuver and fire tactics will be brought out that might otherwise have been omitted, and an excellent opportunity will be afforded to illustrate team work in the battalion.

Local features of the terrain which were included in the original problem, to avoid confusion, have been omitted here. It is to be noted that this problem as written was framed for a particular piece of ground. If used, details may have to be changed to conform to the terrain available.

# PROBLEM

Time: 30 minutes.

Rounds for company, 50; for battalion, 45.

## Object:

To train the company and battalion to function as a unit under full control while firing; to train commanders to exercise fire direction and control; to observe and adjust fire; to train individual soldiers in fire discipline. To illustrate the necessity for celerity of movement, proper rate of fire, accuracy of firing data, good marksmanship, and team work.

## Situation:

The battalion following a successful engagement, is in close pursuit of a retreating enemy. The remainder of the regiment which is following with additional ammunition is about an hour in rear. The ammunition supply is low. No time has been available since the engagement to redistribute. The company which is detached (to fire the problem) is assumed to have fifty rounds per man. The battalion commander's orders are to push on and occupy a certain place in advance of the regiment. (In preparing the problem for presentation to troops this place must be selected so as to require the desired action.) When a suitable point is reached near the target range, the battalion commander is informed that a company

of the enemy, somewhat smaller in number than the companies of the battalion, has taken up a position on his flank and he cannot advance further without driving the enemy therefrom. He is directed to detach a company for this purpose.

*Action:                   The Company*

The detached company is conducted to a point from which it can see the targets and still be protected from fire. The situation is handed to the company commander and he is given a reasonable time to reach a decision. When all is ready the company is permitted to advance, in proper formation, until the point selected for opening fire is reached, say between 800 and 900 yards. At this point the company commander is informed that the accuracy of the enemy's fire prevents further advance except under covering fire. Once fire is opened, the further advance of the company is dependent upon the number of hits made. The exercise is continued until the enemy is assumed to be driven away, the ammunition is exhausted, or the time limit of 30 minutes has expired. Each company in turn fires the exercise.

*Targets:*

Fifty F targets spaced a distance apart sufficient to give the desired width to the whole target. Five E targets in rear will indicate



the director and controllers. These afford a ready means of picking up the target. Hits on these latter targets are disregarded until the conclusion of the exercise. A strip of canvas 19 inches high and somewhat longer than the target is wide, is placed immediately in rear of the line of E targets. The canvas is held in an upright position by means of wooden strips nailed together from both sides of the canvas throughout its width, and spaced throughout its length sufficiently near together to hold it taut and straight. These strips extend above and below the canvas, at which points they fit into greased slots held in position by wooden supports. At either end of the target, wooden latticed drums are placed in an upright position and provided with handles for turning. These drums should be protected from the front by a revetted mound or a combination of mound and ditch. Each end of the canvas strip is made fast to a drum. When the drums are turned the strip unwinds from one and winds upon the other, the upright strips sliding in the slots. As the canvas passes behind the targets it receives hits which are marked and recorded as it is wound on the drum. It was found by practice that about two minutes were required to mark the hits on about 50 yards of canvas. It will be noted that shots passing

between the targets as well as those passing through them will be received upon the canvas and hence recorded, but no particular harm is done by recording "near hits." If desired the actual hits may be counted at the completion of the exercise. From its description this target might be thought too visible but experience has shown that if properly placed in relation to the background it offers a difficult aiming target.

#### *Method of Scoring:*

The following method of scoring is designed to give the highest score to that company which by its collective shooting and fire tactics would probably make the greatest success were the assumed situation real. The object of this exercise is to drive the enemy from his position as quickly as possible and with the least expenditure of ammunition compatible with that end. To carry out this mission the company must inflict so considerable a loss upon the enemy in a short space of time that he will be forced from his position by these losses and by the aggressive forward movement of the attacker. An accurate delivery of fire in adequate volume would not avail if undistributed; hence the rate of movement toward the enemy would depend upon the number of figures hit in a given unit of time. Hits on the canvas are treated as hits

on figures. For a proper conduct of the attack, therefore, an arbitrary table of losses must be prepared based upon which the company would be allowed to advance during the problem in various sized units. In preparing this table a computation must be made of the maximum number of hits per minute that may be expected of good marksmen firing with correct data at the various ranges used. For instance, if the target ground is divided into four zones, 900, 800, 700, and 600 yards, the computation will be made using these ranges as a basis for calculation. This table must be elastic enough to provide for various sized companies and various tactical dispositions. Arrangements must be made for recording the number of hits during the advance and reporting these hits to the umpire, for instance, every two minutes. Based upon these reports of hits the company is permitted to advance by individuals, squads, platoons, etc. No limit should be placed upon the length of the rushes. The units halting at the end of the rush wherever in the opinion of the leader it should have been stopped in war. It is well to assume that if the company reached a point 500 yards from the enemy in 30 minutes the enemy would be defeated by his losses and the fierceness of the attack, and that as the company approaches this critical range the

hostile fire will gradually grow less effective. The table, therefore, should provide for an increasingly difficult advance from 900 to 600 yards, and a gradually decreasing requirement from 600 to 500 yards.

For the purpose of comparison the following four factors may be considered:

(a) Accuracy, or per cent of hits to shots fired.

(b) Distribution or percentage of figures hit, the per cent being based on the number that should have been struck with the ammunition actually fired.

(c) Time required to defeat the enemy (if successful).

(d) Distance covered in the advance.

The method of determining (a) is obvious. In determining (b) one has first to consider how many figures should have been hit by "good" marksmen using accurate data and properly distributed fire over the whole target. (d) should be determined from a table of values for distance advanced, the values varying regularly from 0 for no advance to 100 for an advance of 500 yards. An arbitrary value of say 100, if successful, may be attached to (c), that is, the whole company reaches 500 yards in 10 minutes. This value to be decreased to 0 for success in 30 minutes. The per cents

reached by the above process may be changed to "Points" for the purpose of scoring in the following manner. The per cent of accuracy obtained should be referred to the per cent considered possible, and the quotient called "Points." Thus, if 20 per cent is the possible per cent of accuracy and a company makes 232 hits with 1,981 rounds of ammunition, or 11.7%, which is 58.5% of the possible, its score therefore for accuracy would be 58.5. The per cent of distribution attained is considered as "points" thus: 36 figures hit of 50 exposed by a company firing 1,981 rounds would give a per cent of 72, which are called "points" for distribution. It is to be noted that in this instance a company firing 1,981 rounds should hit all figures. If a company "succeeded" in 23 minutes 20 seconds, their "points" for success would be 33, and if at the end of the exercise it had all of its men at 500 yards, the "points" gained for "progress" would be 100. The following example taken at random from the scores of a number of companies will illustrate the process. It is assumed in this instance that the company should have made 20% of hits:

(a) Accuracy:

$$\frac{649 \text{ hits}}{1,904 \text{ shots}} \text{ gives } 2.57\% ; \frac{2.57\%}{20.0} \text{ gives } 12.85\%, \text{ or } 12.9.$$

(b) Distribution:

27 figures gives 54.0% of the possible, or 54.0.

50 figures

(c) Time, or success. Did not succeed. Value 00.0.

(d) Progress:

7 men at 755 yards, is 16.2% of the company at 755.

36 men at 810 yards, is 83.8% of the company at 810.

16.2%  $\times$  .36 gives 5.83 (755 yds. from table is 36).

83.8%  $\times$  .23 gives 19.30 (810 yds. from table is 23).

---

25.13

Recapitulation:

	<i>First Case</i>	<i>Second Case</i>
(a) Accuracy .....	58.5	12.9
(b) Distribution .....	72	54
(c) Time .....	33	00
(d) Progress .....	100	25.1
	<hr/>	<hr/>
	263.5	92.0

The following plan for the transmission of information from the pit to the umpire has been found satisfactory. Telephone connections from the pit to a convenient point in rear of the first firing position. At this point a post is erected which can be plainly seen from all parts of the range. A movable arm is fastened on the post and the size of the unit which is permitted to advance is indicated by the position of the arm. An assistant to the umpire, provided with the necessary tables, is charged with the duty of indicating the size of the unit to advance.

*Situation:*                      *Battalion*

In the battalion problem it is assumed that the detached company was unsuccessful. If

such was actually the case the initial firing position of the battalion is placed at a point in the advance corresponding to the point reached by the advance of the average company. Thus, if "A" company reaches 600 yards, "B" 650 yards, "C" 675 yards, "D" 700 yards, the initial battalion position would be about 656 yards. If the companies are successful the initial point must be chosen with the idea of meeting the requirements of the problem. Three companies of the battalion are located at or near the point at which their advance was originally assumed to have been stopped. The fourth company is in position at the point selected for opening fire. The situation is assumed to be that at the beginning of the last 10 minutes of the preceding problem, the company in the line has 10 rounds of ammunition, the balance of its allowance of 45 rounds is in bandoleers in the hands of the other companies. It is assumed that this ammunition was obtained by a redistribution in the battalion.

*Action:*

When all is ready the battalion is made acquainted with the situation. When sufficient time has been allowed to transmit this information to the companies, a message is handed to the battalion commander from the company on

the firing line. This message states: "Enemy reënforced by about one company. Losses heavy. Am unable to advance further. Ten rounds of ammunition per man left." When the battalion commander digests this information, fire is opened by the company in position and the problem begins. The tactical situation is designed to require reënforcing by two companies at once. The final company being thrown into the line upon the initiative of the battalion commander or upon the intimation of the umpire that its fire is necessary. The action is continued until the ammunition is practically exhausted, when the battalion is tested in its ability to charge. Extra ammunition for the first company on the line is delivered to it by the first supports sent forward. In order that reënforcements may reach the company on the line before its ammunition is exhausted the place of the receipt of the message by the battalion commander may have to be arbitrarily assumed.

