VOLUME VII NUMBER 3

JULY-SEPTEMBER

THE FIELD ARTILLERY JOURNAL

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THE UNITED STATES FIELD ARTILLERY ASSOCIATION

WASHINGTON, D. C.

Contents
No. 3

PAGE

Coöperation Between Balloons and Artillery **233**
Major D. Rainsford Hannay, Royal Flying Corps, British Army.

A Yale Field Artillery School **242**
Captain Robert M. Danford, U. S. Field Artillery

Scheme for Field Artillery Training **252**

Pages from the Diary of a French Artilleryman **275**
Translated by Lieutenant George Nestler Tricoche, formerly of the French Artillery

Artillery in Europe **294**
Major M. E. Locke, 8th Field Artillery

Spotting Practice for Field Artillery **302**
I.-I.

Computation of Firing Data **307**
Second Lieutenant F. Fielding-Reid, 12th Field Artillery

Recording Firing Data **312**
Captain Sherman Miles, General Staff, U. S. Army

Wooden Guns in War Time **316**
Second Lieutenant Earl C. Moore, First Indiana Field Artillery

Duties of a Subaltern Officer in France **318**
Second Lieutenant R. P. Prentys, R. F. A.

Observation Stations **322**

Machines for Trench Digging **329**

Destruction of Barbed-Wire Entanglement **332**

Designation of Targets **335**
Major Oliver L. Spaulding, Second Field Artillery

Wooden Horses for Training Recruits **337**

Current Field Artillery Notes **339**

Editorial **355**
The Artillery
Yale and the Field Artillery
Organization and Training
A Chief of Field Artillery

Book Reviews **364**

Index to Current Field Artillery Literature **370**

Exchanges **382**

A SERVIAN ROCKET-MAN. HE SIGNALS THE ARTILLERY TO OPEN FIRE

THE FIELD ARTILLERY JOURNAL

VOL. VII JULY-SEPTEMBER, 1917 NO. 3

Coöperation Between Balloons and Artillery

BY MAJOR D. RAINSFORD HANNAY, ROYAL FLYING CORPS, BRITISH ARMY

IT is a very well-known axiom in war that the closest coöperation between the various arms is necessary to secure the best results; and, when it comes to the question of captive balloons observing for artillery, the more that each unit knows about the methods of, and the difficulties experienced by, the other the better.

I propose, therefore, in this number of the FIELD ARTILLERY JOURNAL to describe the working of a balloon section of the British Army in the field.

As regards organization, the balloon service of the Royal Flying Corps is divided into wings, companies, and sections. A section consists of four officers and 90 men and works one balloon. A company consists of two sections. A wing consists of all the companies in any one army.

The balloon now in use in the field is a streamline balloon, the invention of Captain Caquot, of the French Army. It has a cubic capacity of 950 cubic metres and is capable of lifting two observers to a height of 4000 feet. Each section is provided with a mobile winch, the engine of the winch being quite separate from the engine of the truck on which the winch is mounted. Theoretically, the balloon should be let up from the ground at

a considerable distance behind the lines and then run forward on the winch with the balloon high up in the air; but, in practice, it is found that there are very few roads left near the lines which are fit for a heavy truck, and, even if one is found, it is probably too congested with traffic. Owing to these reasons, the majority of balloons, in France, are stationary, at an average distance of about 6000 yards behind the line. Where sections have been able to move their winches forward, they have got within 4000 yards of the front line.

As regards observation of fire, the work of the balloon observer is chiefly with the heavier pieces of artillery, such as the

6-inch howitzers and the 4.7-inch guns,

8-inch howitzers and the 60-pounder guns,

9.2-inch howitzers and the 6-inch guns,

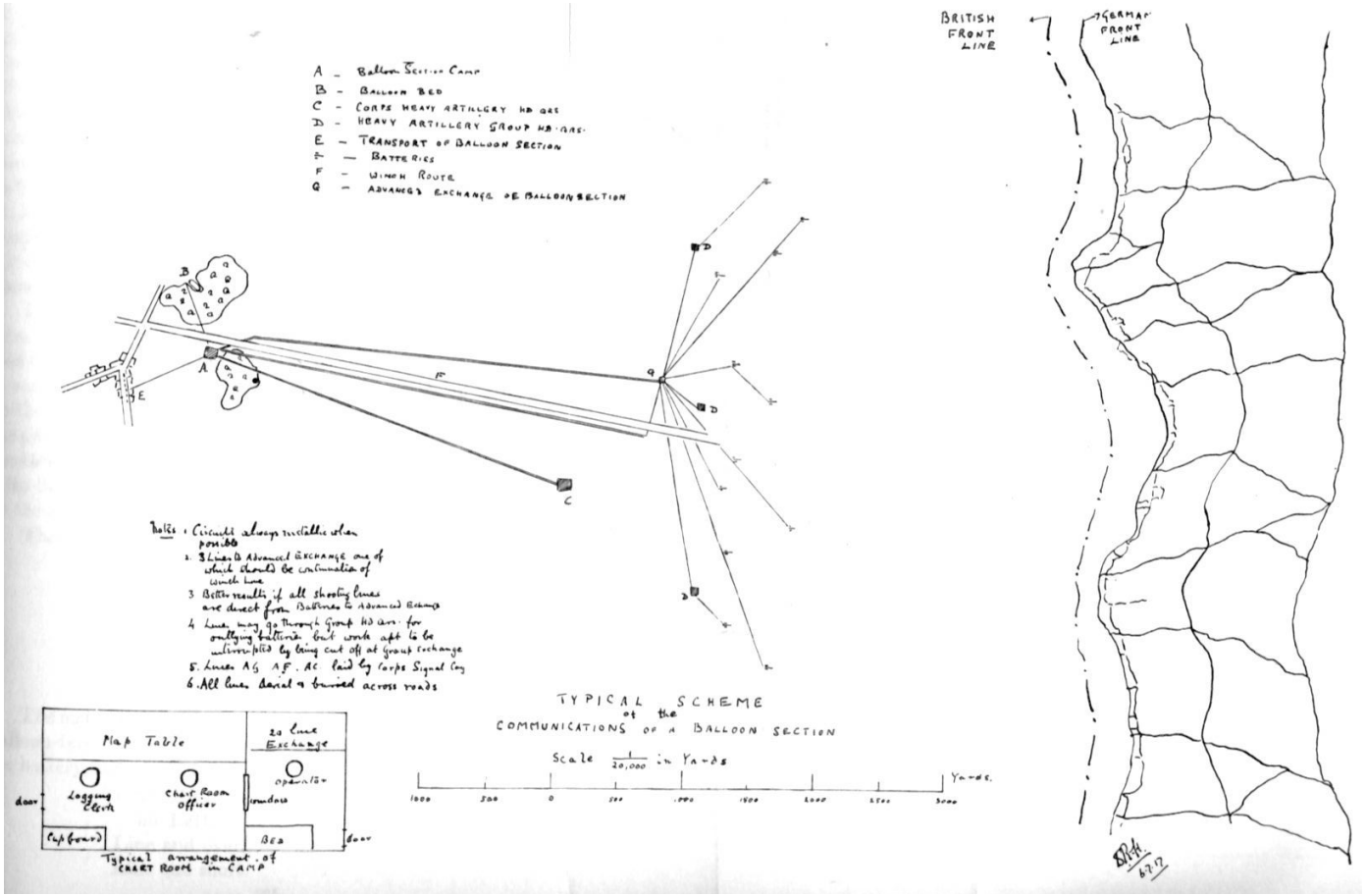
12-inch howitzers,

15-inch howitzers.

In the earlier days of the war, when there were fewer heavy batteries, balloons used to observe for Field Artillery; but, owing to the great increase of the howitzer batteries, and, also, to the somewhat altered rôle of the Field Artillery, very little work is done with them nowadays. In order to avoid confusion, Field Artillery in the British Army consists of only 18-pounder guns and 4.5-inch howitzers.

The balloon section is connected by telephone to all the batteries with which it is likely to work. The sketch gives a typical communication scheme of a section in the field. The upkeep of the telephone service is most important, and it is necessary that batteries should give as much mutual assistance as possible. Unless the lines are working well, the balloon might as well be on the ground, for all the good it can do. An advantage which a balloon has over an airplane, and one that compensates for a great many of the disadvantages, is the fact that the observer in the basket can talk direct by telephone to the battery commander on the ground, and does not have to confine himself

FIG. 1.


A – Balloon Section Camp
B – Balloon Bed
C – Corps Heavy Artillery HQ
D – Heavy Artillery Group HQ
E – Transport of Balloon Section
F – Winch Route
G – Advanced Exchange of Balloon Section
Notes: Circuits always metallic when possible
1. 3 lines to Advanced Exchange one of which should be continuation of winch line
2. Lines to Advanced Exchange
3. Better results if all shooting lines are direct from Batteries to Advanced Exchange
4. Lines may go through Group HQ exchange for outlying batteries but work apt to be unintelligible by being cut off at Group Exchange
5. Lines A.G. A.F. A.C. laid by Corps Signal Coy
6. All lines buried & trenched across roads
TYPICAL SCHEME of the COMMUNICATIONS OF A BALLOON SECTION
Scale 1/20,000 or Yards
Map Table
20 Line Exchange
Logging Clerk
Chart Room Officer
Operator
window
door
Bed
Typical arrangement of CHART ROOM in CAMP
BRITISH FRONT LINE
GERMAN FRONT LINE

to a limited code as used on the wireless. To refer to the sketch, all the telephone lines shown, with the exception of those to Corps Heavy Artillery Headquarters, are the shooting lines of the section, and are used only when observing for, or when arranging shoots with, batteries. Lines lead from the balloon camp exchange to an advanced exchange which is placed in a central position among the batteries. Now when the balloon is in the air, it is connected by a telephone cable to the winch, which is, in turn, connected by aerial line to the camp exchange, and, tapped in on this line, is the chart room of the section, where all the map work and the arranging of shoots with batteries are done.

I have purposely enlarged on the communications of a section for this reason: although the greater part of the lines are laid by the signal companies, when once laid, the balloon section is responsible for their upkeep, and it will be seen, on referring to the sketch, that it is a pretty big job for the small telephone detachment allotted to a balloon section. Therefore it is of the greatest help when batteries assist, as much as is in their power, with the laying and maintenance of the line from their position to the advanced exchange (see Fig. 1).

The work chiefly allotted to the balloon consists of:

1. Destruction of villages;
2. Destruction of strong points behind the line;
3. Registering on cross roads;
4. Registering on exits from villages, woods, and ravines;
5. Counter-battery work.

The method of observation employed is to observe on the line balloon-target, and, by the use of graticuled glasses, to send to the battery such observations as

1° 20′ Right,
30′ Left,
Line and over,
Line and short.

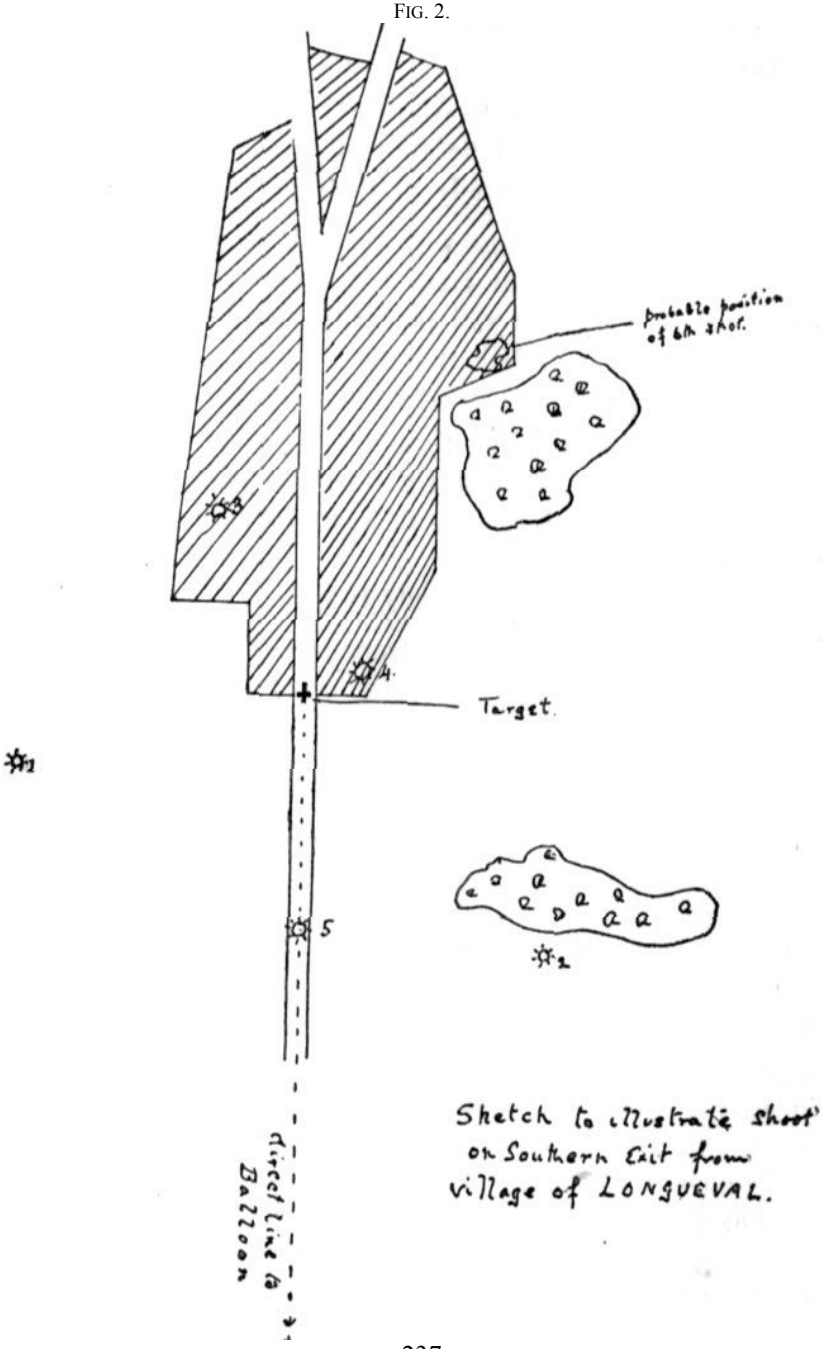
Artillery officers will fully realize that it is not advisable to give observations as regards range until the battery drops a shell fairly close to the balloon-target line. Then, when the observer is able to check the range, the battery commander will register by the bracket system, always remembering that to keep his shells falling on the line balloon-target it will be necessary for him to give deflection for each increase or decrease in the range ordered on the guns. This deflection varies according to the size of the apex angle in the triangle balloon-target battery.

The chief object of the observer is to describe to the battery commander briefly, but clearly, the position of each shot. This can frequently be done with reference to surrounding objects in the vicinity of the target which are shown on the map. For instance, even when a shot does fall wide of the target, it may be possible to check the range owing to its falling short or over some other object on the map, such as a road, stream, small wood, etc. Here the observer would give such an observation as, "40′ right and short of the small wood N. E. of the target." Such information as this is, of course, very valuable to the battery commander, as he can alter his range and deflection at the same time and thus save both time and ammunition.

I will try and describe a typical shoot on a fixed target, let us say the southern exit from a village including the houses on each side of the road. The night before the O. C. Balloon Section No. 24 (code word HAWK; code words are always used when telephoning near the lines in France) arranges to observe for No. 64 Siege Battery, 12-inch howitzers on railway mounting (code word BRASS) on the southern extremity of the village of Longueval, as soon as visibility permits (see Fig. 2). When the balloon goes up, and the observer is ready, and can clearly see the target, he sends the following information through the chart room to the battery:

1. Position of balloon. This is done by dropping a small plumb line about 20 feet long over the side of the

FIG. 2.



Sketch to illustrate shoot on Southern Exit from village of LONGUEVAL.

basket and noting the exact spot over which the basket is hanging.

2. Height of balloon in feet.
3. Strength and direction of wind.
4. When he is ready to observe.

He should also arrange with the battery commander as to the exact reference point from which he will give his observation. In this case he will probably use the spot where the road joins the houses of the village.

The battery will then send to the balloon:

1. Time of flight of shell.
2. Nature of projectile. In this particular case there can be no question, as a 12-inch howitzer fires only high explosives.
3. When they are ready to fire.

When both observer and battery report they are ready, the battery will send, "Stand by," and the observer will then give, "Ready." As soon as "Ready" is received by the battery, the guns will be fired at once and "Gun fired" will be sent to the balloon.

When the battery sends "Gun fired," the chart room officer sets his stop-watch going and says, "Gun fired," to the observer, then, at the correct time: "10 seconds to burst"; "5 seconds to burst"; "4"; "3"; "2"; "1"; "Burst."

This relieves the observer in the balloon of watching with his glasses the whole time. He must keep his eyes fixed on the target, but need not strain them by peering through his glasses during the whole time of flight. When he hears "10 seconds" he gets ready, and at "5" puts them up.

As soon as he sees the burst the observer should make up his mind as quickly as possible what observation he will send down; first impressions are always best in balloon observations. This is sent down to the chart room officer, who passes it on to the

battery. In practice it has been found best for all observations to be passed through the chart room. There is always an officer on duty there, and it is his job to help the observer, and also to check his observations and query any which seem ambiguous or erroneous.

Let us say the first observation is:

"First Shot—30 minutes left."

"Short" or "over" is not given, as, the shot being wide of the target, the observer cannot say for certain.

"Second Shot—20 minutes right and short of the small wood S. E. of the target."

"Third Shot—5 minutes left and over; apparently hit a house, large cloud of red brick dust.

"Fourth Shot—5 minutes right; struck house just to right of target."

"Fifth Shot—Line and short on the road."

"Sixth Shot—Unobserved, but smoke and dust rising 10 minutes right and over from centre of village."

"Unobserved" should always be sent if the actual burst is not seen. Batteries must expect to get a number of unobserved shots, and must not get impatient with an observer who sends down several of them, as it is just as likely to be the fault of the battery as that of the observer. Also, the battery will know they are working with an honest and truthful observer and not with an overconfident or nervous one; both of these types are capable of sending down anything, so long as it is something.

And so the shoot proceeds until the target is registered, when registration is taking place, or demolished if the battery is shooting for effect.

The above is a typical shoot on a normal and fixed target.

We will now discuss counter-battery work, which is perhaps the most important of the work allotted to balloon sections. To remove any possible doubt at the outset, a balloon cannot observe for a destructive shoot (that is to say, it cannot see the emplacements of a hostile battery); but what a balloon can and does do

every day in France is to observe the flashes of hostile guns and note down as accurately as possible the map position, and, by ranging a battery on these flashes, to stop him firing. The procedure is as follows:

The observer sees the flashes of a hostile battery. As quickly and as accurately as possible he notes their map position. (Map reading from balloons is quite the most important part of a balloon observer's training.) This reading is sent down to the chart room officer, who will check it with the records showing the position of all hostile batteries which had been previously reported. He will, if necessary, check the position of the flashes in conversation with the observer. When satisfied, the chart room officer will get in touch with the counter-battery group headquarters and inform them about the flashes. A battery will be detailed to engage the hostile battery. The chart room officer will get in touch with this battery through the advanced exchange, and, in a very short space of time, the hostile battery should be engaged and its activity stopped.

When reporting hostile flashes the observer will endeavor to locate the ground in our lines which is being shelled. This information should always be reported to the heavy artillery headquarters, as it helps in ascertaining the arcs of fire of the hostile batteries.

A balloon observer can observe for shrapnel by the following method:

When he sees the burst of the shell he first notes direction, say, 30 minutes right of the target, and then the height of the burst above the line of sight balloon-target in a vertical plane; this enables the battery commander to correct his fuze as well as his range and deflection. It is obvious that nothing should be said about range when reporting an air burst. An observation for time shrapnel would be sent like this: "30 minutes left and air over 20 minutes." The height above the line of sight can be gauged by the vertical graticules in the binoculars.

The balloon section should coöperate as much as possible with the airplane squadron attached to the corps for artillery observation, and, whenever possible, the officer commanding the corps squadron and balloon section should meet the G. O. C. Corps Artillery the previous evening to arrange the work of the succeeding day. When active operations are taking place it is often possible to have certain batteries placed at the direct call of the balloon, when the latter observes an active hostile battery, or a fleeting target such as transport, on the road. This method tends to greater speed and to a closer touch between batteries and observers. Balloon observers frequently visit the batteries with which they work, and it is a strict order that, if anything goes wrong during a shoot, or if the shoot is unsuccessful in any way, the observer must, as soon as he comes down, visit the battery and find out what has happened at the battery end and work things out with the battery commander so that no mistakes will happen the next time.

Artillery officers must realize that mist, wind, and the position of the sun all militate against good balloon observing, and they should not press the observer to "have a try," or, "Well, do your best," when he has once said that he cannot observe on the desired target.

Dead ground is also a handicap in balloon observation. Batteries should not ask balloons to observe on targets which, for instance, are situated just behind a large wood or at the bottom of a ravine. All balloon sections have maps prepared with all dead ground at the normal range and normal height shaded in, so batteries can always be previously informed if any particular target is invisible to the observer.

In conclusion, balloons have thoroughly proved their value in France and have relieved the airplanes of a great deal of artillery observation work. To get the best results artillery officers must appreciate both a balloon's powers and its limitations, and then by thorough coöperation much excellent work can be done.

A Yale Field Artillery School*

BY CAPTAIN ROBERT M. DANFORD, U.S. FIELD ARTILLERY

I SHALL ever look back to my year and a half at Yale as being the most inspiring service of my life. I feel that the military work at the University during this period has been successful to a degree, but I know just as certainly that its success can in no way be ascribed to me. Any officer in our army, interested in his profession, would have witnessed the same results. It has simply been my good fortune, and I have been honored to be identified with the work.

Its success is to be ascribed to your own President Hadley, whose marvellous grasp of our military problems first came to my attention in reading his annual report of two years ago. It is impossible for me to express the appreciation I feel toward President Hadley for the way in which he has so cordially afforded me every possible assistance. I have often felt that his has been all the worry and mine all the glory, in the work of the military department. The success of the work is to be ascribed to your own A. C. Goodyear, who told me, "We'll go ahead with the armory now, and ask for contributions to pay for it later"; it is to be ascribed to your own E. B. Reed, who has been a leader and a participant in all the work, who is always ready, either with labor or counsel, to do far more than his part in making it a success; it is to be ascribed to your own Faculty, who, over ninety strong, have been taking the drills and have been setting an example in fitting themselves for military service; it is to be ascribed to your own selves, alumni of Yale, who for the past two years have been keenly awake to the military needs of our nation, to the dangers that threatened us, to the vital mistakes in our traditional military policies, and who have therefore been such ardent and insistent apostles of preparedness; and last, but not least, it is to be ascribed to

* Address delivered before the Yale Club of New York.

AUSTRIAN FIELD ARTILLERY IN BUKOWINA

your own successors, the men of Yale of to-day, who would have made a military leader out of any officer who could wear the uniform, so eager have they been to follow. It is they who have set the pace; it is I who have had to struggle to keep from falling behind them. I have always felt the keenest pride in them; I have often looked on them with a sort of fatherly joy, as I said to myself, "They are the finest bunch of lads in the world." My only regret is that Potter, Moretti, and I have been unable, on account of their numbers, to give them all that they have deserved.

A SURVEY OF THE FUTURE

You are all familiar in a general way with the military history of Yale for the past year and a half. I, therefore, am going to confine my remarks, for the most part, to a survey of the future, and to a recital of the way in which you can push the work alone and assist in its continuous improvement. It will always be a matter of keen regret to Potter, Moretti, and myself, that we have had to leave before the work was really under way. We go, leaving that much-coveted new armory unused; we go just as the University is building Artillery Hall, a structure especially adapted to the work of the Training Corps.

The course of instruction prescribed by the War Department for field artillery units of the R. O. T. C. is, in my judgment, a most excellent one. It may seem strange, but it is true nevertheless, that by specializing on the field artillery, a Yale man will have had more than twice as much technical field artillery training as a cadet who graduates from West Point. We field artillerymen, therefore, are of the opinion that in Yale we are to have a Field Artillery School that will add tremendously to the efficiency of our branch of the service.

The Faculty has voted the field artillery course a total of seven hours out of sixty-two toward the A.B. degree. Is it worth it? In my judgment, if it is thoroughly and efficiently

handled by a sufficient number of instructors, it most decidedly is. I feel certain that after the course is organized and running smoothly according to the adopted schedule, those who take it, no matter whether they go into business or professional life, will look back upon it as one of the most valuable in their college course. I mean valuable in an educational way, in a moral way, in a physical way—and then, besides that, it definitely fixes a college man's status, so that in case his country is involved, as it is to-day, he will not have to go about asking or writing an overwhelmed War Department where and how he can best do his bit, but he will be a part of an organization that has been perfected and completed in time of peace, and therefore will be enabled to go quietly and without confusion to his appointed and proper place, and take up the big duties that the hour demands.

THE PRESCRIBED R. O. T. C. COURSE

The course as prescribed extends over the entire four years. In the freshman year it is our plan to take the young man and begin the process of straightening him up. We are told that the college men of to-day are, as a class, drooped, round-shouldered, and sunken-chested. The work of our first year is designed to get those rounded shoulders back, those sunken chests pushed out, and those drooping bodies straightened. The subject of personal hygiene and camp sanitation (valuable to a man in any walk of life) is taken up, and the student is impressed with the fact that disease and neglect kill more soldiers in war than are killed by bullets. He is impressed with the fact that the soldier, especially the officer, must keep himself physically fit, which means clean, moral living, and the avoidance of all forms of dissipation. The officer must learn how to build up his strength, condition himself, conserve his energies, so that when the real test comes he may draw unreservedly on his strength and powers of endurance, in order the more efficiently and effectively to watch over and care for

the men, whose lives might otherwise be sacrified on the altar of his physical unfitness as well as his professional deficiencies.

In the freshman year the fast, precise drills of the cannoneer are designed to develop mental as well as physical alertness, and in this valuable training they are most successful. In his first camp the student is a member of a gun squad, and in that capacity serves the guns in his first target practice.

In the sophomore year our energies will be confined to specializing on the horse, how to ride him and how to drive him in an artillery team. Our new armory is a model in its facilities for instruction in equitation and driving. Our drill regulations are correct in stating, "It is essential that the field artillery officer have a thorough and practical knowledge of how to care for, condition, and train the horses under his charge. Deficiency in this knowledge will result in needless and avoidable wastage of horses in time of war." In his second camp our Yale field artillery student acts as a driver and gets practical experience in the handling of horses on the march and in the field.

As a junior, he is appointed to noncommissioned rank and acts as a drill-master over the freshmen. How valuable this is to any young man came to my attention very forcibly only a short time ago. Immediately after the Easter vacation it became necessary to expand our drilling organization from 250 to nearly 1600 men. Fifty-nine men had to be appointed to the responsible grades of Captain and Lieutenant. In considering the men for these appointments, Captains Potter, Moretti, and I shook our heads over some of the names, but many of those whom we feared could not handle the job had to be appointed. In not a single case were we disappointed. The responsibility which was thus suddenly thrown upon them developed them with amazing rapidity. No man relishes getting out in front of forty to eighty of his fellows and making a fool of himself. The previous training which these men had received at Tobyhanna gave them confidence in themselves;

they studied their drill books carefully, and their mistakes were remarkably few in number.

In the junior year are taken up the more technical subjects, such as field artillery gunnery, with its interesting problems in mathematics, probabilities and principles of fire, the determination and calculation of firing data, use of the battery and battalion commander's details, range finding, sketching, map reading, map making, etc. In camp the junior will get his first opportunity to conduct the service firing of a battery, having been coached up to it through sub-calibre and smoke bomb practice. Besides being intensely fascinating, service firing affords training of unusual value, because it so strikingly places a premium on the man with the cool head, good judgment, and quick decision.

In his senior year the Yale field artillery man will study the tactics of the various arms; he will have map problems and the war game; he will study organization and administration as well as military and international law. In short, the R. O. T. C. course at Yale is going to be a course in efficiency that, in my judgment, will be a most valuable part of a college education.

FIELD ARTILLERY TRAINING NEEDS

Our needs and how you can help us:

1. It is absolutely essential that army officers be detailed in the proportion of one for every one hundred students in the course. Any kind of a course in any subject is valueless without a proper number of qualified instructors. The proportion referred to is that allowed by law, but at the present time we do not have the officers. We should have them after the war, and, with Yale's power of persuasion, I am sure the War Department will see fit to detail them.

2. We must have a sufficient supply of up-to-date equipment. We are just now terribly disappointed over the fact that our R. O. T. C. cannot have a camp this summer. The University was prepared to go the limit in expense to provide

this camp, but the reason is because we cannot have equipment. The universities that took up infantry units of the R. O. T. C. are not so unfortunate, because the shortage in infantry equipment is not so serious. It was only a short time ago that we had but 30 per cent. of the guns and ammunition required for an army of 500,000 men. Our deficiencies should not be so great after the war, and, at that time, besides having enough light guns for our battery drills, Yale should be provided with one of each and every type of field gun and howitzer in our service. Artillery Hall has been designed with that end in view. There is a place reserved there for each one of these types of field artillery. The War Department must also be persuaded to issue us at least one of the tractors that have been adopted for drawing our heavy field guns, so that we may thoroughly understand the maneuvering and handling of our heavy field batteries.

3. We must have horses. The armory has been designed to stable 120 animals, the number required to equip completely one battery. We must be able to have week-end marches into the country with an over-night bivouac; we must be able to haul the guns down to the shore for sub-calibre practice out on the Sound; we must be able to have those thrilling, spectacular, mounted drills; we must be able to turn out a real battery on occasions of ceremony, with our horses' hoofs blacked, their manes and tails rosetted in red and blue, carriages shining—a spick and span, smart, snappy organization, in which every person connected with the University will take a keen and justifiable pride. All this means horses. The War Department will have them after the war, and Yale can get them, I believe, for the asking. To take care of the horses will require a detachment of forty colored enlisted men, such as we have at West Point and the Service Schools. The armory has been built with quarters for these men, and I feel sure the War Department can be persuaded to furnish them.

4. Each summer our authorized camp of six weeks should

be put in at the centre of field artillery activity—that is, at the Fort Sill School of Fire, which, unhappily and most unfortunately, at the present moment is not open. There is no reason, except the matter of slightly increased expense, why our Field Artillery R. O. T. C.'s should not have their camp at the School of Fire, where the maximum benefit would be derived.