### *Targets:*

The original company targets plus additions necessary to bring the target to a size sufficient for a battalion. If facilities are available these additional targets should be made to appear at intervals so as to finally require the absorption of the entire support or reserve into the firing



line. In the problem from which this exercise was taken 17 targets placed on sleds were drawn into position to represent reënforcements. Unfortunately, with such a large number of targets it is not possible to read hits as made. Movements of the battalion forward, therefore, cannot be controlled by its fire effect. Much training, however, can be given in switching, concentrating, and crossing fire without any movement forward, if it is desired to omit this feature. Such adjustments of fire being made to meet assumed phases of the situation, a description of which is transmitted verbally by the umpire to the battalion commander.

### *Scoring:*

The following method of scoring by which percentages made may be reduced to points for purposes of comparison is practicable.

(a) Per cent of hits to shots fired.

(b) Per cent of figures hit to shots fired.

The highest percentage of hits to shots fired is given the value of 1,000. All other per cents made by other battalions are proportional to this value. Thus:

3d Bn. X Inf. (The highest battalion). Percentage of hits 10.82. Value 1,000.

1st Bn. Y Inf. Percentage of hits 9.01. Value 833, for  
 $10.82 : 1,000 :: 9.01 : 833$ .

The highest percentage of figures hit to shots fired is similarly given the value of 1,000

and all other percentages referred to this standard in a similar manner, thus:

3d Bn. X Inf. (The highest battalion). Percentage of figures struck to shots fired 2.321. Value 1,000.

1st Bn. Y Inf. Percentage of figures struck to shots fired was 1.608. Value 692, for  
 $2.321 : 1000 :: 1.608 : 692$ .

The score would be:

*3d Bn. X Inf.*

(a) 1,000

(b) 1,000

---

2,000

*1st Bn. Y Inf.*

(a) 833

(b) 692

---

1,525

If it is desired to include the element of time a third percentage may be included, as (c) Percentage of figures hit to seconds of firing. In this event the possible total would be 3,000.

# APPENDIX

## THE CASEY FIRING PROBLEM

During the 1913 national and international matches at Camp Perry, there was tried out a problem in field firing, devised by Captain K. K. V. Casey, Adjutant, 2d Infantry, N. G. P., which seems so well adapted for use on the ordinary target range, and so full of interesting possibilities, that the following description and comments are given out in hope that out of any discussion of them may come some good to the service in general.

### STATEMENT OF THE PROBLEM

In brief, a representation is made of an attack by a platoon of infantry over open ground upon a prepared position defended by an inferior force. The platoon consists of four squads, and the target represents a line of 16 men.

*Ground:* The ground required is a strip about 1,300 yards long and 200 yards wide, with suitable protection for the observers at the target; such a strip as may be found on most service target ranges.

*Target:* The target is mounted on eight 6' x 12' target frames, so as to form a continuous target 12 feet high and 48 feet long. It is divided by horizontal lines into six zones, each two feet high. The background is of buff or neutral tinted paper. On each of the eight sections of the target are stenciled or pasted two of the ordinary prone silhouettes, in olive drab color, with the bottoms of the figures on the center horizontal line, and so placed as to be 3 feet apart from center to center. Each figure is marked with a number 10, that being the value assigned to a figure hit. The zones from the bottom upward are marked in succession with the value assigned to hits in each, namely: 1, 3, 5, 6 (remaining space in the zone of figures), 4, and 2.

*Firing Line:* The firing line is a platoon of 32 men, properly organized as in I. D. R., with a platoon leader

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NOTE: This same problem was fired at Galveston, Texas, in 1913. The target presented for fire was similar to the one described. In addition, a secondary target was placed in a pit in rear of the first which consisted of a series of targets such as are used on the target range. This permitted of an accurate record of hits made each minute of firing. Plate 46.

GROUP 4				GROUP 3				GROUP 2				GROUP 1			
2		2		2		2		2		2		2		2	
4		4		4		4		4		4		4		4	
6	10	6	10	6	10	6	10	6	10	6	10	6	10	6	10
5		5		5		5		5		5		5		5	
3		3		3		3		3		3		3		3	
1		1		1		1		1		1		1		1	

*Target for Casey Problem.*  
**PLATE 45.**

and a platoon guide. Ninety rounds of ball cartridges are issued.

*Other Arrangements:* In the pit there should be an observer for each section of the target, and a chief observer, who is connected by a field telephone with the officer conducting the test. The latter is accompanied by a musician with a trumpet. Under the control of the chief observer is a large flag or disk so arranged that it may be placed vertically, lowered to an angle of  $45^{\circ}$  or withdrawn from sight.

*Conduct of the Test:* The platoon, when the target is ready, is deployed into line of skirmishers, with an interval, for safety, of 20 yards between squads. The officer conducting the test then causes the musician to sound "Attention"; "Commence Firing." No other commands will be given by him excepting in case of accident, infringement of the rules, or interruption of the exercise. The conduct of the platoon is in the hands of the platoon leader.

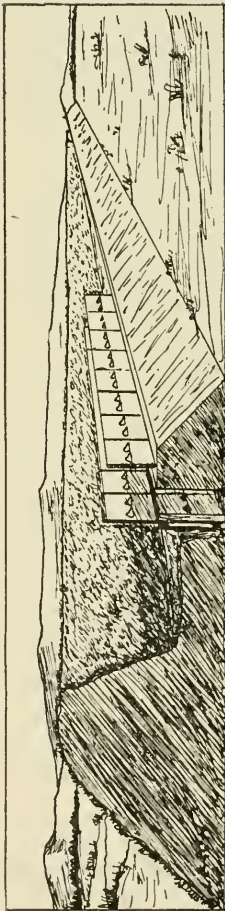
When "Commence Firing" is sounded, the platoon begins its advance and the chief observer at the pit is notified; also as it reaches a point about 1,200 yards from the target, when he causes the flag to be raised vertically. The chief observer is also notified at what ranges the firing is taking place. Firing may begin when the line has passed the 1,200 yard point, and the time is taken as it passes that point. In thirty minutes from that time the director causes "Cease Firing," "Assemble," to be sounded and the exercise ceases.

*Rules:* The principles of attack over open ground will be observed. If the director believes that the advance is being improperly conducted, or that signals are not being obeyed, he may cause "Halt" to be sounded, when all will cease firing. When the matter has been adjusted, "Commence Firing" is again sounded. No time is taken out for such pauses.

While the flag is vertical, no advance may be made; when it is at  $45^{\circ}$ , advance may be made by individuals, and when it is withdrawn, advance may be made by squad.

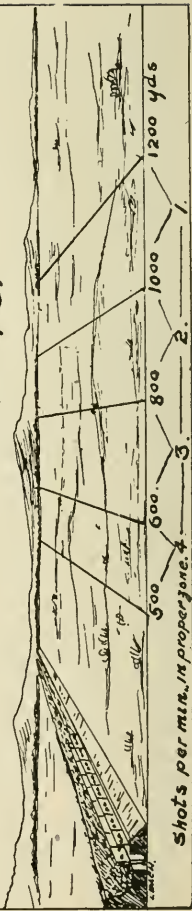
When "Cease firing, Assemble" is sounded, firing will cease and the platoon will assemble. If time permits it may be marched close to the targets to observe the effect.

*Method of ascertaining when superiority of fire is obtained:* Each observer at the pit endeavors to keep



Arrangement of targets showing method of recording

Casey problem  
PLATE 46.



account of the number of hits per minute on his section of the target, and at short intervals the chief observer asks for results, governing the position of the flag accordingly. An arbitrary rule must govern in order to obtain results for comparison.

The question of distribution and the determination of when to change the signal flag, was tentatively solved by the following arbitrary rule + hits of value below four not counted:

<i>Distance</i>	<i>Shots per minute in proper zone</i>	<i>Distribution on target</i>	<i>Unit to advance</i>
1,200—1,000	1	6 out of 8	Squad
		4 out of 8	Individual
1,000— 800	2	6 out of 8	Squad
		4 out of 8	Individual
800— 600	3	6 out of 8	Squad
		4 out of 8	Individual
600— 500	4	6 out of 8	Squad
		4 out of 8	Individual

This arbitrary rule was determined upon after giving due weight to the following points:

1. In actual service the attacking line will not open fire at such extreme ranges as 1,200 yards unless their losses are so great as to make it absolutely necessary. In the case under consideration it is assumed that the attackers came under effective rifle fire as soon as they emerged from the woods—in other words, at about 1,200 yards, and that the advance was to be made over ground without cover of any kind. At the extreme ranges, fire superiority would be obtained by fewer hits, or near hits, than would be necessary at the shorter ranges. One hit per minute on six out of eight targets at 1,200 yards was assumed to give fire superiority, and one hit per minute on four out of eight targets was assumed to be sufficient to permit an advance to be made by individuals.

2. As the attacking line advanced to the shorter ranges, its fire would become more accurate, but, at the same time, the fire of the defenders would also increase in accuracy and the greater number of hits per minute would be necessary in order to obtain fire superiority. This increase in the number of hits was assumed to require two hits per minute at 800 to 600 yards, and four hits per minute at 600 yards and closer—all with the same distribution. As a matter of fact, it is believed

that the distribution should have been  $7/8$  and  $5/8$  at the decisive ranges in order to obtain superiority.