5. Artillery Hall must be fitted up. This we will probably have to ask friends of Yale to do, but the cost will be trifling. Thus we shall need maps and charts of important campaigns and battles; we shall need a small technical library as a branch of the main Yale library; we shall need two or three relief maps for our war games; we shall need thirteen papier-maché horses that can be harnessed and hitched to a gun and caisson on the main floor of Artillery Hall to represent a section of field artillery completely horsed and equipped; we shall need three or four landscape scenes, to be placed on the stage which is at one end of the main room. At the other end of this main room will be a firing battery of four guns placed wheel to wheel. The landscape scenes are exactly similar in principle to that celebrated panorama of the Battle of Gettysburg; that is, as one stands at the position of the battery and looks across the room, there he will see hills, mountains, woods, villages, farmhouses, etc., while on the crests and in the edges of the woods there will be placed to the proper perspective scale the hostile batteries, machine guns, skirmish lines, trenches, etc.; or, in other words, these landscape scenes will be used to afford a variety of aiming points and targets to practise the student gunners during the winter months in sighting and laying the guns.

YALE'S PROBABLE CONTRIBUTION

Our capacity, when under way, will be from 1000 to 1200 students, or one regiment of field artillery, and no doubt we will have that number, especially if universal training is adopted

in this country—a principle which we in the service so hope to see. Our lack of it should be a tremendous object-lesson to our country to-day, since here we are, two months after a declaration of war, absolutely impotent from a military standpoint, and forced to remain so for a long time to come.

The obligations imposed on the student who elects the R. O. T. C. course have been a matter of apprchension on the part of some parents and some students. They should cause no concern. They are as light as can possibly be made and still accomplish the purpose for which the Training Corps were established. The student elects the course with the expressed intention that, unless prevented by unforeseen necessity or circumstance, or unless found deficient in it, he will complete it and accept from the President a commission as a reserve second lieutenant in Field Artillery. In accepting the commission, he obligates himself (of course, barring unforeseen necessity or circumstances) to serve as a reserve officer for ten years. During this time, by taking the prescribed examinations, he may be promoted up to and including the grade of major, and, besides being subject to call for fifteen days' training each year, at the pay of his grade, he can be called to the colors only in case of actual or threatened hostilities. What this means to the country can hardly be realized; it is best brought to our attention, however, by supposing that the Training Corps have been in operation for the past ten years or more. With 1000 to 1200 men in the Corps at Yale, or 250 to 300 from each class, we would then have to-day 2500 Yale graduates who were reserve officers of Field Artillery. This is the officer complement for the field artillery of sixteen divisions, 500,000 men—or Yale could to-day furnish the field artillery officers for this first army of 500,000 men. Could you imagine a greater service that could be rendered the country by a great university?

A "GET-RICH-QUICK" COURSE

Contrasted with this, let us see what we are now doing. We have in twelve different Reserve Officers' Training Camps

at the present moment 7000 Field Artillery candidates from whom we are to select the necessary 2500 for the first army. Not figuring the cost of construction to house them, nor the salaries of the personnel to train them, nor the value of the ammunition they must fire during training, they cost the Government for salary, clothing, subsistence, and transportation approximately $500 each for three months, or a total of $3,500,000. They are thirteen weeks in camp, as opposed to the R. O. T. C.'s eighteen weeks in camp, and they have nothing that corresponds to the four years of drill and theoretical work. In short, although it is the very best possible scheme under the circumstances, it is a "get-rich-quick" course, as opposed to the properly planned, methodical, and extended course for the R. O. T. C.

THE NEED FOR A YALE FIELD ARTILLERY SCHOOL

Surely, gentlemen, the Government can well afford to endow at Yale a field artillery elective that, in point of equipment and instructors, is absolutely up-to-date and complete. Whatever is worth doing at all is worth doing well. A make-believe school, with imagined horses, pretended guns, sights, range finders, and B. C. telescopes, together with empty chairs as instructors, will not satisfy you, nor will it satisfy us of the Field Artillery. I have discovered that Yale men do not tolerate makeshifts; they demand the best, and they get the best, and they have the power to get the best in this proposition. Besides the two strictly military schools of Culver and the Virginia Military Institute, Yale is the only institution in the United States to take up the training of field artillery officers, though trained artillerists are to-day the most serious need of our army. Moreover, it is doubtful if any other institution will take up a field artillery unit of the R. O. T. C., because the requirements in point of equipment and facilities make it a most difficult unit to handle. The Government can therefore well afford to concentrate its efforts in the field artillery line

on Yale, and make the work there a model of perfection; and Yale, in taking up this work, is contributing far more to the military service of the country than it could possibly do in any other line. This, of course, does not mean that Yale should confine herself strictly to artillery; the student body is so large it can support, under a similar plan, a naval unit, an air unit, a signal corps unit, an engineer corps unit, a medical unit, etc., as it has already done, but the Artillery is, of course, the great big work of Yale. I, as a field artilleryman, on whom rests my share of the responsibility of developing the field artillery to its fullest efficiency as a part of the whole army team, want to see Yale, with all her enthusiasm and with all her *esprit*, permanently hitched to the guns. "Victory," said Napoleon, "is likely to be on the side that has the most and biggest guns." With perhaps over 1000 Yale men in the officers' training camps to-day as candidates for commissions in the Field Artillery, you and I, in the present war, are likely to experience the thrill of satisfaction and of pride in seeing Yale struggling with and solving the great task of bringing up the guns, while our brothers in the Infantry, with fervor greater than we can now appreciate, will be encouraging them with the cry, "The Guns! Thank God for Yale, and the Guns."

Scheme for Field Artillery Training

ENLISTED PERSONNEL

RESPONSIBILITY for the training of the troops committed to their charge rests on all commanders. Subject to the principles laid down in the various training manuals, regulations, and this general program, commanders are at liberty to employ such methods as appear best calculated to attain the desired end.

Superior commanders, while holding their subordinates responsible for the training of their units, will never forego their function of guidance and control, and will exercise a general and continuous supervision over their work. In carrying out this duty they should not curb the initiative of their subordinates nor interfere unnecessarily so long as the training is conducted on sound lines.

Without trained cadres of officers and men to carry on the instruction, the presence of all battery officers with their batteries is essential for the proper instruction of their men, especially during the period of preliminary instruction, and officers should not be taken from the batteries to perform staff or other duties for which staff officers are provided.

The captain must supervise the instruction of the sections of his battery, advise the lieutenants, and make corrections whenever necessary to produce results.

Training must include both moral and physical instruction. The development of a soldierly spirit is required to help the soldier bear fatigue, privation, and danger cheerfully; to imbue him with a sense of honor; to give him confidence in his superiors and comrades; to increase his powers of initiative, of self-confidence, and of self-restraint; to train him to obey orders or to act suitably in their absence; to impress upon him that so long as he is physically capable of fighting surrender to the enemy is a disgraceful act; and, finally, to produce such a state of

GERMAN FIELD ARTILLERY IN WARSAW

discipline that each individual will perform his duty coolly and correctly in the stress of battle.

As soon as a man enters the service every endeavor should be made to foster in him a soldierly spirit. Officers and noncommissioned officers must remember that it is chiefly by their example that the development of a soldierly spirit will be achieved.

Field artillery, newly organized, will be composed of men having little or no military training, and officers with some military training but, for the greater part, with little or no experience as officers.

It is essential that some scheme of instruction be announced which, with the modifications made necessary by climate and season, will produce troops uniformly and thoroughly trained along the same lines.

The varying conditions as to equipment and matériel forbid the enunciation of a rigid, detailed program, even if such a plan were considered wise. A system is sought which will harmonize the instruction of all the Field Artillery without robbing commanding officers of initiative or relieving them of any of their responsibility for the fitness of their commands.

Time being limited, concentration on the duties demanded of the Field Artillery in the present trench warfare is imperative.

A general program of instruction, based on a minimum of 40 actual drill hours per week, is attached hereto and marked "A." Based upon this program all commanders and instructors must prepare schedules covering the work allotted to them. The performance of all training *by schedule* is essential.

CONCENTRATED TRAINING—16 WEEKS

The 16 weeks which it is considered may be devoted to concentrated training before required for service abroad will be divided into two general periods, as follows:

(*a*) The first or fundamental period will last about four

weeks and will cover instruction to be given to all Field Artillery soldiers.

(*b*) The second period will be devoted to specialized instruction for the individual and all higher units.

FIRST PERIOD

It is not sufficiently realized to what an extent the success of a soldier's training depends upon the use of his first days in the military life. His mind, from a military standpoint, is open for fresh impressions; his moral courage, *esprit,* and patriotism can be easily aroused and stimulated; he is unconsciously weighing the service, and much of his later value rests with his first instructors.

The objects of drill are: To teach discipline; to acquire military knowledge and proficiency.

Discipline is founded on cheerful obedience, mutual confidence, loyalty, patriotism and *esprit de corps*.

The necessity for the insistence upon small points of discipline must be emphasized. Officers should everywhere and at all times present a model in appearance and military deportment for the men. This is as much the duty of the senior military commander as of the junior subaltern; salutes accorded juniors as well as seniors should be punctiliously observed and strictly conform to regulations. The details of dress, hair-cutting, cleanliness of body and clothing, shaving, correct wearing of equipment, etc., should never be neglected.

Officers must possess an interest in the men of their organization and be quick to observe mental and physical depression. The sympathetic adaptation of instruction in individual cases where men are "blue" or down in spirit will have great influence on the general morale. A man out of spirit tends to depress the enthusiasm of others and should be given a change of duty and kept busy at something which will hold his interest. Due to the home life and family ties of our drafted forces, this condition will arise frequently, and commanding

SCHEDULE "A"

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
	Physical drill	Salutes and courtesies	Organization, clothing and equipment	Dismounted instruction	The pistol, or rifle	Guard duty	Nomenclature care of matériel and projectiles	Simple cordage	Constructing emplacements and revetment	Preliminary exercises of the gun squad	The cannoneer	The firing battery	Individual equipment, rolls and kits, shelter tents	Castramentation	Anti-gas drill	The battery mounted, route marches and occupation of positions	Nomenclature and care of horse equipment	Stables and grooming, care of animals and stables	The soldier mounted	The driver	Sub-caliber practice	Service practice	Visual signaling	The service buzzer	Instruments, range finding and fire-control	Entraining, loading and unloading animals and equipment	Field artillery information service*	Hygiene, personal, barrack and camp	First-aid	Lectures
ALL MEN																														
1st week...	3	2	1	8	1	3	2½			5	1½							6	3									1		
2d week...	3			6	4	1½	1½			1½	6		1½		1½			9					2					1	1½
3d week...	3			5½	3	1	1½	½	3		7		½		1½			9					2[s]						1	1½[s]
4th week**.	3			4½	5		1½	½			3	3		1½					9				2½					1½		1
CANNONEERS																														
5th week...	3			3½[a]			4				5	15			1				7½											1
6th week...	3			3½[a]			4				5	15			1				7½											1
7th week...	3			3½[a]			4				5	15			1				7½											1
8th week...	3[b]			1½[b]	c		4	½	4		4	13			1	3[d]			5											1
9th week...	3			1½			3				3½	16			1	6			5											1
10th week...	3			1½			3				3½	13			1	9			5											1
11th week...	3			1½			3				1½	10			1	14[e]				5										1
12th week...	3			1½			3		7			4			1	18[f]				1½										1
13th week...	3			1½			3	½				10			1	5				3	6					6				1
14th week...	3			1½			3					12½			1	5				3	8	2								1
15th week...	3			1½			4					5½			1							24								1
16th week...	3			1½			4					5½			1							24								1
DRIVERS																														
5th week...	3			3½[a]							1½	3			1		2½	7½	12	5										1
6th week...	3			3½[a]							1½	3			1		2½	7½	10	7										1

7th week...	3			3½[a]						1½	3			1		2½	7½	7	10							1
8th week...	3			1½			½	4			2			1	3	2½	7½	4	10							1
9th week...	3			1½						2½	4			1	6	2½	7½	3	8							1
10th week...	3			1½						1½	5			1	9	2½	7½		8							1
11th week...	3			1½						1½	5			1	14[e]	2	6		5							1
12th week...	3			1½				7			1½			1	18[f]	2	3									1
13th week...	3			1½										1	5	2½	7½		6½	6				6		1
14th week...	3			1½							2½			1	5	2½	7½		6	8	2					1
15th week...	3			1½							½					2½	7½				24					1
16th week...	3			1½							½					2½	7½				24					1

SPECIAL DETAILS

5th week...	3			3½[a]										1		2½	4	12				2	5	6			1
6th week...	3			3½[a]										1		2½	4	10				2	5	5		3	1
7th week...	3			3½[a]										1		2½	4	7				1½	4½	6		6	1
8th week...	3			1½				4						1	3	2½	4	4				1½	4½	4		6	1
9th week...	3			1½										1	2	2½	4	3				1	4	5		12	1
10th week...	3													1	3	2½	4	1½				1	4	4		15	1
11th week...	3			1½										1	10[s]	2	3	1½					2	3		12	1
12th week...	3							7						1	18[f]	2	2½						1	1½		3	1
13th week...	3													1		2½	4	1½		6		1	2	3	6	9	1
14th week...	3			1½										1		2½	4			8	2	1	1	3		12	1
15th week...	3													1		2½	4				24		1	½		3	1
16th week...	3													1		2½	4				24		1	½		3	1

REMARKS

(a) Includes subjects 2, 5 and 6.
(b) 8th to 16th weeks inclusive, subject 1 should be given in connection with 4.
(c) Subject 5 should be included with instruction under 1 and 4 until proficient.
(d) Should include firing a few service rounds, if practicable, for instruction of cannoneers only.
(e) Includes a one day's march with instructions in subjects 13, 14 and 28, and for drivers and special details subject 18.
(f) Includes a two days' march with instructions in subjects 13, 14 and 28, and for drivers and special details subject 18.
(s) Lecture on visual signalling and service buzzer.
** Four hours' inspections in 4th week for purpose of classification of men.
* Includes all duties of specialists not otherwise provided for.

NOTE.—This program shows the relative value attached to the various subjects.

officers must be prepared to meet the situation. To excuse the man from duty will only give him idle time in which to brood, and is the worst procedure, but, as it is the easiest way, officers must guard against this mistake.

Men are taught in *three* ways:

By verbal explanations.—This should be used with caution, as many points never reach the mind of the hearer, and those which do may be soon confused or forgotten.

By demonstration.—This creates an impression which is probably clear for the moment and lasts for a time.

By requiring performance of the action taught.—This method is the only one to use where practicable; most men retain knowledge of and can do again that which they have already done.

The subjects taught during the first period of about four weeks are such as will apply to every Field Artillery soldier. No *soldier,* whatever his position, should be without certain fundamental training. It is better to assume in this regard that each man is a recruit until he can demonstrate the contrary, as many men of some slight military experience soon fall behind when not given the regular instruction.

Based upon a time allotment of 16 weeks, no battery organization should be attempted at first. Arrange all men in four or five sections, assigning to sections in proportion some men of previous military training, and men who seem to stand out above the others. These sections should be uniform in size and not too large. They should be permanent for the first period, the men of a section drilling, bunking, and messing together and having N. C. O.'s and acting N. C. O.'s assigned as permanent section leaders.

A lieutenant should be permanently assigned in charge of one branch of instruction and be given as permanent assistants certain selected men whose individuality or previous military experience mark them as probable N. C. O.'s. The training of these assistants is the duty of the instructor, but when competent

as assistants they are temporarily detached one at a time and sent to learn under other instructors.

The organization commander supervises and is responsible for all instruction. He will attend to all details pertaining to general administration and schedules, and will relieve the instructors assigned to particular branches of all worry and detail not an essential part of that particular instruction. It will be his duty to prepare weekly schedules showing the hours of attendance of all sections and for all instruction. A sample of such a schedule arranged for five sections and an actual drill time of 7½ hours daily is appended, marked "B." It assumes an officer or qualified N. C. O. available as instructor in each of the five divisions. The sections attending the first hours should alternate by weeks in the instruction attended. This weekly time schedule is based on a general schedule for the first period which must be prepared by organization commanders under the supervision of battalion and regimental commanders. This schedule must allot instruction periods for each subject to be covered in the period. Sample schedule attached, marked "C."

Lecture subjects are selected and assigned to officers who will thoroughly prepare themselves upon the subject or subjects assigned. Rather than have an officer lecture upon a subject unprepared, the instruction should be omitted. Inclement weather is generally utilized for lectures, but when necessary they are introduced into the schedule.

The following subjects should be included in the first period:

Artillery.—Daily for the entire period. Weekly programs of instruction are arranged by the officer in charge of artillery instruction and are submitted to battery (and battalion) commanders for approval. The different artillery instructors in the organizations of the regiment should be assembled and lectured upon the particular subject "Preparation of Schedules" by the most competent artillery advisor available, and thereafter should frequently confer with this officer and with one

SCHEDULE "B"

	7.00 to 8.30	8.45 to 10.15	10.30 to 12.00	1.30 to 3.00	3.15 to 4.45	
First section	Artillery	Mounted	Dismounted and calisthenics	Arrangement of bunks	Salutes, etc.	Monday
Second section	Mounted	Dismounted and calisthenics	Arrangement of bunks	Salutes, etc.	Artillery	
Third section	Dismounted and calisthenics	Arrangement of bunks	Salutes and courtesies	Artillery	Mounted	
Fourth section	Arrangement of bunks	Salutes and courtesies	Artillery	Mounted	Dismounted and calisthenics	
Fifth section	Salutes, courtesies, etc.	Artillery	Mounted	Dismounted and calisthenics	Arrangement of bunks	
First section	Artillery	Mounted	Dismounted and calisthenics	Records of soldiers	Measurements for clothing	Tuesday
Second section	Mounted	Dismounted and calisthenics	Records of soldiers	Measurements for clothing	Artillery	
Third section	Dismounted and calisthenics	Records of soldiers	Measurements for clothing	Artillery	Mounted	
Fourth section	Records of soldiers	Measurements for clothing	Artillery	Mounted	Dismounted and calisthenics	
Fifth section	Measurements for clothing	Artillery	Mounted	Dismounted and calisthenics	Records of soldiers	
First section	Artillery	Mounted	Dismounted, etc.	Barracks sanitation	Salutes, records, measures	Wednesday
Second section	Mounted	Dismounted, etc.	Barracks sanitation	Salutes, records, measures	Artillery	
Third section	Dismounted and calisthenics	Barracks sanitation	Salutes, records, measures	Artillery	Mounted	
Fourth section	Barracks sanitation	Salutes, records, measures	Artillery	Mounted	Dismounted, etc.	
Fifth section	Review, salutes, etc. Complete records, etc.	Artillery	Mounted	Dismounted, etc.	Barracks sanitation	
First section	Artillery	Mounted	Dismounted, etc.	Draw clothing	Guard instruction	Thursday
Second section	Mounted	Dismounted, etc.	Draw clothing	Guard instruction	Artillery	
Third section	Dismounted and calisthenics	Draw clothing	Guard instruction	rtillery	Mounted	
Fourth section	Draw clothing	Guard instruction	Artillery	Mounted	Dismounted, etc.	
Fifth section	Instruction for guard duty	Artillery	Mounted	Dismounted, etc.	Draw clothing.	
First section	Artillery	Mounted	Dismounted, etc.	Clothing, etc.	Guard duty	Friday
Second section	Mounted	Dismounted, etc.	Clothing, etc.	Guard duty	Artillery	
Third section	Dismounted and calisthenics	Clothing, etc.	Guard duty	Artillery	Mounted	
Fourth section	Arrangement, marking, inspection as to fit of clothing	Instruction for guard duty	Artillery	Mounted	Dismounted, etc.	
Fifth section	Instruction for guard duty	Artillery	Mounted	Dismounted, etc.	Clothing, etc.	
First section	Artillery	Mounted	Dismounted, etc., miscellaneous			Saturday
Second section	Mounted	Dismounted and calisthenics	*			
Third section	Dismounted and calisthenics, miscellaneous	*	*		Lead in and water	
Fourth section	Police of barracks and grounds	Dismounted and calisthenics, miscellaneous	Artillery			
Fifth section	Dismounted and calisthenics, miscellaneous	Artillery	Mounted			

* Complete records, clothing, etc.

SCHEDULE "C"

First Week

Monday	Artillery	Mounted	Dismounted and calisthenics	Arrangement of bunks and squad-rooms	Salutes and courtesies
Tuesday	Artillery	Mounted	Dismounted and calisthenics	Records of soldiers	Measurement for clothing
Wednesday	Artillery	Mounted	Dismounted and calisthenics	Personal hygiene, around barracks	Review, salutes, etc., complete records
Thursday	Artillery	Mounted	Dismounted and calisthenics	Draw clothing	Guard instruction
Friday	Artillery	Mounted	Dismounted and calisthenics	Arrangement of clothing, fit and method of wearing	Guard instruction
Saturday	Artillery	Mounted	Dismounted and calisthenics	Police of barracks and grounds	Nomenclature pistol. Semaphore
Sunday A.M.	Inspection of barracks (during first period only)				

Second Week

Monday	Artillery	Mounted	Dismounted and calisthenics	Blanket rolls, slickers, etc.	Guard instruction
Tuesday	Artillery	Mounted	Dismounted and calisthenics	Nomenclature of pistol, care of, cleaning, aiming	Gas masks, how to adjust, short talk about gas
Wednesday	Artillery	Mounted	Dismounted and pitching shelter tents and calisthenics	Aiming pistols, snapping, triangles	Talk on war conditions, prisoners of war. Rights of prisoners
Thursday	Artillery	Mounted	Dismounted and qualifying certain men for guard. Calisthenics	Continue pistol	Signaling semaphore
Friday	Artillery	Mounted	Dismounted and qualifying certain men for guard. Calisthenics	Continue pistol	First aid
Saturday	Artillery	Mounted	Dismounted and qualifying certain men for guard. Calisthenics	Pistol, police barracks and ground and semaphore signaling	Personal hygiene venereal diseases. All men last A.M. period
Sunday A.M.	Inspection of barracks				

Third Week

Monday	Artillery	Mounted	Dismounted and calisthenics	Pistol	Tent pitching and guard to qualify
Tuesday	Artillery	Mounted	Dismounted and calisthenics, to include observation of infantry in bayonet experiment	Pistol and semaphore	Gas masks, practical, and questions
Wednesday	Artillery	Mounted	Dismounted and calisthenics, guard formation	Pistol and first aid	Gun emplacements and trench lines
Thursday	Artillery	Mounted	Dismounted and calisthenics, marched to observe infantry in foot drill	Pistol	Laying out gun emplacements
Friday	Artillery	Mounted	Dismounted and calisthenics, guard for backward men	Signaling, methods, necessity different codes	First aid
Saturday	Artillery	Mounted	Dismounted and calisthenics	Police barracks and ground	Entire battery last period A.M. Talk on cover and camouflage
Sunday A.M.	Inspection of barracks				

Fourth Week

Monday	Artillery	Mounted	Dismounted and calisthenics	Pistol and signaling	Building fires for individual cooking
Tuesday	Artillery	Mounted	Dismounted and calisthenics	Pistol and signaling	Trenches for urinals, etc. and kitchen refuse
Wednesday	Artillery	Mounted	Dismounted and calisthenics	Pistol and signaling	Clean up
Thursday	Artillery	Mounted	Dismounted and calisthenics	Pistol and signaling	On instruction laid down and not completed
Friday	Artillery	Mounted	Dismounted and calisthenics	Pistol and signaling	On instruction laid down and not completed
Saturday	Artillery	Mounted	Dismounted and calisthenics	Last hour lecture on maps	
Sunday A.M.	Inspection of barracks				

NOTE.—Lectures are of two kinds, (a) those given by instructor to each section separately as a part of his instruction, (b) those given to the battery as a whole by the captain or other officer.

another. Drill and Service Regulations for Field Artillery, Handbooks of the Ordnance Department, and artillery notes issued by the War Department and School of Fire for Field Artillery should be in the possession of all instructors and thoroughly mastered by them. They will prepare and issue in whatever way may be practicable, list of nomenclature, rules for care of matériel, diagrams of positions, and such other memoranda as will aid the instruction. Instruction in the detailed service of the piece must be thorough and is always more or less monotonous. This may be relieved somewhat by keeping records and stimulating competition. The schedule will be arranged to include the care of all matériel. Sample of schedule attached, marked "D."

Mounted.—Daily for the entire period. Weekly programs of instruction by the officer in charge as for artillery. Instructors are lectured in same manner. The programs of instruction should include the morning police of stables (by the section attending during the first hour). Grooming is a part of the schedule, and horses are either assigned for the purpose or the men groom those they use. This instructor should study carefully the Field and Service Regulations for Field Artillery and service manuals on the care of animals, shoeing, etc. The following points covered in the regulations must be applied from the first: Riding instruction should begin at the walk, on gentle horses, and over varied ground, either with or without saddles; unbroken, nervous or vicious horses should be assigned to picked men for gentling; men having a natural timidity about horses should be given only the quiet animals. The fitting and care of harness, saddles, and bridles should be a matter of schedule. As men become accustomed to riding, the quiet horses should be trained to draft; the men of the most aptitude should then begin training the remaining horses.

Dismounted Instruction.—Daily for the entire period. Weekly programs of instruction by the officer in charge as for artillery. Dismounted instruction is of importance for field

SCHEDULE "D"

First Week

Monday	
½ hour	General nomenclature, purpose and operation of piece and caisson.
1 hour	To form gun squad. To tell off gun squad. Posts of gun squad, carriages limbered. To post the gun squad. Posts of the cannoneers, limbered. To post cannoneers, limbered.
Tuesday	
1 hour	Review general nomenclature. To mount cannoneers. To dismount cannoneers. Posts of cannoneers unlimbered but not prepared for action. To change posts.
½ hour	General description and operation of sights, quadrant, and fuze setter.
Wednesday	
1 hour	Movements by hand, limbered. Duties in unlimbering. Action front. Action rear. Limbering. Front and rear.
½ hour	Tools and accessories. Kinds and use of projectiles.
Thursday	
1 hour	Duties in unlimbering, action right and left. Limbering rear.
½ hour	Operation of sights, quad. and fuze setter.
Friday	
1 hour	Gen. Review. Movements by hand, unlimbered.
½ hour	General duties of G, 1, 2, 3, 4, 5.
Saturday	
1 ½ hours	Nomenclature and care of material (practical, cleaning, oiling, disassembling and assembling).

Second Week

Monday	The range scale and the panoramic sight duties of gunner.
Tuesday	The range quadrant—To open and close breech. Duties of: No. 1—Review. No. 2.
Wednesday	The fuze setter— Duties of 3, 4, 5.
Thursday	The deflection—The site. Measure deflection and site.
Friday	Review of M-T-W & T.
Saturday	Practical nomenclature—cleaning, etc.

Third Week

Monday	Exercises in duties of gunner 1, 2. Exercises in duties of gunner 3, 4, 5.
Tuesday	Same as Monday. Explanation of action of projectiles.
Wednesday	Explanation of making changes in setting at commands.
Thursday	Same as Wednesday and Monday.
Friday	Movements of carriages—unlimbered to prepare for action.
Saturday	Use of oils—tools—methods of carrying—care—cleaning—nomenclature.

	SCHEDULE "D"—*Continued* *Fourth Week*
Monday	Review of first week—drill of gun squad. To prepare for action and march order.
Tuesday	To prepare for action—exercise in duties of cannoneers—method and kinds of fire—march order.
Wednesday	Same as Tuesday.
Thursday	Gun squads working as firing battery—preparation for action—service of piece.
Friday	Lecture—on fire. To give general idea of the trajectory—burst of projectiles. Powers and limits of projectiles. Information about fire used abroad—Names of particular kinds of fire. Necessity for accuracy as support or protection to our infantry.
Saturday	Cleaning. Question on use of oils, tools, cleaning, repairs, nomenclature.

artillery and is a valuable aid in teaching discipline, soldierly bearing, and alertness. It is combined throughout the period with instruction in calisthentics, guard duty, etc. (see remarks on Appendix "A"). Recruits should always be marched to and from drills by squads and at attention.

Calisthenics.—Daily for the entire period with dismounted instruction.

Purely as a setting-up exercise it is best to adapt a few simple exercises which will become known to the soldiers. Swinging exercises which affect a large part of the body are preferable, particularly to supple men more or less muscle-bound. The instructors should regularly execute the exercises with the squad. An object is the development of an athletic spirit in the soldier, and to this end running, jumping, and games of different kinds are recommended. Boxing is useful in developing a fighting spirit, if required of all men, whether skilled or not.

Guard Duty.—Beginning with the first week and continued until qualified. The performance of guard duty should interfere as little as practicable with concentrated instruction. Extracts from Manual of Interior Guard Duty and Camp Guard regulations should be prominently posted where easily accessible

to all soldiers. Where printing facilities are available, a copy of these extracts should be issued to each man.

Hygiene.—Beginning with the first week and continued until instructed. Personal hygiene is taught by schedule, practically, and by lectures, and is observed and regulated at all times. Hygiene and sanitation applicable to camps, marches, billets, bivouac, etc., are taught by lectures and, where possible, by practice. The instructors in this subject should be lectured by competent and practical medical officers. After once outlining the principle of hygiene as a matter of schedule, it is afterwards fixed as a habit by observation and inspection. A practical talk by one of the officers on venereal diseases should supplement lectures given by medical officers.

Individual Cooking.—First period by schedule. To include building of fires. Instruction in the actual methods of cooking can best be had in battery kitchens under the direction of the mess sergeant or a cook. Practical individual cooking will be a part of camping, etc., in the second period.

Salutes, Courtesies, Customs of the Service, Rules of War, Rights of Prisoners of War, Parole, Articles of War Particularly Affecting the Individual Soldier.—Included in the schedule as a part of the first period of instruction. By lectures, and practically for such as admit of practical application. It is important to make soldiers realize what information is of value to the enemy, and the methods generally pursued by the enemy in obtaining this information from prisoners.

Use of Gas Masks.—By schedule for first period. Theoretical and practical by a medical officer or other qualified instructor. Sufficient masks for one battery will probably be issued to each regiment. Instruction periods for batteries will be designated by regimental commanders. Manual on gases which prescribe requirements for qualification in use of masks will be issued by the Medical Department.

Pistol.—(*a*) Manual, nomenclature, care of. To begin with issue of pistols until qualified.

(*b*) Use of. To begin as soon as sufficient pistols are available. Men to be qualified in pointing and aiming, triangles, slow fire at short ranges, quick fire at short ranges. Advance will be made only when qualified in preceding exercise. The object desired is to train all men to deliver a quick fire and at a short distance to be able to hit a figure.

NOTE.—Practice rods for use with miniature targets will assist in this instruction. Where not available, a long lead-pencil with eraser may be of some assistance.

Individual Records.—By schedule first week of first period. Age, nationality, languages spoken, education, occupation in detail. From this investigation the following lists should be made:

(*a*) Probable candidates for commissions (to be observed and sent to special school for officers).

(*b*) Probable N. C. O.

(*c*) Men for special details.

(*d*) Men well below the normal whose military value will be limited.

Measurement for Clothing.—By schedule first week of first period. Depending upon clothing available for issue, this should be followed by clothing issues, instruction in methods of wearing, etc.