3. The rate of fire at the long ranges, to obtain good results, must be much less than at the shorter ranges, and this applies to both attackers and defenders. This was an additional reason for requiring an increase in the number of hits to obtain fire superiority as the attacking line approached the objective.

*Determining the Relative Efficiency:* At the termination of the exercise, the number of hits in each zone is counted, and the values are given as indicated on the target. The method of attributing values to hits on different zones of the target is this:

The success of the attack depends primarily on superiority of fire. This is obtained when the enemy's fire is kept down, and anything that makes him keep his head under cover contributes to superiority. So, shots striking close in front or between the figures are valued next to actual hits, and next come shots just overhead. (See diagram of target, Figure 45.)

Valuation for proper distribution of fire is obtained as follows: The target is divided into four groups of two sections each. The value of hits in each group is determined separately. Then the totals are multiplied by the following weights: the two highest, by 1; the next highest, by 2; the lowest, by 3; and the totals added.

It is readily seen that credit is thus given for distribution of fire. For example, one platoon has made hits of a total value of 400, distributed equally on all four sections; the score would be:

1st Section .....	$100 \times 1 = 100$
2nd Section .....	$100 \times 1 = 100$
3rd Section .....	$100 \times 2 = 200$
4th Section .....	$100 \times 3 = 300$
<hr/>	
Total .....	700

Another platoon has the same total value of hits, but unevenly distributed, then:

1st Section .....	$160 \times 1 = 160$
2nd Section .....	$150 \times 1 = 150$
3rd Section .....	$60 \times 2 = 120$
4th Section .....	$30 \times 3 = 90$
<hr/>	
Total .....	520



Valuation is also given for the distance advanced by the platoon, as follows:

At the termination of the exercise, note is made of the position of the fractions of the line. For purpose of valuation the range is divided into 50-yard zones and values assigned as in the table below. The number of men who have advanced into any zone is multiplied by the value given for the zone, and the total is added to the target score.

Zone	Value
1,200 .....	0
1,150 .....	10
1,100 .....	20
1,050 .....	30
1,000 .....	40
950 .....	50
900 .....	60
850 .....	65
800 .....	70
750 .....	75
700 .....	80
650 .....	85
600 .....	90
550 .....	95
500 .....	100

For example, if 12 men have reached the 700-yard zone, and 20 men were at 750 yards, the total score for distance will be:

$$(80 \times 12 = 960) + (75 \times 20 = 1,500) = 2,460$$

#### COMMENTS

The foregoing problem affords an excellent means of drilling the company in most of the features of the conduct of fire. It will be found that improper distribution, incorrect range, inattention to signals, indifferent rushes, improper rate of fire, and in general poor fire direction, control, and discipline will react very promptly and to the great disadvantage of the firing unit. The rate of advance, that is the attainment of success, is in delicate adjustment with the proper conduct of fire. Even slight errors make themselves manifest very quickly. It is this condition that gives the problem, perhaps, its greatest value. This results from the fact that commanders of all grades are almost instantly made

aware that they have failed in some particular. It becomes at once incumbent upon them not only to discover their error but to apply the remedy. The burden of the fault is placed where it belongs and this in so conspicuous a manner that improvement is almost sure to follow, for publicity of error is a strong incentive for advancement.

The problem is an artificial one and therefore it is to be expected that artificial conditions will arise in its solution. As long as good results are produced these conditions will do no harm provided it is made plain to all that they are artificial and not those to be expected upon the battlefield. In this connection may be mentioned the extreme range at which fire is opened, the intervals between squads, the obliquing of the rushes, for which there would be no room in battle, to avoid danger, the absence of a tactical idea, the absence of a support or reserve, and the necessity which might at times arise for individuals other than unit leaders to control rushes according to the position of the flag.

It was found in practice, that to obtain the best results, long and fairly slow rushes should be made and that other things being equal the rush should halt on the edge of a zone instead of crossing into it, even though a slightly better firing position might be obtained a little farther in advance. These are mere expedients which do very well to meet the conditions at hand but like the points mentioned above must be explained to the men and officers so that erroneous inferences will not be drawn.

While the wording of the problem is rather indefinite with regard to the stopping of a rush once started, it will be found more satisfactory if a unit on its feet and advancing is allowed to continue the advance to its logical conclusion. That is to the most advanced position at that time occupied by the platoon. If this is not done the platoon may be split into several echelons which increases the danger and gives rise to unsatisfactory conditions. If, however, any fraction of a unit is advancing to a firing position not as yet occupied it should be required to halt at once if fire superiority is lost.

## THE RECORDS

(From pamphlet on Combat Firing by The School of Musketry)

THERE ARE TWO DISTINCT TYPES OF RECORDS, THE "UMPIRE'S RECORD" AND THE "STATISTICAL RECORD."

### *Two Types:*

The "Umpire's Record" furnishes the basis for the critique delivered by the umpire, on the ground, at the completion of the exercise, and consists of two parts. The first part covers the tactical phase of the exercise, fire direction, control, and discipline, as a result of the observation of the umpire. The second part is statistical in character and covers essential data from which the umpire draws conclusions and expresses an opinion upon the effectiveness of the fire as affecting the accomplishment of the mission. The "Statistical Record" is a memorandum of the data essential to a thorough analytical study of the exercise, both as to its execution and the material results obtained.

### THE UMPIRE'S RECORD

THE FORM FOR THE RECORD SHOULD BE SIMPLE—THE NUMBER OF FIGURES IN IT IS THE DECIDING FACTOR—THE UMPIRE'S REFERENCE TABLES.

#### *Simplicity of Form:*

The data for this record should be of such a character that it can be obtained quickly without reference to long formulas, numerous tables of factors, etc. It must be as simple as the Umpire's Record in a maneuver problem, if not simpler, for the critique based upon this record is never carried into the "lecture tent" but delivered on the ground.

It will be noted that the Umpire's Record as explained herein contains all data (except number of hits expected) referred to in "records," par. 226, S. A. F. M., and that the excepted data is contained in the "Statistical Record."

The following idea, which controls decisions in maneuvers, should govern in the determination of the character of the "Umpire's Record" in a combat exercise:

"The effect of fire is influenced by so many considerations that it is impossible to predict the result with accuracy.

"There are many factors whose effect cannot be computed. However, by practice in calculating losses in hypothetical cases, a knowledge of the *principal factors* governing the effect of fire is obtained, and a faculty acquired of quickly estimating their influence or effect upon troops. This faculty, umpires are supposed to have acquired by previous study and experience. At maneuvers there is no time to make complicated calculations or to consult a table of losses; the umpires, therefore, decide promptly according to their best judgment."—Par. 16, *Regulations for Field Maneuvers, U. S. Army.*

#### *Distribution Factor:*

The considerations influencing the effect of fire are numerous and while some of them can be clearly shown in terms of hits made, or figures struck, there are many which must be based entirely on observation and opinion. However, so soon as the PRINCIPAL FACTORS are known, from a consideration of the record of any firing, a trained umpire can at once express an intelligent decision as to the probable result of the action. What is wanted is a *prompt decision* from the best obtainable judgment as to the efficacy of the fire and the solution of the fire problem.

In order to add force to the decision, it is sometimes advisable to make a comparison with average shots. In order that this comparison may not involve "complicated calculations" various tables have been combined in order that the percentage of figures struck may be taken from the table at a glance and without computation. The combined table represents the result expected from average shots firing at a correct maximum rate and distributing their fire perfectly while using the correct sight setting.

IT MUST BE REMEMBERED THAT THE ACCOMPLISHMENT OF THE MISSION IN A FIRE PROBLEM IS BASED USUALLY ON THE NUMBER OF TARGETS DISABLED. THE "COMPARISON," THEREFORE, IS BASED ON THIS FACTOR.

As Captain Eames expresses it: "The ultimate measure of efficiency is not the percentage of hits, nor the number of hits, but the *number of figures disabled in a given space of time.*"

#### *Umpire's Reference Tables:*

The tables for use by the umpire in making the comparison are shown and their use explained below.

The two tables which follow, if printed on both sides of a card of convenient size, would be of value to umpires not only as a ready reference in judging of the results of fire, but also in formulating problems with ball cartridges.

There are problems in which the use of these tables would be neither feasible nor necessary, and others in which the decision of the umpire is amply supported by his own judgment. So it is not to be understood that the use of these tables is in any sense mandatory, but rather that, when the umpire believes their use possible and desirable, they may serve him as a guide in arriving at a decision or as a standard whereby he may fortify or confirm a decision already made.

"In all cases where it is a matter of passing on the merits of a combat firing exercise, individual judgment must come into play and numerous modifications and allowances be made to suit the particular circumstances of the case."—McIver.

(Obverse)

UMPIRE'S REFERENCE TABLE

PRONE FIGURES

Time—Minutes

Range Yards	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{3}{4}$	1	$1\frac{1}{2}$	2	$2\frac{1}{2}$	3	$3\frac{1}{2}$	4	5	6	10	15	20	25	30
200	42 <i>39</i>	66 <i>63</i>	80 <i>78</i>	89 <i>87</i>	96 <i>95</i>	99 <i>99</i>	99 <i>99</i>	100 <i>100</i>									
300	30 <i>30</i>	52 <i>51</i>	66 <i>65</i>	77 <i>76</i>	89 <i>88</i>	94 <i>94</i>	98 <i>98</i>	99 <i>99</i>	99 <i>99</i>	99 <i>99</i>	100 <i>100</i>						
400	23 <i>23</i>	41 <i>41</i>	55 <i>55</i>	66 <i>66</i>	80 <i>80</i>	88 <i>88</i>	95 <i>95</i>	96 <i>96</i>	98 <i>98</i>	99 <i>99</i>	99 <i>99</i>	100 <i>100</i>					
500	19 <i>16</i>	34 <i>29</i>	46 <i>40</i>	57 <i>50</i>	71 <i>65</i>	81 <i>75</i>	88 <i>82</i>	92 <i>87</i>	95 <i>91</i>	97 <i>94</i>	99 <i>98</i>	99 <i>99</i>	100 <i>100</i>				
600	15	28	38	48	62	73	80	86	90	92	95	98	100				
700	12	22	31	40	53	63	72	78	83	87	92	95	99	100			
800	9	17	25	32	44	54	62	68	74	79	85	90	98	99	100		
900	7	13	19	25	35	44	51	58	64	68	76	82	94	99	99	100	
1,000	5	10	15	19	27	35	41	47	54	57	66	72	88	96	99	99	100

NOTE: Figures in body of table indicate the percentage of figures that should be struck. Those in *italic* indicate "battle sight."

## (Reverse) UMPIRE'S REFERENCE TABLE

## KNEELING FIGURES

## Time—Minutes

Range Yards	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{3}{4}$	1	1 $\frac{1}{2}$	2	2 $\frac{1}{2}$	3	3 $\frac{1}{2}$	4	5	6	10	15
200	60 59	84 83	93 93	98 98	99 99	100 100								
300	48 47	73 72	86 85	93 92	99 98	99 99	100 100							
400	39 36	63 59	77 74	86 84	95 93	99 98	99 99	99 99	100 100					
500	32 24	54 41	69 55	79 66	90 80	96 88	98 93	99 96	99 98	100 99		99 100		
600	26	46	60	70	84	91	95	99	99	99	100			
700	21	38	51	61	76	85	91	94	97	98	99	99	100	
800	17	30	42	52	66	77	84	89	92	95	98	99	100	
900	13	24	34	42	56	67	75	81	85	89	94	97	99	100
1,000	10	18	26	33	46	56	64	71	76	80	87	91	99	100

NOTE: Figures in body of table indicate the percentage of figures that should be struck. Those in italic indicate "battle sight."

## USE OF TABLES IN JUDGING RESULTS OF FIRE

GENERAL USE IN JUDGING RESULTS—DESCRIPTION OF THE TABLES—USE UNDER NORMAL CONDITIONS—USE UNDER VARIABLE CONDITIONS.

*General Use in Judging Results:*

All tables of expected results are based on the theory of probability. The tabulated results are therefore "probable" results. Any concrete case is mathematically as likely to result in a higher as in a lower figure and in a great number of cases there will be as many on one side of the "probable" as on the other.

This fact applied to tables of expected hits from average shots means that average shots firing an indefinite number of identical problems will have an average result in direct hits equal to that shown in the table, but with as many results below as above the "probable." When we seek to compare the result attained by a firing

group in a concrete case with the tabulated probable result of average shots, we should remember that the average shots themselves in the firing would often attain a number of hits higher (or lower) than the probable and that the purpose of the comparison with the probable is merely that we may have some standard of comparison. We would not expect average shots to hit upon this same standard every time they fired nor would we expect the firing group in any concrete case to do so. Judgment is needed to determine whether the departure in the concrete case is normal or abnormal in amount. The fact that it is above or below is absolutely immaterial, it is only the amount of the departure that is of value in forming a judgment from the comparison.

*Description:*

The amounts in the body of the table indicate the percentages of figures that should be struck by any number of average shots firing at an equal number of figures arranged to represent a linear target occupying a front of one yard per figure. These results are based, too, on the further assumption that the correct elevation and rate of fire is used, that the fire is distributed equally throughout the entire front occupied by the target, and that the visibility is normal.

Of these seven factors, the following four are dependent upon the skill and leadership of the firers, i. e., the use of correct elevation and rate of fire, the equal distribution of the fire, and the marksmanship of the individual rifleman (whether he is good, average, or poor shot). As these factors are, in a sense, within the control of the firers, they may be considered as constant in so far as the use of the table is concerned, or, rather, variable only in that they would serve to indicate whether the performance had been good, bad, or indifferent.

The other three factors—number of figures in the target, number of figures in the target per yard front, and the degree of visibility of the target—may vary with every target and exercise, and visibility may vary even for the same target at different hours of the day.

The object of these tables is to give to the umpire a means, with the minimum of computation, of finding a standard with which to compare the results of any firing. The standard adopted is the single amount representing the percentage of casualties that *should* have been



obtained in the ranks of the enemy (number of figures in the target that should have been struck) in a given time.

In order that the percentages of figures hit can be read directly from the table and thus avoid unnecessary computations in the field, it is suggested, when the character of the problem permits, that the target contain as many figures as there are rifles firing and that the figures be spaced on a frontage of one per yard.

*Normal Conditions:*

*Example 1.*

At a range of 900 yards, 100 men fire for two minutes at a line of 100 kneeling figures on a front of 100 yards. Visibility perfect. In this firing they strike 24 figures.

What is the judgment of this result?

Consult the table headed "Kneeling figures."

In the column headed "Range, yards" find the amount 900. Follow this line to the right until entering the column headed "2" (this corresponds to the time, 2 minutes, during which the fire continued), where is found the amount 67, which is the percentage of figures that should have been struck. How does this compare with the result that was obtained?

First reduce the percentage of figures that should have been struck, 67, to number of figures, in this case 67.

Then at a glance the umpire can see that, in the allotted time, the firing resulted in a little more than one-third the casualties it should have produced.

*Variable Conditions:*

*Example 2. Reduced visibility.*

Fifty men fire at 50 prone figures—normal front—for two minutes, at a range of 600 yards. The figures are not well defined. It is manifest that the same results can not be expected on a target of this character as in one that is clearly visible, hence it would seem advisable to lower the standard. It is only a question of how and how much. This is a matter resting entirely upon the judgment of the umpire, who makes an estimate of the increased difficulties presented to the firers and arrives at a decision which he expresses simply as an opinion, "The visibility of the target is such in this problem that a reduction of efficiency is to be expected. In my



judgment the firing of this organization is satisfactory (deficient, etc.)."

Should the umpire wish to base this opinion upon a computation he may do so in the manner shown below.

The umpire, knowing the range to be 600 yards, for example, says to himself, "While this actual range is 600 yards, the targets appear to me to present all the difficulties of a clearly visible target at 800 yards and, as there is no aiming point that can be used which is as clearly outlined as the targets themselves, I will judge of this firing by the 800 yard standard."

Assume that the fire resulted in 20 figures being struck. Then in the table at the intersection of the 800 yard line and the 2-minute column is found the amount 54, which is the percentage that should have been struck, in this case 27 figures.

Example 3.

Number of firers differing from the number of figures in the target.

Eighty men fire at 40 prone figures for one minute at a range of 700 yards.

In this case it becomes simply a question of determining in what time it would take a number of riflemen equal to the number of figures in the target to deliver an amount of fire equal to that actually delivered.

In this case 40 men firing for 2 minutes would give the same amount of fire as 80 men for 1 minute, and therefore should strike 63%, or 25 of the figures.

Example 4.

Targets on front other than 1 figure per yard.

Sixty men fire at 60 prone figures on a front of 120 yards for two minutes at a range of 600 yards. As the vulnerability of this thin line is only half that of a line of normal density, then the standard is sought in the column indicating half the time actually consumed. In this case the amount sought is at the intersection of the 600-yard line and the 1-minute column and is found to be 48%, or 29 figures, which is the number of figures that should have been struck.

THESE TABLES MAY BE USED ALSO IN DETERMINING COMPARISON FACTORS OF TIME AND MEN—AND IN FORMULATING PROBLEMS WITH BALL CARTRIDGES AS TO DURATION OF FIRE AND NUMBER OF ROUNDS TO BE ISSUED.

*Time and Men Comparison:*

(a) What time should have been required by the firers to have gotten the result obtained?

(b) How many men with proper sight setting, rate, and distribution could have produced the same number of casualties in the actual time consumed by the firers?

Considering the first question (a) and referring to the example where 100 men fired for two minutes at a range of 900 yards on 100 kneeling figures on a front of 100 yards with a result of 24 figures, or 24%, struck, visibility perfect:

Follow the range line (900) to the right until encountering an amount approximately equal to the percentage of figures actually struck. The heading of the time column in which this amount is found will be the answer sought. In this example, the percentage 24, is found on the 900-yard line. As this amount, 24, is found in the  $\frac{1}{2}$ -minute column, the umpire arrives at the conclusion that the firers should have accomplished what they did in one-half minute.

Considering the second question (b) and referring to the same example:

This is answered by solving this simple proportion:

The time actually consumed : The time that should have been consumed :: Number of men actually firing : The number of men required.

In this example it would be  $2 : \frac{1}{2} :: 100 : x$ , or  $x = 25$ . That is, 25 men should have been able to strike 24 out of 100 targets in two minutes' firing.

Just how many of these bases of comparison are used by the umpire depend upon the nature of the problem and whether, in his judgment, the tactical situation calls for additional emphasis of the need for economy of time or economy of men.

*Duration of Fire and Number of Rounds:*

(a) How long to continue the fire at any particular target?

(b) How much ammunition to issue for any particular problem?