Blanket Rolls, Surplus Kit, Field Kit, Slicker Roll, Other Equipment.—Preparation, contents, methods of carrying. Inspection for barracks and field. Instruction by schedule during first period. Thereafter observed and details insisted upon. Diagrams and lists should be prepared and freely exposed where they may be readily consulted.

Shelter Tents.—Instruction in pitching during first period. By schedule as a part of dismounted drill. Arrangement of shelter tent camp of a battery for various differing conditions should be outlined.

First Aid.—Practical by schedule during first period. Drills must be short and for small number of men at a time. Instructors

should prepare schedule after consultation with and training by medical officers. All lectures should, if practicable, be given by competent medical officers. The protection against tetanus, gangrene, and gas must be especially covered. Vermin and trench diseases of all kinds must be made known to all soldiers. Adopt the principle of informing the soldier fully concerning the conditions prevailing where he may serve.

Signalling.—Beginning in first period. An *opportunity* should be given for all men to learn, but *thorough instruction* will be limited to about 25 per cent. of the battery. During first period give general instruction which will *enable* all men to learn the prescribed codes. Have signal cards posted where they may be readily consulted. The special instruction of some men may be undertaken at once.

Simple Cordage.—To include only simple hitches, clove hitch, bow-line, square knot, and some idea of the use of blocks and tackles. To be of practical value in tying animals, fastening ropes in assisting difficult draft, and in care and assembling of matériel.

NOTE.—Particular attention must be given to developing in field artillery an enthusiasm for the infantry with whom they fight. As the infantry training progresses, the field artillery should be taken to witness the drill of well-qualified units, particularly in such matters as bayonet fighting, bombing, etc. This drill should be made real and alive by informal talks in which are included reports or remarks on actual happenings, both our own and the enemy. This lecture should include data on bombs, grenades, etc., with relative effects of each.

SECOND PERIOD

Men are rearranged into general classes of drivers, cannoneers, and men training for special details and duties. The men qualified in special duties should be double the number necessary in the normal battery organization.

Make a general division of the battery in three sections.

First section will comprise all special details as follows:

Signal.

Telephone.

N. C. O. not required as instructors.

Mechanics, horseshoers, saddlers, farriers, carpenters, etc.

Cooks and candidates. Buglers.

Other men not assigned.

Second section will comprise men assigned duty in connection with the service of the gun, cannoneers.

Third section will comprise drivers.

Suggested General Schedule, Fifth to Sixteenth Week (Inclusive)

Fifth to seventh week: Individual instruction.

A. M.—Driver, cannoneers, special details, mounted, artillery, special.

P. M.—Dismounted, pistol, and artillery; mounted, dismounted, and pistol; special, pistol (dismounted at least once a week).

NOTE.—Drivers should have artillery instruction about three times per week in the afternoons; cannoneers, mounted instruction. Dismounted instruction (which will cover all instruction except mounted and artillery) will be daily in the mornings for drivers and cannoneers and occasionally for special details. Pistol for all men until sufficiently instructed. Instructors in artillery and mounted will coördinate schedules and training.

Eighth to twelfth week: Battery instruction.

A. M.—Drivers, cannoneers, and special details will be given maximum time on their special work. Battery commander arranges the work of the different details into a battery organization.

P. M.—Same as for fifth to seventh week.

Thirteenth week:

Battery work.—Occupation of positions, day and night. Laying out of gun positions and emplacements. Practice of leaving camp, entraining, marching, etc.

P. M.—Work on special instruction.

Fourteenth week:

Battalion and battery work. To include selection and occupation of position, construction of complete emplacement, simple firing problem.

Fifteenth and sixteenth weeks:

Firing instruction and practice from selected position, firing from emplacement, relieving artillery in emplacements, firing problems with aerial observation, service practice wearing gas masks, barrage practice.

DRIVERS.—Instruction of drivers includes:

1. Training of new animals for draft.
2. Training of the animals assigned for draft.
3. Draft over terrain of all kinds. It is important that drivers should know the powers and limitations of the team unaided and the best method of negotiating difficult obstacles; the powers and limitations of the team when aided by cannoneers.
4. Movements on the battlefield, concealment, location of limbers, teams, etc.
5. Care of animals in field, forage, feeding, watering, picket lines, care of feet under bad conditions, care of harness. Particular care to be given to the shoulder, neck, and back of horses.

Draft to include night occupation of positions and marches.

SPECIAL INSTRUCTION.—Instructors must be specially qualified. Instruction should conform to drill regulations and be adapted to needs of the present war.

Communication: Wireless, wire, ground, flag, pigeon, special with aeroplane, rockets, etc.

Construction and occupation of observing stations:

(*a*) Near battery or regiment.

(*b*) In trenches.

Use of maps, map reading, orientation, construction, field sketches, panoramic sketches, trench maps.

Simulated field service using gas masks.

Instruments, field-glasses, special instruments, angle measurement with and without instruments. Changes in data from day to day, due to weather conditions.

Cover and *camouflage*.

Movements at night.

Mechanics, cooks, etc. Practical instruction for position sought.

Artillery.

To begin in fifth week with a complete review of first four weeks' instruction and to be continued by a progressive program which will accomplish—

(*a*) Thorough training of individuals as cannoneers.

(*b*) Thorough training of the squads of cannoneers as a battery.

Pistol, as in first period, to include practical handling of arm and qualified when able to fire quickly and accurately on figure targets.

Castrametation.—To include location of camps, sanitation, drainage, etc., pitching tents authorized. Messing in camp, bivouac, billet.

Gas masks.—To complete qualification.

OFFICERS

The instruction of officers of newly organized regiments or of newly appointed officers is a function of battalion and higher commanders.

In addition to training of the enlisted personnel, officers must, by a proper course of reading and study and practical exercises, prepare themselves for all duties required of them as officers.

Regimental and battalion commanders should outline and require, of all officers, a proper course of reading, study, and practical exercises, to the end that they will, at the proper time, be able to perform any duty which properly pertains to their position. This will require a great deal of study and work in addition to the time which they must devote each day to the instruction of enlisted men.

Some of this work may be outlined as follows:

1. Study and recitation in: Drill regulations, field service regulations, manual of courts-martial.
2. Army regulations, customs and courtesies of the service (lecture).
3. Rules of land warfare, with particular attention to present war, prisoners of war, paroles, etc.
4. Sketching, maps, map reading, construction and use of scales, use of French maps, etc.
5. Use of range-finding, fire-control, and signal equipment, including tests of buzzer and telephones.
6. Observation of fire and the correction of errors.
7. Smoke bombs, terrain board, blackboard and simulated fire.
8. Reconnaissance, selection, and occupation of positions.
9. Firing by map, use of compass in obtaining deflections.
10. Computation of firing data.
11. Close shooting as required in trench warfare.

An extract of a report hereto attached "X" should be consulted by regimental commanders in the preparation of schedules for officers' training.

APPENDIX "X"

The object of the course of instruction is to turn out an officer fit to be of immediate practical use. The standard of training and instruction in each subject should therefore be fixed in accordance with this principle as shown below:

1. Physical training. Capable of supervising instruction in this subject and to command units while giving the instruction personally. The officer must be able to detect faults in position and to correct them, and to know whether noncommissioned officers are giving instructions along correct lines.

2. Dismounted drill. Able to instruct and drill a gun squad, or a platoon, dismounted. He should also know and be able to give instructions in guard mounting and the posting of sentries. He must be able to instruct correctly in the manual of the pistol and in pistol firing, and must have fired at least ten rounds from each range prescribed.

3. Gun drill. Able to perform the duties of every number in a gun squad. He must be word-perfect in the drill of a platoon and of a battery, including the duties of a platoon commander.

4. Driving drill. Capable of driving in any position in a gun team, drilling as chief of section or gunner, and should have a thorough knowledge of the signals used in mounted drill. He should also be capable of commanding a firing battery, and adjusting and conducting the fire of a battery. Candidates assigned to motor-drawn artillery must have a thorough knowledge of motors and tractors, and the ordinary repairs incident to their use, and must be able to drive a motor-truck and a tractor, with its trailer or a load, over difficult places.

5. Gun laying and sights. Have a thorough knowledge of the sights of the various guns and howitzers, and the methods of testing and adjusting them, and must be a good layer with the different instruments.

6. Artillery boards, etc. Must understand the construction of the artillery board, and be quick and accurate in its use.

7. Property. Must be thoroughly conversant with the equipment used by officers and enlisted men, and must understand the methods of cleaning, repairing, and preserving same.

8. Signalling and telephone. Capable of sending and receiving messages by semaphore, buzzer, and flash at a rate of at

least six words a minute. Must have a practical knowledge of the principles, construction, and operation of telephones and telephone lines. Must be able to test for telephone and line troubles and make repairs. Must have a detailed knowledge of the receiver, transmitter, buzzer, circuits, and the care of the telephone.

9. Map reading and sketching. Able to make a rough sketch of a trench or locality, or to illustrate a report. Have a thorough knowledge of map reading and the use of the compass. Must be able to determine a point on the map by coördinates and by intersection, and to solve problems on the map involving the location of batteries, the directing point, the observing stations, the targets, etc.

10. Model range. Have a thorough knowledge of all the principles of ranging and the various methods of applying them. Must be word-perfect in the sequence of commands. Must be able to adjust fire from advanced and flank observing stations and from aeroplane and balloon observations.

11. Instruments and firing data. Must be able to use the battery commander's instruments, and to determine firing data with facility and reasonable accuracy.

12. Reconnaissance and occupation of position. Must understand the general requirements of an artillery position and the application of those requirements in relation to the nature of the mission of the battery. Must be able to select a position, conduct the battery to it, locate the various échelons of the battery, give each piece its proper direction, locate the observation post of the battery commander and posts of observation of the field of fire, and of approaches to the battery position; to establish communication between the battery and the observation posts, the post of the battery commander and higher commands or neighboring troops, the security and cover for the matériel, the ammunition and the personnel; preparations for advancing the battery and for retiring; preparation for the attack, involving the destruction of enemy defences, guns, wire,

entrenchments of the various lines, communicating trenches, headquarters establishments, machine-gun emplacements, and positions of concentration; the employment of light artillery and of heavy artillery for the different tasks, and the application of types of guns and of ammunition for the execution of these tasks.

Light artillery: Must be able to adjust each piece upon a target from advanced and flank observing stations, and from aeroplane and balloon observations, or to adjust the fire by salvos. Must be able to fire for effect, for demolition, or for the rolling or the standing barrage. Must be able to select projectiles and fuses according to the target, and to pass to fire of opportunity and to return to the original task without confusion.

Anti-aircraft or trench mortar artillery: Must be able to take the appropriate targets in accordance with the principles of the employment of these guns.

Heavy artillery: Must understand the selection of charges for howitzers and the type of fuses appropriate to the task. Prepare accurate firing data and adjust and regulate the fire as indicated for light artillery.

13. Protection for guns, etc. Must have a practical knowledge of how to conceal batteries and how to construct protection from hostile fire. Must understand the use of *camouflage,* emplacements, ammunition pockets, dugouts for personnel and for telephone stations, false batteries, protection of échelons, construction of observing stations, and of the station for the commanding officer.

14. Matériel. Must be able to dismount and assemble all parts of the guns, breech mechanism, and carriages, and must know the principal characteristics of the different types of guns and howitzers in service. The candidates assigned to each type of artillery must have a detailed knowledge of that type and a general knowledge of other types.

15. Care and training of horses. The candidates assigned

to horse-drawn artillery must know the principles of hygiene and food for horses; how to keep horses in condition, and to restore condition of debilitated horses; the methods that are practised in the case of parasitic and epidemic diseases and the precautions in each case; the treatment of accidents and wounds; care in cantonment and bivouac; care of the feet; the methods of training a horse for draft and for riding.

16. Harness-fitting and draft. Must be able to adjust a collar and breast strap; understand the principles of traction, and the useful and the harmful components of line traction; the causes of saddle and harness sores, the means to avoid and to cure them.

17. Riding. Capable of riding sufficiently well to command a mounted detachment or other suitable unit. Able to give instruction in riding, and to check obvious faults of position and style. The object of this instruction is to have the candidate know how to mount quietly, sit correctly at the walk and the trot, and to regulate the gaits and the movements of the horse with ease. Candidates will not be permitted to attempt obstacles or difficult exercises that might cause serious accidents, because of the limitations of the course. They should not be permitted to gallop until near the end of the course, and then only with well-trained horses. Candidates who are lacking in aptitude or who are physically unsuited for riding should be assigned to the types of artillery that are not horsed.

18. Stables and stable management. Candidates are required to groom horses and to police and care for stables, and to acquire a thorough knowledge of the proper methods of performing these duties.

19. Organizations, discipline, etc. Must understand the organization of the different arms up to the regiments; the duties of noncommissioned officers and subordinates; rewards and punishments; hygiene, military correspondence, reports and returns, passes, furloughs, leaves, classes of courts-martial, charges, arrests, confinements, trial, punishments, and the Articles of War.

20. Entraining, etc. Methods of loading and unloading horses, matériel, and men; arrangements during the journey; feeding, watering, and messing *en route;* guards; care of animals and men, and inspections.

21. Field firing. Candidate must practically calibrate guns, adjust each gun on target, apply ballistic corrections to range tables for accuracy; must adjust from advanced and flank observation stations and from aeroplane observations, and must execute fire or counter-battery work, bombardment, trench destruction, wire-cutting, rolling and standing barrages, fire of opportunity, and map firing. Targets will be appropriate to each type of gun and howitzer, trench mortar artillery, and anti-aircraft artillery.

22. Ballistics, gunnery, etc. Candidates must understand powders, quick and slow, and the application of each; the influence of the elements on loading; pressure and initial velocity; the probabilities of fire and their application; the laws of dispersion and their application to fire for adjustment and to fire for effect.

Definitions and principal properties of trajectories; trajectory *in vacuo;* resistance of the air; effect of gravity; construction of trajectories by the tables of fire; application of problems of defilade and of angle of site; direct and curved fire; influence of the conditions of atmosphere upon the flight of the projectile; methods of determining the amount of such influence.

Effects of fire; projectiles against personnel and against matériel; bursts by time fuses and on ricochet; shrapnel and high-explosive shell; effects of high-explosive shell with instantaneous fuse at surface, and with delay action fuses under the surface.

23. Range tables, etc. Determination of wind, drift, atmospheric corrections; movement of targets, etc.; corrections for muzzle velocity; density of loading; temperature of powder; variations in weight of projectile and the correction of the

different elements of the range table for all conditions of loading and of flight of the projectile.

24. Motors and tractors. Nomenclature; theory of gas engines, construction of motors; cylinders and pistons, gearing and power transmission, and the function of each part of the engine; carburettors and their function; the magneto, construction and function; radiators, construction and function; regulation of air and gas, change of speed, and appropriate speed under varying conditions, capacity of motors and tractors, and limiting loads and strains; lubrication and suitable oils; care of engine and of working parts of motor or tractor; principles of traction, friction, and resistance, and the solution of simple practical problems.

25. Knotting and lashing. Have a good knowledge of all knots in general use, and their application to military needs.

26. Anti-gas. Helmet drill—care, fitting, and inspection of helmets or respirators; breathing exercises; gun drill; words of command and orders in helmets; passing through gas chamber.

BRITISH HOWITZERS ON THE MARCH

Pages from the Diary of a French Artilleryman

TRANSLATION AND COMMENTARY BY LIEUTENANT GEORGE NESTLER TRICOCHE
FORMERLY OF THE FRENCH ARTILLERY

(Modern trench warfare has so modified the tactics of Field Artillery that one is prone to consider somewhat archaic anything partaining to operations of batteries "in the open," like those described in the following notes. We need a mental effort to realize that the present war of position, for field batteries, is not likely to remain the only method of fighting; even now, once in a while, it is necessary to revert to the old tactics. The English, for instance, have thus made a good use of their horse batteries, especially to increase the efficiency of certain fire. The diary from which these extracts are taken was written by a private who subsequently became a noncommissioned officer. But this artillery driver, Mr. Paul Lintier, in civil life was a talented novelist and newspaper man. His style, which, of course, can only be appreciated in the original, is unusually forcible and realistic. The notes he hurriedly jotted down, by the bivouac fire, or while resting with the combat train, were gathered into a book under the title, "Avec une Batterie de 75. Ma Pièce."[1] Mr. Lintier, then a chief of section, was killed by a German shrapnel while correcting the proofs of his diary. This book of nearly 300 pages was awarded the Montyon Prize by the French Academy and is to-day in its 37th edition. Although not rich in purely technical details, "Ma Pièce" is one of the most interesting contributions to the war literature, because it affords to the reader a unique insight into the daily life of the French artilleryman.)

DURING THE MOBILIZATION

The first pages of the diary are naturally reflecting the emotion and anxiety of the first days of mobilization, with the conflicting reports, which come from nowhere in particular, and spread like wildfire, only to be succeeded by other news, just as unreliable, but nevertheless disquieting.

We are reluctantly compelled, by lack of space, to leave out the greater part of this first chapter.

[1] Plon-Nourrit et Cle., Paris.

"SUNDAY, August 2, 1914.

. . . "Above all, the 'Great Event' breaks the monotony of our barrack life. One could say that a strange state of moral blindness prevents us from foreseeing anything which does not pertain to the preparation of our departure. This indifference surprises me; yet I, too, partake of it.

"Shall we call this decision courage? Are we even believing that war is to come? I am not quite sure. One cannot realize what that war could be. One is unable to gauge the horror of it. So it causes us no anxiety. . . .

"MONDAY, August 3.

"We do not know, as yet, this morning, whether war has been declared or not . . . They say the Germans, yesterday, crossed our frontier in three places; but, again, yesterday, they were positive that our men, in spite of their officers' orders, had entered Germany. They say—they say at the same time the most sensible and the most foolish things. . . .

"We are waiting for news, and when we receive it, we shrug our shoulders. . . .

. . . "The personnel of a field artillery section consists of six drivers, six cannoneers, one corporal, and one sergeant, the latter being chief of section. But our piece—the first one of the eleventh battery—has, besides, a chief of platoon,[2] one fire corporal,[3] one bugler, and the captain's 'striker' with his two horses; altogether, eighteen men and nineteen horses. Out of these eighteen men, seventeen belong to the active army. For nearly one year they have led the same life; every day they have drilled together. So this section has its existence proper; it is a society in a nutshell, with its likes and dislikes, its own habits and by-laws. . . ."

[2] A senior sergeant. (TRANSLATOR.)

[3] Who is also assistant to the Supply Sergeant. (TRANSLATOR.)

ON THE WAY TO THE FRONT

The author, being detailed as "stable guard," is in charge of eight horses in a box car. He prefers his lot to that of the men who are crowded, on hard wooden benches, into freight cars, during these hot August days.

"This is the best place for such a trip. Lying upon a heap of hay which I have carefully shaken, I slept, with my head resting squarely between the padded twin cushions of a saddle. . . ."

To understand this, the American reader must remember that, in France, horses in box cars are generally disposed in two rows of four, facing each other. In the space between these two rows, opposite the car's door, there is plenty of room for some forage, the eight saddles and the stable guard.

"Where are we going? Our officers themselves do not know: the locomotive engineer says he does not know either; he shall receive his orders on the way.

"The Territorials, who guard the railroad line, greet us as we are rolling by, by lifting their rifles. We answer by waving our whips. 'Good day, old chaps!' we shout.

"'Good luck, boys!'"

After a thirty-hour trip, the battery detrains the evening of the 9th near Verdun. It marches then through the woods till midnight, and parks in a meadow.

"We have to lie down upon the bare ground. Drivers and cannoneers vie with one another in snatching the horses' blankets. Most men stretch themselves under the caissons and gun carriages, where the dampness of the night is less felt. . . ."

AT THE FRONT

Until the 14th of August, the eleventh battery of the 44th Field Artillery moves to and fro, expecting in vain, every day, to receive its baptism of fire. On the 14th the battery is sent to Azannes, where it must spend the night.

"On the road move our carriages; automobiles are full of superior officers; cavalry platoons escort gold-braided staff officers; supply wagons are raising clouds of dust that never disappear for a moment.

"Our dark uniforms turn gray in a few minutes.[4] Our hair, eyelashes, our fifteen-days-old beard retain the dust. The Parisian autobusses, transformed into meat wagons, which go ahead, give us, as they pass by, the finishing touch, by making us as white as the road itself.

"'Reconnaissance!'

"'What's that?'

"'Reconnaissance, I say. Pass the word!'

"The corporals repeat the order.

"Our captain says simply, as he is spurring his horse, 'We are going to fire.'

"The major, the three captains of the battalion, the buglers, and the fire corporals gather into a detail that gallops off at once. We cross Azannes, where we were supposed to have our *cantonnement*. It is a miserable-looking place, with low houses surrounded with manure heaps. One sees that, here, man never dared to undertake anything. But it is not because the soil is poor: the perpetual fear of a war, of a German invasion, has frozen, so to speak, the spirit of enterprise. . . .

"Farther on, as we come out of the woods, our batteries, which were in column of march, go front into line. . . .

"Where is the enemy? What is the real value of these positions and from where may they be discovered? Does the infantry support us? We feel feverish, nervous. In a meadow, near a field of oats, we unlimber. The limbers go to hide themselves in the woods. Without a minute's delay, Brejard[5] orders

[4] At that time the French Army was not yet supplied with its present blue-gray uniforms. Artillerymen were wearing a dark-blue blouse, dark-blue breeches with a scarlet stripe on the side, and a *kepi* of similar color. (TRANSLATOR.)

[5] A senior sergeant, chief of the first platoon of the eleventh battery. In the present four-gun battery of the French Army, one platoon (two pieces) is commanded by the *adjudant* (a sort of sergeant major); the other by the senior sergeant. The lieutenant is in charge of the firing battery while the captain is at the observing station. The first sergeant is in charge of the limbers. The *échelon*—combat train—is, as a rule, commanded by a Reserve lieutenant. (TRANSLATOR.)

us to dig out, with our pickaxes, some clods of earth with which to increase the protection afforded to cannoneers by the shields.

Our horizon consists only of motionless oats, already ripe, from which rises, under the brilliant sunshine, a hot, metallic glare. The pointer finds neither a tree, nor even a sheaf, to use as an auxiliary aiming point. It is necessary to stick a spade in front of the gun. Had I not seen the batteries take their position, I never should have realized what a force of artillery was awaiting the enemy in these fields—over sixty pieces. With the exception of the observation ladders, upon which the different captains look like big insects on the top of a blade of grass, we do not see anything. . . ."

But it is a false alarm; and the battery, without firing a shot, is sent back to its cantonments, near Verdun. The whole Army Corps moves slowly towards the Belgian frontier, crossing the latter on the 21st of August.

THE BAPTISM OF FIRE

"SATURDAY, August 22.

. . . "On the road that stretches very straight between a double row of trees, the twelve batteries of my regiment, followed by their combat train, form a dark, interminable line, apparently motionless.[6] The captain commands:

"'Dispositions de combat!'

"The cannoneers, lying on the grass, jump up. They remove the muzzle and breech coverings which protect the guns against dust, put in place the sights, and examine the working of the aiming apparatus. . . ."

Several miles ahead, a battle is raging. For the first time, the author and his commanders see hostile shells exploding in the distance.

[6] This regiment consists of twelve batteries (four battalions) because it is "Corps Artillery." Divisional regiments have, in principle, three battalions of three batteries each. The fact that the 44th Field Artillery is the corps regiment of the Fourth Army Corps explains why it did not participate in more engagements during the first phase of operations. During August, 1914, there was on that particular front much scattered fighting, but very few affairs long or important enough to call into action all the Corps Artillery regiments of the different Army Corps. (TRANSLATOR.)

. . . "It seems to me that a feeling of anxiety is growing on me, as if the circulation of my blood were slackening. I am not afraid. . . . This state of unrest causes us all to look sober, and fastens our eyes upon that spot which is constantly struck by the German shells . . . Among men, conversation slackens. One is waiting for I do not know what—a shell's burst, the arrival of orders. . . . Inwardly, I excuse myself for being anxious. A baptism of fire is always disquieting. Immobility, in column, on the road, is enervating. Should our foe increase his range, he would hit us while we are absolutely defenseless."

The noise of the battle increases. Finally the battery moves on.

. . . "Where are we going? Ye Gods! Where *are* we going? . . . Towards that crest, every acre of which has been, for two hours, riddled with German shots? Why are they leading us thither? Are there not, on yonder hills, many other excellent positions? We are going to be slaughtered! And the column, at a walk, advances towards the sloping field, struck every minute by the hostile shells.

. . . "Anxiety almost chokes me. Yet, I reason with myself. I clearly understand that the hour has come to sacrifice my life. We shall go on; we shall all go there; but we shall never come down from these hills. That's all. . . .

"We are going ahead, still at a walk. The drivers, who had dismounted, walk at the head of their teams. . . ."

At last, that dreaded first shell is coming, causing the air to vibrate—and the vibrations seem to extend to the flesh, to the nerves, to the very marrow of the bones.

. . . "The cannoneers are squatting close to the caissons' wheels. The drivers take shelter behind the horses. One is waiting for the burst. One—two—three seconds. Hours! I bend my back; I tremble. I feel that an instinctive desire of running away is surging from my whole being. . . . Here *it* comes! It seems that lightning struck at my feet. . . .

"And now the column halts here, in a potato field so ploughed down by the German fire that one can hardly find a passage for our guns between the holes opened by the shells. . . ."

In spite of this apparently terrific fire, only one man, a driver, is slightly wounded. The battery unlimbers finally; but the captain fails to find any target, on account of a mist which hangs over the hostile positions. German shells fall everywhere, but they are not aimed at the battalion. The latter remains idle while columns of infantry, in retreat, pass by. The situation looks serious.

. . . "Our officers are consulting together. We hear the major repeat over and over again: 'But what could *we* do? No orders. . . . No orders!'

"And still we wait. The tall lieutenant has taken his revolver out of the holster. Cannoneers are cocking their carbines.[7] The hostile artillery has become silent, perhaps because it fears to hit its advancing infantry. At any moment the enemy may appear on the crest. . . . At last: 'Limber up!' This manœuvre is quickly done."

The battery, without firing a gun, has had five or six men wounded; what is worse, a fragment of high-explosive shell broke open the brake of a gun carriage, thus putting the piece out of commission. One follows the retreat, under the fire of hostile machine guns. A horse falls; a bullet passes through a cannoneer's thigh, but the man walks on by the side of the caisson.

"In a dale, well sheltered from the bullets, a meadow forms a clearing in the woods. There our three batteries park, while waiting for orders. . . . But the longer we wait, the fewer chances we have to escape without more harm. . . .

"The major is waiting for orders. His speech is brief, his gestures are jerky. This betrays a nervousness which we know very well. 'He is cracking hazelnuts,' as the saying goes among us, in the battalion. He had sent out a corporal to get some tidings.

[7] French cannoneers are still armed with a carbine, 1892 model, which has a magazine for three cartridges. This weapon is far less effective than the revolver of the mounted men. (TRANSLATOR.)

But, at this time, where is it possible to find the headquarters? The army is in full retreat. . . ."[8]

Again the battalion moves on. To save time, it goes across country, forcing its way with axe and pick through fences and other obstacles. It reaches finally a highway.

"The road to Tellancourt is like a river. In the midst of the human waves made by this multitude in retreat we must make our way by force. Beside the artillery column are infantry battalions which had retained some organization. Right and left, tossed like pieces of cork on a swift current, carried by the eddy, now thrown into the ditch, then dragged by the torrent, remnants of units crowd the edges of the road: there are wounded men, men who are footsore, exhausted men without arms or haversacks who have gone astray. . . . Some cling to our carriages and hoist themselves up to the caissons' chests. . . . The middle of the road is strewn with shoes, mess kits, regulation kettles flattened by the carriages' wheels and the horses' hoofs, pieces of clothing, cartridge belts . . . kepis, broken rifles. That brings tears to our eyes. In spite of myself, I am thinking of the roads followed in August, 1870, by our retreating forces, after Wissembourg, after Forbach. Yet, for a month, they were talking of nothing but victories . . . and at the first battle, *our* army, *our own* army is beaten. With some surprise, I realize that I have been present at a defeat. . . ."

Day after day the battalion wanders to and fro, always alarmed in the early morning, starting in a hurry for nowhere in particular, stopping for hours in some field or perhaps unlimbering without firing a shot. The men seldom get a warm meal; they never undress. The horses, at night, are unhitched and unbridled; but they remain saddled and harnessed. On the 23d of August, a Sunday, while the church bells of a neighboring village are calling people to mass, the men count themselves. Many are missing. The whole combat train has disappeared.

[8] Notwithstanding the retreating movement, there seems to be no excuse for the lack of communication between the Army Corps' headquarters, or at least the Artillery Brigade's headquarters, and the Corps Artillery regiment. (TRANSLATOR.)

"In a circle around the captain we reorganize the sections. The battery has only three guns left; one must send to the rear the one whose brake had been broken by a shell.

"How tired I am! As soon as I remain motionless, I fall asleep. My master pointer, Hutin, opens a box of *singe* for us both:[9]

"'Are you hungry, Lintier?'

"'Not very; yet I have not eaten since day before yesterday.'

"'Same here. . . .'

"In the evening we go back to Torny for the night. That shows that there is nothing threatening in the air. . . . We parted from our bivouac. It is hard work! The guns are parked twenty metres apart; picket lines are fastened between the wheels of two guns. When the horses are attached, the harness is placed upon the pole of the limber. . . ."

The battery is expecting at last a quiet, restful night. But the bivouac is soon disturbed by the appearance of a hostile aeroplane. The cannoneers, half undressed, seize their carbines and shoot at the aircraft, of course, without any result. Then, as the drivers are watering the horses, an orderly arrives at a gallop. We must move on at once.

"Is it a surprise? We harness the teams feverishly, and, before we have time to button our blouses, the first carriage is leaving the park.

"'Forward march! At a trot!'

"We were obliged to throw the oat sacks, still half filled, pell-mell upon the gun carriages; while running along we rope hope them lest they should fall off.

"Then, half dressed, we jump upon the caissons and limbers as the battery is trotting on that rough road. . . ."

On August 25, near Marville, the battery fires its first shot—seventeen days after leaving its garrison.

"'Attention! Pointers, at my side!'

"The men run up to the Captain's position.

[9] In military slang, *singe* (monkey) means canned beef. (TRANSLATOR.)

——"'In front of us, a tree looking like a paint brush.'

——"'Seen,' answer the pointers.

——"Aiming point, that tree. *Plateau,* O. *Tambour* 150. . . . Each pointer runs back to his post and lays his gun. The breech block closes. . . . The pointer raises his arm:

"'Ready!'

"The chief of section commands:

"'For the first shot!'