(a) It is obvious that if the fire is continued too long at a target, the percentage of figures struck ceases to be an indication of the efficacy of fire. Thus, for example, no conclusions of value could be drawn from the results of fire continued for more than one minute on kneeling figures at 200 yards, or for more than  $3\frac{1}{2}$  minutes at prone figures at 400 yards.

Hence in drawing up the problem the umpire may decide on what percentage of figures he desires to have struck in any target, and then (from the table) he can determine for what period he can allow the fire to continue.

For example: How long shall fire continue in order to strike 30 out of 100 prone figures—normal front—at 800 yards? From the table, opposite Range 800 in the 1-minute column, is found 32, the nearest percentage to 30.

For an equal number of rifles, this would be about 1 minute.

For 200 rifles, half the time.

For 50 rifles, double the time.

For half the density of target (1 figure per two yards of front), double the time.

(b) To estimate the amount of ammunition to issue for any particular exercise, multiply the duration of fire by the correct rate for that range (See Table I, under "Statistical Record") or by the umpire's estimated rate. It is advisable to add 10% to this estimate in order to provide ammunition to men whose rate of fire is greater than that ordered. This is to equalize the ammunition unexpended by men who are using a slower rate than ordered due to either lack of training, ground, or vegetation preventing view of assigned targets, to jams, etc.

Assume an exercise in which four targets of prone figures were to be used and fire to be continued until 30 to 40 per cent of the figures have been struck. The range to Target No. 1 is about 800 yards, to No. 2 is 700 yards, to No. 3 is 600 yards, and to No. 4 is 500 yards.

The issue of ammunition would be computed as follows:

Target	Range	Time	Rate	Rounds
1 .....	800	1	5.8	5.8
2 .....	700	1	6.6	6.6
3 .....	600	$\frac{3}{4}$	7.5	5.6
4 .....	500	$\frac{3}{4}$	8.3	6.2
				<hr/> 24.2
Add 10%				2.4
				<hr/> 26.6

That is, in this exercise, 30 rounds per man would be issued—30 instead of 27 merely to save time by issuing only full clips.

THE UMPIRE'S RECORD SHOULD EMBODY SUFFICIENT DATA CONCERNING THE TROOPS ON WHICH TO BASE A DECISION AS TO—

1. LEADERSHIP AND CONDUCT.
  - A. JUDGED FROM THE POSITION OF THE TROOPS.
  - B. JUDGED FROM THE POSITION OF THE TARGET.
2. FIRE EFFECT.
3. THE ACCOMPLISHMENT OF THE MISSION.

The form should provide for the principal points to observe in the leadership and conduct of troops. It should include such basic factors in the result of their "fire effect" as will assist in quick decisions. The elements considered in 1 and 2 above, taken in connection with a decision as to the estimated enemy targets' "fire effect" (a factor too frequently neglected) should form the basis for the umpire's decision as to the accomplishment of the mission, expressed above in 3.

In order to aid the umpire in delivering the critique, the form in detail should cover the following points:

1. *Leadership and Conduct:*

(A) *Judged from the Position of the Troops.*

*The Major General:*

- (a) Effective supervision of battalion.
- (b) Harmonizing ranges.
- (c) Tactical orders.
- (d) Regulating ammunition supply.
- (e) Control of supports.
- (f) Primary apportionment of target.
- (g) Provision for flank protection.
- (h) Observation of enemy and adjoining troops.
- (i) Depth of deployment, extent and density of firing line.
- (j) Fixing bayonets.
- (k) The charge.

*In Attack:*

- (a) Selection of formation in which to advance.
- (b) Direction of advance.
- (c) Objective for each company.
- (d) The general object or special problem for each company or the order and front of each company.

- (c) The base company.
- (f) Time or place for opening fire.

*In Defense:*

- (a) Assignment of sectors.
- (b) Determination of ranges.
- (c) Communication to companies.

*Captain, 1st Sergeant, and Buglers:*

- (a) Leader's knowledge of the situation.
- (b) Explanation of the situation to the company.
- (c) Reconnaissance of the target.
- (d) Use of field glasses.
- (e) Dangerous grouping of platoon leaders and estimators.
- (f) Estimation of the range.
- (g) Designation and apportionment of target.
- (h) Clearness of fire orders to subordinates.
- (i) Advance of the unit to the first firing position.
- (j) Concealment.
- (k) Time of preparation from receipt of situation to "Commence firing."
- (l) Observation of fire effect.
- (m) Correction of material errors in sight setting.
- (n) Orders, if any, for distribution of ammunition.  
Its economical and judicious expenditure.
- (o) The position of the 1st Sergeant and Buglers and duties performed.
- (p) Time of cease firing.
- (q) Signals.

*Platoon Leaders and Guides:*

- (a) Execution of the captain's commands and directions.
- (b) Announcement of correct sight setting.
- (c) Clearness in designation of target or aiming point.
- (d) Additional instructions given to carry out captain's will.
- (e) Correction of sight setting.
- (f) Designation of an aiming point.
- (g) Observation of fire effect.
- (h) Use of field glasses.
- (i) Orders to platoon guides.
- (j) Use of signals.
- (k) Constant communication between platoon leaders and captain.

- (l) Observation and regulation of the rate of fire.
- (m) Their positions.

*Corporals:*

- (a) Alertness for commands and signals. Proper transmission of signals.
- (b) Observation of the conduct of the squad.
- (c) Assistance in enforcing fire discipline and abatement of excitement.
- (d) Participation in the firing.
- (e) Their positions.

*The Privates:*

- (a) Use of cover.
- (b) Excitement or confusion.
- (c) Use of announced sight setting and changes directed.
- (d) Firing on designated objective or in the assigned sector and change of target when directed.
- (e) Readily responding to the signals, particularly "Commence," "Suspend," and "Cease Firing."
- (f) Unnecessary cessation of fire, particularly when bayonets were being fixed, sight setting changed, or when supports joined the firing line.

*(B) Judged from the Position of the Target.*

In order that the umpire may draw a more accurate conclusion of the "Leadership and Conduct," an assistant, accompanied by a competent signalist, should observe the troops, and report on their conduct, from the viewpoint of the enemy. When ball ammunition is not used the assistant should take a position similar to and among the targets. When ball ammunition is used, the assistant should be provided with a periscope (or improvised one), and take a position in the pit or on one flank and on line with the target. In order to aid the assistant who observes the troops from the position of the enemy, the following points may be noted, or a memorandum given him by the umpire:

Advance of troops discerned from noticeable effect of movement in the animal and plant life, from noises, or from sounds of the voice, bugle, or whistle.

Formations, preparatory to deployment.

Groups, exposed in observation.

Deployment, under fire.

Movements by the flank of units and individuals while under fire.

Concealment of the fire director and controllers and of the various parts of the line.

Cover of the troops while advancing.

Signals (flag, arm, and hand) and conclusions drawn from the particular signal observed. For example, SSS, AM, etc.

Location of the leader by observing messengers going to and from his position, or by location of signal flag near him, etc.

Individual movements, in rear of the firing line.

In order that the assistant observing the target may better make his report of the exercise, all umpires and observers near the troops will remain in rear of the line occupied by the leader and will attach a white pocket handkerchief over the crown of their head-dress.

## 2. Fire Effect.

DATA	TARGETS				
	1	2	3	4	5
<i>Accuracy</i>					
True range .....					
Estimated range .....					
Direct hits on assigned targets .....					
Ricochet hits on assigned targets ...					
<i>Distribution</i>					
Figures in target .....					
Figures hit (direct hits) .....					
<i>Volume</i>					
Number of men firing .....					
Number of shots fired .....					
Time .....					
Rate .....					
<i>Comparison—Average Shots</i>					
Figures hit .....					

General Comment.

3. *Was the Mission Accomplished?*

.....  
 .....  
 (Umpire)

## 2. THE STATISTICAL RECORD.

THE STATISTICAL RECORD, BY WHOM KEPT—ITS DISPOSITION—THE FORM FOR RECORD.

*By Whom Kept:*

The Statistical Record of combat firing is kept by the Statistical Officer under the direction of the Umpire.

*Disposition:*

The Statistical Officer makes such disposition of the records as the Umpire may direct.

*The Form:*

The form shown below is a convenient one, though no particular form is prescribed. It is believed, however, that the data included on this form are essential to a thorough analysis of any firing.

The columns headed "Target 1," "Target 2," etc., may be used to record the results on several targets, on a single target from several firing points, on several fractions of a single line, or, when the firing is at a single target from a single firing point, to record the results obtained by successive "orders," thus keeping, on a single sheet, the results of as many repetitions of the same exercise as there are columns in which to record them.

In case certain items of the record are found to be not pertinent to certain exercises, they may be omitted at the discretion of the Umpire.

Both the "Umpire's Record" and the "Statistical Record" should be printed on yellow or green unglazed paper in order to reduce the glare and resulting eye-strain when used in the bright unshaded sunlight of the target range.

## STATISTICAL RECORD OF COMBAT FIRING

Organization ..... Commanding.  
 Exercise..... Order..... School of Musketry,  
 Ft. Sill, Okla., ..... 19...



DATA

<i>Hits</i>	<i>Target 1</i>	<i>Target 2</i>	<i>Target 3</i>	<i>Target 4</i>	<i>Target 5</i>
Hits:					
Direct, in sector or on assigned objective .....					
Ricochet, in sector or on assigned objective .....					
Outside sector .....					
True range .....					
Visibility .....					
Estimated range .....					
Firing data used:					
Elevation .....					
Deflection .....					
Aiming point .....					
Figures in target:					
Number and kind in sector or objective .....					
Number per yard of front...					
Struck by ricochets only.....					
Struck outside sector or objective .....					
Center of impact .....					

## RESULT COMPARED WITH STANDARD

(Same time and strength)

	Standard	Result	Standard	Result	Standard	Result	Standard	Result	Standard	Result
Accuracy:										
Hits .....										
Distribution:										
Figures struck .....										
Volume:										
Rate .....										
Time .....										
Shots .....										
Men .....										
Ricochets included, yes or no .....										

## COMPARISONS ON OTHER BASES

(a) Comparative strengths .....										
(b) Comparative time .....										
(c) Hits expected for shots fired .....										
(d) Distribution ex- pected for hits made .....										

Remarks

.....  
Statistical Officer.

## STATISTICAL OFFICER'S SOURCES OF INFORMATION

THE INFORMATION REQUIRED BY THE STATISTICAL OFFICER  
FOR THE COMPLETION OF HIS RECORD IS OBTAINED, IN  
GENERAL, BY OBSERVATION—FROM THE UMPIRE—FROM

THE RANGE OFFICER—FROM THE COMMANDER OF THE FIRING UNIT—BY COMPUTATION.

*By Observation:*

Estimated range.

Firing data used.

Time.

*From the Umpire:*

Visibility.

Ricochets included, yes or no.

*From the Range Officer:*

True range.

Number of figures in target per yard front.

Number and kind of figures within the sector, or assigned objective.

Hits, direct and ricochet, obtained within and without the sector or assigned objective.

Figures struck within and without the sector, or assigned objective.

Figures struck by ricochets only.

Center of impact.

*From the Commander of the unit firing:*

Number of men firing.

Number of shots fired.

*By Computation:*

Such further entries as are required in the record, he obtains by computation.

#### ENTRIES IN THE RECORD

ENTRIES IN THE RECORD SHOULD INCLUDE HITS—TRUE RANGE—VISIBILITY—ESTIMATED RANGE—FIRING DATA USED—FIGURES IN THE TARGET—CENTER OF IMPACT.

*Hits:*

After the firing is completed and the targets have been marked, the Statistical Officer secures a record of the hits obtained, direct and ricochet, within and without the sector, or assigned objective, from the Range Officer or from the signal squad as is most convenient. In case the Statistical Officer's post is some distance from the signal station, then arrangements should be made to have this information sent to him promptly by messenger.

In case all the figures in the target lie within the limits of the objective or sector, then, obviously, there would be no entry on the line "outside sector."

Whether or not ricochets are to be scored and recorded separately will depend upon the nature of the

exercise and will be decided in each case by the umpire. However, it must be noted that the tables are based on direct hits only.

*True Range:*

This is obtained from the Range Officer and should be the result of an exact measurement, not an estimate.

*Visibility:*

The tables from which the standard of comparison is obtained, as explained hereafter, are based upon the hypothesis that the target or aiming point is clearly visible, thus expressing the probable maximum of expectancy.

When this condition does not exist—and it seldom does in field firing—it becomes necessary to modify the standard by reducing it to meet existing conditions. The amount of this reduction is termed the “visibility,” and is the opinion of the umpire expressed in terms of range. For example, the true range to a target being 600 yards, the umpire may estimate the visibility as “650.” That is to say, it is his belief that the conditions are such that the probable maximum result to be expected is the same as when firing at a clearly visible target at 650 yards, and that the standard is to be computed on that basis.

*Estimated Range:*

The estimated range may or may not agree with the sight setting announced.

During the progress of the exercise, the Statistical Officer remains in the vicinity of the commander of the unit engaged in the practice and, by close observation, learns the estimated ranges. Should the result of his observation leave him doubtful as to the correct figures, he may inquire of the unit commander after the firing is completed or at such other time as not to interrupt the progress of the exercise.

*Firing Data Used:*

Elevation.

Deflection.

Aiming point.

The Statistical Officer obtains this information in the same manner in which he obtains the estimated range, i. e., by observation and inquiry.

When an auxiliary aiming point is used, it is recorded briefly as “tree,” “bush,” “rock,” “house,” “hedge,” etc., and it sometimes may be of advantage also to note its

distance and direction from the target. This may be done by recording the distance (in miles) in Arabic numerals, followed by the direction (clock notation—target at center of vertical clock) recorded in Roman numerals. Thus "Tree-50-IV" would mean that the aiming point was a tree 50 miles from the target in the direction of four o'clock.

*Figures in Target:*

Number and kind in sector, or assigned objective.

Number per yard of front.

Struck by ricochets only.

Struck outside sector, or assigned objective.

This information is obtained by the Statistical Officer from the Range Officer. The first two items may be obtained from the statement of the exercise.

*Center of Impact:*

This information is obtained from the Range Officer or from the Signal Squad, as is most convenient. The Statistical Officer is informed as to whether the fire was equally distributed throughout the entire front of the target or was concentrated in one or more well-defined shot groups. The record should be brief, and, merely for the sake of uniformity, the following abbreviations are suggested. With reference to the target, R, L, and C refer to its right, left, and center.

Right .....	R
Left .....	L
Center .....	C
Right center quarter .....	RC/4
Left center fifth .....	LC/5
Center third .....	C/3
Right half .....	R/2
Distributed .....	Dist.

Should there be any apparent necessity for more precise information than can be given in this manner, it is better to divide the front of the objective into several parts and to obtain a separate record of the hits and distribution in each part. Certain exercises might require that a record be kept of the number of hits on each figure in the target. In such cases, this information would be recorded on a separate sheet and attached to the record, when entries in the body of the record might lead to confusion or misunderstanding.

## RESULT COMPARED WITH STANDARD

THERE ARE SEVERAL STANDARDS BY WHICH THE MATERIAL RESULTS OF COMBAT FIRING MAY BE JUDGED, BUT THE ONE HERE USED IS AN EXPRESSION OF THE PROBABLE RESULT TO BE EXPECTED FROM AN EQUAL NUMBER OF AVERAGE SHOTS FIRING AT THE CORRECT RATE AND WITH THE CORRECT ELEVATION AND FOR THE SAME LENGTH OF TIME.

ENTRIES UNDER STANDARD SHOULD INCLUDE HITS—FIGURES STRUCK—RATE—TIME—SHOTS—MEN—RICOCHETS INCLUDED, YES OR NO.

To compute the standard, the Statistical Officer must have at hand the following data:

Visibility,

Time, or endurance of the fire, in minutes,

Number of men firing, and

Number and kind of figures in the target.

An example will serve best to show the method of arriving at the standard.

Assume the following data: Range 500, Visibility 650, time 2 minutes, men 100, figures in target 100 kneeling.

*Hits:*

Consult Table I. In the left hand column, headed "Range Yards," find the figure "650" (visibility). Follow this 650 line to the right until entering the sub-column "Kneel" (kinds of figures in the target) in the column "No. of hits." Here is found the amount "1.074," which is the number of hits to be expected from one average shot in one minute. This amount multiplied by 2 (time) gives 2.148, or the number of hits to be expected from one average shot in two minutes. This product multiplied by 100 (men) gives 214.8, which is the number of hits to be expected from 100 men firing for two minutes and is the standard sought. Fractions less than  $\frac{1}{2}$  ordinarily are disregarded and so this would be recorded as 215.

*Figures Struck:*

Taking the probable number of hits (215) as the basis, first find the number of times each figure in the target would be struck on the average. As there are 100 figures in the target and there are 215 hits, then 215 divided by 100 would give the average number of hits per figure, or 2.15. Consult Table II. In the col-

umn "H" find the amount 2.15. Then the amount on the same line in the adjacent column "D" to the right expresses the percentage of figures in the target that should be struck with a fire equally distributed throughout the entire front of the objective. In the present instance the amount 2.15 is found in column H. Disregarding fractions less than  $\frac{1}{2}$  as equal to 1, the amount taken from column D is 88. As this amount expresses percentage only as it is a number that is sought, then 88 multiplied by the number of figures in the target (100) and this product divided by 100 will give the number of figures that should have been struck. In this case, as the number of figures in the target is an even 100, the number and percentage are the same, 88. Using the Umpire's Reference Table, Kneeling Figures, and interpolating for Range 650 in the 2-minute column, the percentage is found to be 88.

*Rate:*

The expected rate of fire, expressed in shots per man per minute, is found in Table I at the intersection of the line corresponding to the visibility 650 with the column headed "Rate of Fire." In this example it is 7.0.

*Time:*

The time recorded under "Standard" and under "Result" are identical, i. e., it is the actual duration of the fire in minutes.

The Statistical Officer often will find his computations simplified if, in recording the time, he will express fractional parts of a minute decimally instead of as seconds.

*Shots:*

This is the number of shots that would have been fired had the correct rate been used. Multiply the rate by the time and this product by the number of men.

In this example, 7 (the rate as found in the table) times 2 (the time in minutes) times 100 (the number of men firing) equals 1,400, which is the number of shots that should have been fired.

*Men:*

This is the number of men in the firing line who did or should have used their rifles in the exercise in question. The men recorded under "Standard" and "Result" are the same.

*Ricochets Included, Yes or No:*

Under certain conditions, it might be expected that a given number of ricochets would occur in addition to the direct hits found from Table I. In such a case, the Umpire would decide upon whether or not he desired to consider the ricochets separately and if so, he would notify the Statistical Officer as to the percentage to be expected. The recording of this amount as "20%," for example, under "Standard," would indicate that ricochets were to be included and that 20% were to be expected in addition to the direct hits. If the Umpire decides that ricochets are not to be considered, then the word "No" appears in place of the percentage.