"Fire"! . . . and the firing goes on, quickly, but without any jerking. The men's movements are coördinate, precise, brief. No one speaks. Gestures are sufficient to indicate what is to be done. One hears only the changes of range given out by the captain, and repeated by the chiefs of section. . . .

"The cannoneers stretch themselves on the grass. Some begin to smoke."

But soon that bane of the artilleryman, a hostile aeroplane, is seen soaring above the guns.

. . . "Immediately, German howitzers open fire upon the crests occupied by us and upon a wood near by. It is time to change position. . . ."

That is what the battalion does before the enemy has the exact range. It seems that the German aviators are becoming more active, for on the 30th of August the battery's position is again marked by a hostile aircraft. It is worth noticing that, already in 1914, it was vaguely felt by the French soldiers that their foe was getting temporarily the mastery of the air—a fact which is officially admitted in August, 1917!

. . . "The enemy has succeeded in perfecting the 'aerial arm' so that he uses it as a virtuoso. Unfortunately our '75' is unable to reach these swift 'hawks.' The gun proper is not mobile enough on its carriage. One has to dig a ditch to sink the trail's spade; and, by the time this is done, the bird is far away.

"The avion has marked, with a star, the position of one of

our batteries, placed upon a hill near the river. But, at once, this battery went somewhere else, unknown to the enemy.

"Just now, hostile shells fall, very thick, upon the crest that the guns have left—enormous shells which, when they burst, shake the ground for miles around. . . . 'These must be their famous 22-cm. shell,' the captain explains to us. . ."

Much to the men's sorrow, the Fourth Army Corps continues to retreat. The weather is bad; the fatigue extreme. Even a full day's rest, with abundant food, does not improve things.

. . . "We are leaving our camp in the night. We should feel somewhat rested were we not all suffering from diarrhœa. Nothing is more exhausting; nothing like it to cause a fellow to lose flesh in a hurry! The surgeon is out of bismuth and paregoric. Our only resource is to chew blackthorn bark. . . .

"The horses are still more tired than the men. Many of them have been slightly wounded in the battles of Monday and Tuesday. Their wounds are suppurating. Most of them are not cared for at all; and this is not so bad, because a few have to put up with the nonsensical remedies devised by their drivers. One of the latter is urinating upon his horse's pasterns which had been cut open by a fragment of shell. Almost all horses are limping, for they have been hurt by the tethers or by kicks received at night, while the stable guards, utterly exhausted, were slumbering.

"Seldom unhitched, never out of harness, they have many large sores (caused mostly by the cruppers) and which, all day long, are covered with gadflies. The cavalry is pitiful, and their horses are weakened, moreover, like the men, by a continual diarrhœa."

On the 4th of September the battery entrains to go to the vicinity of Paris. What a contrast with the departure for the front! Then, man and beast were fresh, healthy, ready for anything; now, worn out, emaciated, almost ruined by disease, lack of sleep, and incessant marching, they move as if in a trance.

"At dusk we entrain. Kerosene lanterns, placed at great intervals, light more or less the long platform, covered with straw. Horses, with lowered head, brutalized with fatigue, allow us, without any resistance, to place them in the cars. . . . Men, thirty in each freight car, arrange themselves for the night; some stretch themselves on the benches, some lie on the floor. Great coats are used for pillows; arms are piled up in the car's corners. And, as the sun is setting, the train pulls out slowly, along the now deserted platform. . . ."

The battery detrains at Pantin, a suburb of Paris. Although the report of guns is heard at intervals, life seems absolutely normal there. Cafés are full of people; gayly attired Parisians crowd the street, taking their "constitutional" on that bright sunny Sunday. But that is only a vision. At once the battery starts on an interminable march, amidst clouds of dust. During the long periods of trotting, the men on the caissons, constantly jolted and jerked, are almost too miserable to think, as diarrhœa still tortures them. But, at last, one is going *forward:* the odious bugbear of "Retreat" is vanishing from the men's minds! On September 7 the battery goes into action, playing its part in the famous operation of the Marne.

. . . "Only a thin hedge of brambles and underbrush hides us. From several points, on the horizon, our battery is certainly visible. It is not a good position; but there is no better one at hand. On a private road, near No. 1 gun, our officers have established their observing station. . . . We have heaped sheaves upon our guns and caissons. Yellow, on the background of that yellow field, they may deceive the hostile observer. Then, too, straw is a pretty good protection against fragments of shells.

"At once, as thoughtless as the 'men' moved by players at a game of chess, and with that fatalism natural to men who have been risking their lives for a month, we lie down to sleep in the sun. . . .

"To your pieces!"

"Something dark, artillery perhaps, is moving yonder, at

the foot of wooded hills, more than 5000 metres away. We begin to fire. Right and left, and even in front of us, batteries of '75' are going into action one by one. . . ."

Very shortly we cease firing. The enemy did not answer. But as soon as the breeze clears away the smoke, hostile howitzers open up—three large shells fall together, very accurately, into the hedge in front of the guns.

——"'They have seen the flashes of our pieces,' says the chief of platoon. ——'And they have got the right direction, too,' remarks Hutin, the master pointer. 'It is the 150-mm. gun, all right!' Unluckily, just now, a *caisson de ravitaillement* is coming up from the combat train, at a trot. It is commanded by a corporal, on a big white mare.

"We shout: 'Dismount!' 'Dismount; you will be killed!'

"The drivers do not seem to hear.

"'Dismount, you . . . fools! At a walk! At a walk!'

"But already they have unlimbered the filled caisson, limbered up the empty one; and there they go, at a gallop, in spite of our shouts! . . ."

Shells continue to fall here and there. The battalion does not answer the fire, for it is clearly outranged by the German heavy artillery. A few cannoneers fall. Yet the order to limber up does not come.

. . . "Hutin, the pointer, seated at his post on the gun-carriage, shouts to us:

"'But I see them firing, *les bougres!* I see them, far away, yonder, over 9000 metres! I saw the flash. Here comes the shell! Here it comes! Look out! . . .'

. . . "I hear the captain shouting to the *adjudant:*

"'Daumain, have everybody take shelter to the right. The Major's order. Useless to get killed so long as one does not fire!' We call one another; we get out of the smoke zone; we try to step away from the area searched by the howitzers. But the enemy's fire follows us on that field where we are running, scattered, bending our backs, as if that should protect us. . . ."

"WEDNESDAY, September 9.

"In a field near Sennevières, while waiting, we are making our coffee. . . . To the northeast and to the east, guns are thundering away, like yesterday, incessantly. . . ."

At one time it seems certain that the left wing of the French is weakening. The cannoneers, always dreading a retreat, become anxious:

. . . "Is the enemy to flank us again? We question the captain:

"'What does that mean, *mon capitaine?'*

——"'I do not know more than you do, my friends. I have only to obey orders. I place myself where I am told to do so. That's all!'

"Deprez[10] insists:

"'But they are again turning our left wing!'

"The captain's face betrays, this time, some anxiety.

"'Yes,' he says, 'they are shelling, to-day, woods they were not shelling yesterday. Yet, that proves, at least, that they have not as yet reached this spot. Perhaps, on the contrary, they are threatened by us in that direction. . . . What do we know about all this? And then, should we be outflanked, we are not alone here. We shall face them.'

"He lays a stress on this last phrase by looking squarely at us with those bright, proud eyes of his. He repeats:

"'We shall face them?'

"'For sure, captain!'

"Coffee is hot. The captain gets out of his pocket his aluminum cup and dips it into the black, steaming liquid. All the men of the section, standing by his side, cup in hand, are waiting. When he has served himself, they lean, one by one, towards the kettle, to get their ration. We are silent. We are enjoying the coffee.

"Then the cook's voice is heard:

——"'There is some *rab!'*[11]

[10] A corporal. (TRANSLATOR.)

[11] Abbreviation for *rabiot,* an army slang term for "remnant."

——"How much?' asks the captain, anxious not to slight anyone.

——"Each one, a good half cup.'

"The captain helps himself, then the men follow. And, as there still remains a little coffee mixed up with grounds—some '*rab* of rab'—the process begins again." . . .

———————

We end the quotations here, on that military "family picture" truly characteristic of French Army life. The book is well worth reading in its integrity, for, leaving out the descriptive part of it, it is possible to draw from its perusal some technical conclusions which might be useful. For the benefit of those, among our readers, who will not be able to read "Ma Pièce" in the original, we shall try to condense these conclusions into a few remarks.

Although the book tells only of the experiences of the members of one particular battery, it is obvious that many things which befell this battery befell also the battalion and the whole corps regiment of the Fourth Army Corps, as the twelve batteries of that regiment were generally together. Therefore it is possible to generalize to a larger extent than one should expect at first sight.

1. It seems that communications between batteries and headquarters were often defective. Throughout the book, batteries and battalions are seen awaiting orders, which either come very late, or even do not come at all. The result was, in many instances, that the batteries began their retreat *too late,* when they had no regular support and the enemy was too near. Men and horses suffered thus, unnecessarily, from rifle and machine-gun fire.

Sometimes matériel was lost: the tenth battery of the 44th, for example, had to sacrifice all its caissons in order to save its guns, solely because, during its retreat, it had to take a road which had not been previously reconnoitred. Something similar, if not worse, seems to have occurred, on another occasion, to divisional batteries.

Again, we see the *échelon*—the combat train—cut off from its firing battery—a fact that which can be ascribed only to a strange neglect of the fundamental rules of field artillery tactics.

2. During the two months covered by the diary, early morning alarms occur nearly every day, compelling the batteries to leave the cantonments in a state of confusion and, which is worse, without any possibility of giving the men hot coffee or watering the horses. A great many of the ailments that befell men and beasts in the latter part of August, during the rainy weather, can be ascribed to this condition of things. Alarms will happen in a campaign; but it is hardly possible that they should become a rule, unless there is something wrong at headquarters. What happened near Verdun and in Belgium in August-September, 1914, reminds one very forcibly of the mishaps of the War of 1870-71.

But how could one wonder at this when, even during the annual manœuvres, with all the work carefully planned ahead, long, useless waits and groundless alarms occurred so often? In the very same cantonments occupied early in August, 1914, by the eleventh battery of the 44th regiment, my own battery, manœuvring years ago with the famous Iron Division, had to hitch up sometimes at 2 A.M. and remain at the park until 7, when we departed breakfastless and already drenched by the rain; the origin of such orders could never be ascertained.

3. Battery or battalion commanders often appear to feel some anxiety as regards the safety of their unit. To be sure, during the night, the corps artillery had an infantry *soutien;* but certainly no adequate protection during the day. A battery commander who, in action, is constantly concerned about the guns' safety cannot give to the firing what the latter requires—undivided attention.

4. The lack of field (rolling) kitchens, at the beginning of the war, caused by the unreasonable opposition of officials—and officers—belonging to the old school, caused the batteries to fight or march on an empty stomach, and even to eat *raw meat*. In

that respect, French field artillery was behind the similar units of a little militia country, Switzerland.

5. A large proportion of wounded cannoneers or drivers were hit on the head. Many of these wounds, which were slight (but not infrequently caused blood poisoning), would have been avoided, or their seriousness greatly reduced, had the arm been supplied with helmets, from the beginning. But, although such headgear had been asked for since the early "eighties," again the "stand-pat" spirit of some War Department officials prevented for years the change that Marshal Joffre effected in the twinkling of an eye. The only attempt at a better head protection was an experiment made, a few years before the war, with a helmet which was issued to two horse batteries of the Paris garrison. That headwear, however, was intended as a protection against sabre thrusts. The idea that a helmet could be efficient against fragments of shell or bullets was generally ridiculed. Experience has conclusively shown, during this war, that many small fragments or shrapnel balls which reach a battery have not sufficient remaining velocity to cause any serious harm. That is why gun or caisson shields are more effective than many an artilleryman thought before this war. The number of artillery helmets *deformed*, but not pierced by hostile projectiles, is an eloquent testimony of the usefulness of this adjunct to the uniform.

6. As regards the morale of the men, this diary, like all other works of a similar nature written during the campaign, shows conclusively that artillerymen accustom themselves to the hostile fire much more quickly than is generally expected by officers who have not yet been present at a battle. It must be remembered that artillery, unlike the infantry, is exposed, or at least should be exposed, only to hostile shells, and not *also* to the fire of rifle and machine guns.

It does not take long for the men to realize that, terrible as the effects of bursting shells may be, they are less formidable than they look—especially in newspaper reports. The remaining

velocity of shrapnel balls or fragments, when the latter reach the guns, is often, *in fact,* for different reasons, much smaller than it ought to be *theoretically*. Besides, the heavy howitzer projectiles, so destructive when they "fall plump" upon a gun's crew or a group of limbers, for instance, are by no means as "black" as they are painted. In the particular battery mentioned in Mr. Lintier's book, the cannoneers realized very quickly that the steeper the angle of fall, the less the cone of dispersion is to be dreaded, especially upon a light soil. Says the author:

. . . "The (heavy) shell, by falling almost perpendicularly on the soft ground, sinks very deep. It displaces, in bursting, an enormous amount of earth. But many fragments of steel are lost in the depth of the hole, and the murderous 'gerbe'[12] is so much the more reduced. This is borne out by facts. As we walked away from the little crater, the tall *topinambours'* stalks[13] are cut higher and higher from the ground. Twelve steps away from the hole, the fragments have struck only the top of the highest stalks. Therefore a man, lying down very near the point of burst, would probably not have been hit. Farther, a circular zone has been entirely spared. Farther still, here and there, fragments, when falling back,[14] have knocked down leaves and small limbs of trees; and, in that area, one would run as much risk standing near the guns, as lying flat on the ground. . . ."

And the author concludes with that remark which deserves attention: "The shell, studied in that way, loses much of its moral effect."

A mere perusal of the diary shows clearly that the soldiers were haunted by the "ghost of 1870." The slightest movement of troops backwards causes an anxiety which is absolutely

[12] Cone of dispersion. (TRANSLATOR.)

[13] Jerusalem artichokes. The howitzer shell in question had fallen in the middle of such a field. (TRANSLATOR.)

[14] Therefore after the velocity caused by the bursting charge has been spent. (TRANSLATOR.)

natural. The word "treason" is on the soldiers' lips, but it is gratifying to notice, in these trying circumstances, the coolness and good sense of the *cadres*. Yet, in spite of the grumbling, drivers and cannoneers remain perfectly in the officers' hands—first, because these officers have known how to win their men's confidence; second, because, by its very organization, artillery is the most "solid" of all arms. As the author very aptly remarks:

"The infantryman, the cavalryman, the engineer are units by themselves. For us, the unit is the gun crew. These seven men are the organs, closely bound together (and dependent on one another) of a being to which they impart life—the piece in action.

"This chaining of the seven men together and of each of them to the gun makes any weakness more conspicuous, more important, and sets forth more forcibly the shame which arises from it. Then, in this joint responsibility, the effluvia which create psychological contagion, develop themselves easily; one or two cannoneers faithful, cool headed, impressed with a greater sense of duty, are often all that is necessary to give courage to a whole section. . . ."

Artillery in Europe

BY MAJOR M. E. LOCKE, 8TH FIELD ARTILLERY

THE following notes and impressions of the writer are the result of his recent presence in Europe, both on the western front and elsewhere. The observations made pertained particularly to artillery activities, and other matters outside of that sphere were merely incidental. The impressions obtained resulted from visits to training and school centres of the English artillery in England; to the schools, ammunition parks, ordnance repair shops, and operations of intelligence, balloon and airplane services behind the British lines in France; the operations of the artillery staffs at British Great Headquarters, Army Headquarters, Corps Headquarters, and Divisional Headquarters; also visits to all types of British artillery in position and firing, forward observing stations, and general scenes of activity at the front from Ypres to Armentières. This front was the scene of the successful Wytschaete-Messines attack on June 7 last and the further advance in this region since August 4 of this year. Embraced also in this visit was a trip to the French front in the vicinity of Rheims, covering the sector of Craonne–Moronvilliers.

The writer was particularly struck with the operations at the Wytschaete-Messines battle above referred to, as they constitute one of the most, if not the most, successful offensives of the Allies to date. This battle resulted in forcing back the German line for an average depth of two thousand yards, over a ten-mile front, and destroyed the southern face of the troublesome Ypres salient. It was accomplished with a minimum loss of men, which was due in a great measure to the power and efficiency of the British artillery, which after a seven-day bombardment, covering every objective in the area selected for assault, succeeded in overmastering the German artillery and causing the withdrawal of its guns. With its own divisional

A FRENCH HEAVY HOWITZER

guns the British then formed, on the day of the assault, a rolling barrage and a standing barrage for its infantry. The infantry followed this rolling barrage, at a distance varying from fifty to one hundred yards, and captured the ground above described. It will be seen, then, what a controlling influence on any offensive the artillery exercises in this war. The French and British now possess a formidable artillery, both in numbers and efficiency, and it is still being augmented. Such an artillery is secured by the mobilization of all national industries to produce the matériel and the most thorough organization and training of the personnel. Our task is the same as that of the Allies.

Our present artillery organization is believed to be very satisfactory in many respects until we get beyond the regimental organization. We have yet to create the artillery staffs for the higher units. Abroad, the artillery staffs of the armies, corps, and divisions are quite numerous and might seem, when listed, to have an excessive number of officers, but in both British and French armies it can be safely said that there is not one too many officers to coördinate the complex activities of the artillery, especially during such an offensive as above described. Organizations for such staffs will undoubtedly be evolved for us. It is regretted that data on this subject must be excluded from an article such as this.

The subject of training or instruction is most important. The training of officers and men ceases only during the time when actually engaged at the front. Before going to the front there is intensive instruction for both the new officers and the new men. Immediately upon the withdrawal from the front for purposes of rest, selected officers and men are at once sent to various schools behind the lines and there instructed. This applies not only to the artillery, but to all branches of the army. Behind the French and British lines there are schools of application for every form of military activity. Every British army has its artillery school, and at this school officers are given the training which will keep them ready to employ the methods of

the "moving battle" (war of maneuver), as well as the methods of trench warfare. The article by Colonel Reilly in the April-June number of the JOURNAL described the French artillery school at Fontainebleau, giving some idea of the extent and thoroughness of just one phase of this training. It was the writer's privilege to visit and inspect this school thoroughly. It is sufficient to say that it turns out nine thousand fairly well-trained artillery officers a year. It is impossible to give here the results obtained by these intensive methods of instruction, but the writer can say that he has seen field batteries which were trained in three months from raw recruits. He saw them when they were ready to go to the front, at which time they conducted service practice and executed mounted drill in a very creditable manner. There is no doubt that a system which can turn out efficient troops in such a short time is a growth. By this time a great corps of instructors, drawn from officers who by reason of wounds or other disabilities are no longer fit for the front, is available for this work. Such a corps is lacking with us at present. By the return of officers to this country, after a certain service at the front, for duty as instructors, the work of instruction can be greatly expedited.

In the conduct of artillery operations, trench warfare has produced many changes. The normal appearance of a field battery in position is quite different from what one would expect, judged by the open battle methods taught in all armies before this war. The guns are kept in pits or surrounded by trees to such an extent that distant aiming points are impossible. No caissons are with the guns, the ammunition being in racks in the pits. These pits have little or no covering, usually only sufficient head covering to resist shrapnel or shell splinters. The limbers and horses are ordinarily one to two miles in the rear of the guns; the B.C. station, if such exists, is in the battery itself.

All observation of fire is made from the posts of the forward observing officers (F. O. O.'s), which are called observation positions (O. P.'s) and are in masked and carefully protected

positions located near the first line of trenches. If possible they avoid putting the O. P. in the front line trenches themselves. These O. P.'s are connected by telephone with their batteries, and from them the fire is conducted, usually by the captain, during an important action. During "Peace Time War," as the English call the normal conditions along the front, the duty of F. O. O. is taken in turn by each of the battery officers for a certain length of time. This duty at times is, of course, extremely dangerous.

The personnel at the battery usually have dugouts constructed wherein they can take refuge when bombarded. It is expected that they take refuge in these dugouts whenever the battery is bombarded, unless they are engaged on some special or important gun service, such as delivery of a barrage. In such case they must remain at their posts, whatever may be the cost.

Over each gun is stretched a canopy of netting to which are tied tufts or strips of burlap painted green, yellow, and brown. These nets form the *camouflage* for the guns and diminish the chances of their detection by ærial observers. Every British light gun carries on it as part of its equipment one of these nets. Extra ammunition is scattered around everywhere in the vicinity of the battery ("dumps"). Every such "dump" is *camouflaged* with brush or by paulins thrown over them and painted the various colors required by that particular terrain. The art of *camouflage* is one of the most interesting products of this war. It calls to its service everything, from the work of artists and sculptors down to that of day laborers. It is regretted that this article cannot more fully describe its activities.

The wire communications of a battery in position are a very complex thing. There is frequently a telephone exchange in the B. C. station which makes it possible for the B. C. to talk to his division commander, to his battalion commander, to his F. O. O.'s, and to the commander of the infantry whose front he protects. To many of these officers he has alternative routes of communication besides the direct lines thereto. All telephone

wires are buried six to eight feet in the ground until the area of the trenches is reached, where, if it is no longer possible to bury them, they are pinned on to the sides of the trenches. All telephone lines in the trench area have the double metallic circuit, as the ground return permits the enemy to read all messages by means of detectors created for the purpose. For the same reason messages at the front are sent in buzzer code instead of by voice. Both sides forbid the use of spoken messages over the telephone where the lines are located in the trench district, except in the greatest emergencies.

It is not an uncommon sight in the posting of batteries to see the guns posted in tiers. The firing of artillery over personnel in its front is taken as a matter-of-course procedure. Batteries in the lower tier of guns usually have a parados in the rear of each gun as a partial protection from premature bursts of guns in the rear.

The writer cannot recall having seen the employment of a distant aiming point in any battery, light or heavy. The siting of the guns usually forbids this. The normal procedure seemed to be to establish the direction of the directing gun by the use of the map or compass bearings, then establish parallel fire in the battery and give each gun its own aiming post not more than fifty to one hundred yards away. Another method was to establish by some form of survey the line of fire for a sort of sight bar set up close beside a gun and then by means of a reflecting apparatus on the gun sight secure parallelism of the gun with the sight bar.

It will be seen, from the extent of the communication system of a battery, that a great number of men will be needed in the B. C. detail. British batteries, including signallers, have about twenty-one men. Our own details will have to be materially increased and signalling must be carefully taught, using all the various kinds of materials—large flag, small flag, telephone, buzzer, daylight lamp, daylight shutter, etc., depending upon conditions. Every known means of communication has been, and may often have to be, employed, including such things as

rockets, flares, carrier pigeons and dogs. So great is the need for many and thoroughly expert signallers that every British battery endeavors to maintain a competent understudy for every signal man in the detail.

As regards the technique of firing, the following were noticed as among the most important features:

The widespread use of firing by the map;

The frequency of firing by compass;

The methods of conducting "airplane shoots" (conduct of fire from airplanes);

The calibration of guns to compensate for loss of muzzle velocity due to wear of the guns;

Corrections for atmospheric conditions;

Corrections for map's distortion.

It will be seen from the above that a large amount of the work of the guns partakes of the character of bull's-eye shooting, particularly when charged with the destruction of small material targets. At any rate, every precaution is taken to insure the shot falling in a small zone.

Three great kinds of work exacted of the artillery may conveniently be grouped as follows:

"Destructive shoots";
Counter battery work;
Barrages.

The "destructive shoot" is firing undertaken to demolish various hostile structures, such as firing trenches, communication trenches, wiring, dugouts, depots, dumps, etc. These "destructive shoots" may be performed by all classes of guns, but are usually the function of the heavier calibres. Counter battery work is usually the function of the heavy guns and howitzers. Like the subject of *camouflage,* a detailed description of the various activities of counter-battery work extends far beyond the scope of this article. The head of a counter-battery service calls to his aid for the location of hostile batteries the assistance of the intelligence, flash-spotting, balloon, airplane, and aerial photograph services, to say nothing of the map department.

He assigns to his batteries for destruction all targets located by the foregoing instrumentalities.

Barrage firing may be a curtain of fire which rolls along the ground at a predetermined rate. This is called the rolling barrage. Behind it marches our own infantry at such a sufficiently short distance that they are able, after a barrage has rolled over a trench, to rush into that trench before the defence can come up from their dugouts and line the parapet with their machine guns. It goes without saying that during the intensive bombardment the defence cannot remain in their fire trenches and live. They must take refuge in their dugouts.

The standing barrage is a curtain of fire which moves by a series of lifts or bounds, varying in amount, having some definite objective at each lift. Its principal duty is to bring fire to bear on certain areas in advance of the rolling barrage from which ruinous fire might be delivered upon our attacking infantry, as, for example, machine guns posted in suitable places and fired by indirect fire through our rolling barrage into our infantry. The standing barrage, by the use of smoke shell, also masks the progress of the attack from the enemy.

All barrage fire is a function of the divisional artillery. It seems well established that infantry, after proper artillery preparation, can advance under the cover of a well-regulated barrage, but its advance is limited to the range of the guns. When the extreme limit of the barrage has been attained the infantry must consolidate and wait until the guns can be pushed to the front. A multitude of details must be cared for when making the arrangements for barrage firing for a great attack. The coördination of these details finds its expression in the barrage maps prepared and issued by each corps and in the firing schedules prepared by every battery commander. In doing all the foregoing the need for the numerous high artillery staffs already spoken of becomes apparent. Once supplied with his barrage map, every battery commander must make out for each of his guns a time-table for firing in the barrage. This table is far more exacting than that of any railroad train,

for every gun must during every designated minute of time fire a certain number of shots with a certain set of firing data different for various times.

The infantry in the front line trenches has a certain amount of divisional artillery told off to defend its front. Infantry in the front line trenches, which suspects an attack, sends in to its supporting artillery an S. O. S. call. Censure awaits any battery which fails to respond by fire within thirty seconds after the call is sent. The response has come in seventeen seconds. The fact that guns are, when not otherwise employed, always kept laid on their S. O. S. positions and that the sector for each gun is so small simplifies this performance somewhat.

Undoubtedly there will be evolved some "doctrine" of training for all our artillery, designed to give instruction in all that it is needful to know in this present war. It is believed that this instruction will involve the following subjects for artillery officers, some of which had not attained before the war the importance which they now have, viz.:

More instruction in map and compass firing;
The preparation of battery battle charts;
The calibration of guns;
Correction for atmospheric conditions;
Greater proficiency of officers in all kinds of signalling;
Aerial observation of fire;
The conduct of fire at service practice from O. P.'s;
Camouflage;
The preparation of barrage maps and time-tables;
Methods of counter-battery work.

In the pursuit of these studies the instruction must never lose sight of the principles covering artillery in the open battle, as laid down in our drill regulations.

Spotting Practice for Field Artillery

BY L-I.

TRAINING hundreds of young men to be officers by intensive methods, with very limited resources, is a problem of huge proportions. In an attempt to establish field artillery instruction in the training camps, National Guard units of that arm were sent to them for station during the first session. It was hoped that double use might be made of the matériel by having it on hand both for the training of the candidates and the organizations to which it belonged. In some cases this deprived states of all of their field artillery equipment, so that there was none to use in training the new units that were formed. True, in some cases it has been reported that patriotic feeling, accompanied by the spur of necessity, has resulted in the building of wooden fieldpieces which, with spare sights attached, have answered the purpose quite well for drill purposes; but the work of improvising means has a limit, depending upon the capacity of those engaged and the materials at hand. The shortage of equipment not only affects training camps and National Guard, but the whole new National Army as well. It is expected that in consequence of the lack of matériel there will be more or less hesitation on the part of some as to the methods to pursue in order to quickly pick up artillery technique. It is believed that it is incumbent upon all of us to put unpublished methods in the hands of our new officers with a view to assist in speeding the general preparation and in helping them particularly in those locations where they are waiting the arrival of matériel. Under these considerations, certain methods which were developed in the First Field Artillery at Schofield Barracks, Oahu, several years ago, are described.

At different times methods for preliminary training and indoor work have been devised which have resulted in the present systems of black-board and terrain-board firing. To date, outside of actual firing, well-manipulated smoke bomb practice is

the best way we have for teaching quick thinking in the conduct of fire, as well as illustrating the proper handling of the sheaf, because the visible effect is more nearly that of actual target practice than any other scheme practised. It is highly important, therefore, that this drill should be frequently held. Its particular disadvantages have been the time necessary to make preparation for its use by more or less permanent arrangements and the necessity sometimes for going long distances in order to find a suitable range upon which it may be installed; it does not permit a ready adaptation for moving targets, either. Rapid and correct handling of black-board firing should be considered as a preliminary essential to smoke bomb practice. As a *substitute* method only, where smoke bomb firing cannot be held, the system of "spotting practice" is outlined, with the idea of having it put in use to supplement black-board work. Its advantages are:

(*a*) Outdoor work necessitating the use of field-glasses;

(*b*) It can be held at short ranges in the immediate vicinity of camp;

(*c*) It keeps the signalmen in proper training;

(*d*) It can be operated with almost equal rapidity by either semaphore or telephone, except in the case of moving targets, where semaphore should be used;

(*e*) It necessitates quick thinking on the part of the person conducting the fire;

(*f*) The matériel used can be easily carried between camp or barracks and the place of operation.

STATIONARY TARGETS

MATÉRIEL NEEDED: (*a*) Ordnance miniature targets or paper soldiers, about 4 to 6 inches high, sold in toy stores for children, tacked to stakes 6 inches long by ½ inch wide, so that they may be easily stuck in the ground in any formation desired. (*b*) A marker consisting of a staff about 6 feet long, having at its end a circular tin disk, 5 or 6 inches in diameter, one side of

the disk being painted white (air burst) and the other side black (graze burst). The marking staff for pistol practice will do. (*c*) Two telephones with one reel of wire, or two semaphore kits.

PERSONNEL NEEDED: One signalman (telephone or semaphore operator) at the station of the acting B. C.; one signalman (telephone or semaphore operator) at the target; one marker at the target.

METHOD OF USING: The conductor of fire (student officer) at the B. C. station gives all of the commands, just as they would go to his battery if present, and they are sent by the signalman stationed with him, as given, to the signalman at the target, who calls them out, as received, to the marker. The latter assumes initial errors (similar to black-board methods) are made, and indicates the bursts with the staff (which, when not being used, is kept with the edge of the tin disk toward the B. C. station) by dropping the disk into the position of the assumed burst for each shot, keeping it exposed there for two seconds for each shot indicated, and then withdrawing it. Whenever air bursts are indicated, the white side of the disk is exposed to the B. C., and for grazes the black side is exposed, always letting the lower edge rest upon the ground in this latter case. Using the telephone, the marker assumes the approximate time of flight for the range ordered before marking. With the semaphore (as the work may be rather slow) this is not necessary at first.