In case ricochets are considered, the Statistical Officer increases the expected hits as found in the table by the percentage of ricochets as announced by the Umpire. He then uses this increased number of hits in his further computations.

THE ENTRIES UNDER RESULT SHOULD INCLUDE HITS—FIGURES STRUCK—RATE—TIME—SHOTS—MEN—RICOCHETS INCLUDED, YES OR NO.

*Hits and Figures Struck:*

These amounts are the ones obtained from the Range Officer as explained above, and include ricochets or not, as directed by the Umpire.

*Rate:*

This is the rate of fire actually obtained and is found by dividing the total number of cartridges fired by the product of the men and time.

*Time, Shots, Men:*

This is merely a record of fact as to the duration of the fire, the total number of shots fired, and the number of men in the firing line who did or should have used their rifles during the exercise.

*Ricochets Included, Yes or No:*

This is a statement as to whether or not the results recorded under hits and figures struck include ricochets. It would be unusual to include ricochets in the standard and not in the result, or vice versa.

COMPARISONS ON OTHER BASES SHOULD INCLUDE COMPARATIVE STRENGTHS—COMPARATIVE TIME—HITS EXPECTED FOR SHOTS FIRED—DISTRIBUTION EXPECTED FOR HITS MADE.

*Comparative Strengths:*

A given firing line produces a given number of casualties in the enemy's ranks (strikes a given number



of figures in the target) in a given time. What is sought then is how many riflemen of average ability, using the correct elevation and rate, and distributing their fire equally throughout the entire front of the target will be required to produce the same number of casualties in the same time.

This may be found from the "Umpire's Reference Tables," as previously explained, or, if more precise results are desired, by the solution of the following equation:

$$M_s = \frac{H \ N}{B \ T \ F}, \text{ in which}$$

M is the number of men (standard conditions) producing results.

H is an amount found from the distribution table, Table II, as hereinafter shown.

N is the number of figures in the target—within the sector, or assigned objective.

B is an amount found from Table I, as hereinafter shown.

T is the time or duration of the fire in minutes.

F is the number of figures in the target per yard of front.

To find the value of *H*, multiply the number of figures struck by 100 and then divide this product by the number of figures in the target. Consult Table II and find an equal amount to this quotient in Column D. The amount on the same line, in column H to the left, is the value of *H* sought.

Example:

Number of figures in target, 50.

Number of figures struck, 26.

Then  $26 \times 100 \div 50 = 52$ , and in the column D of Table II (fourth column from the left) is found the amount 51.8, which is the closest approximation to 52. In the column H to the left and on the same line is found the amount 0.73, which is the value of *H* sought.

To find the value of *B*, consult Table I. In the column "No. of Hits," select the appropriate sub-column depending upon the kind of figures (kneeling or prone) in the target. The value of *B* sought will be found at

the intersection of this sub-column with the line corresponding to the visibility.

Example:

Prone figures.

Visibility, 800.

Follow the 800 line to the right until entering the column "No. of hits, prone," there is found the amount .384, which is the value of B sought.

*Example of use of equation:*

Number of figures struck, 43.

Number of figures in target, 65 kneeling.

Visibility, 950.

Figures in target per yard of front,  $\frac{1}{2}$ .

Time, 2 minutes.

Substituting in the equation:

$$M_s = \frac{1.08 (H) \times 65 (N)}{0.474 (B) \times 2 (T) \times \frac{1}{2} (F)} = \frac{70.20}{.474} = 148.$$

That is, it would take 148 average shots, to strike 43 out of 65 kneeling figures in two minutes.

*Comparative Time:*

How much time should be used by average shots of a given number to strike a given number of figures?

This can be found, in the same manner as the comparative strength, from the Umpire's Reference Table, or, with greater precision, by a transposition of the above equation to read

$$T_s = \frac{H N}{B M F}$$

The values are the same as in the original equation except that  $T_s$  is the time or duration of the fire in minutes (standard conditions) producing equal results.

*Hits expected for shots fired:*

Consult Table I. Multiply the percentage of hits, as found on the line corresponding to the visibility, by the number of shots fired. The product is the number of hits expected for shots fired.

*Distribution expected for hits made:*

Solve as "figures struck" under "Standard."

STATISTICAL OFFICER'S TABLES

THE RATE OF FIRE AND THE PERCENTAGE AND NUMBER OF HITS, ON THE PRONE AND KNEELING FIGURES, EXPECTED AT EACH RANGE, ARE SHOWN IN TABLE I. THE PERCENTAGE OF FIGURES IN A LINEAR TARGET THAT SHOULD BE STRUCK BY AN EVENLY DISTRIBUTED FIRE, BASED ON THE AVERAGE NUMBER OF HITS PER FIGURE, IS SHOWN IN TABLE II.

TABLE I

Range Yards	Rate of Fire	% of Hits		No. of Hits	
		Prone	Kneel	Prone	Kneel
200	10.833	20.05	33.41	2.172	3.619
		<i>18.52</i>	<i>33.05</i>	<i>2.006</i>	<i>3.580</i>
250	10.416	16.78	29.19	1.748	3.041
		<i>16.01</i>	<i>28.61</i>	<i>1.668</i>	<i>2.980</i>
300	10.000	14.49	25.87	1.449	2.587
		<i>14.08</i>	<i>25.59</i>	<i>1.408</i>	<i>2.559</i>
350	9.583	12.91	23.40	1.237	2.242
		<i>12.89</i>	<i>22.41</i>	<i>1.235</i>	<i>2.148</i>
400	9.166	11.67	21.40	1.070	1.962
		<i>11.62</i>	<i>19.72</i>	<i>1.065</i>	<i>1.808</i>
450	8.750	10.79	19.88	.944	1.740
		<i>10.05</i>	<i>16.13</i>	<i>.980</i>	<i>1.411</i>
500	8.333	10.00	18.57	.833	1.547
		<i>8.30</i>	<i>12.86</i>	<i>.692</i>	<i>1.072</i>
550	7.916	9.30	17.35	.736	1.374
600	7.500	8.65	16.22	.649	1.217
650	7.083	8.05	15.16	.570	1.074
700	6.666	7.54	14.17	.503	.945
750	6.250	7.03	13.27	.439	.829
800	5.833	6.59	12.45	.384	.726
850	5.416	6.18	11.71	.335	.634
900	5.000	5.78	11.00	.289	.550
950	4.583	5.42	10.34	.248	.474
1.000	4.166	5.12	9.77	.213	.407

Amounts in italic indicate "battle sight."

The degree of precision desirable in the use of this table is dependent upon the duration of the fire and upon the amount of ammunition expended. In "Rate of Fire" and "No. of Hits," use one place of decimals when firing less than 5 minutes, two places when firing less than 10 minutes, and three places when firing more than 10 minutes. In "% of Hits," use no fraction when less than

100 shots are fired, one place of decimals when less than 1,000 are fired, and two places when more than 1,000 are fired.

The amounts in the body of the table under "Rate of Fire" indicate shots per man per minute when firing at the correct rate.

The amounts under "% of Hits" indicate the percentages of hits to be expected from average shots on lines of prone or kneeling figures occupying a frontage of one yard per figure. For different spacing of the targets, multiply the amount in the table by the number of figures per yard of front.

The amounts under "No. of Hits" indicate the number of hits to be expected from one average shot in one minute (correct rate and elevation being used) on lines of prone or kneeling figures occupying a frontage of one yard per figure. For different spacing of targets, multiply the amount given in the table by the number of figures per yard front.

The amounts in the body of the table are based upon the further supposition that the targets are clearly visible.

TABLE II

H	D	H	D	H	D	H	D	H	D
0.01	1.0	0.41	33.6	0.81	55.5	1.42	75.8	2.55	92.2
0.02	2.0	0.42	34.3	0.82	56.0	1.44	76.3	2.60	92.6
0.03	3.0	0.43	34.9	0.83	56.4	1.46	76.8		
0.04	3.9	0.44	35.6	0.84	56.8	1.48	77.2	2.65	92.9
0.05	4.9	0.45	36.2	0.85	57.3	1.50	77.7	2.70	93.3
0.06	5.8	0.46	36.9	0.86	57.7	1.52	78.1		
0.07	6.8	0.47	37.5	0.87	58.1	1.54	78.6	2.75	93.6
0.08	7.7	0.48	38.1	0.88	58.5	1.56	79.0	2.80	93.9
0.09	8.6	0.49	38.7	0.89	58.9	1.58	79.4		
0.10	9.5	0.50	39.4	0.90	59.3	1.60	79.8	2.85	94.2
								2.90	94.5
0.11	10.6	0.51	40.0	0.91	59.8	1.62	80.2		
0.12	11.3	0.52	40.5	0.92	60.2	1.64	80.6	2.95	94.8
0.13	12.2	0.53	41.1	0.93	60.6	1.66	81.0	3.00	95.0
0.14	13.1	0.54	41.7	0.94	60.9	1.68	81.4		
0.15	13.9	0.55	42.3	0.95	61.3	1.70	81.7	3.25	96.4
0.16	14.8	0.56	42.9	0.96	61.7	1.72	82.1	3.50	97.8
0.17	15.6	0.57	43.4	0.97	62.1	1.74	82.4		
0.18	16.5	0.58	44.0	0.98	62.5	1.76	82.8	3.75	98.3
0.19	17.3	0.59	44.6	0.99	62.8	1.78	83.1	4.00	98.7
0.20	18.1	0.60	45.1	1.00	63.2	1.80	83.5		
								4.50	99.0
0.21	18.9	0.61	45.7	1.02	63.9	1.82	83.8	5.00	99.3
0.22	19.7	0.62	46.2	1.04	64.7	1.84	84.1		
0.23	20.5	0.63	46.7	1.06	65.4	1.86	84.4	5.50	99.5
0.24	21.3	0.64	47.2	1.08	66.0	1.88	84.7	6.00	99.8
0.25	22.1	0.65	47.8	1.10	66.7	1.90	85.0		
0.26	22.9	0.66	48.3	1.12	67.4	1.92	85.3		
0.27	23.7	0.67	48.9	1.14	68.0	1.94	85.6		
0.28	24.4	0.68	49.4	1.16	68.6	1.96	85.9		
0.29	25.2	0.69	49.8	1.18	69.3	1.98	86.2		
0.30	26.0	0.70	50.3	1.20	69.9	2.00	86.5		
0.31	26.7	0.71	50.8	1.22	70.5	2.05	87.1		
0.32	27.4	0.72	51.3	1.24	71.1	2.10	87.7		
0.33	28.1	0.73	51.8	1.26	71.6	2.15	88.4		
0.34	28.8	0.74	52.3	1.28	72.2	2.20	88.9		
0.35	29.5	0.75	52.8	1.30	72.7	2.25	89.5		
0.36	30.2	0.76	53.2	1.32	73.3	2.30	90.0		
0.37	30.9	0.77	53.7	1.34	73.8	2.35	90.4		
0.38	31.6	0.78	54.2	1.36	74.3	2.40	90.9		
0.39	32.3	0.79	54.6	1.38	74.8	2.45	91.4		
0.40	32.9	0.80	55.0	1.40	75.3	2.50	91.8		

If every figure in the target is hit *H* times on the average, then from table, *D* per cent of the figures will be hit.

## INFANTRY DRILL REGULATIONS

*Arm Signals*

43. The following arm signals are prescribed. In making signals either arm may be used. Officers who receive signals on the firing line "repeat back" at once to prevent misunderstanding.

*Forward, march.* Carry the hand to the shoulder; straighten and hold the arm horizontally, thrusting it in direction of march.

This signal is also used to execute quick time from double time.

*Halt.* Carry the hand to the shoulder; thrust the hand upward and hold the arm vertically.

*Double time, march.* Carry the hand to the shoulder; rapidly thrust the hand upward the full extent of the arm several times.

*Squads right, march.* Raise the arm laterally until horizontal; carry it to a vertical position above the head and swing it several times between the vertical and horizontal positions.

*Squads left, march.* Raise the arm laterally until horizontal; carry it downward to the side and swing it several times between the downward and horizontal positions.

*Squads right about, march* (if in close order) or, *To the rear, march* (if in skirmish line). Extend the arm vertically above the head; carry it laterally downward to the side and swing it several times between the vertical and downward positions.

*Change direction or Column right (left), march.* The hand on the side toward which the change of direction is to be made is carried across the body to the opposite shoulder, forearm horizontal; then swing in a horizontal plane, arm extended, pointing in the new direction.

*As skirmishers, march.* Raise both arms laterally until horizontal.

*As skirmishers, guide center, march.* Raise both arms laterally until horizontal; swing both simultaneously upward until vertical and return to the horizontal; repeat several times.

*As skirmishers, guide right (left), march.* Raise both arms laterally until horizontal; hold the arm on the side of the guide steadily in the horizontal position; swing the other upward until vertical and return it to the horizontal; repeat several times.

*Assemble, march.* Raise the arm vertically to its full extent and describe horizontal circles.

*Range, or Change elevation.* To announce *range*, extend the arm toward the leaders or men for whom the signal is intended, fist closed; by opening and closing the fist, expose thumb and fingers to a number equal to the hundreds of yards; to add 50 yards describe a short horizontal line with forefinger. To *change elevation*, indicate the *amount of increase or decrease* by fingers as above; point upward to indicate increase and downward to indicate decrease.

*Suspend firing.* Raise and hold the forearm steadily in a horizontal position in front of the forehead, palm of the hand to the front.

*Cease firing.* Raise the forearm as in *suspend firing* and swing it up and down several times in front of the face.

*Platoon.* Extend the arm horizontally toward the platoon leader; describe small circles with the hand. (See par. 44.)

*Squad.* Extend the arm horizontally toward the platoon leader; swing the hand up and down from the wrist. (See par. 44.)

*Rush.* Same as *double time*.

44. The signals *platoon* and *squad* are intended primarily for communication between the captain and his platoon leaders. The signal *platoon* or *squad* indicates that the platoon commander is to cause the signal which follows to be executed by platoon or squad.

## INFANTRY DRILL REGULATIONS

CHANGES }  
No. 14. }

WAR DEPARTMENT,

Washington, May 18, 1916.

Paragraph 43, Infantry Drill Regulations (corrected to November, 1913), is changed as follows:

Insert after eighth line, page 19, the following:

*What range are you using? or What is the range?*  
Extend the arms toward the person addressed, one hand open, palm to the front, resting on the other hand, fist closed.

*Are you ready? or I am ready.* Raise the hand, fingers extended and joined, palm toward the person addressed.

*Commence firing.* Move the arm extended in full length, hand palm down, several times through a horizontal arc in front of the body.

*Fire faster.* Execute rapidly the signal "Commence firing."

*Fire slower.* Execute slowly the signal "Commence firing."

*To swing the cone of fire to the right, or left.* Extend the arm in full length to the front, palm to the right (left); swing the arm to right (left), and point in the direction of the new target.

*Fix bayonet.* Simulate the movement of the right hand in "Fix bayonet" (paragraph 95).—C. I. D. R., No. 14, May 18, 1916.

CHANGES }  
No. 13. }

WAR DEPARTMENT,

Washington, February 4, 1916.

Paragraph 47, Infantry Drill Regulations (edition approved August 19, 1911, and edition corrected to November, 1913), as amended by C. I. D. R. No. 9, W. D., 1914, is rescinded and the following substituted therefor:

47. (1) For communication between the firing line and the reserve or commander in the rear, the subjoined signals (Signal Corps codes) are prescribed and should be memorized. In transmission, their concealment from the enemy's view should be insured. In the absence of signal flags, the headdress or other substitute may be used.



Letter of alphabet	If signaled from the rear to the firing line	If signaled from the firing line to the rear
A M . . . . .	Ammunition going forward.	Ammunition required.
C C C . . . .	Charge (mandatory at all times).	Am about to charge if no instructions to the contrary.
C F . . . . .	Cease firing . . . . .	Cease firing.
D T . . . . .	Double time or "rush" . .	Double time or "rush."
F . . . . .	Commence firing . . . . .	Commence firing.
F B . . . . .	Fix bayonets . . . . .	Fix bayonets.
F L . . . . .	Artillery fire is causing us losses.	Artillery fire is causing us losses.
G . . . . .	Move forward . . . . .	Preparing to move forward.
H H H . . . .	Halt . . . . .	Halt.
K . . . . .	Negative . . . . .	Negative.
L T . . . . .	Left . . . . .	Left.
O . . . . .	What is the (R. N. etc.) ? Interrogatory.	What is the (R. N. etc.) ? Interrogatory.
(Ardois and semaphore only.)		
— — — — —	What is the (R. N. etc.) ? Interrogatory.	What is the (R. N. etc.) ? Interrogatory.
(All methods but ardois and semaphore.)		
P . . . . .	Affirmative . . . . .	Affirmative.
R . . . . .	Acknowledgment . . . . .	Acknowledgment.
R N . . . . .	Range . . . . .	Range.
R T . . . . .	Right . . . . .	Right.
S S S . . . .	Support going forward . .	Support needed.
S U F . . . .	Suspend firing . . . . .	Suspend firing.
T . . . . .	Target . . . . .	Target.

(2) THE TWO-ARM SEMAPHORE CODE

(See illustrations on page 295)

CAVALRY SERVICE REGULATIONS

CHANGES }  
No. 2. }

WAR DEPARTMENT,

Washington, February 4, 1916.

The Cavalry Service Regulations (Experimental), 1914, are changed as follows:

Appendix B, pages 329 and 330, as amended by C. C. S. R., No. 1, W. D., 1915, is rescinded and the following substituted therefor:

*Appendix B*

1. SEMAPHORE CODE FOR CAVALRY

- A M ..... Ammunition going forward (if signaled from the rear to the front).  
                     Ammunition required (if signaled from the front).
- C C C ..... Charge (if signaled from the rear to the front).  
                     About to charge if no instructions to the contrary (if signaled from the front).
- C F ..... Cease firing.
- D T ..... Double time, rush, or hurry.
- F ..... Commence firing.
- F L ..... Artillery fire is causing us losses.
- G ..... Move forward (if signaled from the rear to the front).  
                     Preparing to move forward (if signaled from the front).
- H H H ... Halt.
- K ..... Negative.
- L T ..... Left.
- M ..... Bring up the horses (if signaled from front to rear).  
                     Horses going forward (if signaled from rear to front).
- O ..... What is the (R. N., etc.)? Interrogatory. (Ardois and semaphore only.)
- What is the (R. N., etc.)? Interrogatory. (All methods but ardois and semaphore.)
- P ..... Affirmative.
- R ..... Acknowledgment.
- R N ..... Range.
- R T ..... Right.
- S S S ..... Support going forward (if signaled from the rear to the front).  
                     Support needed (if signaled from the front).
- S U F ..... Suspend firing.
- T ..... Target.

2. THE TWO-ARM SEMAPHORE CODE  
 (See illustrations on page following.)