Arbitrarily it may be assumed by the marker (who at first should be a commissioned officer) that a low burst is between the shoe-top and the ground; a normal burst is between the calf of the leg and the shoe-top; a high burst extends anywhere between the knee and the calf of the leg; a very high burst would be indicated at some reasonable height above the knee. Any similar estimate to suit the assumed range will do, bearing in mind the relative height of the target. A reasonable frontage in

mils must also be assigned the target, and the width of the sheaf estimated upon that as a basis for shifts of the same corresponding to the commands.

A number of targets of various kinds at different ranges should be set out, in order that the sheaf may be shifted for each new problem.

At the battery end, the senior officer present should note errors made on the part of the one who conducts the fire, and, after the problem is completely fired, hold a short *critique*.

Students waiting their turn to fire a problem at spotting practice should be required to:

(*a*) Make a panorama sketch of the terrain and targets;

(*b*) To listen to the conduct of fire and to be prepared to conduct a *critique* if called upon to do so;

(*c*) To record all observations exactly as at smoke bomb practice;

(*d*) To be prepared to conduct the fire at any time that an officer is "killed" for making a bad mistake during his problem;

(*e*) To occasionally relieve the signalman at his work at the telephone or semaphore;

(*f*) To take turns at being "recorder" for the conductor of fire, for the purpose of keeping a permanent record of all commands given.

Care must be taken that the marking disk is not exposed in each position for more than two seconds for each shot. Quick thinking is vital. To use a greater time in marking is to encourage bad habits.

The marker must not stand so that the shadow of any portion of his body falls upon the target.

At first, if the officer who conducts the fire takes more than 10 seconds to give the next command after the "flash" of the burst of the last shot of a salvo is noted, the director "kills" the officer. After a few lessons this time is reduced to 7 seconds, and this rule is invariably followed. When this detail is carried out an extra officer should act as time-keeper.

Actual ranges should vary between 150 and 300 yards. Since the figures are very small and grass 3 or 4 inches long conceals them to a large degree, very gently rolling cleared spaces, with short grass, are the best.

MOVING TARGETS

These are direct fire problems. It is (for smooth working) assumed in spotting practice that the direction of fire is always successfully adjusted by the chief of platoon after the first salvo or volley is fired.

At the battery end, semaphore signalling is used. An extra man is needed to tow the target and to call out (quietly) the range to the marker. The man who tows the target is given some such direction by the marker as this: "Tow your target diagonally toward the right flank of the battery that is supposed to be firing—" or, "From this (indicating) point to that (indicating) point; assume your initial range as being 2400 yards, walk very slowly, every eighth step call out a range 100 yards less." The man towing the target calls out "2400" as he starts to take his first step, "2300" as he takes his eighth step, "2200" as he takes his sixteenth step, etc. This lets the marker know constantly what the assumed range is. The marker follows the target and listens to his signalman, who follows him. The marker's signalman watches the B. C. position as he walks along and calls out to the marker the data as they are given by the semaphore man at the B. C. station. This shows the marker instantly how to mark, since he remembers the last assumed range called out by the man towing the target.

In conclusion, it may be said that this method is not a theory. It was used by every battery in the battalion in which it was initiated. In demonstration problems before an artillery inspector these batteries made faster time than all other batteries. The smooth working of the details and the quick thinking and operation of all parties concerned in these tests are to be attributed, probably, more greatly to many hours of this particular kind of instruction, day after day, than to any other single matter affecting this result.

Computation of Firing Data

ERRONEOUS DETERMINATION OF SIGN OF THE PARALLAX OF THE AIMING POINT

BY SECOND LIEUTENANT F. FIELDING-REID, 12TH FIELD ARTILLERY

IT seems to be the prevalent opinion that in applying Rule V, paragraph 1198, Provisional Drill and Service Regulations for

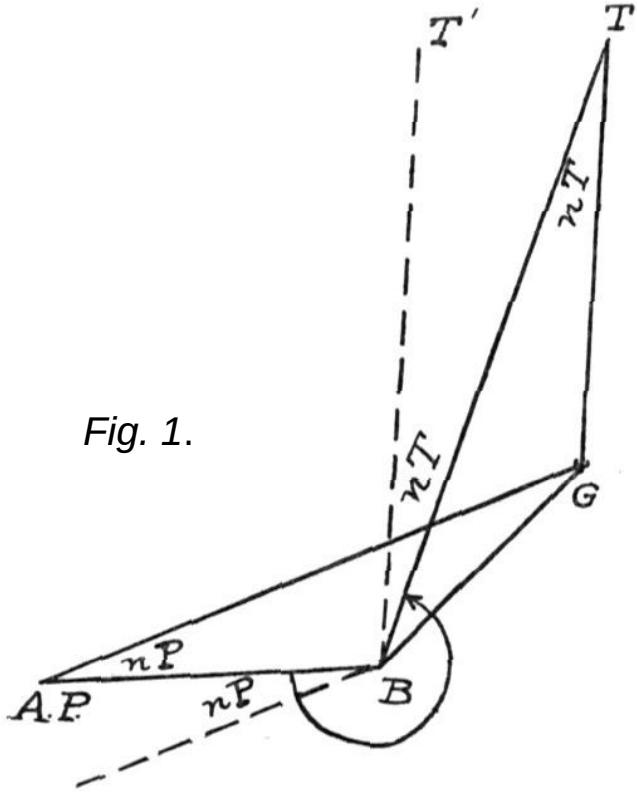


Fig. 1.

Field Artillery, 1916, the sign of *P* (parallax of the aiming point) is to be taken without modification from paragraph 1158.

Rule V reads: "The deflection of the directing piece is equal to the angle from aiming point to target, as measured

at the observing station, increased algebraically by as many times the convergence difference as there are platoon fronts in the interval between observing station and directing piece; or, $D = A + n\,(P - T)$.

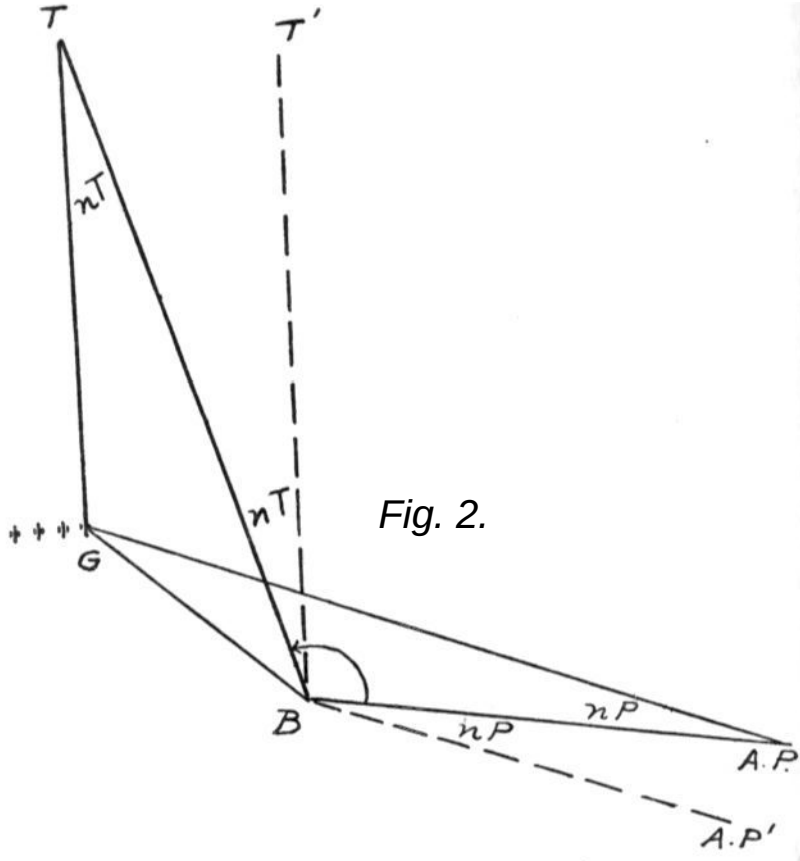


Fig. 2.

"If the observing station is on the right flank, *n* is positive in the foregoing equation; if it is on the left flank, negative."

The symbol *P* is defined but once previous to paragraph 1198 (*i.e.,* in paragraph 1192), and is then defined as "Parallax of aiming point"; hence to apply paragraph 1158, without modification, to Rule V is a natural error, which leads to the following formula:

$$D = A \pm n\,(\pm P - T),$$

in which the sign before *n* is positive when the B.C. station is on the right of the guns and negative if on the left, and the sign before *P* is positive *if the aiming point is in front of the line of guns and negative if in rear* (deduced from paragraph 1158).

This formula will not hold if the aiming point is in rear of the line of guns, but in front of the line from the guns to the B.C. station (which may happen in the second and third quadrants); nor will it hold when the aiming point is in front of

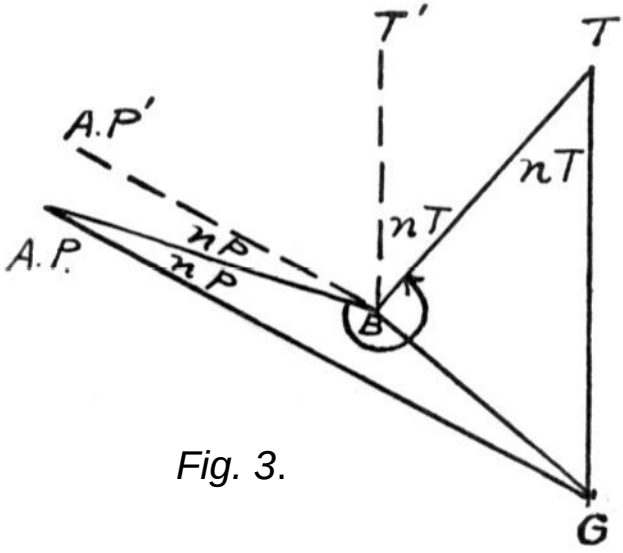


Fig. 3.

the line of guns, but in rear of the line from the guns to the B.C. station (which may happen in the first and fourth quadrants).

To make this formula apply universally, *P,* when meaning the angle subtended at the aiming point by platoon fronts between the guns and the B.C. station, must be considered positive when the aiming point is in front of the *line from the guns to the B.C. station* and negative when the aiming point is in rear thereof, *entirely irrespective of whether the aiming point is in front or in rear of the line of guns*.

Omitting obliquity factors, which have no bearing upon

the matter under discussion, the accompanying four figures will illustrate the point:

Referring to Figure 1, from

$$D = A \pm n\ (\pm P - T),$$

we get, by considering the position of *A.P.* with respect to the line of guns,

$$D = A + nP + nT,$$

which is obviously incorrect.

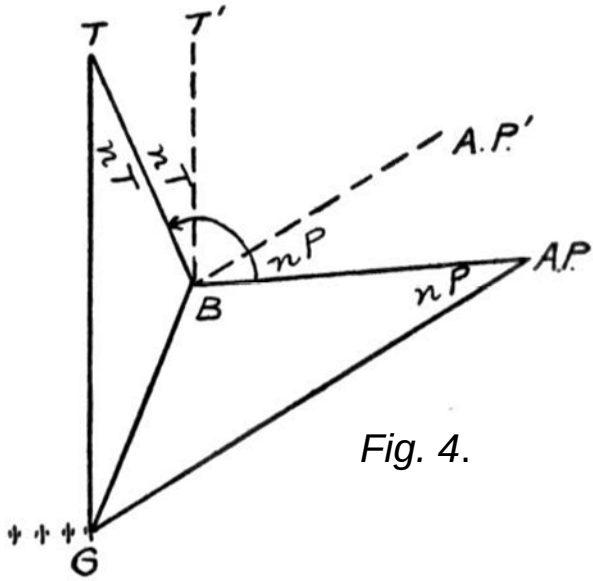


Fig. 4.

By considering the position of *A.P.* with respect to the line *GB,* we get

$$D = A - nP + nT,$$

which is obviously correct.

Referring to Figure 2, from

$$D = A \pm n\ (\pm P - T),$$

we get, by considering the position of *A.P.* with respect to the line of guns,

$$D = A - nP - nT,$$

which is obviously incorrect.

By considering the position of *A.P.* with respect to the line *GB,* we get

$$D = A + nP - nT,$$

which is obviously correct.

Referring to Figure 3, from

$$D = A \pm n\,(\pm P - T),$$

we get, by considering the position *A.P.* with respect to the line of guns,

$$D = A - nP + nT,$$

which is obviously incorrect.

By considering the position of *A.P.* with respect to the line *GB,* we get

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we get, by considering the position *A.P.* with respect to the line of guns,

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which is obviously incorrect.

By considering the position of *A.P.* with respect to the line *GB,* we get

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which is obviously correct.

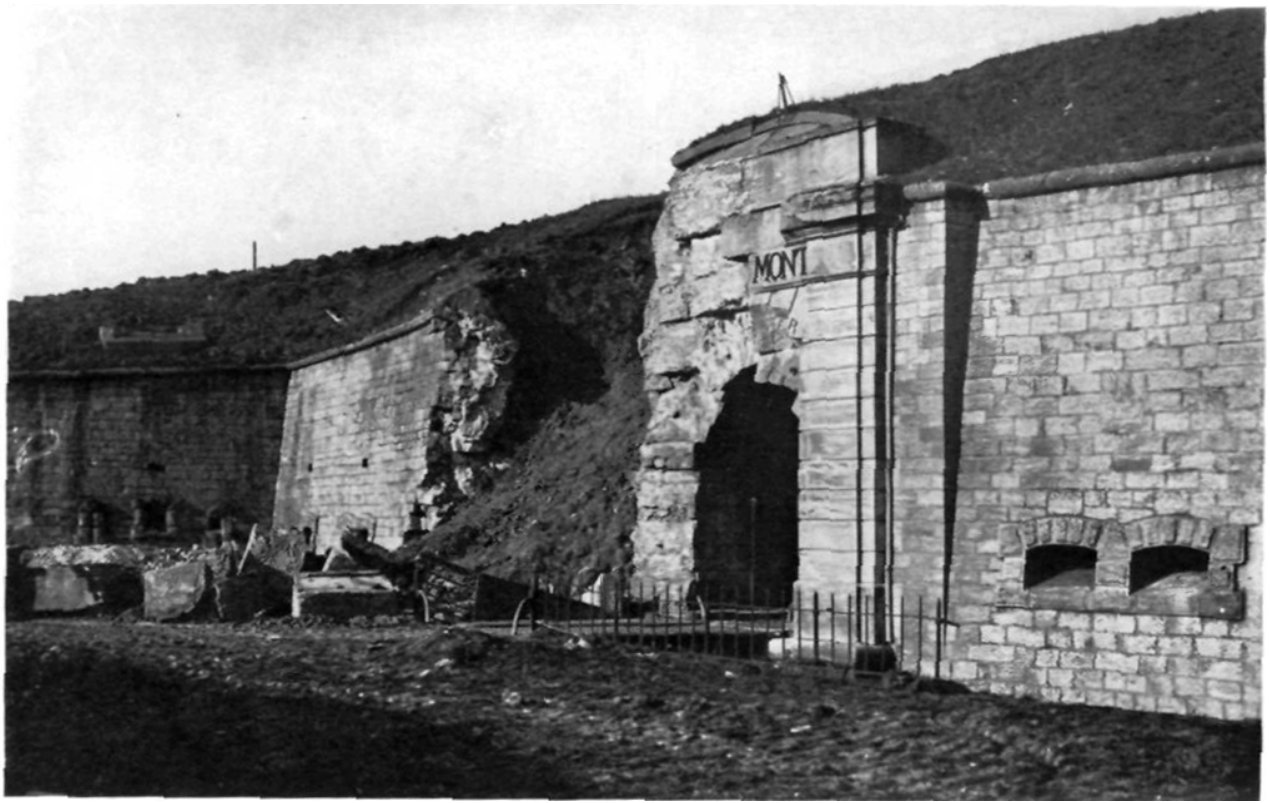
Recording Firing Data

BY CAPTAIN SHERMAN MILES, GENERAL STAFF, UNITED STATES ARMY

IN connection with Captain Dunn's article on "How to Record Firing Data," published in the last number of the FIELD ARTILLERY JOURNAL, I suggest a method of rapid and accurate computation of the deflection for each piece which has been found to aid the recorder (Scout No. 1) very materially in his work.

The method is based on the fact that all deflections corrected for deflection differences run from right to left in arithmetical progression. The exception to this rule is the case of individual corrections for deflection or deflection difference, which are to be avoided whenever possible, and therefore need not be considered in a method for rapidly and accurately computing the data ordinarily received. I might say, before dropping the subject of individual corrections, that they should be recorded as suggested by Captain Dunn, with circles drawn around them.

The fact that normal deflections corrected for deflection difference are always in arithmetical progression can and should be used both to speed up the work of the recorder and to check his work. It accelerates the recorder's work by requiring at most two, instead of four, calculations, and it checks up his work because any individual error will be detected immediately by spoiling the series of arithmetical progression. It is true that an error may be made which will produce a perfect series in arithmetical progression three (or even four) elements of which are wrong. But in this case we will still get a *perfect sheaf*, though one improperly opened or closed, and this is very much easier for the battery commander to correct than an imperfect sheaf three elements of which are right and the fourth is wrong.



FAMOUS FORT DOUAUMONT
When retaken by the French, these outer walls were piled so high with earth blown up by their own shells that no stone showed. From the outside Douaumont looked like a mud-heap.

The recorder should have a data book ruled as suggested by Captain Dunn:

IV	III	II	I	DEF	DD

Data then comes down—"Deflection 1240. On first piece open 10." The recorder enters the deflection and deflection difference in their columns, as shown below, and then writes down in column I, "40." Taking the next column (II), he figures, "40 plus 10," and writes down "50." Then, dropping the figuring, he uses the arithmetical progression to write down "60" in column III and "70" in column IV, as below:

IV	III	II	I	DEF	DD
70	60	50	40	1240	1st 0.10

Data then comes—"Right 200. On second piece open 10." He enters "-200" and "2d 0.10" in the columns of deflection and deflection difference. Then, going to the column of the *piece on which the sheaf is to be opened* (II), he writes down "1050." Then he takes a neighboring column, say the first, and figures, "40 minus 10 is 30," and writes down "30" in that column. He then drops his figuring and completes his series of arithmetical progression by writing down "70" for column III and "90" for column IV.

IV	III	II	I	DEF	DD
70	60	50	40	1240	1st 0.10
90	70	1050	30	–200	2nd 0.10

Data then comes—"Left 20; on third piece close 5." As above, he writes "+20" and "3d C. 5" for the DEF and DD

columns. Then he goes to *column III,* adds 20, and writes "90." Then he goes to a neighboring column (say IV), adds 15, which is 20 – 5, and writes "1105." Then he drops his figuring and completes the series by recording "75" and "60." and so on.

IV	III	II	I	DEF	DD
70	60	50	40	1240	1st 0.10
90	70	1050	30	–200	2nd 0.10
1105	90	75	60	+20	3rd C. 5

With the new model sight, the principle of arithmetical series can be used, and rather more advantageously, if anything, than with the old model sight, since changes of both the deflection and deflection difference are laid off on a single same right-and-left scale, for fire on any one target.

I used this method in my battery for several months, including an annual target practice. Of course, it was opposed at first by the recorder and the chiefs of sections, as is any change; but once they got used to it they saw the advantage of using the series as a check and as an aid. My recorder soon became very expert at it, and could always have his data written down in all six columns before the guns were ready to fire. Unless the battery commander indicated that he wanted fire of the greatest rapidity, the executive officer had orders to check the deflection of each piece just before firing. He did this by saying, "check" in an ordinary tone of voice to the recorder just after the last gun was signalled "ready." The recorder then read off, from right to left, and loud enough for all gunners to hear, "60, 75, 90, 1105" (taking the last example, above). Ordinarily the last two digits are quite sufficient, unless (as in this case) there is a change in hundreds within the series. Any gunner whose deflection differed from that read off by the recorder had orders to change his deflection to the deflection read before firing his

piece. The gunner may have been right and the recorder wrong, but the chances are strongly the other way, because the recorder was aided by the series; and, in any event, the recorder's figures will give a perfect sheaf, even though it may be one improperly opened or closed.

I have not found that one man can accurately keep all data. Scout No. 1 can keep the deflection and deflection difference very well, as above. Operator No. 1 is the best man for the recording of the other elements of the data. He can record them readily as he gets them over the telephone.

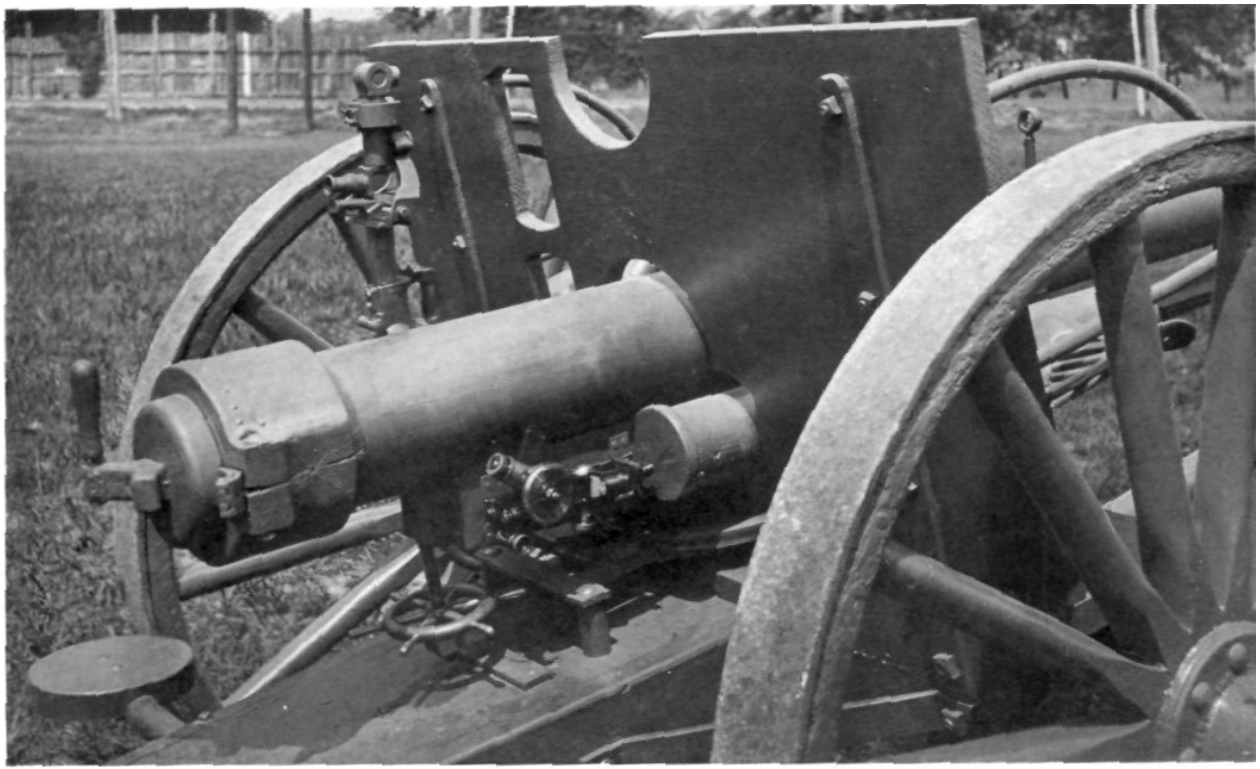
Wooden Guns in War Time

BY SECOND LIEUTENANT EARL C. MOORE, FIRST INDIANA FIELD ARTILLERY[1]

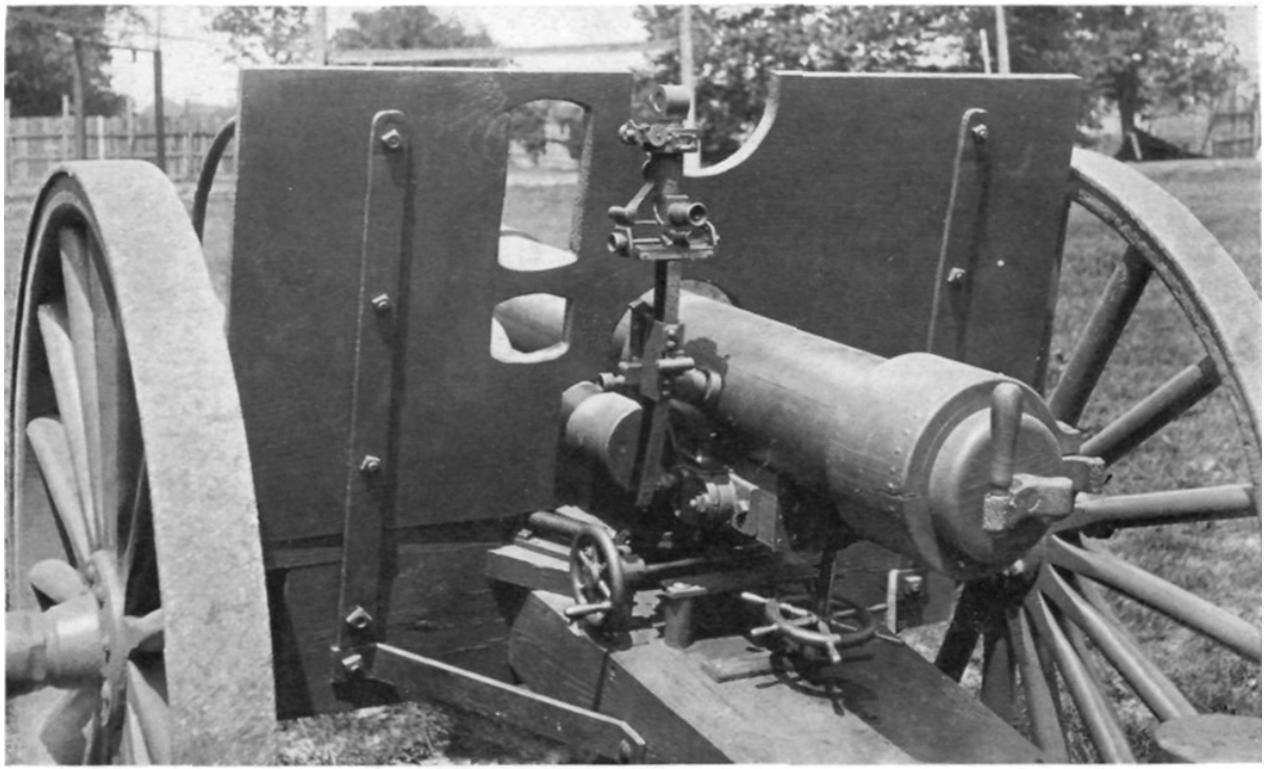
IN the early part of this year Battery F, First Indiana Field Artillery, was organized in Bloomington and struggled at the beginning of the war for Federal recognition. While we were trying to comply with the demands of the Government and establish the organization on a sound basis, it was essential that we should keep up the interest of the personnel of the battery and progress in training at the same time. Until the Militia Bureau extended recognition to us there was no hope of receiving our equipment or matériel. Artillery without guns was an impossibility. What could we do? The idea embracing the solution came to the writer one day while looking at a magazine which featured a picture of a dummy gun constructed for the express purpose of deceiving airplanes. If a wooden gun could be used for such a purpose as that, then why could not one be constructed in sufficient detail for the purpose of training gun squads?

The idea having been conceived and thought of value, the next step was to execute a solution. Looking around for junk that might be suitable, it was found that there was plenty which could be used to advantage. Through the kindness of Mr. Frank Gentry, of the Gentry Brothers' Circus, the wheels for the gun-carriage and limber were donated. The axle of the carriage was boxed up with 2 inches × 10 inches pine, and this furnished a good foundation for the rest of the equipment. The trail was easily constructed of two-inch pine. Two old mower seats cost fifty cents at the junk yard and made excellent

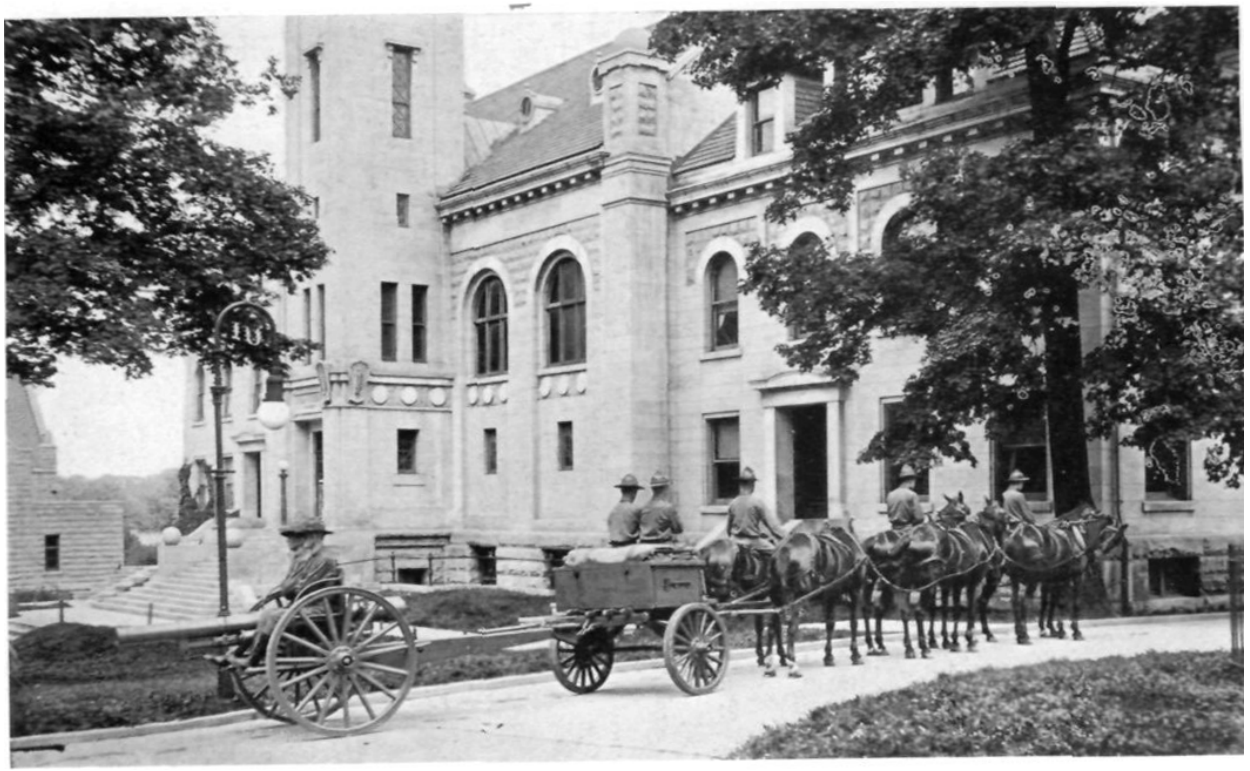
[1] Unable to secure any guns from the Federal Government, for the purpose of elementary Instruction for Battery F of the First Indiana Field Artillery, Lieutenant Moore devised and had constructed a gun, carriage and limber, and the accompanying photographs show the success attained. It is an exemplification of how, in spite of obstacles, the American spirit will rise to the occasion of necessity and exact an immediate, if but temporary, solution.—EDITOR.



NEAR VIEW OF WOODEN GUN, SHOWING QUADRANT ATTACHMENT AND ELEVATING GEAR



NEAR VIEW OF WOODEN GUN, SHOWING SIGHT ATTACHMENT AND TRAVERSING AND ELEVATING GEARS



IMPROVISED MATÉRIEL, BATTERY "F," FIRST INDIANA FIELD ARTILLERY

BATTERY "F," FIRST INDIANA FIELD ARTILLERY, DRILLING WITH HOME-MADE MATÉRIEL

axle seats. The barrel of the piece was made from a porch column and cost two dollars and a half. Since the barrel was nearest in size to a five-inch piece, two recoil cylinders were made instead of but one. In design the details were carried to such an extent that the piece was equipped with operating, elevating, and traversing mechanism, as the photographs will show. Coming to our rescue, Battery A lent us a panoramic sight and range quadrant, attachments for which were made, and we were then ready to use our "gun."

Having a gun, it was natural that drill in serving the piece and in mounted work should next follow; so a limber was constructed by building a heavy box of proper dimensions and mounting it directly upon the platform springs. The smaller equipments were then added, included in these items being lanterns, picket-ropes, paulins and hand axes, all of which assisted in giving a business-like finish to the result.

As a final touch, a liberal use of olive-drab paint over all parts ordinarily so treated, gave us such a good effect, that to our satisfaction (as well as to our amusement, too) about one-half of the people in the town thought that we had a real gun.

The piece, such as it is, was designed and built by the writer, taking some five weeks to complete it, since it was made during such time as could be spared from vocational hours. Its total cost was thirty-five dollars, but we realize that it has proven its worth many times, since we know that we could hardly execute any better the ordinary fundamental drill even with a regulation piece.

Duties of a Subaltern Officer in France[1]

BY 2ND LIEUT. R. P. PRENTYS, R. F. A.

WHEN a subaltern joins a field battery in action in France or Flanders there are a considerable number of facts (relative to the battery to which he is posted) to be absorbed by him before he becomes efficient, or can face with equanimity a visit from his Colonel or Brigadier, either at the battery or at the O. P.

It rarely happens that the B.C. or senior subaltern has the necessary time to instruct new officers in great detail. In the majority of cases, therefore, necessary facts are only acquired slowly and laboriously, frequently at the cost of a diet of humble pie, the unlucky subaltern only discovering his lamentable ignorance when suddenly questioned by a staff officer concerning some matter the very existence of which he has been unaware.

The aim of these few notes is to outline to the young artillery officer the most important facts with which he should acquaint himself while his battery is engaged in the present form of stationary warfare. Also to give hints as to where the necessary information may be gleaned in order that he may direct his enquiries with intelligence. Until the young officer has familiarized himself with these facts and added them as an appendix to his Gunnery Notes he should allow himself no peace of mind.

1. Map reference of the Battery Position, Zero Point and O. P.

2. The contour on which the battery is located (required for calculating angles of sight). If, as occasionally happens, the battery is in action on a slope, learn whether the same contour is used for calculating the angle of sight with the highest as with the lowest gun.

3. Are lines of fire parallel or concentrated?

4. Learn the gun intervals between the pits—prepare a table

[1] Reprinted from The Journal of the Royal Artillery, April, 1917.

BRITISH DETACHMENT SIGNALLING FROM SHELL CRATER

of concentrations for these intervals at the ranges commonly used, so that the necessary orders may be quickly given to concentrate all guns on a point, or to bring lines of fire parallel.

5. Learn the true bearings of the average line of fire of the guns, for calculating windage corrections.

6. Enquire from the B. C., or the No. 1's of each subsection, the maximum switch R. and L. of Zero which each gun pit will allow of, and the ranges at which they will clear the crest at the various switches.

7. Enquire as to the calibration of the guns in the battery. Also whether any guns have any peculiarities and shoot either "over" or "short."

8. Learn whether daily tests of sights are made, and, if so, by whom.

9. Secure from the battery clerk a registration book (A. B. 421) and make a copy of the map spotting, angles and normal ranges of all targets registered, Night, Day and S. O. S. lines, Hostile Trench Mortar and Machine-gun emplacements, special targets, etc.

10. Learn the tour of duty of the various officers in the battery—usually comprising duty at the O. P., with the guns, and liaison duty with the infantry.

11. Ascertain whence the ammunition is drawn—whether from your own wagon line, B. A. C. or D. A. C., and, if the latter, the map reference, the telephone call and the best routes.

12. Know the map reference of your own wagon line, the route to it, and its telephone call.

13. Memorize the number of the Infantry Brigade covered by the battery, the map reference of its H. Q. and the battalions comprising the brigade.

14. Learn the map references of the Company H. Q. and Battalion H. Q. of the infantry unit in the line which the battery covers.

15. Procure from the battery files a trench map of our own trenches in the battery sector and make a careful study of it.

16. Enquire from the B. C. what codes are in use, also the word for use with the Playfair code, and the key to the "number code."

17. Learn the position your Brigade occupies in the Division—Right Group, Centre or Left Group. Likewise the battery position in the brigade—Right, Centre or Left—and the sector on the map which it covers.

18. Learn from the Signaller N. C. O. the telephone call of all the batteries in the brigade, Brigade Headquarters and Divisional Headquarters.

19. Learn the map position of all rocket stations for S. O. S. signals, and what the S. O. S. rocket signal is. (This information can usually be obtained from the Brigade Signals Officer.)

20. Learn all you can from the Signaller N. C. O. of the battery, concerning the battery lines of communication. What lines there are, where they lead, whether they are "air" or "buried," the routes taken, the labels on the wires, the positions of test boxes and exchanges, and the identification marks of terminals. Add to your notes a "straight-line diagram of these wires."

21. Learn from the same source what arrangements there are for visual signalling by day and night between the front line and O. P. and between the O. P. and battery.

22. Enquire whether it is the practice of the battery to fire a fixed number of rounds of shrapnel every day for the purpose of determining the "corrector for the day," and also obtain information as to ammunition allowance, and the proportions of H. E. and shrapnel.

23. Learn for what ranges the correction for the day is calculated, and how often during the 24 hours the correction is made.

24. Learn the difference which is allowed between gun range and map range for H. E. and shrapnel shells. (Fifty yards is usually dropped from the map range when using H. E., though the allowance may vary with different ranges and under different conditions.)

25. Obtain from the Battery Clerk the "Précis of Artillery Arrangements," and carefully digest contents. Understand thoroughly what procedure is adopted when an S. O. S. call is received from the battalion on the immediate front, on the Right or on the Left. Familiarize yourself with the method of retaliation on active hostile Trench Mortars, and what to do when a gas alarm is given.

26. From the same "Précis," master the actions of the battery for any defence schemes which may have been prepared and take an early opportunity of visiting the selected defensive positions. Do not fail to familiarize yourself with the routes to these positions.

27. Enquire as to what restrictions there are when talking by telephone—whether the direction of fire from the O. P. is done by map reference or by angles from the Zero point.

28. Enquire as to list of targets which may be awaiting registration by aeroplane coöperation. Obtain the map spotting and the code names by which these are known, so that you may have the angles and ranges calculated ready for immediate use if such are called for by the R. F. C.

29. Learn the existing local traffic regulations enforced by the A. P. M.—overloading wagons, led horses, exercising on main roads, etc.

Some of the details mentioned in the foregoing paragraphs may seem trivial, but in reality the possession of a knowledge of them may, at any moment, become of supreme importance to a junior officer, and the time spent in mastering them is well laid out, as the writer knows from his own personal experience.

Observation Stations

To derive full benefit from the accuracy and rapid fire of modern equipment and to insure effective support to other arms, correct observation with reference to the objective is of vital importance. The necessity for accurate fire on all occasions cannot be overestimated, and it is especially important in trench warfare, when the opposing trenches are often in close proximity to one another.

Although it is possible to determine by calculation the direction and range required to be given to a gun to hit a target, and although these corrections may have been accurately worked out and applied, yet it is improbable that the maximum effect will be obtained on the target unless the actual fall of the rounds can be observed. To enable a battery to engage a target effectively, either reliance must be placed on observation from the air, or a position must be selected from which the target can be clearly seen and the fire of the battery accurately observed and controlled. This position is called an observation station, and when selected for a battery, battalion, or regimental commander is referred to as the battery commander's (B. C.) station, battalion station, or regimental station, as the case may be. In the British service it is frequently alluded to as the "O. P.," meaning observation post or point.

The closer the observation station is to the target, and the better the view of the ground in its vicinity, the easier it is to determine with accuracy the distance a projectile has burst over, or short of, the target. To attain this accuracy of observation it will usually be necessary to select an observation station within 600 yards of the target. Should it be necessary, for any reason, to select an observation station which is more distant than this from the target, it must be realized that the same accuracy of observation cannot be obtained, even when aided by the best glasses and telescope.

A TRENCH MORTAR

In trench warfare it is the target to be dealt with that is the controlling factor in the selection of this position. In every situation there is probably one locality above all others from which the best view of a particular target can be obtained. The finding of this locality will often necessitate a prolonged and careful reconnaissance, and officers must not be satisfied until they have assured themselves that all ground, buildings, and so on, have been thoroughly reconnoitered with this object in view. With the very accurate maps that can usually be obtained of most of the terrain included in the fighting activity of the Western Front, it should be possible, more or less, to foresee what points are likely to give a good view of a particular locality, and much time can be saved by a close study of the contours of a map before going out to definitely fix the location of an observation station on the actual terrain. The extent of country included in the reconnaissance should not be restricted to the immediate front allotted to a battery or other field artillery unit, but should cover an extensive area, as it is impossible to be sure of obtaining the best possible view of the whole front, or of a particular target (such as a machine-gun emplacement), unless the reconnaissance is carried out thoroughly. This is particularly the case in undulating country. In a battle of maneuver, where time is the controlling factor, it will generally be found impossible to carry out such an extended reconnaissance, and, therefore, a position that fulfils the immediate requirements may have to be selected.

It is impossible to lay down definitely the distance an observation station belonging to a battery should be in rear of the infantry units that it is supporting. This distance depends mainly on the conformation of the ground. When the ground is concave in shape, the observation station may be some distance in rear, but the necessity for accurate observation must not be overlooked. If the ground is convex, the observation station may, of necessity, be placed in the front line trench or immediately behind it. When this is the case it is generally due to the selection of the infantry line having been made without

taking into consideration the requirements of good observation for the artillery. As the position of the observer in the latter case renders him liable to be put out of action by any hostile bombardment of his portion of the front line, or to interference caused by the retirement of our infantry, or to capture in the event of a successful attack by the enemy, or at least to have his communications cut, it is imperative in such a situation to provide a second, or reserve, observation station farther to the rear from which the ground behind the front line is visible, and this station should be maintained ready for occupation in case such an emergency should arise.

If a position cannot be found from which the whole of the front is visible, and as accurate fire is essential, the observation must be from a point which gives a clear view of at least one registration point, so that the error of the day may be corrected. In open warfare it may be necessary to select a position still farther to the rear so as to obtain a more extensive view of the ground over which the fire of any particular battery may be required, and also because it may be impossible to keep up communications with an advanced observation station.

Officers must be able to range their batteries at short notice on objectives far to a flank, and must know where the best view of such localities may be obtained.

In selecting the position for an observation station, the following requirements must be kept in view:

1. It must be suitably located to carry out the task in hand.
2. It requires to be carefully screened, so as not to be recognized by the enemy.
3. It should, if possible, have a concealed means of approach.
4. It should afford cover and protection to the observing officer and his assistants.
5. It should allow of intercommunication with the infantry.

Observation stations may be classified as follows:

(*a*) Permanent.
(*b*) Extemporized.
(*c*) Temporary.

(*a*) A *permanent observation station* must be strongly constructed, and be sufficiently large to accommodate several observers and their assistants. A covered approach is a matter of vital importance. It must be provided with a "dugout" capable of resisting at least a 6-inch howitzer shell. It should afford an extended view of the front. It should not be exposed to fire directed on the infantry front line system of defenses. The dust and smoke and the moral effect on the observer, if posted in the infantry line, render observation difficult, if not impossible.

(*b*) An *extemporized observation station* is used to carry out a special task, such as the destruction of a machine-gun emplacement, or wire cutting. It should be provided with splinter-proof accommodation for the observer and his assistants. The field of view is of secondary importance.

(*c*) A *temporary observation station* is used in open warfare when there is insufficient time available to provide artificial cover. In this case, use is made of houses, trees, haystacks, trenches, shell-holes, or any other suitable place which gives facilities for both observation and concealment.

Every battery must be provided with at least one observation station, for the maintenance and control of which it is responsible. This station must afford a good view of at least one or more registration points. All stations should be made as strong as possible, but the fact that a battery is provided with a strongly constructed post must not deter officers from utilizing the best places available, irrespective of cover, for the observation of any particular task they may be required to carry out.

An observer in one observation station may have little chance of seeing more than a limited extent of the ground which his guns can cover. Moreover, it is often not realized that the principle of concentration of fire cannot be put into practice unless batteries are prepared to fire on the whole extent of their sector, however far it may be outside their normal defensive zone. Arrangements must therefore be made to have a number of observation stations along the front, so that every possible part of the hostile lines is visible from at least one of these points.

A concentration of observation stations at any one point must be avoided as far as possible. As it is practically impossible to provide each battery with a sufficient number of stations from which to observe the whole of the ground covered by the sectors of fire of its guns, arrangements must be made to form group exchanges, and these exchanges must be connected up to the exchanges of neighboring groups. Such exchanges must be made practically impervious to artillery fire. By this means it is possible to provide a telephone system that will enable each battery to be ranged on any particular point required, and an observer can direct the fire of any battery within range to cover any target in his zone of observation. This arrangement simplifies the concentration of fire on any point, but, in order to derive full advantage from it and thus inflict the greatest damage possible on the enemy, it is imperative that every officer of the artillery should be capable of sending back observations for any battery, irrespective of its nature.

There are several purposes for which an observation station is required, which differ somewhat with the nature of the battery, the task to be undertaken, and the tactical situation.

They may be classified as follows:

(a) *Field Guns*

The 3-inch guns are usually charged with the direct support of an infantry battalion holding a front. This front is watched by day, and often at night, by an artillery observer, in order that any movement of the enemy by day may be at once seen and dealt with, and signals for support from the infantry responded to at night. An observation station for this purpose should command, if possible, the whole zone allotted to the battery without being too far back, but it should not be in the front line if it can be avoided. It should afford a view of the ground over which the enemy must attack for at least two hundred yards in front of our own front line, and it should be possible to observe a portion of the ground behind this belt over which

the enemy may be expected to move his troops. If it is near the battalion or company headquarters, the communication with the infantry is facilitated.

(b) *Field Howitzers*

A field howitzer battery is usually responsible for the whole front covered by the field artillery battalion to which it belongs, and, further, it is required to support the brigades on the flanks. It is seldom possible to obtain an observation station with this field of view. Observation from several stations is therefore necessary. The usual custom is for the battery to have a permanent station in some central position, and to supplement the observation by utilizing observers in other observation stations belonging to the brigade and division. This is rendered possible by the provision of exchanges.

(c) *Heavy Howitzers*

The siege battery may be required to fire on any portion of the enemy's lines which the sectors of fire of its guns can cover. It follows, therefore, that field artillery officers assigned to duty with the siege artillery require an even more extended knowledge of our own and the enemy's front, from the point of view of observation, than officers assigned to duty with the light batteries. Furthermore, the heavier the nature of the artillery, the more important it becomes to obtain close and accurate observation of a target. The provision of suitable observation exchanges for the siege artillery is even more important than for the light artillery. The observation exchanges of both light and siege artillery should be connected, so that full advantage may be derived from all observation exchanges.

(d) *Heavy Guns*

The chief rôle of the heavy batteries is the neutralization of hostile guns and the searching of distant approaches, observation on which is impossible except from the air. When an airplane

is not available, this shooting must usually be done from a map, the guns being calibrated from time to time on a registration point.

As heavy batteries are also employed to enfilade trenches, they must be provided with observation stations giving a good view, not only of the registration points, but also of as much ground in the enemy's advanced works as possible. These stations must be connected up to the observation exchanges as in the case of the siege artillery.

Heavy and siege batteries are often required to furnish observers both by day and by night to assist special observers in the spotting of flashes of hostile guns. Such observing stations are often far back, and on the highest ground available.

The following data should be maintained in an observation station:

1. A panoramic sketch of the view from it.
2. Orders as to the procedure in the case of an emergency call for artillery assistance (S. O. S.).
3. Orders as to the procedure in the case of a gas attack, particularly instructions as to the use of the telephone.
4. A diary of what is daily observed on the front, and information which may be of importance to a battery which may have to take over the zone. This should include the known and suspected positions of trench mortars and machine guns, and localities where the enemy's movements are visible.

The supreme importance of quickly establishing forward observation stations in the event of a successful advance cannot be too strongly impressed upon all artillery officers. It is in such a situation that the greatest advantage may be reaped from the early occupation of advanced observation stations and commanding heights beyond the original hostile front line, which afford direct observation of the terrain occupied by the hostile artillery. This is especialy important in the case of those batteries allotted to the counter-battery groups.

Machines for Trench Digging

NOT long ago, in a street of one of our Ohio cities, a ditch digger was noted, moving along steadily, up grade, at the rate of something better than a yard a minute, cutting through a heavy macadam road the prepared surface and bed of which was in perfect condition, excavating a ditch two feet wide and five and one-half feet deep. The excavated earth was being poured out of the machine, to one side of the ditch, where it rose to a height of some three feet above the natural surface.

This machine was preparing a continuous excavation for the purpose of laying a pipe line, and it was so efficient that no gang of workers, with the pipe already stretched along the route, could lay this pipe in the bottom of the ditch and join it and execute the filling as fast as the machine could travel. The result was that the machine worked but a few hours a day; the pipe-laying detail worked all day.

Efficient machinery is coming to the front these days in many ways to assist in warfare when the opportunity offers. Trench digging is one of them. Every one knows how important trenches are in modern warfare. Machinery originally designed for the quieter pursuits is, with little or no modification, put in use for the defense of a nation, and the exhausting manual labor is spared the soldier, or he is put at some other task that no machine can yet accomplish.

There are many types of machines useful for earth excavation, practically all of which would be material aids to the military man in preparing positions for defense. Steam power is used in some of these machines; gasoline in others.

Two photographs are shown herewith which will give a pretty good idea of the quantity of earth that can be conveniently excavated by a single machine making reasonable progress. These

machines are self-contained and travel along on caterpillar continuous treads.

Referring to the Austin product, it is reported that the same kind of machine can be made to perform different duties by substituting various types of digging booms, and that either the drainage ditch or military trench can be constructed.

Figures which give the capacity for excavation of certain of these machines, and which show their power as well, may be accepted as follows: A trench can be formed five and one-half feet deep, two feet across the bottom, fourteen feet across the top, with the sides and excavated earth forming about a 1 on 1 slope; other machines will excavate a ditch two feet wide and ten feet deep. For military use, the excavated earth is employed in giving cover to those who occupy the trench, and, depending upon the cross-section of the ditch dug, will vary in height; a very good idea of the amount of cut and height of excavated earth above the natural soil may be obtained by their comparison in the pictures with the relative height of a man.

The Buckeye excavator (except for peat) uses cutting buckets on the circumference of a large wheel, whereas on the Austin type it is noted that booms carry buckets on an endless chain. It is claimed that excavators can not only make a perfect trench at one cut, but that grades may be maintained accurately and curves negotiated as well; further, that in some cases they will operate on ten to fifteen per cent, grades, and that when special means are used they will climb grades as steep as thirty per cent.

Depending upon the type, the Buckeye excavator has cutting speeds up to three yards a minute, and in other models will cut to the width of a yard with a depth of twelve feet; open ditchers will excavate a sectional area of twelve feet across the top and five and one-half feet deep.

So much for the trench diggers themselves. The day of the motor-propelled field battery has arrived. What are we going to do with our tractors after they have placed our guns

BUCKEYE TRENCH EXCAVATOR

AUSTIN DITCHER, TYPE USED IN CANADIAN CAMPS

in position? It can hardly be expected that, save in grave emergency, they will be used to furnish power for our ammunition supply, since the battery would be then left unable to move. If, in a defiladed position, there is opportunity for their further use, it should be seized. Is it possible to add to the design of the field artillery tractor an auxiliary which may be utilized for light excavation when the machine itself is not needed for tractor duties? For days—even months—batteries may move but little. Can we make our tractors do their bit in these long days of waiting and add some measure of safety to the cannoneers by building them emplacements and parapets for their guns? It seems a legitimate problem for our inventors and designers to work upon.

Destruction of Barbed-Wire Entanglement

BARBED wire can be cut by any of our artillery ammunition. The particular circumstances of the case determine the choice. Each case is a problem for the battery commander. The task always demands the greatest care and precision and absolute accuracy of adjustment.

THE LIGHT GUN

The burst centre must be kept in the wire. Perfect accuracy in direction and range is indispensable.

Breaches must be made by battery, not by piece. A space about 25 yards wide is a fair task.

Sights and quadrants must be in perfect adjustment.

Each piece is fired singly until a 50-yard bracket of the visible portion of the target is established. Then the burst centre is accurately adjusted in the wire by firing the pieces separately at the mid-range.

If the target is shallow, say 15 yards, fire for effect by battery salvos is opened at the mid-range of the bracket. Fire for effect must be interrupted from time to time for frequent verification *by piece*. Shallow entanglement may thus be breached with great economy of ammunition.

Against deeper wire, fire for effect by battery salvos is opened at the short limit of a 25-yard bracket of the mid-range. Fire is conducted at successive ranges, differing by 25 yards, 4 to 6 rounds at each, alternately forward and backward through the wire. The first range should be surely short or bracketing. The short range must be verified by piece from time to time. Single rounds must be sensed. No reliance should be placed on the sense of a salvo.

The number of ranges to be used will vary with the depth of the entanglement. To determine it, add one to the next higher whole number obtained by dividing the depth by 25.

BRITISH GUN ON RAILWAY MOUNT

Thus, for a depth of 70 yards, the number of ranges will be 70, divided by 25, or 3, increased by 1, making 4.

If the wire is not visible from the ground, very accurate observation by map or from aircraft is essential. Fire for effect is opened at the longest range observed to be surely short of the wire or of ground near it. Then the zone is thoroughly beaten. Again fire is opened at the initial range. Each time the results at that range must be verified.

SHELL

To make a breach 20 to 25 yards wide at ranges of from 2000 to 4500 yards in entanglement of 0.16-inch wire, about 50 rounds of thin-walled shell with large bursting charge per gun per range will be required. For 0.20-inch wire 75 rounds per gun per range will be necessary. Thus, using our newly adopted point-fused 3-inch shell with increased bursting charge, it may be estimated that the following amounts of ammunition will be required to make breeches in wire obstacles:

Depth of entanglement, yards	Rounds, number
10 to 15	500
15 to 25	600
25 to 50	900
50 to 75	1200

These figures depend upon absolute accuracy of adjustment of fire. *No matter how much ammunition is used, breaches will not be cut without absolutely accurate adjustment.*

On a reverse slope a range change of 25 yards will make a surface change of

$$25 \text{ times } \frac{w}{w-p}$$

in which w is the angle of fall and p is the slope, both in mils. The range bounds should therefore be decreased if the depth of wire exceeds 25 yards. The larger is w the less is this difference. Hence longer ranges may favor particular cases.

SHRAPNEL

Up to 2500 yards good effect of shrapnel against wire not exceeding 0.16-inch diameter may be expected. Larger wire is touched but not cut. The height of burst must be adjusted to one mil, so that all bursts will be within the entanglement. Within 2500 yards, against wire not exceeding 0.16 inch, and with the perfect accuracy of adjustment described above as necessary for shell fire, about twice as many rounds of shrapnel will be required for a particular task.

DIRECTION OF FIRE

Accurately adjusted oblique or enfilade fire is very effective against wire obstacles, because the law of dispersion causes a larger percentage of bursts in the wire. Deflection must be very perfectly adjusted. Fire must be shifted slightly occasionally; if this is not done, a few wires may be left uncut. In many cases oblique or enfilade fire will produce better results than direct fire, especially on reverse slopes. But breaches thus caused may impose irregular and undesirable limits upon the direction of advance of attacking troops.

TIME REQUIRED

Wire cutting involves fire of precision, adjustment with the greatest nicety, and frequent verification. Hence it takes a long time. A rapidity of fire of more than 100 rounds per gun per hour should not be counted upon. Thus an ordinary breach would take about one and one-half hours. As there are likely to be unforeseen delays, it is prudent to allow three hours in planning operations.

OTHER CANNON

No data are at hand on which to base conclusions regarding the attack of wire by our howitzers or heavy guns.

BRITISH FIELD HOWITZERS

Designation of Targets

BY MAJOR OLIVER L. SPAULDING, 2ND FIELD ARTILLERY

WHEN a battalion of artillery goes into action, the problem of designating targets always arises. The battalion commander, at his own station, finds himself called upon to assign targets, often at short notice, to batteries several hundred yards away. Generally the guns are brought upon the desired targets, but sometimes at the expense of considerable delay.

A method has recently been developed in the Second Field Artillery which combines simplicity, speed, and accuracy in a high degree. It may have been practised elsewhere, but I have never happened to see it in precisely this form.

The principle is that of the ordinary parallel method of calculating firing data. The battalion commander designates a reference point and sets the zero of his own telescope upon it. Each battery commander lays his telescope parallel to it, making allowance for parallax in the usual manner. The battalion commander reads the azimuth of any target and telephones it to the selected battery. The battery commander sets his telescope at the designated azimuth, then turns toward the battalion station by an angle equal to the parallax of the target, and finds the target.

In practice, several refinements have been grafted upon this scheme. The routine adopted in the regiment is something like this:

During his instructions to his battery commanders, the battalion commander indicates a reference point—any point will do, but obviously the best results are obtained with a reference point about in the middle of the field of fire, both in deflection and range. This reference point is not considered as fully identified until the site and range from the battalion station have been given.

The battery commander, having established his own station,

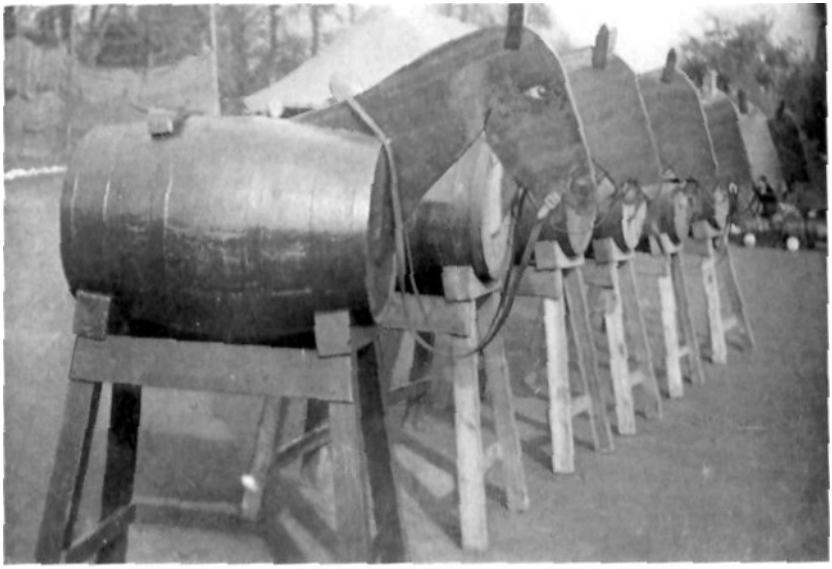
calculates the data necessary to lay his guns upon the reference point, or some other point selected by himself. He then records the site and range of the reference point as read from his own station; comparison of these figures with those given by the battalion commander furnishes a basis for correcting any data sent from the battalion station.

The battery commander then lays his telescope parallel to the line battalion station—reference point.

The battalion commander now assigns a target to the battery. His message is—"Deflection 175; site 295; range 3000. Line of timber; battery behind."

The battery commander sets his telescope at the deflection indicated. Evidently his telescope is again parallel to that of the battalion commander. He calculates the parallax of the target, and turns toward the battalion station by that angle; his plane of sight now cuts the battalion commander's at the designated range. Next he sets his instrument at the designated angle of site, corrected by the amount determined in his preliminary work, as above; again the two instruments converge, at the range of the reference point, which makes approximate convergence at the range of the target, since we are here considering very small angles.

A point on the ground is thus determined, which must be very near the target. A short search in the immediate vicinity of this point discloses the target. If a range finder is available at each station, the accuracy of the relocation is great; if distances are estimated, the limits of search for the target are wider, but rarely very wide. The method has been described for use with a telescope, but naturally the same principle may be applied, using no instruments but a ruler; in this case, "site 295" usually becomes "10 mils below skyline," or something of that sort.



STRIPPED WOODEN HORSE, SHOWING CONSTRUCTION

WOODEN HORSE, SHOWING ATTACHMENT OF SADDLE

REACHING EXERCISE ON WOODEN HORSE

BENDING EXERCISE ON WOODEN HORSE

Wooden Horses for Training Recruits

WITH a million men to train at once and little or no equipment in many cases with which to make a suitable beginning, the United States will, for months to come, be taxed to its utmost to find suitable extemporized schemes which will permit the most to be made of these early months of preparation. From abroad we can well afford to take a few hints, and particularly from a country that was caught unprepared, with a relatively small army and dependent upon voluntary enlistments when this great war began, since the situation was very much like our own in some respects.

Col. C. P. Summerall, of the United States Field Artillery, who recently returned from a trip of observation in England and France, presented to the JOURNAL for publication the photographs which appear in connection with this article, and gave this explanatory statement:

"Wooden horses, constructed as indicated by the accompanying photographs, have been used to a very great extent in training recruits for mounted batteries at the training camps in England. It has been found that a recruit will learn the proper method of standing to horse, holding the reins, mounting and dismounting, and of executing many of the mounted exercises as well with the wooden horses as with real animals. The wooden horses have the advantage of not intimidating the recruit, of saving real horses much rough handling about the mouth, and of enabling them to be utilized for more advanced instruction with harness and draft and with equitation. It is believed that these wooden horses will prove as advantageous in our training camps as they have done in the training camps of England."

The construction of these auxiliaries is easy and the time is ripe. Many issues of rations are made in containers that can be utilized. Vinegar and flour both come in barrels that can be employed, when empty, to make the bodies of these "chargers." Sugar is frequently issued in barrels, too. The heads and necks of the wooden horses can be made from the boxes which contain such items as canned goods, soap, candles, etc. A few sturdy limbs cut from trees, or small logs, will suffice to take the place of "two by fours" or other dressed heavy lumber needed for the "legs" and supporting framework. Lack of animals should not prevent drills in the preliminary mounted work in suppling the rider, and these exercises should be of genuine value if suitable, thorough, exacting, conscientious, and well-devised schedules be carried out on these substitutes.

Current Field Artillery Notes

Trench Gunnery

(*Continued from April—June Number*)

REGISTRATION OF TARGETS

To *register* a target is to adjust fire upon it with a view of being able at some future period to open an immediately effective fire upon it. As might be supposed, the data found at one time are not necessarily correct for a subsequent time, as the conditions of temperature, barometric pressure, and wind will not be the same. For accurate shooting, it is therefore undesirable to rely upon an "*error of the day*." A few hours, or even a few minutes, may often so change the atmospheric conditions as to render such an "*error of the day*" incorrect.

It is therefore necessary to correct the data obtained by the proper range table corrections for barometer, temperature, and wind, at the standard readings (barometer 750 mm., thermometer 15° C.) for which the range tables are computed. These data should then be reconverted to conform to the conditions existing at the time of firing.

The record of registration of a target should include:

(*a*) The range.
(*b*) The deflection.
(*c*) The corrector.

All of these data should be corrected as above described whenever accurate firing is likely to be required.

In the case of the deflection it is apparent that the only atmospheric condition that materially affects it is the velocity and direction of the wind. A projectile is less affected by a cross wind than by one that blows up or down the range. The correction for *line* will therefore be more reliable than that for *range*, and enfilade fire may therefore be expected to give better results than frontal.

A good map of the terrain is indispensable. For accurate fire, however, the map should be supplemented by careful ground reconnaissance, including the triangulation of gun positions and the locations of various objects that are to be used as targets or as registration marks.

THE INDIVIDUAL ERROR OF THE GUNS

For accurate shooting it is essential that the individual error of each gun be determined and the necessary corrections applied. This is especially true when the guns of a battery are in different states of wear. The data obtained by rough practical methods in the field cannot be comparable to the careful methods of the proving ground, but it has been found possible thus to correct these individual errors and to obtain a much better grouping of the shots of an entire battery.

The following is suggested as a method of determining the individual errors of the guns of a battery:

(*a*) Select a target such that the line of fire of the guns will be as near as possible in prolongation of the trail.

(*b*) Adjust the sights and quadrants; see that the wheels are on the same level, and make any other adjustments that may be necessary to avoid lost motion in the carriage.

(*c*) Choose a day on which the wind is steady and the velocity does not exceed 20 miles per hour.

(*d*) Locate accurately the gun positions and the position of the target, and determine with the greatest possible accuracy the range and deflection.

(*e*) Obtain readings of barometer and thermometer, the velocity and direction of the wind, and the temperature of the powder charge, and make the corresponding corrections in the data. Note the lot of powder.

(*f*) Fire at least five shots from each gun, and carefully plot them with respect to the target.

(*g*) Determine the range to the centre of impact of each group, and with it compute the muzzle velocity of each gun. With the muzzle velocity the angles of elevation for the tabular ranges can be computed. The temperature coefficient of the powder may also be determined.

While these methods cannot supersede the careful computations made on the proving ground, they can, to some extent, supplement them in the field, especially when guns cannot be withdrawn for purposes of test.

Tables for each gun should be prepared, or the range scale adjusted to correct for the average error, for the gun at mid-range.

It will be found convenient to construct slide rules for making the necessary corrections, as follows:

(a) *A battery rule*, to correct for barometer, thermometer, and wind.

(b) *A gun rule*, to correct for the individual error of the gun and the temperature of the powder charge.

NOTES ON METEOROLOGICAL CONDITIONS AFFECTING ACCURACY OF FIRE

Barometer:

The aneroid barometer will give readings of sufficient accuracy, if the instrument is corrected from time to time by comparison with a standard mercurial barometer. The reading of the mercurial barometer with which the aneroid should agree is not the reading for mean sea level, but the reading for the height at which the aneroid is placed.

Temperature:

Ordinarily the temperature may be found with sufficient accuracy from a thermometer hung in a shady, but not enclosed, place, in which the air can freely circulate. For instance, a thermometer hung in the shade of a tree gives satisfactory readings, whereas one hung against the wall of a house will not.

On a hot day the temperature, even in the shade, may be too high, the error being often as much as 50º F.; in the early morning and at night the temperature from an openly exposed thermometer will be sufficiently accurate, if there is some wind blowing and the sky is overcast; but if it is nearly calm and the sky is clear, the thermometer will give readings that are too low, as much as 10º F., at times, because the air below 200 feet cools, while the stratum above through which the projectile passes retains the temperature that it had during the day, the reduction during the night being small. A good rule in this case is to add to the night temperature two-thirds of the difference between it and the day temperature; thus, if the night temperaure is 52º and the day temperature 76º, the temperature for the correction computation will be 52º plus two-thirds of the difference (24), or 68º.

This applies only to calm weather, and not to a change of temperature due to the change of wind and weather.

Wind:

As a rule, the velocity of the wind increases from the ground upward, quite rapidly at first and then slowly. The variations are such that it is practically impossible to deduce the wind velocity of the upper air, through which a projectile must pass, from the surface velocity, as measured by the anemometer.

Moreover, the direction of the upper stratum of the atmosphere is not necessarily the same as the surface stratum, and the wind at 2000 feet may be blowing in quite a different direction.

The fact that a projectile, especially at the longer ranges, is subject to the influence of the wind at altitudes of from 3000 to 6000 feet makes the correctness of the data a matter of importance.

The direction and velocity of the wind should therefore be obtained from aviators or from the captive balloon sections.

Care of Matériel

CARRIAGES

WAR experience indicates that limbers and caissons are too often neglected. They should receive daily care.

Minute and frequent inspection of all matériel must be held. The daily inspection should verify the fact that the bearing surfaces of all instruments, sights and quadrants are scrupulously clean at all times.

Elevating and traversing gears should be operated to *their full extent* and oiled in the prescribed fashion.

All bronze and steel bearings, screws, racks, etc., should be carefully cleaned. All bearing surfaces should be cleaned and oiled. One should never find dirty black oil in elevating and traversing mechanisms. All loose screws and bolts should be tightened at once.

Verify the greasing of axles and repair and replace everything not in good condition. *Do not wait until parts are unserviceable*. Carelessness results in excessive demands on the parts, delay in delivery and harm to the interests of the Service in time of war.

Send to the parts promptly all parts replaced, in order that they may be utilized at the rear.

Keep cleaning material complete; renew the supply methodically and prevent waste. Use nothing but regulation matériel, *especially for recoil mechanism*.

Recoil mechanisms should be verified as often as the nature of the service permits. All cylinders lose more or less oil, which should be replaced at once. Recoil mechanisms, especially in the older matériel, are liable to be ruined if not properly filled.

That guns will function properly if given reasonable care is shown by the report, regarding field pieces, that "eight guns fired 6000 rounds in one day; one gun had fired 1000 rounds during a day; carriages with a continuous record of 13,000 rounds were in excellent condition. One battery, in the course of four hours, fired 1800 rounds, and the recoil mechanisms were functioning perfectly at the end of the day."

TUBES

When tubes are cleaned, cooled and properly cared for, and fire is conducted in such a manner that sections and platoons are rested alternately, they will last long under severe conditions. For example, one battery fired 3800 rounds in twenty-four hours—nearly 1000 rounds per gun—without wear, copper-fouling or change in the bore.

The rounds were fired as follows: 1200 rounds in four hours; 1000 rounds in two and one-half hours; 1200 rounds in three hours and 400 rounds in one hour.

Pack Saddles for Mountain Artillery

BY CAPTAIN LEROY P. COLLINS, 4TH FIELD ARTILLERY

AT this time, when the Army is being enlarged and equipment is being made in large quantities, it seems opportune to decide upon the best type of pack saddle for mountain artillery and pack trains. In my service with mountain artillery—about ten years—I have been of the opinion—and I believe this opinion is shared by the majority of officers who have served with it—that the present aparejo is not a satisfactory pack saddle. It is not satisfactory for the following reasons:

a. It requires the services of an expert to set it up.
b. It is too heavy.
c. It breaks down easily.

The relative importance of these faults is in the order named.

In the summer of 1912 the Fourth Field Artillery made an 844-mile march, accompanied by the Field Artillery Board, for the purpose of testing mountain artillery equipment. Battery C tested on this march some modified English pack saddles. The following is quoted from the report of (then) 1st Lieutenant L. J. McNair, Fourth Field Artillery, who commanded this battery:

"*Pack saddle:*

"It is understood that a decision has been made adopting the aparejo as the pack saddle of mountain artillery; and that this decision was imperative at this time in order that the reserve pack equipment may be manufactured. This decision, or rather the necessity for making it now, is regrettable.

"As between the two types of saddles used on the march, the aparejo and the English, in their present state, the decision is correct; although it cannot be denied that the condition generally of the animals carrying aparejos leaves much to be desired.

"But, if a pack saddle were possible:

"*a*. That would be taken new from shipping boxes and placed on a mule ready for service,

"*b*. That would carry loads, herded, up to the physical endurance of the animal without injury to the back,

"*c*. That had padding so simply arranged and so accessible that the pressure on sores (if from nothing more than a cactus prick) could be relieved by an enlisted man, without special skill,

"*d*. Whose padding was such that it could not be disarranged in rough handling by ship or rail,

"*e*. That could be placed on any mule in any condition of flesh without special arrangement of the padding,

"*f*. That is better adapted than the aparejo to carrying heavy top loads,

"*g*. That is a better hill climber,

"*h*. That could carry an effective load greater than 70 per cent. of the total load, such a saddle would be manifestly superior to the aparejo. From the experience of the march, it is believed that such a saddle is not impossible of attainment, or at least that it can be approached more nearly than the present type of aparejo.

"The forces acting on a pack saddle should be investigated theoretically and experimentally; and experimental saddles constructed and tested in as severe a manner as on this march. To proceed to the perfection of a type before the type is established as the best obtainable is unprogressive and unscientific. Such an investigation has not been made, as far as is known, in our service.

"The development of a modern weapon for mountain artillery has already been under way for some seven years. The pack saddle is as important, if not more so, than the weapon. Its investigation should be equally thorough, even though not necessarily as long."

I believe that the further test recommended by Captain McNair has never been made. There has always existed in our service a strong prejudice in favor of the aparejo to the exclusion of other types of pack saddles, probably due to the feeling that what was good enough for the old Army in its severe frontier service, is good enough for us. This feeling has been strengthened undoubtedly by the influence exerted on the army by the old time civilian pack masters. While no one denies that the aparejo has played an important rôle in our past history, yet the great number of sore backs, ensuing after a long march make it a matter of great importance that a pack saddle which is easier on a mule's back be adopted, if such a one exist or can be developed. Many mules returned from the march mentioned with holes in their sides which could not be covered by two hands and these were months in healing with no work.

I believe that the French pack saddle with rigid wooden tree padded on the under side is suitable for our use. I believe that one or more of these saddles were received by the Field Artillery Board at Fort Sill for test about two years ago. This saddle appears to be correct in principle as it is the reverse of the aparejo in that the greater the load

the looser it has to be cinched and it does not require an expert to adjust it to any mule's back. It is made of wood and canvas with scarcely any leather on it, which undoubtedly makes it cheaper to manufacture.

Definition of Terms

TRENCH warfare has evolved much of a special nature in the military literature which pertains to it. The exact use of terms applied with a technical meaning therefore becomes important, especially when met with in writings emanating from foreign sources, where the general usage may be perhaps somewhat different from our own. For the purpose of understanding British methods more thoroughly, the following list of terms frequently used, relating to their field artillery, is given below.

Map Range.—The distance from the gun to the target, measured on the map.

Gun Range.—The range on the sight or quadrant which gives effective fire on a target.

Normal Gun Range.—The gun range corrected to normal conditions for all the known variations due to atmospheric conditions, and for any variations due to other known influences.

Registered Range.—The range recorded by a B. C. during registration. The registered range will be the gun range corrected to normal atmospheric conditions, and adjusted, *if necessary*, by a gun correction to the calibration of the standard gun or guns.

Calibration Error.—The differences in the shooting of guns from their range-table form, due to wear of guns and mountings. This would be the difference between the map range and the normal gun range.

Zero Point.—The selected point or object on which the line of one gun is laid on to establish zero lines.

Zero Line.—The line of one gun in a zone from which all horizontal angles are measured.

Calibration Points.—Objectives of which the map range is accurately known, and which enables a B. C. to check the calibration corrections.

Atmospheric Error.—The difference in shooting due to variations from the normal atmospheric conditions, which are (for British calculations): temperature, 60º F.; barometer, 30 inches; wind, *nil*.

Gun Correction.—The correction in yards to adjust the calibration error of any individual gun to the standard calibration error of the battery.

This is the difference between the gun range of any individual gun and the gun range of the standard gun at the same target.

Datum Points.—Objectives which can be clearly seen and ranged upon, and of which the registered range is accurately known. They are used to check the atmospheric error immediately before shooting at other targets.

Frequently, in English writings on artillery, the abbreviation "O. P." is encountered. These are the initials for "Observation Point" and correspond to our term "B. C. Station" or any other observation station from which firing data may be calculated or the result of fire may be observed.

New and Ingenious Methods for Trench Warfare

THE weekly edition of the *London Times* recently contained the following article, which was contributed by its special correspondent:

"FRENCH HEADQUARTERS, July 22.

"Among recent developments in the science of war, both for attack and defense, the following three examples are, perhaps, the most interesting which have been devised by the enemy.

"The first is concerned with the composition and use of asphyxiating gases and gas shells. In order to exploit to the utmost this branch of offensive warfare, three special staffs have been formed of officers picked from the artillery in the field. They travel from one army corps to another, staying a week or ten days with each, partly to give instruction in the different ways of fighting with gas, and partly to study local conditions affecting its use.

"The second innovation is the use of smoke-producing machines for *camouflage* of batteries the position of which has been 'spotted' by our airmen. To protect the guns and their crews from bombs and shells, sites are prepared beforehand around the battery, not less than 270 yards from it and about ten yards apart, and when the need arises the smoke machines are placed in sites to windward so that the concealing cloud sweeps over the guns and hides them from our airmen.

"The third device is an ingenious method of establishing communication during an engagement by means of *nachrichtengeschosse*, or message projectiles, when telephone wires have been cut by heavy bombardment. There are two forms of these message carriers—(1) bombs for communication between the front line and battalion and regimental commanders, fired by grenade-guns with a range of 550 to 650 yards; (2) light shells for extending communication back from infantry and artillery commanders to brigade headquarters, fired from *Minenwerfer* with a range of 1300 yards."

New German Devices

THE following items were taken from the *Washington Evening Star* of August and relate to new schemes used by the Germans in conducting the war on the West Front.

EXPLOSIVE CAPSULES USED AS DECOY

The French War Office announces that the Germans have invented a new ruse to lull their opponents into belief that artillery batteries are still in position for action when actually they have been withdrawn, and by it to prevent untimely advances.

The device consists of a mechanism fitted with half a dozen globular capsules filled with an explosive which is placed on the site of the battery to be or being withdrawn. The capsules explode every thirty or forty seconds with a sound exactly like that of a field gun heard from a distance. They are said to lead a listener into thinking that he is still facing artillery.

SHELLS FILLED WITH LIQUID POISON

British medical officials are trying to determine the nature of the new poison used, it is believed, for the first time by the Germans on the French town Armentières, near the Belgian frontier. The poison bore a certain resemblance to the gas which temporarily blinded a large number of British troops a fortnight ago, but its effects are infinitely more serious.

A number of persons taken from Armentières are in a grave condition. Many have died in hospitals at Hazebrouck, Aire-on-the-Lys, and particularly at St. Pol-on-the-Ternoise, where most of the victims were taken.

The first time the new poison was observed it coincided with the firing into the town of a hail of small shells of a calibre insufficient to break the paving. These contain neither powder nor gas, but a colorless liquid which spreads over the soil. In the streets and in courtyards and gardens where the shells burst traces of the noxious liquid may be found hours afterward.

As the liquid evaporates it produces a heavy gas which penetrates from room to room and descends into cellars. It is tenacious in character and seems to make more victims among women than men, closing about their hair. The fumes of tobacco seem to act as an antidote in the case of men.

The odor is variably described as resembling that of acetylene, mignonette,

or pungent mustard. Its effects are not immediate. Some inhabitants of Armentières who inhaled the emanations in the forenoon returned home without experiencing any ill effects and took luncheon, but five or six hours later they were obliged to take to bed and their condition became rapidly worse.

The victims at first were affected in the bronchial tubes, then their eyes swelled, and eventually they lost their sight. These symptoms were accompanied by a feeling of burning inside and an incessant cough and fever. The skin turned an earthy color, and in several cases death followed rapidly. Occasionally, in addition to the symptoms mentioned, the victims were affected by terrible hallucinations and delirious laughter.

German Minenwerfer Emplacements

THESE days one hears various queries regarding trench mortars, particularly since it is expected that before long trench mortar batteries will be incorporated as a part of the field artillery assigned to the newly organized, smaller divisions. It has become a live subject for our field artillerymen

The days of the Civil War developed infantry entrenchments, and and the general use of trenches. Even before that came the Coehorn mortar, a forerunner of the various types of trench mortars in use to-day.

The magnitude of the undertaking among the warring nations in Europe, particularly on the West Front, has developed the trench mortar wonderfully, and there are now several classes of them, depending upon their size and the use to which they are to be put. We now find long trench mortars and short trench mortars; there are trench mortars that are properly classed as light, medium, or heavy, depending upon their calibre; and, in addition to all these are various devices for throwing bombs and mines, each having a particular place in the scheme of things and related more or less tactically and in fire technique to the trench mortar itself.

With the numerous types of mortars, it followed as a natural consequence that there should be many variations in the kinds of projectiles used. As a result, the latter vary in pattern from the spherical aerial mine (called "plum-puddings" by the English) to the heavy, elongated projectile, with ogival nose, equipped with vanes to steady it in its flight of very low velocity. Even the gas projectile has been developed for certain types of the trench mortar.

Aerial reconnaissance by direct observation and photography has

been so highly developed that a great deal of detailed attention is paid to the construction of the emplacements for the trench mortars.

That the Germans, with their characteristic thoroughness, have carefully screened their minenwerfers from aerial observation and direct attack is shown in the following descriptive note accompanied by sketches of the minenwerfer emplacements existing in a certain locality. A close study of the description of these emplacements in suggested with a view to having our artillerymen improve upon them in design.

EMPLACEMENT FOR A HEAVY OR MEDIUM MINENWERFER (SEE FIGURE 1)

On the right of the communication trench there is a shelter for the men. This is formed by a gallery 23 to 26 feet below the surface, with two outlets.

Opposite this shelter, a communication trench, provided with light cover, leads to the emplacement. In the middle of this communication trench there is a shelter for ammunition (a gallery 20 to 23 feet below the surface).

The emplacement is formed of three rows of tree trunks 4 to 6 inches in diameter. On the left of the emplacement there is a small recess for tools. On the right there is an ammunition recess in which about a dozen shells are always stored.

Behind the minenwerfer there is an exit *O* (generally masked by a tent-square) by which the minenwerfer, after being dismounted, is introduced into or removed from the emplacement by night, when it is necessary to change its position.

The shelter sometimes consists merely of an underground chamber placed at the end of a gallery opening on to a communication trench (see Figure 2).

This chamber is provided with an opening *A*, through which the projectile passes. This elongated opening, placed at a certain distance from a communication trench, is the only indication by which the existence of such a shelter can be ascertained from a photograph. shelter for the personnel.

EMPLACEMENT FOR A LIGHT MINENWERFER (SEE FIGURE 3)

The shelter is formed of one or two rows of tree trunks. As the minenwerfer never remains permanently in one position, the shelter is generally provided with light cover only, as is also the case with the

The shelter for the ammunition is formed by a gallery 10 to 13 feet below the surface.

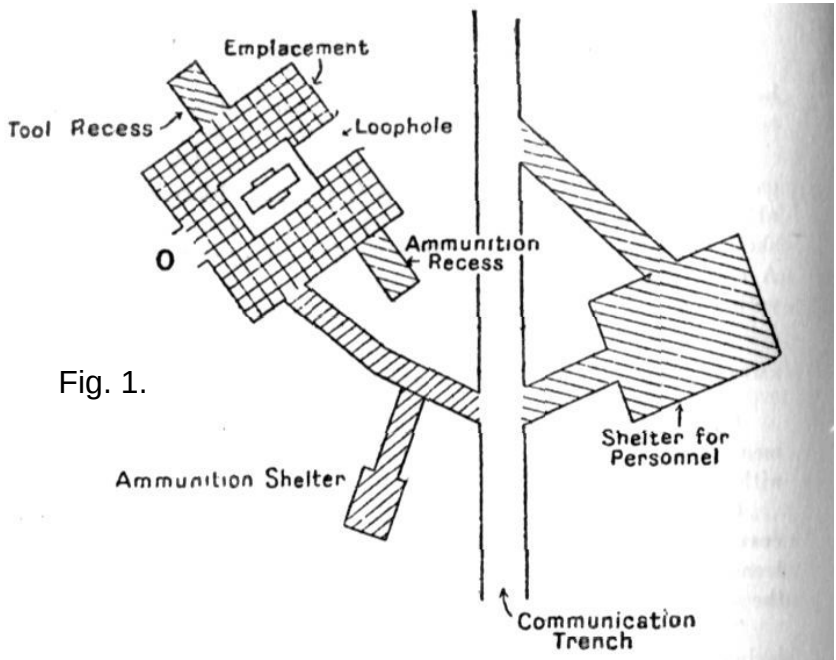


Fig. 1.

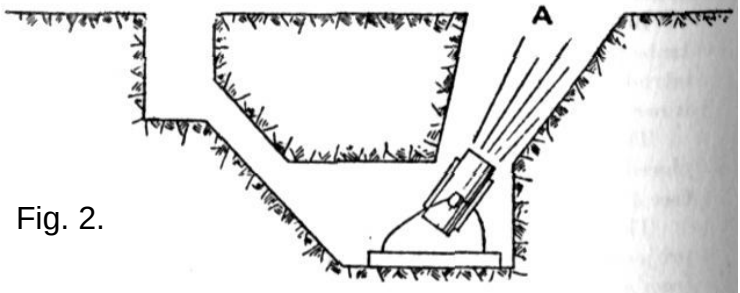


Fig. 2.

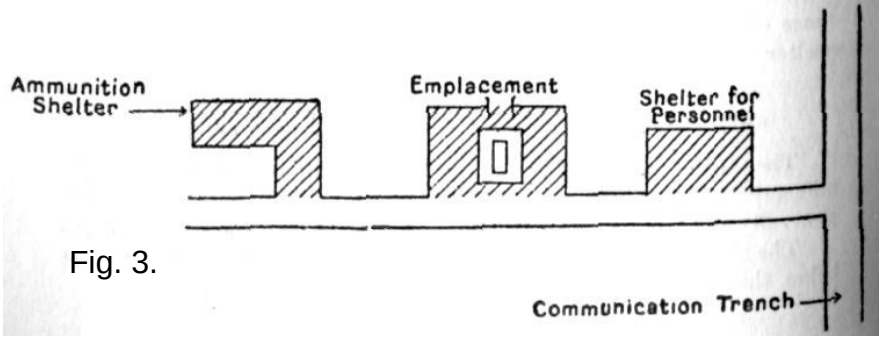


Fig. 3.

1-Metre Base Range Finders

Accuracy:

IN the special specifications governing the purchase and manufacture of 1-metre base range finders it is noted that the tolerance of accuracy of these instruments shall be as follows:

Range	Error
500 yards	5 yards
1,000 yards	10 yards
2,000 yards	50 yards
4,000 yards	100 yards
5,000 yards	150 yards
6,000 yards	200 yards
8,000 yards	400 yards
10,000 yards	500 yards

An experienced man will take ten readings in good weather to an easily recognizable target. The mean will be taken of this set of ten measurements. The deviations of the several single measurements from the obtained average are then added without regarding the algebraic signs and divided by the number of readings taken. The result is the average error of the setting, which must not exceed the values specified.

Dependability:

No one reading in the test for accuracy shall differ from the average reading by an error of more than 150 per cent. of the allowed errors for accuracy.

Durability:

The range finder shall be so solidly constructed as to stand field service, and the weight of the instrument complete, with carrying cases, shall not exceed 40 pounds.

It will be mounted on a jolting apparatus and jolted for two hours in each of two positions, the jolting to be so arranged as to give the instrument a drop of two inches under its own weight thirty times per minute. At the conclusion of this test the instrument should show no defects which will necessitate its being sent to an optical repair shop. Range readings will be taken by the instrument after adjustment, and the errors must be within the tolerances given above.

The instrument will be exposed five minutes to artificial rain. At the conclusion of the test no water must have penetrated into the interior of the instrument.

4.7 Howitzer, Railway Mount

THIS consists of a pedestal cast in the centre of, and integral with, a large rectangular base which is suspended between two railway trucks by a structural frame bolted to it at each end. These frames, extending well over the trucks, form platforms of a higher level and are protected by shields on the sides and end.

When travelling, the pedestal is five inches above the rails; but, when the howitzer is to be fired, the mount is lowered so that the pedestal rests directly on the rails. Two side arms on each side of the pedestal serve as outriggers and insure the stability of the mount when fired at low elevations, but under normal conditions the use of the side arms is unnecessary. Four pairs of rail hooks, located near the corners of the pedestal, grip the rail heads and prevent skidding along and lifting from the rails. The howitzer may be fired at all positions by using rail hooks only, but should not be fired in the raised position without the rail hooks, as too great strain is then placed on the mechanism. This may, however, be done in case of emergency. Stops are provided to prevent motion across the rails. The mount is elevated to the travelling position by two screw jacks located at the truck pintles.

Notes for Cavalry Regiments Organized as Field Artillery

PENDING the receipt of equipment, many expedients for battery training must be resorted to, and surprising results may be obtained if ingenuity is shown in improvising the various instruments for instruction. In the English Army many regiments had no matériel for as long as ten months, but were practically ready to fire when matériel was finally obtained.

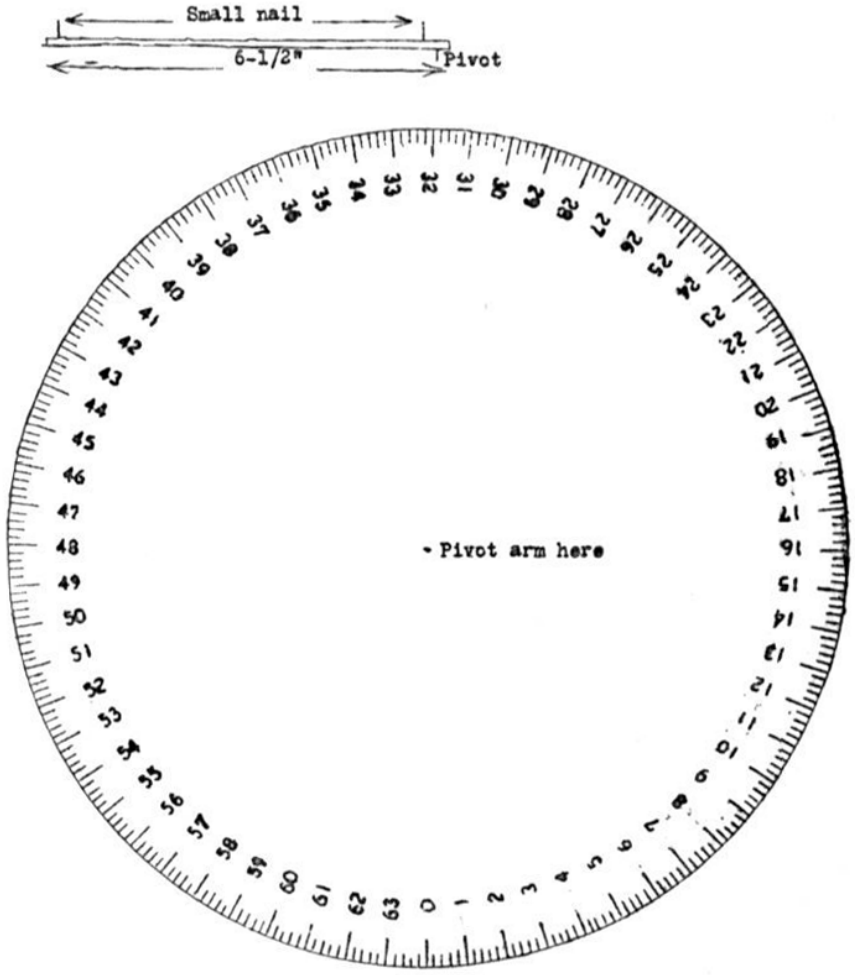
The training of the battery and battalion details can be practically completed without issue of the regular equipment. Battery commanders' rulers may be made by pasting slips, graduated in mils, on thin pieces of board, such as parts of cigar boxes, and attaching a cord to the middle. The graduations should be so made that the centre of the ruler is brought 20 inches from the eye when in use. A knot, tied in the cord at this distance from the ruler, is placed against the cheek-bone while measuring angles.

Every officer and member of the special details must know the International Morse Code. Improvised buzzers may be made with a telegraph key, an ordinary dry cell, and a small commercial buzzer.

For the training of the battery before the receipt of the equipment, all will depend upon the energy and the resourcefulness of the officers. Pair drill and drill of the pairs in teams can be carried on so that the

personnel becomes thoroughly familiar with the mounted drill, and, when carriages are received, no time need be lost in going at once to drill of the

TO REPRESENT IMPROVISED PANORAMIC SIGHT



Diameter 14 inches.

battery mounted. Escort wagons may be used to represent carriages, and the traces of lead and swing pairs fastened to the traces of pairs in rear by rope or baling wire. Drill of the gun squad can be

taught with escort wagons to represent carriages, and the cannoneers thus learn their posts both for the piece limbered and unlimbered. Great stress should be laid on having all movements at the carriages at double time. Too much attention cannot be paid to keeping the men on the alert, and to executing every movement with snap and vigor. Short drills, with the men kept energetically moving every minute, will accomplish far more than slow and long-drawn-out drills. Insist, therefore, upon a lively execution of every command. In setting off firing data, accuracy comes before speed, but consistent practice will bring necessary speed in this important duty, too.

To represent the gun unlimbered, take off the bed of the escort wagon, using the front wheels to represent the caisson and the rear wheels the gun. Put a log about eight inches in diameter and seven feet long on it to represent the gun, and in such a position that when the rear hounds rest on the ground the dummy gun is about horizontal.

For teaching gunners the mechanism of determining the data of their pieces, they may be placed four in a line to represent the four guns of the battery. Each gunner has pencil and paper. Firing data will then be announced by the instructor and each man taught to determine the proper deflection for his imaginary gun.

To represent the panoramic sight, cut a circular piece of board about 14 inches in diameter and graduate it as shown in the accompanying drawing. At its centre, pivot a small arm about 6½ inches long; place two pins, or small nails with their heads filed off near each end to use as sights. At the outer end of this arm drive a tack, or otherwise mark an index point, so that when the index is brought opposite any graduation on the board the gunner can, by sighting along the pins, lay the dummy gun with the proper deflection. Attach this board near the breech of the gun, so that it is approximately level.

Every man must know the semaphore code, and the B.C. detail must be expert in its use. The latter must be able to send the firing data with rapidity, both by semaphore and buzzer, and each officer and member of the details must be able to receive it.

In teaching evolutions of the battery mounted, small blocks may be used to represent gun carriages and placed to show them in the various battery formations.

EDITORIAL DEPARTMENT

The Artillery

IT must be with a profound feeling of professional pride that those of our arm read of the truly wonderful achievements secured by it in Europe. In varying forms we see it repeatedly expressed that, in modern battle, the great triumvirate consists of guns, aircraft, and infantry. We all know of the cavalry, being held in leash to give the *coup de grace* when the hostile line wavers, then fails, and is finally pierced; we know of the marvellous work performed by the engineers who construct, the supply departments which clothe and feed and pay, the sanitary troops which guard our physical well-being, and all of the auxiliaries which do their part in land operations. Also, we know, too, how the ever-patient infantryman, standing in the mud of trenches, the stench of dead bodies in his nostrils, bearing the rays of a mid-summer sun or the stinging hail of midwinter, the object of gas attacks and a deluge of projectiles, clinches the efforts of the artillery and in bodily contact drives the enemy from his stronghold. And, too, we know of what our daring pilots of the air are doing and how at great personal risk they disclose our targets and then direct our fire upon them. The knowledge of all these things permits us to survey the importance of the whole and to realize that each is but a working part of an intricate machine.

Out of France, from the British Headquarters, appearing in the *Washington Post* as an Associated Press despatch of July 1, came this message:

> "But after all is said and done, it has been guns and still more guns, shells and still more shells, that have turned the tide of war in favor of the entente allies.
>
> "The artillery has solved most of the problems of modern war. It was the artillery that blew the Germans

"from their grim grip on Vimy Ridge; it was the artillery "that shook them loose from their nearly three years' hold "on the high ground about Messines. It was the artillery "that shattered and crumpled the steel and concrete "defenses of the Hindenburg line from Arras nearly all the "way to Queant. It is the artillery to-day that is harassing "and pounding the Germans until they are fairly dazed "when the infantry attacks begin.

"The limited depth of the battles to-day is due to the "fact that the infantry must not get beyond the protecting "cover of their artillery. It was with their enormous guns, "which no other nation possessed, that the Germans "expected to blast their way to quick victory in 1914. Now "their military ambitions and their military prowess are "being dashed to pieces against the rocks of skilled "supremacy in guns and gunners."

Such an estimate of the artillery must be a spur to every thinking man and officer of our arm. What others have done we not only must do, but do equally as well; better, if we can. It is a reputation that must be sustained.

Yale and the Field Artillery

ALTHOUGH our arm is but one part of a great and complex organization for war, those of us who are in it are responsible for developing its efficiency to the greatest possible extent. Wherever interest and coöperation are shown, we should, as a whole, give our enthusiastic support, with a view to securing eventually for our army the very best that this great country of ours affords.

Bearing this in mind the Field Artillery should be deeply interested in the work which our colleges and universities accomplish in developing units of this branch in the Reserve Officers' Training Corps, and particularly just now, it is deserving that a great part of that interest should be centred at Yale University.

There, the future for field artillery training seems to promise very definite and far-reaching results. Systematic effort has crystallized into substantial development. This university has already spent more than $110,000 for a new armory and is spending, in addition, about $30,000 on a building specially adapted to indoor instruction in field artillery theory and practice. Besides all this, they have maintained horses for instruction at the expense of the University.

Originally Yale began its artillery coöperation with four batteries in the National Guard. The establishment of the Training Corps necessitated the disbanding of these units; but fruitful seed had been sown. Of about six hundred men encamped at Tobyhanna last summer more than five hundred of them were in the Officers' Training Camps in the month of July. What does this indicate? It means that Yale is giving, in the hour of need, men of intelligence and education, who are expanding their military professional attainments with the expectation of being officers, and, as such, necessarily leaders; it means, too, that Yale *esprit,* her marvellous enthusiasm and her traditions of patriotism are actually and materially permeating and furthering the development of the entire Field Artillery arm.

Yale already has cause to be proud of its accomplishments in its progress in field artillery matters; and, to her, in common with those colleges and universities which have contributed their part too toward the furnishing of the urgently needed educated war personnel, there will be a debt of appreciation and of gratitude that will ever be owed by our army and our country.

Organization and Training

SOME time ago, Hohenlohe, in his "Letters on Artillery," made use of an expression which has often been repeated by artillerymen, and has been considered the very essence of the result toward which the gunner strives. He said, in effect, "The

duties of artillery are three: the first is to hit, the second is to hit, and the third is to hit." Recently, one of our officers, in commenting upon the military situation abroad, from which he had obtained a first-hand view, said, also in effect, "Two fundamentals direct the military preparation; they are organization and training." Permit us to suggest one strong link—marching—and we may say the chain is completed, for we now have, as the most important initial parts, organization and training, and, for the culmination, marching and shooting. Of course, training may strictly be said to include the two latter divisions, although the idea that it is wished to convey here is rather their execution as a preliminary to, and a part of, the crucial test—battle.

To revert strictly to the utterance of our artilleryman, it is with a sense of some reassurance that we view the situation regarding the former feature, since it is believed that our organization for the basic units in our arm will need relatively few changes even to meet the peculiar conditions and phases of trench fighting. Of course, we must organize our trench mortar batteries and perhaps other more or less similar new units, but our fundamental organization for our light batteries seems, at present, satisfactory. So far, so good.

The problem of really massive proportions which confronts us is the matter of training. In the great army that is now being formed our diminutive Regular Army, as it existed before the war, is being engulfed. Had we but to consider the training of the enlisted men, the matter would shape itself nicely; but it is the training of hundreds of young officers that give the worry. Many of them have gone through an intensive course of a rather (for the field artillery) "get-rich-quick" nature, and have necessarily gained merely but a part of that knowledge that they must possess to be efficient instructors and leaders of the enlisted personnel. They will learn to shoot only by shooting, and, for that reason, we hope to see our School of Fire at Fort Sill greatly expanded, so that, eventually, we may send

them through that institution for qualification in such numbers that there will be two officers at least assigned to each battery who have had the benefit of that course prior to their trial in battle.

Our country, unprepared, should seize with avidity this opportunity for military training. It has so happened that, instead of ruined cities, cities held up for ransom, families losing their homes and household goods, and women being obliged to meet the disgusting horrors and cruelties of war, this great land has so far been spared these terrible things, these bitter deeds. But our troops are soon to witness war in all its frightful aspects, in a country stripped and ruined by the invader, and our soldiers should ever be impressed with the fact whenever energy and interest seem to lag, that if we are to be successful we cannot, even for a moment, ease up on ourselves in the training. It must be train, train, train constantly with the end in view of meeting our enemies physically fit, professionally able, and mentally prepared so that each and every one of us can give the very best that is in us for the decisive test. The task not only is not light, but it looms up in monstrous proportions. To meet an enemy who is not only fully prepared, but one who has remained for three years on foreign territory, is the labor that confronts us. We send our new troops against veterans. It is the full realization of these facts which must be constantly brought before our own troops in order that they must with grim determination maintain snap and vigor in the more elementary and monotonous drills after their interest or curiosity in them ceases. They should ever be taught that their own lives depend upon the perfection of their training, which, in the end, will permit them to overcome troops not so well trained.

Training brings with it something far more important than mere individual education. It must resolve itself into team work through and through. Team work for the artillery begins

in the gun-squad, each man helping to discover and correct errors, and, at the same time, striving to speed up his work and always helping his neighbors. Team work begins also among the drivers. Here lead and swing and wheel pair must work to conserve their forces, to develop their endurance, and to function properly in unison. Team work begins at once in camp. The dirty man must be taught to be clean for the safety of others, if he will not realize himself the comfort of cleanliness. A soldier indeed must be his brother's keeper. Team work must be initiated early between the B. C. detail and the firing battery. Team work ever must be the rule between the batteries in the perfection of the battalion. The ultimate development of team work is practically reached when perfect liaison and coördination are attained in all the elements of a division in combat problems both of maneuver and of trench tactics. How is this all to be secured? The answer is plain: it is to train, train, train.

A Chief of Field Artillery

THE policy of our nation is practically entrusted in the hands of one man. To him is given almost unlimited power, particularly in time of war. The destiny of a nation being given to one man, it is but natural that other subordinates should have complete power within their own sphere of action. This principle is followed throughout all the professional and business concerns of any magnitude in our country. Every organization has its head in whom final responsibility rests. Necessarily, all large concerns have not only their presidents, but their active managers, their heads of departments, and so on down. In our Government we have a subdivision of labors, and the same general idea is carried out in the existence of the War and Navy Departments, which represent its military establishment. But, within the Department which governs the interests of the Army at large, the system of having individual responsible heads does not apply throughout. The

special departments and corps (all solely auxiliaries of the mobile troops) whose existence is largely to pay, clothe, supply, regulate the laws, and to maintain the health of the combatants, all have their recognized single heads. Strange to say, at the head of the three great branches of the mobile army, we fail to find a chief responsible for the general supervision of the development, management, and coördination of the arm. The Army is without a system which permits an intimate knowledge of the professional attainments and most useful functions of its personnel.

Consider the case as it exists to-day. Part of the field artillery is three thousand miles away on the soil of France. These troops are undoubtedly under the direct supervision of the senior field artillery officer with them, and their movements are, of course, regulated by the indicated desires of the general commanding the forces in the field. Coördination (call it rather the advanced development of team-work) must play its great part in this war. The School of Fire at Fort Sill, the Artillery Board, the Field Artillery section of the Ordnance Department, the observation units of the Signal Corps, the training camps for field artillery officers, the field artillery in the divisions (whether of Regulars, National Army, or National Guard), the corps artillery, and the trench mortar batteries, together with all the remaining mobile artillery, *must* coöperate, must work for a common end and be in unison both at home and abroad in the design, development, training, and use of all parts. To establish, guide, and perfect a policy which will permit the proper combinations to be worked out would be to-day a great work for a chief of field artillery. The recommendations of the committees in the War College no doubt will point the way for solutions of the problems which arise, but would it not be far better to maintain an office of trained experts, of high rank, in a single arm to care for the technical problems of our own? The answer seems to lie in a comparison. In the Coast Artillery their well-established and maintained

office, with its efficient corps of assistants, has certainly been the ideal solution. To-day one frequently hears the query as to who regulates the policy of the Field Artillery as such. The answer, of course, is that to-day it has no head. It seems odd, too, for if we compare this arm again with the Coast Artillery, we find that proportionally it is an enormously greater proposition.

In any arm the disposition of the personnel is a great task, and, where there is an office which watches this detail closely, far more satisfactory results are bound to ensue. To obtain the greatest efficiency an officer should be assigned to duty that he can best perform. Daily, cases like the following arise: Lieutenant A—— is an expert on motor tractors and is to be assigned somewhere. Vacancies exist in both horse-drawn and tractor batteries. The assignment for him is plainly indicated—yet, having no chief, no office which goes into these matters, he may be put anywhere. Take a second case. Captain B—— is a lover of horses and an authority on breeding and related subjects. Are his talents and ability to be wasted by putting him in the trenches, say in charge of a mortar battery? Major C—— is a well-known writer on problems relating to gun-fire and an instructor of long standing in our School. Is he to be put in the ammunition train? Colonel D—— is peculiarly well fitted to command and has always maintained a unit favorably known for its probable fighting efficiency. Is he to be given a desk detail? Colonel E—— has long been connected with the Adjutant General's Department and is considered to be particularly able in such duties. Is he to be given charge of a remount station? And so we might go on relating the possibilities of failure to get the best results merely because the personnel was not coördinated. The proper caring for and suitable arrangement of several thousand officers of the field artillery will be an enormous task.

Handling of the personnel is but a small part of the duties properly given to such an office. Many problems might be

stated herein, but they must all be more or less apparent. Had we a Chief of Artillery, the coördination through other departments could be maintained. For instance, artillery officers of experience should determine what guns are to be used for a specific purpose and then collaborate with the Ordnance Department regarding their design and perhaps their delivery. The kind, quantity, and calibre needed should be regulated in general by the Chief of Field Artillery coördinating with others. And we might go on mentioning other problems for him to solve, but it surely seems that the one need alone of securing coördination among the widely distributed units of this extensive arm is great enough to cause to be initiated at least some temporary arrangement whereby an experienced field artillery officer will, to all practical intent, be given the power and assistance to establish and maintain an office as Chief of Field Artillery.

BOOK REVIEWS

NOTES ON TRAINING FIELD ARTILLERY DETAILS. Practical Instruction for Field Artillery Officers, Noncommissioned Officers, and Members of Special Details. By Captain Robert M. Danford, Field Artillery, United States Army, and Captain Onario Moretti, Field Artillery, United States Reserves. Yale University Press, New Haven, Connecticut. 275 pages. $2 net.

This book is prepared for the student, having been written in large, clear print as "a text to cover in a simple and thorough manner the subjects that were deemed essential in the education and training of the various members of the battery, battalion and regimental details," and, "intended as a guide and a text in mastering one of the most important and interesting phases of field artillery training."

The special details are the very life, heart, brain and nerve fibres of the central control system of the Field Artillery. They cannot be too highly trained. The trouble in the past has been to secure, in convenient form, an intimate description of the details of their duties and how to perform them. Failure to have such a manual, with lack of coördinated instruction, has, in some cases, resulted in lack of balance in these details, and has permitted gaps in their military education. The authors have gone a long way toward solving that difficulty by the detailed, careful explanations of the technique of the many duties which devolve upon these, our most technical, enlisted men.

An examination of the Table of Contents indicates that the following are some of the principal subjects treated: map reading; military sketches; elementary field gunnery; firing data records; auxiliary observers; blackboard method of fire; estimation of ranges; communication; duties of scouts, couriers and route markers; battalion reconnaissance problems; elementary probabilities; useful tables.

As a text for our Reserve Officers' Training Corps units this volume should receive official sanction; it should be of immense help to the student candidates in the training camps and be a valuable book of reference in the library of every field artillery officer.

We believe that the book can be improved by inserting a series of problems, based upon the range tables, showing the application of such corrections as pertain, say, to thermometric or barometric changes,

with a view to educating our details how to make range corrections in situations resulting from the conditions of trench warfare.

The least that could be said in regard to this book would be that the Field Artillery owe appreciation to Captains Danford and Moretti for placing in our hands such a valuable compilation and writing in such a convenient and interesting form for study.

This volume should be placed in the battery library for the use of our enlisted men and as a handy reference book.

FIELD GUNNERY. By Lieutenant Donald A. MacAlister, R. G. A. Preface by Captain Daniel W. Hand, United States Field Artillery. Published by George U. Harvey, New York City. 153 pages. Price $1.

To a field artillery man, accustomed to using mils and thinking almost solely in terms of mils, the manipulation of a system of angular measure involving radians, degrees, and minutes seems awkward indeed; hence it is probable that this feeling of lack of ease will make a deep impression upon any American field artillery officer who reads this little book for the first time. However, it may be said that diligence and application in the study of this volume will be repaid. The rehearsal in one's mind of the trigonometric relations governing the computation of firing data is brought about by the careful inspection of these pages, and, by this stimulation of thought certain good is accomplished. Then, too, we learn how others have discovered what, for them, are suitable ways, and we are enabled to grasp the situation from another viewpoint, all of which broadens our own field of perception.

It is with a sense of disappointment that we fail to find a description of some of the details of the use of the barrage; but, being a matter of technique, which is probably more or less confidential, we assume that it has, for that reason, been omitted.

Chapter VII, which discusses "Ranging and Methods of Fire," gives us some idea of English methods, which differ somewhat from our own.

If we are to fight side by side with the British troops, then we must learn how they do things in order that our coöperation may be the fullest. For that reason officers of the Field Artillery should thoroughly acquaint themselves with the details of British methods. No better way suggests itself at present that by reading texts with even meticulous care which elucidate the intimate points of the British

system. Bearing that in mind, it is suggested that the study of this volume will surely repay those who will so devote their time.

With a page about the size of that usually to be found in our own drill books, it makes it comfortable to carry in the pocket, especially since it is bound in flexible covers and has rounded edges.

SELECTIVE SERVICE MANUAL. By Captain A. L. James, Jr., 15th Cavalry, U. S. Army. Times-Mirror Printing and Binding House, Los Angeles, Calif. 262 pages.

The author says: "This little volume is prepared primarily for the benefit of the men who will be called to the colors. By a careful study of its contents before reporting for duty, they will get some idea of the primary training that will be given them, and by so doing they will not only greatly facilitate the work of their instructors, but also will make their own tasks much more simple. The man who knows even a little about the elementary work will be a shining light in a sea of darkness."

Roughly speaking, this book gives some eighty-five pages to physical training, about twenty-six to elementary infantry drill, close to a hundred to elementary cavalry drill, and practically all the rest is included in a chapter of general information gleaned from the following official publications, viz.: Cavalry Drill Regulations, Field Service Regulations, Signal Book of the U. S. Army, Infantry Drill Regulations, Army Regulations, and General Orders of the War Department.

As a whole the book is properly classed as a compilation of some of the more elementary portions of our standard official military publications, and, particularly so, to a large degree of the Manual of Physical Training, Infantry Drill Regulations, and Cavalry Drill Regulations.

There is a total omission of all items pertaining to Field Artillery, an arm that is supposed to coördinate most intimately with the Infantry. It would seem, since the publication is intended particularly for "the solution of the problem of training our New National Army," an army that is being raised primarily to fight the German enemy on French soil, under conditions demanding extensive use of artillery which will probably continue to be similar to the historical affairs of Verdun, Ypres, and Messines, that it is an omission so great that the book should be considered to have been written rather for those who ultimately expect to follow the Flag wearing either the yellow or light-blue hat-cord. For those who hope to serve with the Red Guidon in France, and to help batter the way through lines of concrete and miles of intricately laced

barbed-wire, so that our infantry may attack with success and minor losses, the study of elementary artillery matters is naturally recommended.

As the author further says, "This book will fit the pocket of the uniform and will therefore be no incumbrance to the man in training and can be referred to readily."

COMPLETE U. S. INFANTRY GUIDE. For Officers and Noncommisioned Officers. Arranged by Major James K. Parsons, United States Infantry. J. B. Lippincott Company, Philadelphia, Pa. Fully illustrated. 2176 pages. 8vo. Buckram binding. Price, $6 net.

This one book contains the following: Army Regulations, complete to changes 55; Infantry Drill Regulations, complete to changes 18; Manual of Physical Training, selected; Manual of Interior Guard Duty, complete to changes 1; Personal Hygiene and First Aid, selected; Signal Book, selected; Regulations for Field Maneuvers, complete; Army Ration Issue and Conversion Tables, complete; Automatic Pistol, complete; Instruction for Care and Repair of Small Arms and Ordnance Equipment, complete; United States Rifle, Model 1903, complete; Instructions for Assembling the Infantry Equipment, complete; Small Arms Firing Manual, complete for Infantry, to changes 16; General Orders, Circulars and Bulletins of the War Department, selected, to General Order 35 and Bulletin 16, 1917; Engineer Field Manual, Parts I, II, III, V and VI, selected; Manual of Courts-Martial, complete; Field Service Regulations, complete to changes 5; Rules of Land Warfare, complete except text of treaties and conventions in Appendix; Infantry Unit Accountability Equipment Manual, complete for war strength; Regulations for the Uniform of the U. S. Army, complete to changes 18; Infantry Drill Regulations for Automatic Machine Rifle, complete to changes 1; Field Firing and the Proficiency Test, complete; Extracts from Tables of Organization, 1917; Model Remarks for Muster Rolls, complete; Manual of the Bayonet, complete. All of these are reprinted from Government publications.

When one considers that the essential parts of twenty-five official books are contained in this single volume prepared for the use of the infantryman, this fact alone will commend the work to its place as a handy book of reference on the desk of the Supply Officer, the Adjutant, the Commanding Officer, the Company Commander, and the First Sergeant.

In camp there is always difficulty in obtaining publications relating

to the many military subjects that enlisted men and officers are both obliged to familiarize themselves with to a greater or less degree. This book solves the problem, whether it be needed for reference, for study, or for general information. It saves, too, numerous books lying around and which may be easily mislaid. When transportation allowances are small, it also permits saving in weight.

It is believed that there is a special use for this book. Many new units of the National Army are at present being brought into existence, and with them the larger number of their officers will be men of little military training and who, perhaps, do not know where to go to get military information. With this book at their side, in their cantonments, a rough way will be made easier and the individuals concerned will feel well repaid for the money invested in the possession of the book, feeling that they have all that is necessary for a beginning at least.

The name is well selected. It is but a guide. That fact alone, and a view of the book, should so impress the young officer of the type who pretends to know it all that he will be less liable to make the mistake of believing that the military profession is one to be mastered in a few days.

The actual use of the volume is assisted by the complete index, which is arranged to show both page and paragraph of the subject discussed.

SEMAPHORE SIGNALING SIMPLIFIED. A Progressive System. Prepared by Captain Clarence Deems, Jr., 6th United States Field Artillery. The Edward T. Miller Company, Columbus, Ohio. Price, 25 cents. Second edition.

In ten coördinated lessons this booklet opens the way for instructor and student alike to grasp the essential principles, and have a real working knowledge of this kind of communication. It was written for the National Guard, with a view to utilizing fully, in consecutive instruction, the short time that they could allot from the legitimate duties of their business or profession. It has to-day the special value of conciseness, and can be particularly useful in assisting the active training of so many wholly new units, and particularly the personnel of the National Army. The daily exercises are so arranged as to take up new matter and to keep fresh in the mind of the student, by constant review, what he has already learned.

The publishers state that this pamphlet has been so popular that it is now going into the third edition.

FUNDAMENTALS OF MILITARY SERVICE. By Captain Lincoln C. Andrews, United States Cavalry. Prepared under the supervision of Major General Leonard Wood, U. S. Army. J. B. Lippincott Company, Philadelphia, Pa. 428 pages.

Published in February, 1916, this book has already been reprinted four times. Its place in current military literature is now established.

Its special chapters relating to the Engineer Corps, the Coast Artillery, the Infantry, the Signal Corps, and the Field Artillery, written by officers of these various branches of the Service, enhance its value and add to its interest.

To quote the author in his preface, "An honest performance of the duties of citizenship demands, first, that each citizen shall learn enough about the military service and its needs to give him an *intelligent opinion* thereon; and, second, that each youth shall prepare himself reasonably to meet his individual responsibilities as a citizen soldier. Thus alone we may avoid having to go to war amidst such unpreparedness as must result in national humiliation, with wholesale loss of life and treasure.

This book is designed to supply the means for attaining these qualifications for citizenship, to place in one volume the fundamentals of military service, its meanings and its requirements."

The young candidate in a training camp or the officer about to join his regiment for the first time can well afford to study this book most carefully. He should read over and over again the chapters on Psychology of the Service and Military Training, and, after thoroughly digesting their contents, should not be content until he is able to apply their lessons successfully when assuming the part of an instructor.

Fundamentals in the military service are not only equally as important as elsewhere, but probably are properly considered even of greater importance, since the correct place for their application is in war—a game of honor as well as of life and treasure. The subjects treated are truly fundamentals, the very subjects that demand the most accurate and intimate knowledge and execution. Such being the case, the book should be of special value as a text in colleges and universities where military training is a part of the curriculum.

Index to Current Field Artillery Literature

Compiled from monthly list of military information carded from books, periodicals and other sources furnished by the War College Division, General Staff.

Officers requesting information will please give the number of the entry and the date of the list. For officers on duty in Washington, D. C., a formal call is not necessary; a telephone call will be sufficient. When a book is called for, the title and author will be given in the language in which it is printed. The material here listed is not available for general loan outside of the U. S. Army.

Accounts—United States.—A method for the prompt equipping of reserves, simplifying the accounting for property and for reducing army paper work. By Captain W. J. Browne, Philippine Scouts. (Journal of the Military Service Institution of the United States, March-April, 1917, p. 195.)

Aerial navigation—United States.—Aerial navigation over water by Elmer A. Sperry. (Journal of the United States Artillery, March–April, 1917, pp. 225–237.)

Aerial navigation—United States.—What is being done at the Mineola army aviation school in the way of laying a substantial foundation for America's air fleet. Illustrated. (Scientific American, February 17, 1917, p. 170.)

Aerial warfare—European war.—Aviation on the western front. In English army—Organization, types of machines, armament, pilotage, etc. In French and German armies—Names, speed and lifting data of principal types seen on this front. (La Guerra y su Preparacion, February, 1917, pp. 117–137.)

Aeronautics—United States.—Senate bill 80 proposes to establish a department of aeronautics. (Army and Navy Journal, April 14, 1917, p. 1047.)

Aeroplanes.—Military observation balloons. Their advantages over airplanes. (The Field Artillery Journal, January-March, 1917, pp. 15–20.)

Aeroplanes—United States.—Illustrations showing American battle planes. Illustrations. (Aerial Age Weekly, April 16, 1917, p. 142.)

Aeroplanes—United States.—Specifications of American airplanes. (Motor Age, February 10, 1917, p. 25.)

Aircraft.—Distant control of aircraft by whistling. Diagram of device. (Scientific American Supplement, No. 2155, April 21, 1917, p. 245.)

Aircraft, defense by.—Value of aircraft in combating submarines. (The Navy and Merchant Marine, April, 1917, pp. 57–59.)

Aircraft—United States.—Development of new types of aircraft. Problems of aircraft. Illustrated. (American Machinist, April 19, 1917, pp. 661–666.)

Ammunition, artillery.—A unit system for the packing and handling of artillery ammunition. Illustrated. (Scientific American, April 21, 1917, p. 385.)

Ammunition—Expended in battle—European war.—General Sixt von Arnim's report concerning battle of the Somme and showing the amount of artillery ammunition expended in any one day of 4 hours and average daily expenditure during entire month of July, 1916. (The Artillery Journal, January-March, 1917, p. 31.)

Ammunition—Germany.—Study of German supply of cotton linters and ammunition supplies as compared with the Allies. (The Military Historian and Economist, April, 1917, pp. 218–223.)

Ammunition—Mexico.—Methods of smuggling ammunition from the United States into Mexico. Legal situation which permits smuggling. (The Saturday Evening Post, April 21, 1917, p. 29.)

Ammunition, artillery—United States.—Total amount and value of field artillery ammunition which ought to be accumulated in anticipation of the possible breaking out of war; degree of completion, etc. Letter of the Secretary of War, January 23, 1917. (Congressional Record, February 27, 1917, p. 4999.)

Anti-aircraft defenses.—Anti-aircraft defenses for coast fortifications. By Major Thomas Q. Ashburn, C.A.C. (Journal of the United States Artillery, pp. 166–173.)

Anti-balloon guns.—Sights for anti-aircraft guns. (Translation from the Technische Rundschau, a supplement of the Berliner Tageblatt, 1917. Filed Envelope case—Anti-balloon guns.)

Armament—European war.—Plea for the standardization of munitions and reasons why the United States should use ammunition, guns, etc., of the Allies. (National Service, May, 1917, p. 222.)

Armies—Canada.—Objections to volunteer system as a result of recruiting experience in Canada. (Congressional Record, April 30, 1917, p. 1575.)

Armies—Canada.—Status of Canadian militia and availability to conscription by order to that effect. (The Canadian Annual Review, 1915, p. 224. Filed F 1008 C 28 1915.)

Armies, cost of.—Cost of armies per unit of fighting force. Table. (Congressional Record, April 18, 1917, p. 819. JRS.)

Armies—France.—Experience from France shows that men from 18 to 30 are best able to stand the strain of infantry. Men older break down faster. (Congressional Record, April 21, 1917, p. 927.)

Armies—France.—Notes on the organization of the French sanitary service in the European war. (The Military Surgeon, May, 1917, p. 531.)

Armies—France.—Passage from professional army of 1831 to universal service of 1917. Survivals of professional army. History. (Clipping from La France Militaire, February 10, 1917. Filed Envelope Case—Armies—France.)

Armies—Germany.—Discipline and conditions in German Army during European war. (Clipping from La France Militaire, February 10, 1917. Filed Envelope Case—Armies—Germany.)

Armies—Mexico.—Pictures showing Mexican Army. (Revista del Ejercito y Marina (Mexico), January, 1917, p. 84.)

Armies—Roumania.—Strength, organization, etc., of Roumanian Army. (Revista Militar (Argentine), January, 1917, p. 57.)

Armies—Russia.—Standing army of 1905 compared with democratic army of 1917. (The World's Work, May, 1917, p. 19.)

Armies—Spain.—Reorganization of the Spanish Army, 1916. (Revista Militar (Portugal), February, 1917, p. 81.)

Armies—Switzerland.—Foreign militias. A chronological essay on Swiss artillery. (Journal of the Military Service Institution of the United States, March-April, 1917, p. 205.)

Armies—Switzerland.—Organization and training of the Swiss Army. By Theodore A. Christen. (National Service, May, 1917, p. 204.)

Armies—United States.—"A comparative study of the United States Army." Inspections by the Inspector General's Department illogical and unmilitary. Foreign methods compared with American methods. Article by George Nestler Tricoche. (Infantry Journal, April, 1917, p. 615.)

Armies—United States.—Making ready the Army. By Newton D. Baker. (The Independent, April 14, 1917, p. 109.)

Armies—United States.—Number of volunteers and regulars in each of the five great wars in which the United States was engaged. (Congressional Record, April 23, 1917, p. 947.)

Armies—United States.—Organization of the United States Army for the German-American war. How to profit from British mistakes in 1914. By S. Brooks. (The Independent, April 14, 1917, p. 117.)

Armies—United States.—The President's military policy and what it means. By Colonel X. (National Service, May, 1917, p. 199.)

Armies—United States.—Recruiting the United States Army for the German-American war. Recommendations based on British experience. (The Independent, April 14, 1917, p. 117.)

Armies—United States.—Suggested change in tactical organization of the United States Army. Reasons for suggesting a large division and field army. (The Military Historian and Economist, April, 1917, pp. 229–240.)

Armies—United States.—Statement and analysis of Senate Bill 1871 to increase temporarily the military establishment of the United States. (Congressional Record, April 21, 1917, p. 920.)

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